CONTRACT DOCUMENTS

For the Construction of the

TOHOPEKALIGA WATER AUTHORITY

OAKWOOD DR. GRAVITY SEWER REHABILITATION PROJECT

CONTRACTING REQUIREMENTS
TECHNICAL SPECIFICATIONS

SEPTEMBER 2018

Prepared For:

Toho Water Authority

Prepared By:

TETRA TECH

Tetra Tech, Inc.
201 East Pine Street, Suite 1000
Orlando, FL 32801
(407) 839-3955

Tetra Tech #200-08466-18010

NOT FOR CONSTRUCTION

Bid Set Submittal

TABLE OF CONTENTS

DIVISION 0	BIDDING AND CONTRACT REQUIREMENTS	PAGE	
00030	Invitation for Bid	00030-1	
00100	Instruction to Bidders	00100-1	
00300	Bid Form	00300-1	❸
00300	Bid Bond	00300-1	
00310	Affidavit of Non-Collusion and Non-Interest of TWA Employees	00310-1	
00330	Sworn Statement Under Section 287.133(3)(a), Florida Statutes on Public Entity Crimes	00330-1	
00420	Questionnaire	00420-1	
00500	Agreement	00500-1	
00520	Florida Trench Safety Act	00520-1	
00610	Performance Bond	00610-1	
00620	Payment Bond	00620-1	
00700	General Conditions	00700-1	
00800	Supplementary Conditions	00800-1	
00910	Notice of Award	00910-1	
00920	Notice to Proceed	00920-1	
00930	Change Order Form	00930-1	
00940	Application for Payment Form	00940-1	
00950	Request for Information Form	00950-1	
00965	Schedule of Values	00965-1	
00980	Certificate of Substantial Completion	00980-1	
00990	Certificate of Final Inspection	00990-1	
00995	Contractor's Release	00995-1	

DIVISION 1	GENERAL REQUIREMENTS	PAGE	
01000	Index of Drawings	01000-1	
01010	Summary of Work	01010-1	
01041	Project Coordination	01041-1	
01050	Field Engineering & Controls	01050-1	
01070	Abbreviations	01070-1	
01150	Measurement and Payment	01150-1	❸
01152	Applications for Progress Payments	01152-1	
01200	Project Meetings	01200-1	
01310	Project Schedule Using CPM Network Analysis	01310-1	
01340	Shop Drawings and Submittals	01340-1	
01370	Schedule of Values	01370-1	
01380	Construction Photographs and Preconstruction Audio-Video	01380-1	
01410	Testing and Testing Laboratory Services	01410-1	
01500	Construction Facilities and Temporary Controls	01500-1	
01568	Temporary Erosion and Sedimentation Control	01568-1	
01570	Traffic Regulation	01570-1	
01580	Project Signs	01580-1	
01600	Materials and Equipment	01600-1	

01700	Contract Closeout	01700-1
01710	Project Housekeeping	01710-1
01720	Project Record Documents	01720-1
01740	Warranties and Bonds	01740-1
DIVISION 2	**SITEWORK**	**PAGE**
02050	Demolition and Maintenance of Service During Construction	02050-1
02080	Abandonment, Removal, and Salvage or Disposal of Existing Pipe	02080-1
02110	Clearing, Grubbing, and Stripping	02110-1
02140	Dewatering	02140-1
02220	Excavation, Backfilling, and Compaction	02220-1
02516	Collection System Bypass	02516-1
02574	Pavement/Other Removal and Replacements	02574-1
02761	Cleaning Sanitary Sewer Systems	02761-1
02762	Televising Sanitary Sewer Systems	02762-1
02764	Televising Existing Manholes	02764-1
02771	Cure-In-Place Pipe for Sanitary Sewer Renewal	02771-1
02774	Wastewater Gravity Collection System	02774-1
02775	Wastewater Manhole Rehabilitation	02775-1
02822	Loaming and Sodding	02822-1
DIVISION 3	**CONCRETE**	**PAGE**
03300	Cast-In-Place Concrete	03300-1
03410	Precast Concrete Structures	03410-1
DIVISION 4	**MASONRY**	
04230	Reinforced Unit Masonry	04230-1

DIVISIONS 5-8 (NOT USED)

DIVISION 9	**PAINTINGS AND COATINGS**	
09220	CEMENT PLASTER (STUCCO)	09220-1

DIVISIONS 10-14 (NOT USED)

DIVISION 15	**MECHANICAL**	**PAGE**
15050	Utility Piping, Fittings, Valves, and Accessories	15050-1
15064	Polyvinyl Chloride (PVC) Pipe and Fittings	15064-1

DIVISION 16 (NOT USED)

APPENDICES

APPENDIX A: APPROVED MANUFACTURERS AND MATERIALS
APPENDIX B: RECORD DRAWING ACCURACY TABLE
APPENDIX C: COORDINATE ASSET TABLE TEMPLATE
APPENDIX D: WARRANTY FOR COATINGS AND LINERS TEMPLATE
APPENDIX E: GEOTECHNICAL REPORT
APPENDIX F: CONTAMINATED SITES SUMMARY

DIVISION 0
BIDDING AND CONTRACT REQUIREMENTS

SECTION 00030
INVITATION FOR BID

NOTICE IS HEREBY GIVEN Tohopekaliga Water Authority (TWA) will receive sealed Bids until 1:30 PM on August 11, 2017 for TWA Oakwood Dr. Gravity Sewer Rehabilitation Project, which includes furnishing all labor, equipment and materials necessary to: Replace gravity sewer mains, laterals, and manholes, and rehabilitate gravity sewer mains and laterals by Cured-In-Place-Pipe (CIPP) lining, and rehabilitate manholes by sealing and coating, at along Oakwood Drive.

Prospective bidders may obtain drawings and proposal forms at no charge through DemandStar (www.demandstar.com) or Vendor Link (www.myvendorlink.com).

Bid documents will be available on XXXXXXX.

Questions shall be submitted to Felicia Holmes, Procurement Manager at fholmes@tohowater.com. Deadline for questions shall be August 4, 2017 at 5:00 p.m.

The successful contractor will be required to furnish a Public Construction, Performance and Bid Bond as described in the Contract Documents.

Two (2) hard copies and one (1) PDF copy of the BIDS shall be submitted in a sealed envelope, plainly marked on the outside:

"SEALED BID FOR TOHOPEKALIGA WATER AUTHORITY OAKWOOD DR. GRAVITY SEWER REHABILITATION PROJECT"

Sealed bids should be submitted to the following address:

Tohopekaliga Water Authority
Procurement Services Warehouse
Attention: Felicia Holmes, Procurement Manager
1628 S. John Young Parkway
Kissimmee, Florida 34741

Directions to TWA's Procurement Services Warehouse: From US 192, take John Young Parkway south; turn right onto Mohawk Drive just south of RaceTrac; continue straight onto Toho Water Authority's property to stop sign, then turn right; follow signs to Warehouse Building.

Immediately following, or as soon thereafter, the time above shown, the proposals received will be publicly opened and read. Late bids will not be opened.

SECTION 00100
INSTRUCTION TO BIDDERS

ARTICLE 1 - DEFINED TERMS

Terms used in these "INSTRUCTION TO BIDDERS" which are defined in the General Conditions have the meanings assigned to them in the General Conditions

ARTICLE 2 - COPIES OF BIDDING DOCUMENTS

2.1 Complete sets of the Bidding Documents may be obtained in the manner defined in the Invitation for Bids.

2.2 Complete sets of Bidding Documents shall be used in preparing Bids; neither TWA nor ENGINEER nor DESIGN ENGINEER assume any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.

2.3 TWA in making copies of Bidding Documents available on the above terms does so only for the purpose of obtaining Bids on the Work and does not confer a license or grant for any other use.

ARTICLE 3 - QUALIFICATION OF BIDDERS

Each Bid must either contain evidence of the Bidder's qualifications to do business in the State of Florida or covenant to obtain such qualification prior to award of the contract.

To demonstrate qualifications to perform the Work, each Bidder must submit with their bid package, information including, but not limited to; previous experience and qualifications per Section 00400 - *Qualifications* and Section 00420 – *Questionnaire,* including references and evidence of authority to conduct business in the jurisdiction where the Project is located. This information must be received by TWA with the bid submittal. Submittals requested pursuant to this paragraph are in addition to those required elsewhere.

ARTICLE 4 - EXAMINATION OF CONTRACT DOCUMENTS AND SITE

4.1 Before submitting a Bid, each Bidder must (a) examine the Contract Documents thoroughly; and (b) visit the site to familiarize himself with local conditions that may in any manner affect cost, progress or performance of the Work; and (c) familiarize himself with federal, state and local laws, ordinance, rules, regulations and policies that may in any manner affect cost, progress or performance of the Work; and (d) satisfy himself with traffic maintenance requirements for each road including temporary roads, flagmen, police officers, or any other requirements; and (d) study and carefully correlate Bidder's observations with the Contract Documents; and (e) make written requests for interpretations promptly after discovering any conflicts, errors, ambiguities, omissions or inconsistencies.

4.2 Reference is made to the General Requirements for the identification of those reports of investigations and tests of subsurface and latent physical conditions at the site or otherwise affecting cost, progress or performance of the Work which have been relied upon by DESIGN ENGINEER in preparing the Drawings and Specifications. TWA shall make copies of such reports available to any Bidder requesting them. These reports are not guaranteed as to accuracy or completeness, nor are they part of the Contract Documents; they are provided for guidance only. If this information is used by Bidder in preparing his proposal, he shall assume all risks resulting from actual conditions differing from the conditions set out in the reports.

4.3 When a log of test borings showing a record of the data obtained by the investigation of subsurface conditions by the TWA, the DESIGN ENGINEER or their consultants is included with the plans or other documents, it is expressly understood and agreed that said log of test borings does not constitute a part of the contract, represents only the opinion of the TWA, or the DESIGN ENGINEER or their consultants as to the character of the materials encountered by them in the test borings, is included in the plans or other documents only for the convenience of bidders, and its use is subject to all of the conditions and limitations set forth in this article. If this information is used by Bidder in preparing his proposal, he shall assume all risks resulting from actual conditions differing from the conditions set out in the reports.

4.4 Before submitting a Bid, each Bidder shall, at Bidder's own expense, make or obtain any additional investigations, examinations, explorations and tests and obtain any additional information which pertain to the physical conditions (surface, subsurface and Underground Facilities) at or contiguous to the site or otherwise which may affect cost, progress or performance of the Work and which Bidder deems necessary to determine its Bid for performing the Work in accordance with the time, price and other terms and conditions of the Contract Documents.

4.5 On request, TWA will attempt to provide each Bidder reasonable access to TWA owned sites to conduct such investigations and tests as each Bidder deems necessary for submission of his Bid. If access is provided, Bidder shall restore site to condition existing prior to conducting said investigations and tests.

4.6 The lands upon which the Work is to be performed, rights-of-way for access thereto and other lands designated for use by CONTRACTOR in performing the Work are identified in the Contract Documents. All additional lands and access thereto required for temporary construction facilities or storage of materials and equipment are to be provided by Contractor at no additional cost to TWA.

4.7 The submission of a Bid shall constitute a conclusive representation by the Bidder that he has complied with every requirement of this Article 4 and that the Contract Documents are sufficient in scope and detail to indicate and convey understanding of all terms and conditions for performance of the Work.

4.8 The submission of the Bid shall be an indication that the Bidder has considered normal local weather conditions (daily and monthly variations) for the previous ten years from the date of the Bid as compiled by the National Weather Service and measured at Orlando International Airport.

ARTICLE 5 - INTERPRETATIONS

All questions about the meaning or intent of the Contract Documents shall be submitted to the attention of the Design Engineer. Bidders are required to advise the Design Engineer and TWA of any conflicts in the Contract Documents or any discrepancies between conditions noted at the project site and those shown on the Drawings or described in the Specifications. Replies will be issued by Addenda mailed or delivered to all parties recorded by TWA as having received the Bidding Documents. Questions received less than three days prior to the date for the opening of Bids shall not be answered. Only questions answered by formal written Addenda shall be binding. Oral and other interpretations or clarifications will be without legal effect.

ARTICLE 6 - BID SECURITY

6.1 Bid Security shall be made payable to TWA, in an amount of five percent of the Bidder's maximum utility Bid price and in the form of a certified or cashier's check, a Bid Bond on the form provided

(or substantial equivalent) issued by a Surety meeting the requirements of paragraph 5.1 of the General Conditions, or other security as provided by law.

6.2 The Bid Security of the Low Bidder shall be retained until such Bidder has executed the Agreement, furnished the required Contract Security, and the Insurance Certificates, and complied with all applicable requirements, whereupon it will be returned; if the Low Bidder fails to execute and deliver the Agreement or furnish the required Contract Security and the Insurance Certificates, and complied with all applicable requirements within fifteen (15) days of the Notice of Award, TWA may annul the Notice of Award and the Bid Security of that Bidder may be forfeited.

The Bid Security of any Bidder whom TWA believes to have a reasonable chance of receiving the award may be retained by TWA until the earlier of the seventh day after the "effective date of the Agreement" (which term is defined in the General Conditions) or the ninety-first day after the Bid opening. Bid security of other Bidders may be returned within seven days of the Bid opening.

ARTICLE 7 - CONTRACT TIME

The time of completion is the essence of the contract, and the Bidder awarded the Contract shall proceed with the Work in accordance with the Contract time period specified in the Contract Documents. In the event of failure to complete the Work within the time specified, the TWA may assess damages as provided by law or the Contract Documents, unless an appropriate extension of time has been granted by the TWA.

ARTICLE 8 - LIQUIDATED DAMAGES

Provisions for liquidated damages, if any, are set forth in the Bid Form and Supplementary Conditions.

ARTICLE 9 - SUBSTITUTE MATERIAL AND EQUIPMENT

The Contract, if awarded, will be on the basis of material and equipment described in the Drawings or specified in the Specifications without consideration of possible substitute or "or-equal" items. Whenever it is indicated in the Drawings or specified in the Specifications that a substitute or "or-equal" item of material or equipment may be furnished or used by CONTRACTOR if acceptable to ENGINEER, application for such acceptance will not be considered by ENGINEER until after the "effective date of the Agreement." The procedure for submittal of any such application by CONTRACTOR and consideration by ENGINEER is set forth in Paragraphs 6.7, 6.7.1, 6.7.3 of the General Conditions which may be supplemented in the General Requirements. If a substitution list is provided as part of the prescribed Bid Form, Bidders must identify proposed substitute materials and a deductive amount representing 50 percent of the cost difference between the specified item and the proposed item. These substitute materials and equipment shall be evaluated after "effective date of the Agreement." In all cases, the Low Bidder shall be determined on the basis of the Base Bid which shall reflect the cost for the materials and equipment specified.

ARTICLE 10 - SUBCONTRACTORS, ETC.

10.1 The TWA shall receive from the Apparent Low Bidder (or the Low Bidder), within ten days after receipt of written notification by TWA, a list of all Subcontractors and other persons and organizations, including those who are to furnish the principal items of material and equipment. This list shall include the name and address of the Subcontractor, person or organization, a description of the services, materials or equipment to be supplied, estimated time required for the preparation and submittal of shop drawings, and estimated lead times required for the fabrication of any long lead items and concurrence thereof. Such list shall be accompanied by a statement of experience with pertinent information as to similar projects and other evidence of qualification for each such Subcontractor, person or organization. If TWA or ENGINEER has reasonable objection to any proposed Subcontractor, other person or organization, either may, before the Notice of

Award, request the Apparent Low Bidder (or the Low Bidder) to submit an acceptable substitute without an increase in Bid price. If the Apparent Low Bidder (or the Low Bidder) declines to make any such substitution, the contract may not be awarded to such Bidder at the TWA's sole discretion, but his declining to make any such substitution may not constitute grounds for sacrificing his Bid Security. Any Subcontractor, other person or organization so listed and to whom TWA or ENGINEER does not make written objection prior to the Notice of Award will be deemed acceptable to TWA and ENGINEER, but TWA and ENGINEER do not thereby waive any right they may have against the Contractor because of the actions or omissions of said Subcontractor, other person or organization.

ARTICLE 11 - BID FORM

11.1 The Bid Form is included in the Contract Documents.

11.2 Bid Forms must be completed in ink or by typewriter. The Bid price of each item on the form must be stated in words and numerals.

11.3 Bids by corporations must be executed in the corporate name by the president or a vice-president (or other appropriate corporate officer) and the corporate seal must be affixed and attested by another corporate officer. The corporate address and state of incorporation shall be shown below the signature.

11.4 Bids by partnerships must be executed in the partnership name and signed by an authorized partner, whose title must appear under the signature.

11.5 All names and titles must be typed or printed below the signature.

11.6 The Bid shall contain an acknowledgment of receipt of all Addenda (the numbers of which shall be filled in on the Bid Form).

11.7 The address to which communications regarding the Bid are to be directed must be shown.

ARTICLE 12 - SUBMISSION OF BIDS

Submit bid on Bid Forms provided in the Contract Documents. Bids shall be submitted at the time and place indicated in the INVITATION FOR BID and shall be included in an opaque sealed envelope marked with the Project title and name and address of the Bidder and accompanied by the Bid Security, the Affidavit of Non-Collusion, and the sworn statement on Public Entity Crimes (and other documents if called for in the Contract Documents). If the bid is sent through the mail or other delivery system, the sealed envelope shall be enclosed in a separate envelope with the notation "BID ENCLOSED" on the face thereof.

Bids received after the time and date specified in the INVITATION FOR BID shall not be considered and will be returned unopened.

The Bid package includes Bid Documents for and a bid summary sheet. Failure to complete each bid may result in a finding that the Bidder is non-responsive and may result in rejection of the bid. Failure to submit the required qualifications will result in the Bidder being considered non-responsive and will result in rejection of the bid.

ARTICLE 13 - MODIFICATION AND WITHDRAWAL OF BIDS

13.1 Bids may be modified or withdrawn by an appropriate document duly executed (in the manner that a Bid must be executed) and delivered to the place where Bids are to be submitted at any time

prior to the opening of Bids. Withdrawal of a bid will not prejudice the rights of Bidder to file a new Bid.

13.2 If within 24 hours after bids are opened, any Bidder files a duly signed written notice with TWA, and within 48 hours thereafter demonstrates to the reasonable satisfaction of the TWA that: a) there has been a material and substantial mistake in the preparation of the Bid; b) the mistake is of such great consequence that to enforce the Contract would be unconscionable; and c) the mistake occurred notwithstanding the exercise of reasonable care in the preparation of the Bid; the Bidder may withdraw its Bid, and the Bid Security will be returned provided that the TWA is not seriously prejudiced, except for the loss of its bargain. Bidder shall not be allowed to correct a bid with a material and substantial mistake. Thereafter, that Bidder shall be disqualified from further bidding on the work to be provided under the Contract Documents.

ARTICLE 14 - OPENING OF BIDS

14.1 At the specified time and place as indicated in the "INVITATION FOR BID," Bids shall be opened publicly and read aloud.

14.2 An abstract of the amounts of the base Bids and major alternates (if any) will be prepared and made available within a reasonable time after the opening of Bids.

14.3 More than one Bid received for the same work from an individual, firm or partnership, a Corporation or Association or other legal entity under the same or different names shall not be considered. Reasonable grounds for believing that any Bidder is interested in more than one Bid for the same work will cause the rejection of all such Bids in which the Bidder is interested. If there are reasonable grounds for believing that collusion exists among the Bidders, the Bids of the participants believed to be in such collusion shall not be considered.

14.4 Notwithstanding any other provision contained in the Contract Documents, the TWA reserves the right to reject any and all bids and waive any and all irregularities, and the right to disregard any or all nonconforming, unbalanced or conditional bids or counter proposals. The TWA may reject, as non-responsive, any or all bids where bidders fail to acknowledge receipt of addenda as prescribed. If the TWA elects not to reject a bid which fails to acknowledge receipt of any addendum, the Bid shall be construed as though the addendum had been received and acknowledged by the Bidder.

14.5 Discrepancies between words and figures shall be resolved in favor of words. Discrepancies between the indicated sum of any column of figures and the correct sum thereof shall be resolved in favor of the correct sum. Discrepancies in the extension of the unit price times the estimated quantity for any line item shall be resolved in favor of the correct extension.

ARTICLE 15 - BIDS TO REMAIN OPEN

15.1 All Bids shall remain open for ninety days after the day of the Bid opening, but TWA may, in its sole discretion, release any Bid and return the Bid Security prior to that date.

15.2 Extensions of time when bids shall remain opened beyond the ninety-day period may be made only by mutual agreement between the Tohopekaliga Water Authority, the low Bidder, and the Surety, if any, for the low Bidder.

ARTICLE 16 - AWARD OF CONTRACT

16.1 Award shall be based on products, equipment and materials named in the Contract Documents. Consideration of and decisions regarding substitution shall not be made until after Award of the

Contract. Bid award can be made based on any combination of Base Bids and Alternates, either Additive or Deductive, that is most advantageous to TWA.

16.2 In evaluating Bids, TWA shall consider the qualifications of the Bidders, and whether or not the Bids comply with the prescribed requirements.

16.3 In evaluating Bids, the TWA shall consider the information provided by the Low Bidder as described in these "INSTRUCTION TO BIDDERS."

16.4 The low Bidder shall submit, upon request of TWA, documentation evidencing its capability to perform classes of work contemplated, and the necessary plant and sufficient capital to execute the work properly within the time specified. This information must be received by TWA within ten days of Bidder receiving written request.

16.5 The TWA may require the low Bidder to submit a certified statement describing his organization, plant, manpower, financial resources and list all previous and/or ongoing construction contracts over the last five years regardless of amount or completion status. Information shall be submitted on the Associated General Contractors of America Form "Standard Questionnaires and Financial Statement for Bidders" available from AGC, 1957 "E" Street, N.W., Washington, D.C. 20006, or other form acceptable to TWA. The information shall be certified by a Certified Public Accountant for bids over $25,000. The TWA, at its discretion, may require any or all of the above listed information from any other Bidder.

16.6 TWA will consider the qualifications and experience of Subcontractors and other persons and organizations (including those who are to furnish the principal items of material or equipment) proposed for those portions of the Work as to which the identify of Subcontractors and other persons and organizations must be submitted as provided in the Supplementary Conditions and Article 10 of these Instructions. Operating costs, maintenance, considerations, performance data and guarantees of materials and equipment may also be considered by TWA.

16.7 TWA may conduct such investigations and require supplemental information as it deems necessary to assist in the evaluation of any Bid and to establish the responsibility, qualifications and financial ability of the Bidders, proposed Subcontractors, proposed equipment and material suppliers, and other persons and organizations to do the Work in accordance with the Contract Documents to TWA's satisfaction within the prescribed time.

16.8 TWA reserves the right to reject the Bid of any Bidder who does not pass any such evaluation to TWA's satisfaction.

16.9 TWA reserves the right to reject the Bid of any Bidder which is behind on the approved completion schedule for any existing contracts with the TWA, or in litigation with the TWA, or has previously defaulted on a contract with the TWA.

16.10 Bids shall be analyzed to determine whether they are unbalanced bids with respect to unit priced or individually prices line items. Bid may be mathematically unbalanced if it is based on prices that are significantly less than the cost for some Contract line items and significantly overstated in relation to cost for others. A bid may be materially unbalanced and:

A. There is reasonable doubt that the bid would result in the lowest overall cost to TWA, even though it is the lowest evaluated bid/ or
B. The bid is so grossly unbalanced that its acceptance would be tantamount to allowing an advance payment.

Bids that are materially unbalanced may be rejected.

16.11 TWA reserves the right to reject all Bids.

16.12 If the Contract is to be awarded, TWA will give the Bidder a Notice of Award within ninety days after the day of the bid opening subject to the conditions in Article 15 and 16 of the Instructions to Bidders.

16.13 TWA, while reviewing the Bid of the apparent successful Bidder, may reasonably require other Bidders to submit promptly for TWA inspection, information, including, but not limited to, their responsibility, qualifications, financial ability, proposed Subcontractors and Suppliers, and other necessary information.

ARTICLE 17 - BONDS AND INSURANCE

Article 5 of the General Conditions sets forth TWA's requirements as to Bonds and Insurance. When the successful Bidder delivers the executed Agreement to TWA, it shall be accompanied by the required Bonds and Insurance Certificates as prescribed by TWA. The TWA must receive within forty-five days after the successful Bidder executed the Agreement, copies of all insurance policies for the insurance requirements set forth in the General Conditions. Attorneys-in-fact who sign Bid Bonds, Performance Bonds and Payment Bonds must file with such Bonds a certified copy of their power-of-attorney to sign the Bonds.

ARTICLE 18 - SIGNING OF AGREEMENT

18.1 When TWA gives a Notice of Award to the successful Bidder, it will be accompanied by at least three unsigned counterparts of the Agreement and all other Contract Documents. Within fifteen days of receipt thereafter, successful Bidder shall sign and deliver at least three counterparts of the Agreement to TWA together with the documents described in Article 17 above attached.

18.2 Failure by a successful Bidder to whom the contract is awarded to execute the Agreement or to correctly complete or furnish the required Bonds or insurance certificates or to comply with other requirements of the Contract Documents shall be just cause for the annulment of the award and the forfeiture of the Bid Security.

18.3 A successful Bidder who is awarded the Contract and fails to execute the agreement or correctly complete or furnish the required Bonds and insurance certificates within the time period specified in 18.1 above or fails to comply with other requirements shall be liable to the TWA for all damages resulting therefrom including reasonable attorneys' fees and costs, and attorneys' fees and cost on appeal. The Bid Security forfeited shall not be limitation thereon.

ARTICLE 19 - SCHEDULE SUBMITTALS

Within ten days following receipt of written request by TWA, the bidder shall submit a preliminary progress schedule in accordance with appropriate formats set forth in the General Requirements. This schedule shall show in a summary fashion the order in which the Bidder proposes to perform the work and shall indicate approximate starting and completion dates for the major work elements.

This progress schedule shall not replace, but serve as a basis for, the progress schedule submittals to be developed as required in the Specifications. Failure by the Bidder to furnish these Schedule Submittals, as required in a sufficiently complete and responsible manner shall void evaluation of the Bid, and will constitute proof that the Bidder has abandoned all his rights and interests in the award, and his Bid Security may be declared forfeited to the TWA as liquidated damages and the work may be awarded to another Bidder.

ARTICLE 20 - EPA SUBMITTALS

For Federally Assisted Wastewater Facilities Contracts, the Bidder is required to submit to the TWA within ten days after the opening of Bids those items listed in the Supplementary General Conditions for Federally Assisted Wastewater Facilities Contracts, Attachments No. 6 (p. EPA-38 of 49) and No. 9 (p. EPA-46 of 49).

ARTICLE 21 - CONCURRENT WORK BY OTHERS

Bidders are advised that there may be other contractors working at the project site concurrent with the construction of the Work described herein. Accordingly, Bidders should consider the limitations to site access and the construction sequencing described in the Contract Documents when preparing this bid.

If areas are designated in the Contract Documents which are to be shared with other contractors and these areas must be disrupted, the CONTRACTOR shall provide alternate acceptable access for other contractors.

CONTRACTOR is required to coordinate his activities in the designated areas described above with other contractors working at the project site. CONTRACTOR must submit to the ENGINEER a description and schedule as to how the designated areas will be utilized, recognizing the required coordination with other contractors.

ARTICLE 22 - SPECIAL WARRANTY, GUARANTY, GUARANTEE, BONDS INSURANCE MAINTENANCE, AND CORRECTION PERIOD REQUIREMENTS

There may be special requirements pertaining to Warranty, Guarantee, Bonds, Insurance, Maintenance and the Correction Period, which are described in the Contract Documents. Bidders should review these special requirements, if applicable, and reflect in their bids all costs associated therewith.

END OF SECTION

SECTION 00300
BID FORM PROPOSAL TO THE TOHOPEKALIGA WATER AUTHORITY
FOR THE CONSTRUCTION OF
OAKWOOD DR. GRAVITY SEWER REHABILITATION PROJECT

Name of Bidder:_____Mailing Address: _____

Street Address: _____City/State/Zip: _____

Phone Number: (___)_____Fax Number: (___)_____

TO:___TOHOPEKALIGA WATER AUTHORITY (TWA)

Pursuant to and in compliance with your notice inviting sealed proposals (Invitation for Bid), Instructions to Bidders, and the other documents relating thereto, the undersigned Bidder, having familiarized himself with the terms of the contract documents, local conditions affecting the performance of the contract, and the cost of the work at the place where the work is to be done, hereby proposes and agrees to perform within the time stipulated in the contract, including all of its component parts and everything required to be performed, and to provide and furnish any and all of the labor, material, and tools, expendable equipment, and all utility and transportation services necessary to perform the contract and complete in a workmanlike manner, all of the work required in connection with the construction of said work all in strict conformity with the plans and specifications and other contract documents, including Addenda Nos. _____ through _____ on file at the_____for the prices hereinafter set forth.

The undersigned bidder agrees that the Work shall be completed according to the schedule set forth in the Agreement. The undersigned bidder further agrees to pay liquidated damages as described herein and as may be provided in the Supplementary Conditions, which shall be in addition to such other amounts for actual delay damages.

Bid prices must be stated in words in accordance with paragraph 11.2 of the Instruction to Bidders in the blank space(s) provided for that purpose.

The undersigned as Bidder, declares that the only persons or parties interested in this proposal as principals are those named herein; that this proposal is made without collusion with any person, firm or corporation; and he proposes and agrees, if the proposal is accepted, that he will execute a contract with TWA in the form set forth in the Contract Documents; that he will furnish the Contract Security, Insurance Certificates and Policies, that he will comply with all requirements of the Contract Documents, that he is aware that failure to properly comply with the requirements set out in the failure to properly comply with the requirements set out in the "Instruction to Bidders" and elsewhere in the Contract Documents may result in a finding that the Bidder is non-responsive and a forfeiture of the Bid Security.

Attention: Bids shall only be considered from those Bidders who have obtained these Contract Documents directly from the ENGINEER.

SECTION 00300
PROPOSAL AND BID FORM

DESCRIPTION OF CONTRACT: **OAKWOOD DR. GRAVITY SEWER REHABILITATION PROJECT**

TWA Board of Supervisors
Tohopekaliga Water Authority
Kissimmee, Florida

Pursuant to and in compliance with your Invitation for Bid, the Instruction to Bidders, Special Provision, Qualifications, and other documents relating thereto, the undersigned hereby agrees to furnish all labor, materials, and equipment to do the work in strict accordance with the contract documents and all addenda, if any, issued prior to the date of this proposal at the price herein as follows:

Schedule of Prices

Item	Description	Estimated Quantity	Unit	Unit Price	Amount
1.	Mobilization and Demobilization (10%)	1	LS		$_____
	Item No. 1 Total (in words) _____ DOLLARS				
2.	General Requirements, Bonds, and Permits	1	LS		$_____
	Item No. 2 Total (in words) _____ DOLLARS				
3.	Indemnification	1	LS	$ 100.00	$ 100.00
	Item No. 3 Total (in words) _____ DOLLARS				
4.	Maintenance of Traffic (2.5%)	1	LS		$_____
	Item No. 4 Total (in words) _____ DOLLARS				
5.	Locate Utilities in Advance of Construction	1	LS		$_____
	Item No. 5 Total (in words) _____ DOLLARS				
6.	Pre-Construction Survey	1	LS		$_____
	Item No. 6 Total (in words) _____ DOLLARS				
7.	As-Built Survey	1	LS		$_____
	Item No. 7 Total (in words) _____ DOLLARS				
8.	Clean and CCTV (15” to 24” Diameter Main)	1,582	LF	$_____	$_____
	Item No. 8 Total (in words) _____ DOLLARS				
9.	**Furnish and Install Cured In Place Pipe (CIPP) Liner for Various Pipe Diameters**				
9a	15" CIPP Liner	1,085	LF	$_____	$_____
	Item No. 9a Total (in words) _____ DOLLARS				
9b	18" CIPP Liner	202	LF	$_____	$_____
	Item No. 9b Total (in words) _____ DOLLARS				
9c	24" CIPP Liner	296	LF	$_____	$_____
	Item No. 9c Total (in words) _____ DOLLARS				

Item	Description	Estimated Quantity	Unit	Unit Price	Amount	
10.	Remove and Replace Existing Gravity Sewer Main with New Gravity Sewer Main					3
10a.	8-inch PVC Gravity Sewer Main	704	LF	$_____	$_____	
	Item No. 10a Total (in words) _____ DOLLARS					
10b.	15-inch CI Gravity Sewer Main	50	LF	$_____	$_____	
	Item No. 10b Total (in words) _____ DOLLARS					
10c.	18-inch PVC Gravity Sewer Main	33	LF	$_____	$_____	3
	Item No. 10c Total (in words) _____ DOLLARS					
11.	Remove and Replace Existing Gravity Sewer Main with New Gravity Sewer Main at Point Repairs					3
11a.	8-inch PVC Gravity Sewer Main	61	LF	$_____	$_____	
	Item No. 11a Total (in words) _____ DOLLARS					
11b.	15-inch VCP Gravity Sewer Main	50	LF	$_____	$_____	
	Item No. 11b Total (in words) _____ DOLLARS					
11c.	24-inch PVC Gravity Sewer Main	17	LF	$_____	$_____	
	Item No. 11c Total (in words) _____ DOLLARS					
12.	Sanitary Sewer Lateral Removal and Replacement	3	EA	$_____	$_____	
	Item No. 12 Total (in words) _____ DOLLARS					
13.	**Install/Replace Sanitary Sewer Clean-out**					
13a.	Sanitary Sewer Clean-out – Grass Area	2	EA	$_____	$_____	
	Item No. 13a Total (in words) _____ DOLLARS					
13b.	Sanitary Sewer Clean-out – Asphalt or Concrete	1	EA	$_____	$_____	
	Item No. 13b Total (in words) _____ DOLLARS					
14.	**Replace Existing Sanitary Sewer Manhole**					
14a.	Manhole 4' Diameter, 12 – 14 ft deep	1	EA	$_____	$_____	
	Item No. 14a Total (in words) _____ DOLLARS					
14b.	Manhole 5' Diameter, 14 – 16 ft deep	2	EA	$_____	$_____	
	Item No. 14b Total (in words_____ DOLLARS					
15.	Seal and Coat Manhole	44	VF	$_____	$_____	
	Item No. 15 Total (in words) _____ DOLLARS					
16.	Line Manhole	68	VF	$_____	$_____	
	Item No. 16 Total (in words) _____ DOLLARS					
17.	Re-bench Flow Channels	3	EA	$_____	$_____	
	Item No. 17 Total (in words) _____ DOLLARS					
18.	Install Interior Drop Connection	3	LS	$_____	$_____	

Item	Description	Estimated Quantity	Unit	Unit Price	Amount
19.	Asphalt Open Cut Restoration	622	SY	$_____	$_____
	Item No. 19 Total (in words) _____				DOLLARS
20.	Asphalt Mill and Resurfacing	2,554	SY	$_____	$_____
	Item No. 20 Total (in words) _____				DOLLARS
21.	Concrete Sidewalk, Driveway Removal and Replacement	44	SY	$_____	$_____
	Item No. 21 Total (in words) _____				DOLLARS
22.	Demolition of Existing Masonry Screen Wall & Installation of New Masonry Screen Wall Components	1	LS	$_____	$_____
	Item No. 22 Total (in words) _____				DOLLARS
23.	**Replace Existing Sanitary Sewer Manhole**				
23a.	6-inch PVC Water Main	20	LF	$_____	$_____
	Item 23a Total (in words) _____				DOLLARS
23b.	8-inch PVC Water Main	315	LF	$_____	$_____
	Item 23b Total (in words) _____				DOLLARS
24.	**Remove and Replace Existing Storm Drain Pipe**				
24a.	12-inch Storm Drain Pipe	40	LF	$_____	$_____
	Item 24a Total (in words) _____				DOLLARS
24b.	15-inch Storm Drain Pipe	40	LF	$_____	$_____
	Item 24b Total (in words) _____				DOLLARS
24c.	18-inch Storm Drain Pipe	40	LF	$_____	$_____
	Item 24c Total (in words) _____				DOLLARS
24d.	30-inch Storm Drain Pipe	40	LF	$_____	$_____
	Item 24d Total (in words) _____				DOLLARS

TOTAL BASE BID (SUM OF ITEMS 1 THROUGH 24)

_____

_____ **$**_____

(In Words) **(In Numbers)**

The Work shall be substantially completed as described in paragraph 14.13 of the General Conditions, within 270 days after the date when the Contract Time begins to run as provided in paragraph 2.2 of the General Conditions. The Work shall be completed, ready for final payment in accordance with paragraph 14.14 of the General Conditions, within thirty (30) days after the actual date of Substantial Completion, unless agreed to otherwise in writing.

The TWA and CONTRACTOR recognize that time is of the essence of this Contract and Contractor recognized that TWA will suffer financial loss if the Work is not substantially completed as described in Article 14.8 of the General Conditions within the time specified below, plus any extensions thereof allowed in accordance with Article 12 of the General Conditions. The parties also recognize the delays, expense and difficulties involved in proving in a legal or arbitration proceeding the actual delay damages (excluding

engineering fees and inspection costs) suffered by the TWA if the work is not completed on time. Accordingly, CONTRACTOR agrees to pay TWA as liquidated damages $500.00 per day for each day CONTRACTOR exceeds the Contract Time for Substantial Completion (defined as 270 days starting when the Contract Time starts to run as provided in Article 2.2 of the General Conditions) until the Work is substantially complete. The Work shall be completed, ready for final payment is accordance with Article 14.13 of the General Conditions, within thirty (30) days after the actual date of Substantial Completion, unless agreed to otherwise in writing. The CONTRACTOR shall pay or reimburse, in addition to the liquidated damages specified herein, the TWA'S expenses for engineering fees and inspection costs arising from CONTRACTOR's delay in meeting either or both the Substantial Completion and Final Completion dates.

ACCOMPANYING THIS PROPOSAL IS:

_____

(insert the word(s) "cashier's check," bidder's bond," certified check," or other security as provided by law, as the case may be) in an amount equal to at least 5% of the total amount of the bid, payable to the TOHOPEKALIGA WATER AUTHORITY. The undersigned deposits above-named security as a proposal guarantee and agrees that it shall be forfeited to TWA as liquidated damages in case this proposal is accepted by TWA and the undersigned fails to execute a contract with TWA as specified in the contract documents accompanied by the required payment and faithful performance bonds with sureties satisfactory to the OWNER, and accompanied by the required certificates of insurance coverage.

Should TWA be required to engage the services of an attorney in connection with the enforcement of this bid, bidder promises to pay TWA's reasonable attorney's fees and costs (including attorney's fees and costs on appeals) incurred with or without suit.

The names of all persons interested in the foregoing proposals as principals are as follows: (NOTICE - If bidder or the interested person in a corporation, state legal name of corporation, also names of the president, secretary, treasurer, and general manager thereof; if a partnership, state true names of firm, also names of all individual partners composing firm; if bidder or other interested person is an individual, state first and last name in full; if bidders or other interested person is a joint venture, state the name of joint venture and all joint ventures; if bidder or other interested person is a legal entity not mentioned here, state name and designate the form of the entity.)

SUBSTITUTIONS AND "OR EQUAL"

The undersigned as Bidder agrees that substitutions or "or-equal" items will not be considered until after the "effective date of the Agreement" and will be evaluated in accordance with Article 6.7 of the General Conditions. If Bidder intends to propose substitutions or "or-equal" items after the "effective date of the Agreement," it is agreed that these items shall be listed on the Substitution List included with the Bid Form (provided herein) with a deductive amount representing 50 percent of the total savings between the named item and the proposed item.

The undersigned as Bidder also agrees that if a substitution or "or-equal" item is not listed on the Substitution List included with the Bid, all of the savings between the named item and the proposed item will go to TWA if TWA accepts the proposed item in accordance with Article 6.7 of the General Conditions.

(*This portion intentionally left blank*)

SUBSTITUTION LIST

Bidder offers the following substitutions and "or equal" items:

Item Number: _____

Equipment Item or Material: _____

_____

Specification Section: _____

_____

Alternative Manufacturer/Suppler (List One Only): _____

_____

*Deductible Amount (Indicate Whether Lump Sum or Unit Price): _____

_____

Item Number: _____

Equipment Item or Material: _____

_____

Specification Section: _____

_____

Alternative Manufacturer/Supplier (List One Only): _____

_____

*Deductible Amount (Indicate Whether Lump Sum or Unit Price) _____

_____

***** Represents 50% of the difference in cost in accordance with paragraph 6.7.5 the General Conditions.

(Bidder may make and attach additional copies of this page as required.)

NOTE: If a bidder is a corporation, the legal name of the corporation shall be set forth below, together with signature(s) of the officer or officers authorized to sign contracts on behalf of the corporation and corporate seal; if bidder is a partnership, the true name of the firm shall be set forth below with the signature(s) of the partner or partners authorized to sign contracts in behalf of the partnership; and if the bidder is an individual, his signature shall be placed below; if a partnership, the names of the general partners.

Bidder: _____
(Type or Print)

By: _____

Name: _____
Title: _____

Dated: _____20_____

(Corporate Seal)

Attest (if corporation)

By: _____
(Signature)

Name: _____

Title: _____

Witnesses:_____
(if partnership or individual)

Signature_____

SECTION 00300
BID BOND

KNOW ALL MEN BY THESE PRESENTS, that we _____, as Principal, and _____, as Surety, are held and firmly bound unto the Tohopekaliga Water Authority, hereinafter called TWA in the penal sum of _____ _____Dollars ($_____), lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, and successors, jointly and severally, firmly by these presents.

The condition of this obligation is such that whereas the Principal has submitted the accompanying bid dated _____,20____, for the construction of.

NOW THEREFORE, if the Principal shall not withdraw said bid within the period of time set forth in the contract documents, and shall within fifteen (15) calendar days after receipt of the Notice of Award enter into a written contract with TWA in accordance with the bid as accepted, and if the Principal shall give the required bonds with good and sufficient sureties for the faithful performance and proper fulfillment of such contract and for the protection of subcontractors, laborers and materialmen, and if the Principal has provided the required evidence of insurance as set forth in the Contract Documents and complied with all other contract provisions, or in the event of the withdrawal of said bid within the periods specified, or the failure to enter into said contract, or failure to five such bonds within the time specified, or failure to provide the required evidence of insurance, or failure to comply with the other requirements of the Contract Documents, or otherwise, if the Principal shall within sixty (60) days after request by TWA pay to TWA the difference between the amount specified in said bid and the amount for which TWA may procure the required work if the latter amount be in excess of the former, then the above obligation shall be void and of no effect, otherwise to remain in full force and effect.

It is further agreed that if TWA is required to utilize legal counsel to recover on this bond, it may also recover its costs relating thereto including a reasonable amount for attorney's fees and costs, including attorney's fees and costs in appellate proceedings.

IN WITNESS WHEREOF, the above-bounden parties have executed this instrument under their several seals this _____day of _____, 20____ in the name of corporate seal of each corporate party being hereto affixed and these presents duly signed by its undersigned representative pursuant to authority of its governing body.

WITNESSES
(if individual or partnership)

_____

_____

_____

_____

PRINCIPAL

BY:_____

(signature)

BY:_____

(signature)

Name: _____

Title:_____

ATTEST (if corporation)

By:_____

(signature)

Name: _____

Title:_____

(Corporate Seal)

SURETY

_____

By:_____

(signature)

Name:_____

Title:_____

(Surety Seal)

Attach a certified copy of Power-of-Attorney appointing individual Attorney-in-Fact for execution of Bid Bond on behalf of Surety

Any claims under this bond may be addressed to:

_____
Name of Surety

_____
Mailing Address

_____

Street Address

_____

_____
Name and mailing address of agent or representative in Florida if different from above

_____

_____

_____

_____

Telephone number of Surety
(_____)_____

and agent or representative in Florida
(_____)_____

END OF SECTION

SECTION 00310
AFFIDAVIT OF NON-COLLUSION
AND OF NON-INTEREST OF TWA EMPLOYEES

DESCRIPTION OF CONTRACT: **OAKWOOD DR. GRAVITY SEWER REHABILITATION PROJECT**

STATE OF FLORIDA}
ss}
COUNTY OF _____}

_____,** being first duly sworn, deposes and says that he (it) is the bidder in the above bid, that the only person or persons interested in said bid are named therein; that no officer, employee or agent of the Tohopekaliga Water Authority or of any other bidder is interested in said bid; and that affiant makes the above bid with no past or present collusion with any other person, firm or corporation.

_____
Affiant

Sworn and subscribed before me this _____ day of _____, 20___, in the State of _____, County of _____.

_____
Notary Public
My Commission Expires:

** NOTICE: State name of Bidder followed by name of authorized individual (and title) who is signing as Affiant. If Bidder is an individual, state name of Bidder only.

END OF SECTION

Bid or Contract No._____

SECTION 00330
SWORN STATEMENT UNDER SECTION 287.133(3)(A),
FLORIDA STATUTES, ON PUBLIC ENTITY CRIMES

(To be signed in the presence of notary public or other officer authorized to administer oaths.)

DESCRIPTION OF CONTRACT: **OAKWOOD DR. GRAVITY SEWER REHABILITATION PROJECT**

STATE OF FLORIDA
}ss
COUNTY OF_____}

Before me, the undersigned authority, personally appeared _____, who, being by me first duly sworn, made the following statement:

1. The business address of _____ (name of bidder or contractor, is) _____.

2. I understand that a public entity crime as defined in Section 287.133 of the Florida Statutes includes a violation of any state or federal law by a person with respect to and directly related to the transaction of business with any public entity in Florida or with an agency or political subdivision of any other state or with the United States, including, but not limited to, any bid or contract for goods or services to be provided to any public entity or such an agency or political subdivision and involving antitrust, fraud, theft, bribery, collusion, racketeering, conspiracy or material misrepresentation.

3. I understand that "convicted" or "conviction" is defined by the statute to mean a finding of guilt or a conviction of a public entity crime, with or without an adjudication of guilt, in any federal or state trial court of record relating to charges brought by indictment or information after July 1, 1989, as a result of a jury verdict, non-jury trial, or entry of a plea of guilt or nolo contendere.

4. I understand that "affiliate" is defined by the statute to mean (1) a predecessor or successor of a person or a corporation convicted of a public entity crime, or (2) an entity under the control of any natural person who is active in the management of the entity and who has been convicted of a public entity crime, or (3) those officers, directors, executives, partners, shareholders, employees, members, and agents who are active in the management of an affiliate, or (4) a person or corporation who knowingly entered into a joint venture with a person who has been convicted of a public entity crime in Florida during the preceding 36 months.

5. Neither the bidder or contractor nor any officer, director, executive, partner, shareholder, employee, member or agent who is active in the management of the bidder or contractor nor any affiliate of the bidder or contractor has been convicted of a public entity crime subsequent to July 1, 1989.

(Draw a line through paragraph 5 if paragraph 6 below applies.)

6. There has been a conviction of a public entity crime by the bidder or contractor, or an officer, director, executive, partner, shareholder, employee, member or agent of the bidder or contractor who is active in the management of the bidder or contractor or an affiliate of the bidder or contractor. A determination has been made pursuant to Section 287.133(3) by order of the Division of Administrative Hearings that it is not in the public interest for the name of the convicted person or affiliate to appear on the convicted vendor list. The name of the convicted person or affiliate is _____

_____. A copy of the order of the Division of Administrative Hearings is attached to this statement.

(Draw a line through paragraph 6 if paragraph 5 above applies.)

Signed by:_____

Name:_____

Title:_____

On _____ day of _____, 20___.

Sworn and subscribed before me in the state and county first mentioned above on the _____ day of _____, 20___.

_____
Notary Public

(affix seal)

_____
My commission expires

END OF SECTION

SECTION 00400
QUALIFICATIONS FOR THE CONSTRUCTION OF
OAKWOOD DR. GRAVITY SEWER REHABILITATION PROJECT

This information must be received by TWA with the bid submittal. The Contractor(s) and subcontractor(s) must supply (with the bid form) a list of five (5) similar projects successfully completed by the Contractor(s) or subcontractor(s)**,** as a Prime or Sub contractor within the last ten (10) years. Failure to provide this information may be cause for the Bidder to be deemed non-responsive and for Bid rejection.

The Contractor(s) and subcontractor(s) shall submit previous successful project experience that includes the following elements for all five (5) required similar projects where applicable for their proposed role:

- Lining of a minimum of 25,000 linear feet of 8-inch diameter or larger gravity sewer main with a minimum of 10,000 linear feet of CIPP being in an existing residential neighborhood for which the Contractor completed a minimum of 80 percent of the sewer lining. Contractor will be required to provide final pay application to confirm this percentage.

- AND -

- Lining of a minimum of 100 laterals within an existing residential neighborhood from the gravity sewer main to the cleanout (full lateral lining).

EACH SIMILAR PROJECT IS TO BE LISTED WITH COMPLETE INFORMATION THAT <u>MUST BE PROVIDED ON THE REFERENCE FORMS</u>. FAILURE TO PROVIDE REFERENCE INFORMATION ON THAT FORM MAY BE DEEMED NON-RESPONSIVE AND RESULT IN BID REJECTION.

The determination of whether a Contractor is responsive or not shall be at the sole discretion of TWA. Although TWA may request submission of a minimum number of similar projects for evaluation, TWA's determination of a contractor's responsiveness shall not be solely based on the number of similar projects submitted.

In addition, in order to be acceptable for consideration of award for this project, the Contractor must submit with their bid, the following qualifications as noted below for review by TWA. The Owner has the sole discretion in determining if a Contractor or subcontractor are deemed as being qualified for this bid. Any Contractor or subcontractor who omits the requested qualification items, provides incomplete or inadequate submittals, or has incomplete or poor references, will be deemed as non-responsive and not meeting the required qualifications for this project and will result in bid rejection.

Minimum Qualifications and Experience required for the Contractor's staff are listed below. The inability to document such experience may be grounds for rejecting the Contractor's proposed staff.

<u>Gravity Sewer Lining Qualifications</u>

- The proposed Superintendent(s) must have a minimum of three (3) years of CIPP lining supervisory field experience on projects totaling a minimum of 150,000 LF of 8-inch or greater CIPP liner installation using the methods and materials proposed for this Work, as documented by a minimum of three (3) verifiable references.

- Superintendent(s) resume of projects: Each reference project shall include the pipe dimensions, length of installation, size/type of flow control required to perform the Work, description of the actual work

performed including installation method, owner's name, telephone number and contact person, and date of installation. It is required that the Superintendent(s) named are the Superintendent(s) assigned to this project and on site during the entire project construction. All referenced experience shall be for projects completed within the United States or Canada and shall have used the same installation method, CIPP liner and resin combination proposed for this project. References will be checked.

- Installation Crew: At least 1 person other than the Superintendent from each of the CIPP installation crews shall have a minimum of 2-years of CIPP experience totaling at least 20,000 lineal feet of 8-inch or greater installed liner. The crewmember with listed qualifications must be on the project site during all installation activities and for the entire project construction.

- Boiler Technician: Contractor shall provide the name and information for the boiler technicians who will perform the actual Work. The boiler technician must have a minimum of at least 20,000 lineal feet of CIPP lining in which a similar position was held.

Lateral Lining Qualifications

- Lateral Cutter Technician: Contractor shall provide the name and information for the technicians who will perform the actual Work. The lateral cutter technician must have a minimum of 5 projects totaling at least 20,000 lineal feet of CIPP lining in which a similar position was held.

- Lateral Liner Crew: At least 1 person from each of the CIPP lateral liner installation crews shall have a minimum of 2-years of CIPP lateral lining experience and a total of at least 1,000 installed lateral liners from the gravity sewer main to the cleanout. The crewmember with listed qualifications must be on the project site during all lateral installation activities.

Manhole Rehabilitation Qualifications

- Manhole Rehabilitation Crew: At least 1 person from each of the manhole rehabilitation crews shall have a minimum of 1-year of manhole rehabilitation experience totaling at least 4,000 vertical feet or greater of manhole rehabilitations. The crewmember with listed qualifications must be on the project site during all manhole rehabilitation activities.

Gravity Sewer CCTV Inspection Qualifications

- CCTV Inspection Crew: Lead CCTV inspectors shall be NASSCO PACP certified to report gravity main liner defects.

Lateral CCTV Inspection Qualifications

- CCTV Inspection Crew: Lead CCTV inspectors shall be NASSCO PACP/LACP certified to report lateral liner defects.

Contractor’s Staff must provide manufacturer’s certification letters that the submitted installers have been trained and approved in the handling, mixing and application of the products to be used dated within the last 6 months from the bid date.

The final decision to accept or reject the product, manufacturer, and/or installer lies solely with TWA. The named Manufacturers, Field Superintendent, CIPP Lead Installer, Boiler Technician, Lateral Cutter Technician, CIPP Lateral Lead Installer, Manhole Rehabilitation Lead Installer and CCTV Inspector must be employed to perform the Work for the entire duration of the contract, unless changes are specifically authorized by the Owner.

EMPLOYEE/SUBCONTRACTOR LIST

Bidder shall submit at the time of Bids, in the spaces provided, the names of the employee/subcontractors that Bidder proposes to use as part of this Project. The listed employee/subcontractor will be the basis upon which the Contract will be awarded.

Upon award of a Contract, the Work shall be performed using the listed employee/subcontractors. Substitutions will be permitted only if the proposed employee/subcontractors meets all of the qualification requirements and specifications. All substitutions require the approval of TWA prior to the Contractor implementing the substitution.

Preliminary acceptance of an employee/subcontractor shall not in any way constitute a waiver of the specifications covering such required qualifications. CONTRACTOR shall provide Submittals in accordance with requirements of the Project Manual for ENGINEER's review for conformity with the specifications.

Role	Employee/Subcontractor
Superintendent	_____
CIPP Installation Lead Installer	_____
Boiler Technician	_____
Lateral Cutter Technician	_____
Lateral CIPP Lead Installer	_____
Manhole Rehabilitation Lead Installer	_____
Gravity Sewer CCTV Inspector	_____
Lateral CCTV Inspector	_____

SECTION 00420
QUESTIONNAIRE

DESCRIPTION OF CONTRACT **OAKWOOD DR. GRAVITY SEWER REHABILITATION PROJECT**

Bidder: _____

NOTES TO THE BIDDER:

(A) The OWNER may require Low Bidder, and any other Bidders, to complete and submit this form in addition to the "Standard Questionnaires and Financial Statement for Bidders" named in Article 16 of the Instructions to Bidders, within the time required by Article 16 of the Instructions to Bidders.

(B) The undersigned Bidder warrants that all statements and answer made to the interrogatories that follow are current, accurate and complete as of the date indicated below.

1. ORGANIZATION

1.1 Date of organization (or incorporation) _____ State of incorporation _____ (IRS) EIN _____.

1.2 Title and name of Principals (President, Vice-President, Secretary and Treasurer, if a corporation; partners, if a partnership _____
_____
_____

1.3 If your organization has ever been convicted of a felony, or has felony charges pending, in any state within the last three years from the date of Bid opening, disclose with this Questionnaire all material facts pertaining to any such felony conviction or any such pending felony charges against (a) your organization, (b) any business entity related to or affiliated with your organization, or © any present or former executive employee, officer, director, shareholder (owning twenty percent (20%) or more of the outstanding shares), partner, or owner of your organization or of any such related or affiliated entity.

Attachment _____, consisting of _____ pages.

2. LICENSING

2.1 If your organization holds valid contractors licenses covering all classifications and subclassifications of work which your organization intends to self-perform, attach a list of all such licenses together with a copy of each license.

Attachment _____, consisting of _____ pages.

3. EXPERIENCE

3.1 Attach a list of all contracts or subcontracts over $1,500,000 similar in character and scope to the Work under the Bidding Documents which your organization has performed over the last five (5) years. For each contract or subcontract, include the OWNER'S contract number, contract title, contract price, substantial completion date or percent complete (if not completed), and the name, address and telephone number of a representative of the owner familiar with your organization and its work.

Attachment _____, consisting of _____ pages.

3.2 Within the last five (5) years, have any claims arising from or relating to a contract or subcontract been made against your organization or any officer or partner of your organization which resulted in litigation or arbitration?_____ If so, the Bidder (or nominated subcontractor) shall attach a description of each claim, the amount of the claim, the parties involved, and the settlement amount or award.

Attachment _____, consisting of _____ pages.

3.3 Within the last five (5) years, has your organization or an officer or partner of your organization made any claims arising from or relating to a contract or subcontract which resulted in litigation or arbitration? _____. If so, the Bidder (or nominated Subcontractor) shall attach a description of each claim, the amount of the claim, the parties involved, and the settlement amount or award.

Attachment _____, consisting of _____ pages.

4. ADDITIONAL QUALIFICATIONS

4.1 Does your organization rent or lease equipment or facilities from other affiliate organizations? _____. If so, state the name of the affiliate organization(s)_____.

4.2 Credit available? $_____

5. REFERENCES

5.1 Trade references: _____

5.2 Bank references: _____

Signed by: _____

Name: _____

Title: _____

on _____ day of _____, 20____.

VERIFICATION

STATE OF _____FLORIDA
}ss
COUNTY OF _____}

Before me, a Notary Public duly commissioned, qualified and acting, personally appeared _____to me well known, who being by me first duly sworn upon oath says that he is the attorney-in-fact for _____ , and that he has been authorized by _____ to execute the attached the attached Questionnaire on behalf of the Bidder in favor of the OWNER.

Subscribed and sworn before me this _____ day of _____, 20_____.

_____
Notary Public

My Commission expires:

END OF SECTION

SECTION 00500
AGREEMENT

THIS AGREEMENT is dated as of the _____day of _____ in the year 20__ by and between the Tohopekaliga Water Authority and _____.

TWA and CONTRACTOR, in consideration of the mutual covenants hereinafter set forth, agree as follows:

ARTICLE 1. WORK

CONTRACTOR shall complete all Work as specified or indicated in the Contract Documents. The Work is generally described as follows:

> **Replace gravity sewer mains, laterals, and manholes, and rehabilitate gravity sewer mains and laterals by Cured-In-Place-Pipe (CIPP) lining, and rehabilitate manholes by sealing and coating, at along Oakwood Drive.**

The project for which the Work under the Contract Documents may be the whole or only a part is generally described as follows:

OAKWOOD DR. GRAVITY SEWER REHABILITATION PROJECT

ARTICLE 2. ENGINEER

2.1 DESIGN ENGINEER as named in the Contract Documents shall mean:

2.2 ENGINEER will be named at the Preconstruction Conference.

ARTICLE 3. CONTRACT TIME

3.1 The provisions regarding Contract Time and Liquidated Damages set forth in the Bid Form and may also be set forth in the Supplementary Conditions.

ARTICLE 4. CONTRACT PRICE

4.1 TWA shall pay CONTRACTOR for performance of the Work in accordance with the Contract Documents on the basis of the prices indicated on the Bid Form.

ARTICLE 5. PAYMENT PROCEDURES

CONTRACTOR shall submit Applications for Payment in accordance with Article 14 of the General Conditions. Applications for Payment will be processed by ENGINEER as provided in the General Conditions.

5.1 Progress Payments. TWA shall make progress payments on the basis of CONTRACTOR's Applications for Payment as recommended by ENGINEER, in accordance with Article 14 of the General Conditions.

5.1.1 Prior to Substantial Completion progress payments will be in an amount equal to ninety percent (90%) of the Work completed, and at the option of the TWA, the TWA may pay an amount equal to ninety percent (90%) of materials and equipment not incorporated in the Work but delivered and

suitably store, less in each case the aggregate of payments previously made. In no event shall payments for materials and equipment stored on site exceed ninety percent (90%) of the value of the related cost for the specific item of work shown in the breakdown of Contract Price regardless of the stated value of the materials or equipment. TWA may, at its sole option, pay an amount equal to ninety percent (90%) of materials and equipment not incorporated in the Work stored off-site if stored in a manner acceptable to TWA, as stated above for on-site stored materials. When payment to CONTRACTOR is made for stored materials and equipment, CONTRACTOR shall submit invoices marked paid by the supplier with the next month's request for payment to document that CONTRACTOR has paid for said materials and equipment or the previously paid amount for stored materials shall be deducted from any remaining payment(s) or retainage for any stored materials not so properly documented.

5.1.2 Upon Substantial Completion of all the Work, TWA may at its option pay an amount sufficient to increase total payments to CONTRACTOR to ninety-five percent (95%) of the value of the substantially completed work. TWA will consider recommendations of ENGINEER in accordance with Article 14 of the General Conditions.

5.2 Final Payment. Upon final completion and acceptance of the Work in accordance with paragraph 14.9.1 of the General Conditions, TWA shall pay the remainder of the Contract Price as provided in said paragraph 14.9.1

ARTICLE 6. RETAINAGE IN ANTICIPATION OF LIQUIDATED DAMAGES

TWA may withhold additional retainage if CONTRACTOR is behind schedule and it is anticipated by TWA that the Work will not be completed within the Contract Time. The retainage may equal but not exceed $500 per day as defined as liquidated damages for failure to meet the substantial completion date.

ARTICLE 7. CONTRACTOR'S REPRESENTATIONS

In order to induce TWA to enter into this Agreement, CONTRACTOR makes the following representations:

7.1 CONTRACTOR has familiarized himself with the nature and extent of the Contract Documents, Work, locality, weather, and with all local conditions and federal, state and local laws, ordinances, rules, policies and regulations that in any manner may affect cost, progress or performance of the Work.

7.2 CONTRACTOR has studied carefully all reports of investigations and tests of subsurface and latent physical conditions of the site or otherwise affecting cost, progress or performance of the Work which were relied upon by ENGINEER in the preparation of the Drawings and Specifications and which have been identified in the Contract Documents.

7.3 CONTRACTOR has made or caused to be made examinations, investigations and tests and studies of such reports and related data in addition to those referred to in paragraph 7.2 as he deems necessary for the performance of the Work at the Contract Price, within the Contract Time and in accordance with the other terms and conditions of the Contract Documents; and no additional examinations, investigations, tests, reports or similar data are or will be required by CONTRACTOR for such purposes.

7.4 CONTRACTOR has correlated the results of all such observations, examinations, investigations, tests, reports and data with the terms and conditions of the Contract Documents.

7.5 CONTRACTOR has given ENGINEER written notice of all conflicts, errors or discrepancies that he has discovered in the Contract Documents and the written resolution thereof by ENGINEER is acceptable to CONTRACTOR.

ARTICLE 8. CONTRACT DOCUMENTS

The Contract Documents which comprise the entire agreement between TWA and CONTRACTOR are made a part hereof and consist of the following:

8.1 This Agreement.

8.2 Certificates of Insurance.

8.3 Payment Bond and Performance Bond (or Public Construction Bond as required by the Contract Documents).

8.4 Notice of Award.

8.5 General Conditions.

8.6 Supplementary Conditions

8.7 Supplemental General Conditions for Federally Assisted Construction Contracts.

8.8 Specifications bearing the title and consisting of the divisions as listed in table of contents thereof.

8.9 Drawings, as listed in the Index of Drawings Section 01000 of the General Requirements.

8.10 Addenda numbers _____ to _____, inclusive.

8.11 CONTRACTOR's Bid (including documentation accompanying the bid and documentation prior to Notice of Award).

8.12 Documentation submitted by CONTRACTOR prior to Notice of Award.

8.13 Any Modification, including Change Orders and Field Orders, duly delivered after execution of Agreement.

8.14 Invitation for Bid, Instruction to Bidders, Bid Bond and Affidavit of Non-Collusion, Proposal, Notice to Proceed, and Sworn Statement.

8.15 Certificate of Substantial Completion, Certificate of Final Inspection and Contractor's Release.
There are no Contract Documents other than those listed above in this Article 8. The Contract Documents may only be altered, amended or repealed by a Modification (as defined in Section 1 of the General Conditions).

ARTICLE 9. MISCELLANEOUS

9.1 Terms used in this Agreement which are defined in Article 1 of the General Conditions shall have the meanings indicated in the General Conditions.

9.2 No assignments by a party hereto of any rights under or interests in the Contract Documents will be binding on another party hereto without the written consent of the party sought to be bound and

any such assignment shall be void and of no effect; and specifically but without limitation, moneys that may become due and moneys that are due may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by law), and unless specifically stated to the contrary in any written consent to an assignment, no assignment will release or discharge the assignor from any duty or responsibility under the Contract Documents.

9.3 TWA and CONTRACTOR each binds himself, his partners, successors, assigns and legal representatives to the other party hereto, his partners, successors, assigns and legal representatives in respect to all covenants, agreements and obligations contained in the Contract Documents.

9.4 Waiver of Jury Trial; Legal Costs. It is mutually agreed by and between the Contract and OWNER that each of the parties do hereby waive trial by jury in any action, proceeding or claim which may be brought by either of the parties hereto against the other on any matters concerning or arising out of this Agreement. In any such action, the prevailing party shall be entitled to an award of fees and charges of attorneys, engineers, architects and other professionals and court costs, including those incurred in appellate proceedings.

ARTICLE 10. OTHER PROVISIONS

In consideration of the CONTRACTOR's Indemnity Agreement as set out in the Contract Documents, TWA specifically agrees to give the CONTRACTOR $_____ and other good and valuable consideration, receipt of which is hereby acknowledged.

(*This portion intentionally left blank*)

IN WITNESS WHEREOF, the parties hereto have signed three (3) copies of this Agreement. At least one counterpart each has been delivered to TWA and CONTRACTOR. All portions of the Contract Document have been signed or identified by TWA and CONTRACTOR or by ENGINEER on their behalf.
This Agreement will be effective on _____, 20___.

TOHOPEKALIGA WATER AUTHORITY

_____
Chairman, Board of Supervisors

By_____
(CORPORATE SEAL)

Attest:_____

Title_____

Address for giving notices:

_____

_____

CONTRACTOR

_____

Name_____
(Type)

Title_____
(CORPORATE SEAL)
Attest: _____

Title_____

Address for giving notices:

_____

_____

APPROVED AS TO FORM AND LEGALITY
For the use and reliance of the
Tohopekaliga Water Authority only
_____, 20_____

_____
TWA Attorney
Kissimmee, Florida

Florida State Contractor's
License No._____

Agent for service of process:

_____
Name

_____
Street Address

_____
City, State and Zip

END OF SECTION

SECTION 00520
FLORIDA TRENCH SAFETY ACT
AFFIDAVIT ATTACHMENT TO BID PROPOSAL

DESCRIPTION OF CONTRACT: **OAKWOOD DR. GRAVITY SEWER REHABILITATION PROJECT**

TO: TOHOPEKALIGA WATER AUTHORITY
KISSIMMEE, FLORIDA

At the time the Bid Proposal is submitted, each Bidder shall attach to his bid a sworn statement executed by an officer of the firm or corporation submitting the Proposal and shall be sworn to before a person who is authorized by law to administer oaths.

STATE of _____, COUNTY of _____. Before me, the undersigned authority, personally appeared _____, who being duly sworn, deposes and says he/she is _____ of _____ _____
(Title) (Firm)
the Bidder submitting the attached proposal for the work covered by the Contract Documents for Tohopekaliga Water Authority.

The affiant further stated that he/she will fully comply with the applicable trench safety standards and all requirements of the Occupational Safety and Health Administration's (OSHA) excavation safety standards as defined in 29 CFR 1926.650 Sub-part P as required by the State of Florida Trench Safety Act, CS/SB 2626, and further that submittal of this Bid Proposal for the Project is full acknowledgment of the requirements and that the costs associated with said compliance have been included in the Bid Proposal.

_____
(Bidder)

_____
(Signature)

_____
(Title)

Sworn and subscribed to before me this _____day of _____, 20____.

_____
Notary Public

My Commission Expires:

END OF SECTION

SECTION 00610
PERFORMANCE BOND

(100% of Contract Amount)

KNOW ALL MEN BY THESE PRESENTS: that

_____

(Name of Contractor)

_____

(Address of Contractor)

_____,

(Corporation, Partnership or Individual)

herein called Principal, and

_____

(Name of Surety)

_____

(Address of Surety)

hereinafter called Surety, are held and firmly bound unto **Tohopekaliga Water Authority** hereinafter called OWNER, in the penal sum of _____ Dollars, ($_____) in lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, successors, and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION is such that whereas, the Principal entered into a certain contract with the OWNER, dated the _____ day of _____, 20___, a copy of which is hereto attached and made a part hereof for the construction of:

_____

This Bond is being entered into to satisfy the requirements of Section 255.05, Florida Statutes, as the same may be amended.

The Surety shall be bound by any and all arbitration awards to the same extent as CONTRACTOR is bound.

NOW, THEREFORE, the condition of this obligation is such that if Principal:

1. Promptly and faithfully performs its duties, all the covenants, terms, conditions, and agreements of said Contract including, but not limited to the guaranty period and the warranty provisions, in the time and manner prescribed in the Contract, and

2. Pays OWNER all losses, damages (liquidated or actual), expenses, costs and attorneys' fees, including costs and attorney's fees on appeal that OWNER sustains resulting directly or indirectly from any breach or default by Principal under the Contract, and

3. Satisfies all claims and demands incurred under the Contract, and fully indemnifies and holds harmless the OWNER from all costs and damages which it may suffer by reason or failure to do so, then this bond is void; otherwise it shall remain in full force and effect.

* **All dates to be filled in by OWNER**.

In the event that the Principal shall fail to perform any of the terms, covenants and conditions of the Contract during the period in which this Performance Bond is in effect, the Surety shall remain liable to the OWNER for all such loss or damage (including reasonable attorneys' fees and costs and attorneys' fees on appeal) resulting from any failure to perform up to the amount of the Penal Sum.

In the event that the Surety fails to fulfill its obligations under this Performance Bond, then the Surety shall also indemnify and hold the OWNER harmless from any and all loss, damage, cost and expense, including reasonable attorneys' fees and costs for all trial and appellate proceedings, resulting directly or indirectly from the Surety's failure to fulfill its obligations hereunder. This paragraph shall survive the termination or cancellation of this Performance Bond.

The Surety, for value received, hereby stipulates and agrees that its obligations hereunder shall be direct and immediate and not conditional or contingent upon OWNER'S pursuit of its remedies against Principal, shall remain in full force and effect notwithstanding (i) amendments or modifications to the Contract entered into by OWNER and Principal without the Surety's knowledge or consent (ii) waivers of compliance with or any default under the Contract granted by OWNER to Principal without the Surety's knowledge or consent, or (iii) the discharge of Principal from its obligations under the Contract as a result of any proceeding initiated under the Bankruptcy Code of 1978, as the same may be amended, or any similar state or federal law, or any limitation of the liability or Principal or its estate as a result of any such proceeding.

Any changes in or under the Contract Documents (which include the Plans, Drawings, and Specifications) and compliance or noncompliance with any formalities connected with the Contract or the changes therein shall not affect Surety's obligations under this Bond and Surety hereby waives notice of any such changes.

Further, Principal and Surety acknowledge that the Penal Sum of this Bond shall increase or decrease in accordance with approved changes or other modifications to the Contract Documents.

(*This portion intentionally left blank*)

IN WITNESS WHEREOF, this instrument is executed in _____(number) counterparts, each of which shall be deemed an original, this _____ day of_____, 20___.

ATTEST:

_____
(Principal) Secretary

Name_____
(Type)
(Corporate Seal)

_____
Witness to Principal

_____
Witness to Principal

_____
Principal

Name_____
(Type)
Title_____
Address_____
City/State/Zip_____

_____

ATTEST:

_____
(Surety) Secretary

Name_____
(Type)
(Corporate Seal)

_____
Witness as to Surety

_____
Witness as to Surety

_____
Surety

By _____
Attorney-in-fact

Name _____
(Type)
Address _____
City/State/Zip_____

_____

NOTE: Date of the BOND must not be prior to date of Contract. If CONTRACTOR is Partnership, all partners should execute BOND.

IMPORTANT: Surety companies executing BONDS must appear on the Treasury Department's most current list (Circular 570 as amended) and be authorized to transact business in the State where the Project is located, unless otherwise specifically approved in writing by TWA.

ATTACH a certified copy of Power-of-Attorney appointing individual Attorney-in-Fact for execution of Performance Bond on behalf of Surety.

The Performance Bond and the Payment Bond and the covered amounts of each are separate and distinct from each other.

END OF SECTION

SECTION 00620
PAYMENT BOND
(100% of Contract Amount)

KNOW ALL MEN BY THESE PRESENTS: that

_____

(Name of Contractor)

_____

(Address of Contractor)

_____,

(Corporation, Partnership or Individual)

herein called Principal, and

_____

(Name of Surety)

_____

(Address of Surety)

hereinafter called Surety, are held and firmly bound unto **Tohopekaliga Water Authority**

hereinafter called OWNER, in the penal sum of _____ Dollars,$ (_____) in lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, successors, and assigns, jointly and severally, firmly by these presents.
THE CONDITION OF THIS OBLIGATION is such that whereas, the Principal entered into a certain contract with the OWNER, dated the _____ day of _____, 20___, a copy of which is hereto attached and made a part hereof the construction of:

_____

The Surety shall be bound by any and all arbitration awards to the same extend as CONTRACTOR is bound.

(*This portion intentionally left blank*)

NOW, THEREFORE, the condition of this obligation is such that if Principal shall promptly make payments to all claimants as defined in Section 255.05(1), 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, than this obligation shall be void; otherwise, it shall remain in full force and effect subject, however, to the following conditions:

1. This bond is furnished for the sole purpose of complying with the requirements of Section 255.05, Florida Statutes, as the same may be amended.

2. It is a specific condition of this bond that a claimant's right of action on the bond is limited to the provisions of Section 255.05, Florida Statutes, including, but not limited to, the one-year time limitation within which suits may be brought.

Therefore, a claimant, except a laborer, who is not in privity with the Contractor and who has not received payment for his labor, materials or supplies shall, within forty-five (45) days after beginning to furnish labor, materials or supplies for the prosecution of the work, furnish the Contractor with a notice that he intends to look to the bond for protection. A claimant who is not in privity with the Contractor and who has not received payment for his labor, materials or supplies shall within ninety (90) days after performance of the labor or completion of delivery of the materials or supplies, deliver to the Contractor and to the Surety written notice of the performance of the labor or delivery of the materials or supplies and of the nonpayment. No action for the labor, materials or supplies may be instituted against the Contractor or the surety on the bond after one (1) year from the performance of the labor or completion of the delivery of the materials or supplies.

* **All dates to be filled in by OWNER**.

3. The Surety, for value received, hereby stipulates and agrees that its obligations hereunder shall remain in full force and effect notwithstanding (i) amendments or modifications to the Contract entered into by OWNER and Principal without the Surety's knowledge or consent, (ii) waivers of compliance with or any default under the Contract granted by OWNER to Principal without the Surety's knowledge or consent, or (iii) the discharge of Principal from its obligations under the Contract as a result of any proceeding initiated under The Bankruptcy Code of 1978, as the same may be amended, or any similar state or federal law, or any limitation of the liability of Principal or its estate as a result of any such proceeding.

4. Any changes in or under the Contract Documents (which include the Plans, Drawings and Specifications) and compliance or noncompliance with any formalities connected with the Contract or the changes therein shall not affect Surety's obligations under this Bond and Surety hereby waives notice of any such changes. Further, Principal and Surety acknowledge that the Penal Sum of this Bond shall increase or decrease in accordance with the approved changes or other modifications to the Contract Documents.

(*This portion intentionally left blank*)

IN WITNESS WHEREOF, this instrument is executed in _____(number) counterparts, each of which shall be deemed an original, this the ____ day of_____, 20_____.

ATTEST:

_____
(Principal) Secretary

Name_____
(Type)
(Corporate Seal)

_____
Witness to Principal

_____
Witness to Principal

_____
Principal

Name_____
(Type)
Title_____
Address_____
City/State/Zip_____

_____

ATTEST:

_____
(Surety) Secretary

Name_____
(Type)
(Corporate Seal)

_____
Witness as to Surety

_____
Witness as to Surety

_____
Surety

By _____
Attorney-in-fact

Name _____
(Type)
Address _____
City/State/Zip_____

_____

NOTE: Date of the BOND must not be prior to date of Contract. If CONTRACTOR is Partnership, all partners should execute BOND.

IMPORTANT: Surety companies executing BONDS must appear on the Treasury Department's most current list (Circular 570 as amended) and be authorized to transact business in the State where the Project is located, unless otherwise specifically approved in writing by TWA.

ATTACH a certified copy of Power-of-Attorney appointing individual Attorney-in-Fact for execution of Performance Bond on behalf of Surety.

The Performance Bond and the Payment Bond and the covered amounts of each are separate and distinct from each other.

END OF SECTION

SECTION 00700
GENERAL CONDITIONS
TABLE OF CONTENTS

ARTICLE 1	**DEFINITIONS/INTERPRETATIONS**
1.1	Definitions
1.2	Interpretations
ARTICLE 2	**PRELIMINARY MATTERS**
2.1	Copies of Documents
2.2	Commencement of the Contract Time; Notice to Proceed
2.3	Before Starting Construction
2.4	Preconstruction Conference
ARTICLE 3	**CONTRACT DOCUMENTS**
3.1	Applicable Law; Intent
3.2	Priority of the Contract Documents
3.3	Use of Forms Provided
3.4	Reuse of Documents
ARTICLE 4	**AVAILABILITY OF LANDS; PHYSICAL CONDITIONS; REFERENCE POINTS**
4.1	Availability of Lands
4.2	Physical Conditions (Including Underground Facilities
4.3	Differing Physical Conditions (including Underground Facilities)
4.4	Resolution of a Report of Differing Physical Conditions
4.5	Special Requirements for Underground Facilities
4.6	Reference Points
ARTICLE 5	**BONDS AND INSURANCE**
5.1	Performance, Payment and Other Bonds
5.2	Contractor's Insurance - General
5.3	TWA's Insurance
5.4	Workers' Compensation Insurance and Employer's Liability Insurance
5.5	Liability Insurance
5.6	Property Insurance
5.7	Waiver of Rights
5.8	Owner May Object to Insurance
ARTICLE 6	**CONTRACTOR'S RESPONSIBILITIES**
6.1	Supervision and Superintendence
6.2	Personnel and Working Hours
6.3	Apprentices
6.4	CONTRACTOR's Responsibilities for Furnishing
6.5	Items of Material or Equipment
6.6	Wood Products
6.7	Equivalent Materials and Equipment
6.8	Concerning Subcontractors, Suppliers and Others
6.9	Patent Fees and Royalties
6.10	Permits
6.11	Laws and Regulations
6.12	Use of Premises
6.13	Record Documents

6.14	Safety and Protection
6.15	Emergencies
6.16	Shop Drawings and Samples
6.17	Continuing the Work
6.18	Indemnity
6.19	Progress of the Work
6.20	Project Meetings
6.21	CONTRACTOR Not Agent of TWA
6.22	Inspection and Audit
6.23	Truth-in-Negotiation
6.24	Correspondence
6.25	Protection of Historical Properties
6.26	Responsibility of Connecting to Existing Services and Utilities
6.27	Additional Provisions
ARTICLE 7	**WORK BY OTHERS**
7.1	Related Work at Site
7.2	Mutual Duties and Responsibilities
7.3	Extensions in Contract Time
7.4	Contract Time Coordination
ARTICLE 8	**TWA'S RESPONSIBILITIES**
8.1	General
ARTICLE 9	**ENGINEER'S AND DESIGN ENGINEER'S STATUS DURING CONSTRUCTION**
9.1	TWA's Representative
9.2	Visits to Site
9.3	Project Representation
9.4	Duties, Responsibilities and Limitations of Authority of Construction Manager
9.5	Duties, Responsibilities and Limitations of Authority of Field Representative
9.6	Clarifications and Interpretations
9.7	Authorized Variations in Work
9.8	Rejecting Defective Work
9.9	Determinations of Quantities and Classifications of Unit Price Work
9.10	Decisions on Disputes
9.11	Limitations on ENGINEER's, DESIGN ENGINEER's and Field Representative
ARTICLE 10	**CHANGES IN THE WORK**
10.1	Changes in the Work
10.2	Change Orders and Change Requests
10.3	Waivers
ARTICLE 11	**CHANGES IN CONTRACT PRICE OR CONTRACT TIME**
11.1	Changes in Contract Price or Contract Time
11.2	Proposals or Claims Substantiating Adjustments
11.3	Methods for Determining Adjustments in Contract Price
11.4	Determining Cost Adjustments to Changes in Contract Price
11.5	Costs Covered by CONTRACTOR's Allowances
11.6	CONTRACTOR Allowances for Change and Additions to the Work
11.7	Unit Price Work
11.8	Cash Allowances
11.9	Criteria for Determining Adjustments in Contract Time
11.10	Waivers

ARTICLE 12 **SCHEDULES**
12.1 Progress and Submittal Schedules

ARTICLE 13 **WARRANTY AND GUARANTEE, TESTS AND INSPECTIONS, CORRECTIONS, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK**
13.1 Warranty and Guarantee
13.2 Access to Work
13.3 Tests and Inspections
13.4 Uncovering Work
13.5 Correction or Removal of Defective Work
13.6 Acceptance of Defective Work
13.7 TWA May Correct Defective Work
13.8 Warranty Period
13.9 Extended Warranties and Guarantees
13.10 Special Maintenance Requirements
13.11 Extended Warranty Period Due to Defective Work

ARTICLE 14 **PAYMENTS TO CONTRACTOR AND COMPLETION**
14.1 Schedules
14.2 Application for Payment
14.3 Materials on Site
14.4 CONTRACTOR's Warranty of Title
14.5 Review and Payment
14.6 Retainage
14.7 Overpayment
14.8 Final Application for Payment
14.9 Final Payment and Acceptance
14.10 Waiver of Claims
14.11 TWA's Obligations
14.12 Partial Utilization
14.13 Substantial Completion
14.14 Final Inspection
14.15 CONTRACTOR's Continuing Obligation

ARTICLE 15 **SUSPENSION OF WORK AND TERMINATION**
15.1 TWA May Stop Work
15.2 Suspension for Convenience
15.3 Termination for Cause
15.4 Termination for Convenience
15.5 CONTRACTOR May Stop Work or Terminate

ARTICLE 16 **INTENTIONALLY OMITTED**

ARTICLE 17 **MISCELLANEOUS**
17.1 Giving Notice
17.2 Notice to Other Agencies
17.3 Computation of Time
17.4 Claims for Injury or Damage to Person or Property
17.5 No Conflict with Laws or Regulations
17.6 Partial Invalidity
17.7 No Waiver of Rights, Duties
17.8 Advertising
17.9 Venue
17.10 Recovery of Damages

ARTICLE 1 - DEFINITIONS/INTERPRETATIONS

1.1 Definitions

Whenever used in the Contract Documents, the following terms shall have the meanings indicated, which shall be applicable to both the singular and plural thereof.

Addenda - Written or graphic instruments issued prior to the date for opening Bids which modify or interpret the Contract Documents by additions, deletions, corrections or clarifications.

Acceptance, Final Acceptance - The formal action by TWA accepting the Work as being complete after certification by ENGINEER of final completion.

Agreement - The written agreement between TWA and CONTRACTOR covering the Work to be performed; other Contract Documents are incorporated in or referenced in the Agreement and made a part thereof as provided therein.

Apparent Low Bidder - The Bidder submitting the lowest Bid at the Bid Opening without correction of numerical discrepancies or determination of responsiveness and responsibility.

Application for Payment - The form furnished in the Contract Documents which is to be used by CONTRACTOR in requesting progress or Final Payments and which shall contain an affidavit of CONTRACTOR that Progress Payments theretofore received from TWA on account of the Work have been applied by CONTRACTOR to discharge in full all of CONTRACTOR's obligations stated in prior Applications for Payment. The application includes such supporting documentation as required by the Contract Documents.

Bid - The offer or proposal of a Bidder submitted in the prescribed manner on the prescribed forms to perform the Work in accordance with the Contract Documents.

Bidder - The individual, partnership, corporation, joint venture, or other legal entity or combination thereof submitting a Bid for the Work directly to TWA through an authorized representative.

Bid Security - The security designated in the Instructions to Bidders.

Bonds - Instruments of security furnished by CONTRACTOR and his surety in accordance with the Contract Documents.

Change Order - A written instrument issued on or after the Effective Date of the Agreement, which when duly executed by TWA amends the Contract Documents to provide for changes in the Work or in the provisions of the Contract Documents, or changes in Contract Price or Contract Time, or any combination thereof.

Change Request - A written instrument which when signed by TWA is a directive authorizing a change in the Work or in the provisions of the Contract Documents, or an adjustment in Contract Price or Contract Time, or any combination thereof. Even when signed by TWA, a Change Request is not an instrument that amends the Contract Documents; however, it may be converted to a Change Order. An unsigned Change Request may be used by TWA and CONTRACTOR to negotiate changes in the Work or in the provisions of the Contract Documents, or adjustments in Contract Price or Contract Time, or any combination thereof TWA - Tohopekaliga Water Authority; the OWNER.

Construction Manager - The authorized representative of TWA who is assigned to the Project.

Contract Documents - Those documents named in Article 9 of the Agreement.

Contract Price - The total compensation, subject to authorized adjustments, payable by TWA to CONTRACTOR under the Contract Documents as stated in the Agreement.

Contract Time - The period of time allotted in the Contract Documents, subject to authorized adjustments, for Substantial Completion of the Work, or specified part thereof.

CONTRACTOR - The individual, partnership, corporation, joint venture, or other legal entity or combination thereof who has entered into the Agreement with TWA for the performance of the Work. The term "CONTRACTOR" means CONTRACTOR or its authorized representative.

Cost and Pricing Data - Refers to all data available to or relied upon by CONTRACTOR in negotiating, pricing or costing Work covered by a Change Order or a Change Request, or involved in a proposal or claim. Sample Cost and Pricing Data include proposal or claim estimates, CONTRACTOR's Bid estimate, estimating guides, CONTRACTOR's computations and projections, and the assumptions made by CONTRACTOR in pricing or figuring increases or decreases in Contract Price or Contract Time.
Date of Commencement of the Contract Time - The date given by the Notice to Proceed when the Contract Time commences to run.

Day - A calendar day of 24 hours lasting from midnight one day to midnight the next day.

Defective - An adjective which when modifying the word Work refers to work that is unsatisfactory, faulty or deficient, or does not conform to the Contract Documents, or does not meet the requirements of any inspection, reference standard, test or approval referred to in the Contract Documents, or has been damaged prior to Final Payment (unless responsibility for the protection thereof has been assumed by TWA).

DESIGN ENGINEER - The person, firm, or corporation who is named as such in the Agreement who designed the Project and has the rights and authority as assigned to him in the Contract Documents. The term "DESIGN ENGINEER" means DESIGN ENGINEER or its authorized representative.

Drawings, Plans - The Drawings, Plans or reproduction thereof, which show scope, character, location, dimensions, and other details of the Work to be performed and which are included in the Contract Documents.

Effective Date of the Agreement - The date indicated in the Agreement on which it becomes effective, but if no such date is indicated it means the date on which the Agreement is signed by the last of the two parties to sign.

ENGINEER - The individual, partnership, corporation, joint venture, or any combination thereof, named as ENGINEER in the Agreement who will have the rights and authority assigned to ENGINEER in the Contract Documents. The term "ENGINEER" means the ENGINEER or its authorized representative.

Federal Contract Provisions - Federal Regulatory Agency or statutory requirements applicable to the Work and included in the Contract Documents under this heading.

Field Order - A written instrument issued by ENGINEER to CONTRACTOR which orders minor variations in the Work, as opposed to a change in the Work, and which does not involve an adjustment in Contract Price or Contract Time.

Field Representative - Person who is assigned to the site or any part thereof by TWA.
General Requirements - Sections of Division 1 of the Specifications.

Holidays - Days designated by the Tohopekaliga Water Authority as legal holidays.

Laws and Regulations; Laws or Regulations - Laws, Rules, Regulations, Ordinances, and/or court or administrative Orders of the federal, state and local governments.

Low Bidder - The lowest responsive, responsible Bidder.

Notice of Award - The written notice of the acceptance of the Bid from TWA to Low Bidder.

Notice to Proceed - The written notice issued by TWA to CONTRACTOR authorizing it to proceed with the Work and establishing the Date of Commencement of the Contract Time.

OWNER - Refer to definition of TWA.

Payment Bond - The security furnished by CONTRACTOR and its surety as a guarantee that CONTRACTOR will pay in full all Bills and accounts, from claimants as defined in Florida Statutes Chapter 713, or as amended, for material, labor, services and supplies used directly or indirectly in the prosecution of the Work; the covered amount of the Payment Bond is separate and distinct from the covered amount of the Performance Bond.

Performance Bond - The security furnished by CONTRACTOR and its surety as a guarantee that CONTRACTOR will perform all of its contractual obligations in accordance with the terms of the Contract Documents; the covered amount of the Performance Bond is separate and distinct from the covered amount of the Payment Bond.

Progress Schedule - All documentation related to the planning and scheduling of the Work as described in these General Conditions and the General Requirements.

Project - The total construction of which the Work to be provided under the Contract Documents may be the whole, or a part as indicated elsewhere in the Contract Documents.

Request for Information - CONTRACTOR's inquiries for information as submitted on the Request for Information form included in the Contract Documents.

Shop Drawings - All Drawings, diagrams, illustrations, schedules and other data which are specifically prepared by or for CONTRACTOR to illustrate some portion of the Work and all illustrations, brochures, standard schedules, performance charts, instructions, diagrams and other information prepared by a Supplier and submitted by CONTRACTOR to illustrate material or equipment for some portion of the Work, specifically indicating how CONTRACTOR will comply with the Contract Documents.

Specifications - Those portions of the Contract Documents consisting of written or graphic technical descriptions of materials, equipment, construction systems, standards and workmanship as applied to the Work and certain administrative details applicable thereto.

Sub-Agreement - A contract or purchase order awarding a part of the Work under the Contract Documents to a Subcontractor, Supplier or other person or entity.

Subcontractor - An individual, partnership, corporation, joint venture, or other combination thereof having a Sub-agreement with CONTRACTOR for (a) the performance of labor in connection with part of the Work at the site; or (b) for both performing labor in connection with part of the Work at the site and furnishing items of materials or equipment for incorporation into the Work. Subcontractor also means an individual, partnership, corporation, joint venture, or other combination thereof who has a Sub-agreement with another Subcontractor to perform any of the Work at the site.

Substantial Completion - That date when (a) the Work (or a specified part thereof) is complete in accordance with the Contract Documents, with the exception of the minor items identified during the inspection described in these General Conditions, and (b) the Work can be utilized for the purposes for which it is intended, as may be evidenced by successful completion of all specified pre-operational start-up and demonstration tests. The terms "substantially complete" and "substantially completed" as applied to any Work refer to Substantial Completion thereof.

Supplementary Conditions - The part of the Contract Documents which amends or supplements these General Conditions or other portions of the Contract Documents as stated therein and is designated as such.

Supplier - A manufacturer, fabricator, supplier, distributor, materialman or vendor.

Underground Facilities - All pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels or other such facilities or attachments, and any encasements containing such facilities which have been installed underground to furnish any of the following services or materials: electric, gases, steam, liquid petroleum products, telephone or other communications, cable television, sewage and drainage removal, traffic or other control systems or water.

Unit Price Work - Work to be paid on the basis of unit prices. The term contingent Unit Price Work refers to Unit Price Work which is foreseeable but not certain to materialize during the performance of the Work.

Warranty Period - The period of time within which CONTRACTOR shall promptly, without cost to TWA and in accordance with TWA's written instructions, either correct defective Work or, if it has been rejected by TWA, remove it from the site and replace it with non-defective Work.

Work - Any and all obligations, duties, responsibilities, labor, materials, equipment, temporary facilities, utilities, and incidentals and the furnishing thereof necessary to complete the construction assigned to, or undertaken by CONTRACTOR pursuant to the Contract Documents. Also, the completed construction or parts thereof required to be provided under the Contract Documents, including all materials, equipment, and supplies incorporated or to be incorporated in the construction.

1.2 Interpretations

1.2.1. Any reference to an Article or paragraph in these General Conditions without identification of the particular Section shall means a reference to these General Conditions.

1.2.2. Each Article in these General Conditions is composed of sub-articles, numbered as this sub-article 1.2 is numbered; parts, numbered as this part 1.2.1 is numbered; and sub-parts - all of which are generally referred to as "paragraphs". A reference to a sub-article means a reference to the entire sub-article, or to a part, or a sub-part, or any combination of them, depending on the intent of the reference.

1.2.3. Often, the Contract Documents omit the modifying word "all" and "any", and the articles "the" and "an". However, omitting modifiers or articles from, or inserting any of them into, a statement shall not in any way affect the meaning or interpretation of either statement.

ARTICLE 2 - PRELIMINARY MATTERS

2.1 Copies of Documents

TWA shall furnish to CONTRACTOR three (3) copies of the Contract Documents free of charge. CONTRACTOR will reimburse the Design Engineer for the preparation of additional copies.

2.2 Commencement of the Contract Time; Notice to Proceed

2.2.1. The Contract Time will commence to run on the day indicated in the Notice to Proceed. The Notice to Proceed may indicate a Date of Commencement of the Contract Time any time within thirty days after the Effective Date of the Agreement.

2.2.2. CONTRACTOR shall start to perform the Work on the Date of Commencement of the Contract Time. No Work shall be done at the site prior to the date on which the corresponding Contract Time commences to run unless otherwise authorized in writing by TWA.

2.3 Before Starting Construction

2.3.1. Before undertaking each part of the Work, CONTRACTOR shall carefully study and compare the Contract Documents and check and verify pertinent figures shown thereon and all applicable field measurements. CONTRACTOR shall promptly report in writing to ENGINEER any conflict, error or discrepancy which CONTRACTOR or any of his Subcontractors or Suppliers may discover and shall obtain a written interpretation or clarification from ENGINEER before proceeding with any work affected thereby; provided, however, CONTRACTOR shall not be liable to TWA or ENGINEER for failure to report any conflict, error or discrepancy unless CONTRACTOR or any of his Subcontractors or suppliers had actual knowledge thereof or should reasonably have known thereof.

2.3.2. Within ten days after the Effective Date of the Agreement (unless otherwise specified in the General Requirements), CONTRACTOR shall submit to ENGINEER for review a preliminary Progress Schedule indicating the starting and completion dates of the various stages of the Work, a proposed schedule of Shop Drawing submissions, a proposed schedule of values of the Work on the form provided by ENGINEER, and a listing of manpower and cash flow projections through the Contract Time.

2.3.3. The schedule of values shall include quantities and prices of items aggregating the Contract Price, and shall subdivide the Work into component parts in sufficient detail to serve as the basis for Applications for Payment during construction. CONTRACTOR shall confirm in writing at the time of submission, that an appropriate amount of direct costs, supplemental costs, administrative expenses, contingencies and profit have been allocated to each item of Work.

2.3.4. If the Bid Form contains a bid item price for mobilization, the Schedule of Values shall distribute these costs such that no more than 50% of the bid item amount shall be paid as mobilization in the first Application for Payment and at least 10% of the bid item amount shall be paid in the last Application for Payment as demobilization with the remainder paid in equal installments over the Contract Time. In no event shall the Contractor be entitled to receive in its first Application for Payment an amount in excess of five (5) percent of the original Contract Price for mobilization.

2.3.5. TWA or ENGINEER will review and return the schedules submitted in accordance with this Article and CONTRACTOR, if required, shall revise, adjust or modify and resubmit

acceptable schedules within the time periods required, and if none are required, at least ten (10) days before submission of the first Application for Payment.

2.4 Preconstruction Conference

2.4.1. Prior to commencement of Work at the site, a conference will be held for review of the schedules, to establish procedures for handling Shop Drawings and other submittals and for processing Applications for Payment, and to establish a working understanding among the parties as to the Work. CONTRACTOR shall attend such conference and shall require any or all of its Subcontractors and Suppliers, as TWA directs, to attend the conference.

2.4.2. Unless otherwise stated at the Preconstruction Conference or a Project Meeting, the Construction Manager as assigned in writing by the TWA will be the single authorized representative assigned the duty of, and authorized to, transmit or receive communications between CONTRACTOR and ENGINEER for the remaining term of the Agreement.

ARTICLE 3 - CONTRACT DOCUMENTS: INTENT and REUSE.

3.1 Applicable Law; Intent

3.1.1. The Contract Documents comprise the entire agreement between TWA and CONTRACTOR concerning the Work. The Contract Documents are complementary; what is called for by one is as binding as if called for by all. The Contract Documents will be governed by the law of the place of the Project.

3.1.2. It is the intent of the Contract Documents to describe a functionally complete Project (or part thereof) to be constructed in accordance with the Contract Documents. Any Work, materials or equipment that may reasonably be inferred from the Contract Documents as being required to produce the intended result shall be supplied whether or not specifically called for. When words which have a well-known technical or trade meaning are used to describe Work, materials or equipment, such words shall be interpreted in accordance with that meaning. Reference to standard specifications, manuals or codes of any technical society, organization or association, or to the Laws or Regulations of any governmental entity whether such reference be specific or by implication, shall mean the latest standard specification, manual, code or Laws or Regulations in effect at the time of opening of Bids, except as may be otherwise specifically stated. However, no provision of any referenced standard specification, manual or code (whether or not specifically incorporated by reference in the Contract Documents) shall change the duties and responsibilities of TWA, CONTRACTOR, DESIGN ENGINEER or ENGINEER, or any of their consultants, agents or employees from those set forth in the Contract Documents, nor shall it assign to TWA or ENGINEER, or any of their consultants, agents or employees, any duty or authority to supervise or direct the furnishing or performance of the Work or any duty or authority to undertake responsibility contrary to the provisions of Article 9 or 10.

3.2 Priority of the Contract Documents

3.2.1. If, during the performance of the Work, CONTRACTOR, or any of his Subcontractors or Suppliers, finds a conflict, error or discrepancy in the Contract Documents, CONTRACTOR shall so report to ENGINEER in writing at once, and before proceeding with the Work affected thereby, shall obtain a written interpretation or clarification from ENGINEER. However, CONTRACTOR shall not be liable to TWA or ENGINEER for failure to report any conflict, error or discrepancy in the Contract Documents unless CONTRACTOR or any of his Subcontractors or Suppliers had actual knowledge thereof or should reasonably have known thereof. ENGINEER will promptly investigate the matter and respond to CONTRACTOR with an interpretation or clarification.

After CONTRACTOR's discovery of such a conflict, error or discrepancy, or after the date when CONTRACTOR should have reasonably known thereof, until the interpretation or clarification is obtained from ENGINEER, any Work done by CONTRACTOR which is directly or indirectly affected by same, will be at CONTRACTOR's own risk and CONTRACTOR shall bear all costs and delay arising therefrom.

3.2.2. In resolving such conflicts, errors or discrepancies, the Contract Documents shall be given preference in the following order: Change Orders, Executed Change Requests, Field Orders, Agreement, Notice to Proceed, Notice of Award, Addenda, Federal Contract Provisions, Supplementary Conditions, Instructions to Bidders, General Conditions, General Requirements, Divisions 2 through 16 and Appendices of the Specifications, Drawings, Invitation for Bid, CONTRACTORS's Bid, Bonds, Insurance Certificate(s) and Affidavits.

3.2.3. If the issue of priority pertains to Divisions 2 through 16 of the Specifications and the Drawings, figured dimensions shall govern over scaled dimensions, but Work not dimensioned shall be as directed, and Work not particularly shown, identified, sized, or located shall be the same as similar parts that are shown or specified. Further, detail Drawings shall govern over general drawings, larger scale drawings take precedence over smaller scale drawings, Change Order or Change Request Drawings govern over Contract Drawings, and Contract Drawings govern over standard or Shop Drawings. In all cases where notes, specifications, sketches, diagrams, details or schedules in the Specifications or in the Drawings, or between the Specifications and the Drawings, conflict, the higher cost requirement shall be furnished by CONTRACTOR, unless otherwise directed by ENGINEER.

3.2.4. If the issue of priority is due to a conflict or discrepancy between provisions of the Contract Documents and any referenced standard specification, manual, or code of any technical society, organization or association, the provisions of the Contract Documents will take precedence if they are more stringent or presumptively cause a higher level of performance. If there is any conflict or discrepancy between standard specifications, manuals, or codes of any technical society, organization or association, or between Laws or Regulations, the provision with the higher cost requirement shall be binding on CONTRACTOR, unless otherwise directed by ENGINEER.

3.2.5. In accordance with the intent of the Contract Documents, CONTRACTOR recognizes and accepts that compliance with the priority order specified shall not justify an increase in Contract Price or extension in Contract Time.

3.3 Use of Forms Provided

Unless TWA provides to the contrary, only those forms (Change Request Form, Change Order Form, Notice of Award, Notice to Proceed, Application for Payment, Insurance Certificates, Bonds, Bid Form, etc.) provided in the Contract Documents shall be used and no modifications or substitutions shall be allowed.

3.4 Re-use of Documents

Neither CONTRACTOR nor any Subcontractor or Supplier or other person or organization (other than TWA) shall acquire any title to or have ownership rights of any of the Drawings, Specifications or other documents (or copies of any thereof) prepared by or bearing the seal of DESIGN ENGINEER; and they shall not be reused on extensions of the Project or any other project nor shall they be generally published without written consent of TWA.

ARTICLE 4 - AVAILABILITY OF LANDS; PHYSICAL CONDITIONS; REFERENCE POINTS

4.1 Availability of Lands

4.1.1. TWA shall furnish, as indicated in the Contract Documents, the lands upon which the Work is to be performed, rights-of-way and easements, and those other lands which are designated for the use of CONTRACTOR. Easements for permanent structures or permanent changes in existing facilities will be obtained and paid for by TWA, unless otherwise provided in the Contract Documents. Any additional lands, rights-of-way and easements not furnished by TWA that CONTRACTOR deems necessary, including but not limited to requirements for temporary construction facilities, access and egress, or for storage, shall be obtained by CONTRACTOR at no increase in Contract Price or extension in Contract Time, and CONTRACTOR shall confine his operations to those areas furnished or obtained at its expense.

4.1.2. CONTRACTOR shall obtain permits and written approvals (and submit copies to TWA before utilization of those areas) from the appropriate governmental entity or property owner(s), for use of lands not furnished by TWA; and for all lands which include borrow pits, waste and disposal areas, such permits and approvals shall specify their treatment during and at completion of construction.

4.1.3. Access to municipal structures, hydrants, valves, manholes, fire alarms, etc., shall not be obstructed by CONTRACTOR. CONTRACTOR is to make no connections to or operate valves on water mains or otherwise interfere with the operation of the water system, without first giving written notice to and securing written approval from the appropriate governmental entity.

4.2 Physical Conditions (Including Underground Facilities)

4.2.1. The Contract Documents may identify reports of explorations and tests of subsurface conditions at the site, and those drawings of physical conditions in or relating to existing surface and subsurface structures or Underground Facilities owned by TWA which are at or contiguous to the site, that have been utilized by DESIGN ENGINEER in preparation of the Contract Documents. CONTRACTOR may rely upon the accuracy of the technical data in those reports or drawings, but not upon non technical data, interpretations or opinions, or for their completeness for CONTRACTOR's purposes. Except as indicated in the preceding sentence and in Paragraphs 4.4 and 4.5, CONTRACTOR shall have full responsibility for physical conditions, and Underground Facilities owned by TWA, shown or indicated in the Contract Documents.

4.2.2. The information and data shown or indicated in the Contract Documents with respect to Underground Facilities at or contiguous to the site is based on information and data furnished to TWA or DESIGN ENGINEER by the owners of such Underground Facilities or by others. TWA, ENGINEER and DESIGN ENGINEER shall not be responsible for the accuracy or completeness of any such information or data, and, CONTRACTOR shall have full responsibility for reviewing and checking all such information and data.

4.2.3. Unless it prejudices Work already excavated and uncovered, CONTRACTOR shall schedule layout, excavation and uncovering of Work or Underground Facilities a sufficient time in advance to allow ENGINEER's review, and the possible amending or supplementing of the Contract Documents.

4.3 Differing Physical Conditions (including Underground Facilities)

CONTRACTOR shall immediately, after becoming aware thereof, and before the conditions are disturbed (except in a case of an emergency), notify ENGINEER in writing of any subsurface or latent physical conditions, or Underground Facilities, encountered at or contiguous to the site which differ materially from those indicated in the Contract Documents; Underground Facilities not shown or indicated in the Contract Documents encountered at or contiguous to the site; unknown physical conditions encountered or uncovered at or contiguous to the site, of an unusual nature, differing materially from those ordinarily encountered at or contiguous to the site which differ materially from those indicated in the Contract Documents; unknown physical conditions encountered or uncovered at or contiguous to the site, of an unusual nature, differing materially from those ordinarily encountered and not generally recognized as inherent in Work of the character provided for in the Contract Documents.

4.4 Resolution of a Report of Differing Physical Conditions

4.4.1. Promptly after receipt of notice from CONTRACTOR, ENGINEER will review the pertinent conditions, determine the necessity of obtaining additional explorations or tests, and advise TWA in writing of his findings and conclusions. Until such time when CONTRACTOR resumes the affected Work (and at all times thereafter), CONTRACTOR shall be responsible for the safety and protection of the affected Work.

4.4.2. If TWA, with the advice of ENGINEER, concludes that the conditions do materially differ, and that the Contract Documents need to be amended, TWA shall, without invalidating the Agreement and without notice to any surety, by duly executed Change Order or Change Request, order the necessary changes in the Work, as long as TWA has not exercised its rights to terminate the Agreement.

Upon receipt of that order, CONTRACTOR shall promptly proceed or continue with the Work involved pursuant to the conditions stated in the order.

4.4.3. If TWA, with the advice of ENGINEER, concludes that the Contract Documents need to be supplemented only, appropriate minor deviations in the Work shall be authorized by a Change Request duly executed by TWA or a Field Order issued by ENGINEER. TWA's determination that the Contract Documents do not need to be amended shall be final and binding on CONTRACTOR unless CONTRACTOR delivers to TWA written notice of a claim within seven (7) days of receipt of notification of that decision.

4.4.4. If any change in the Work required due to differing physical conditions causes an increase or decrease in CONTRACTOR's cost of or the time required for the performance of all or

part of the Work, TWA shall make an adjustment in Contract Price or Contract Time, subject to the provisions of this Article, and Articles 10 and 11.

4.4.5. If the Contract Documents necessitate amending to order changes in the Work due to Underground Facilities, whether they be shown or indicated or newly discovered, TWA shall authorize the required changes in the Work, including any necessary adjustments in Contract Price, by Change Order or Change Request. If those Underground Facilities cause or will cause delays in the performance or extend completion of all or part of the Work, CONTRACTOR shall absorb all related delay, extension or acceleration costs, however caused; except that, if TWA and CONTRACTOR believe that the delays require a change in Contract Time, TWA shall authorize the necessary change in Contract Time. However, an extension in Contract Time, when and if so granted shall be CONTRACTOR's sole and exclusive remedy with respect to TWA for any delay, disruption, interference, extension or hindrance and associated costs, however caused, resulting from variance in the location or configuration of Underground Facilities shown or indicated, or from newly discovered Underground Facilities.

4.4.6. No proposal by CONTRACTOR for an adjustment under this Article, nor claim by CONTRACTOR for an adjustment on account of differing physical conditions, shall be allowed unless CONTRACTOR has given the written notice required in paragraph 4.3.

4.5 Special Requirements for Underground Facilities

CONTRACTOR shall have full responsibility: a) for locating any and all Underground Facilities shown or indicated as to depth and alignment in advance of excavation; b) for identifying the owner of any newly discovered Underground Facility and promptly notifying that owner and ENGINEER of that discovery; c) for shoring, blocking, and protecting Underground Facilities shown, indicated or discovered; d) for coordination of the Work with the owners of all Underground Facilities shown, indicated or discovered; e) for repairing any damage done to the satisfaction of those owners, to the extent that the damage was due to CONTRACTOR's failure to adhere to the requirements of this paragraph or paragraph 4.2.2., or to the fault or negligence of CONTRACTOR; and f) for the safety and protection of any affected Work, and for repairing any damage done to the Work. Except as otherwise provided in paragraphs 4.4.5. and 4.4.6., all costs involved and time required to perform these responsibilities shall be considered as having been included in the Contract Price and in the CONTRACTOR's schedule for the performance of the Work within the Contract Times, even if the Contract Documents need amending to authorize minor deviations or changes in the Work due to those Underground Facilities.

4.6 Reference Points

4.6.1. TWA shall provide the engineering surveys to establish reference points for construction which in ENGINEER's judgment are necessary to enable CONTRACTOR to proceed with the Work. CONTRACTOR shall be responsible for laying out the Work, shall protect and preserve the established reference points and shall make no changes or relocations without the prior written approval of ENGINEER. CONTRACTOR shall report to ENGINEER whenever any reference point is lost or destroyed, or requires relocation because of necessary changes in grades or locations, and shall be responsible for the accurate replacement or relocation of such reference points by professionally qualified personnel.

4.6.2. CONTRACTOR shall promptly, after becoming aware thereof and before performing any affected Work (except in a case of an emergency), notify TWA in writing of any reference points which in CONTRACTOR's judgment need correction to enable CONTRACTOR to proceed with the proper performance of the Work.

4.6.3. In resolving a report of differing reference points, CONTRACTOR shall adhere to the procedures, assume the duties and responsibilities, and accept the conditions outlined in paragraph 4.4 in all respects.

ARTICLE 5 - BONDS AND INSURANCE

5.1 Performance, Payment and Other Bonds

5.1.1. CONTRACTOR shall furnish a Performance Bond and a Payment Bond, each with good and sufficient surety, and each in an amount at least equal to the Contract Price. These Bonds shall be recorded with the clerk of the circuit court of the County where the Project is located no later than the Date of Commencement of the Contract Time. These Bonds shall remain in effect at least until one (1) year after the date when Final Payment becomes due, except as otherwise provided by Laws or Regulations, or the other provisions of the Contract Documents. CONTRACTOR shall also furnish such other Bonds as are required by the Supplementary Conditions. The Performance Bond requirement in the Contract Documents shall inure solely to TWA and its successors or assigns, as obligee, and no other person shall have any right of action based thereon.

5.1.2. All Bonds shall be in accordance with statutory bond provisions in Florida Statutes and all other applicable Laws and Regulations and be in the form prescribed by the Contract Documents. All Bonds shall be executed by such sureties as are licensed to conduct business in the state of Florida and, except as otherwise provided by Laws and Regulations, are named in the current list of Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (amended) by the Audit Staff Bureau of Accounts, U.S. Treasury Department. All Bonds signed by an agent must be accompanied by a certified copy of its authority to act.

5.1.3. If the surety on any Bond furnished by CONTRACTOR is declared bankrupt or becomes insolvent or its license to do business in the state of Florida is terminated or it ceases to meet the requirements of the Contract Documents, CONTRACTOR shall within five (5) days thereafter substitute another Bond and surety, both of which shall be in accordance with the Contract Documents and acceptable to TWA.

5.1.4. In addition to the other bonding requirements, the surety(ies) named on the Performance Bond and Payment Bond submitted by Low Bidder pursuant to the Contract Documents shall be subject to the approval of TWA. If TWA has a reasonable objection to the proposed Surety, TWA may request Low Bidder to submit an acceptable substitute without an increase in the Bid price. If Low Bidder declines or is unable to make any such acceptable substitution, TWA may, at its sole option, rescind the Notice of Award, and any award of the Contract to Low Bidder will be of no effect. The refusal or inability to make any such substitution may not constitute grounds for sacrificing its Bid Security.

5.2 Contractor's Insurance - General

5.2.1. The types of insurance CONTRACTOR shall purchase and maintain are Worker's Compensation and Employer's Liability Insurance, Liability Insurance, and Property Insurance, which shall include the specific coverages set forth in this Article, as supplemented in the Supplementary Conditions, and be written for no less than the limits of liability coverage provided in the Supplementary Conditions.

5.2.2. CONTRACTOR shall not commence or continue to perform any work unless it, at its own expense, has in full force and effect all required insurance, and until all insurance Certificates have been filed evidencing the specific insurance coverage required, nor shall any payment for Work performed become due and payable until such Certificates have been filed. The CONTRACTOR shall not permit any Subcontractor, Supplier or other person or organization to perform work on the Project unless the Worker's Compensation Insurance requirements have been complied with by such Subcontractor, Supplier or other person or organization. Certificates of Insurance will also be filed with application for final payment. Final payment will not be paid without Certificates of Insurance.

5.2.3. Worker's Compensation and Employer's Liability Insurance shall be maintained in effect for the full Warranty Period, even as extended. Property Insurance shall continue and shall not terminate until TWA makes Final Acceptance and Payment for the Work, except as otherwise provided in the General Conditions. Should any coverage approach expiration during the period in which it is to remain in full force and effect, it shall be renewed prior to its expiration.

5.2.4. Insurance coverage shall be placed with satisfactory carriers licensed to do business in the State of Florida and countersigned by a resident agent. Insurers shall have at least an "A" Best's Rating and a Class XI or better financial category in accordance with the most current A. M. Best Company ratings.

5.2.5. At the time indicated in the Instructions to Bidders, as evidence of specified insurance coverage, CONTRACTOR shall provide certificates of insurance evidencing the specific policies issued, the limits of coverage afforded, all in accordance with the requirements of the forms prescribed in the Contract Documents, and if none are included, as required by TWA. No alteration or substitution of said insurance certificate forms will be allowed, unless approved by TWA in writing.

5.2.6. If so requested in writing by TWA, CONTRACTOR shall deliver one (1) copy to TWA of each insurance policy purchased by CONTRACTOR pursuant to this Article within thirty (30) days of the request.

5.2.7. All the policies of insurance so required of CONTRACTOR in the Contract Documents shall be endorsed to include as additional insurers: TWA, DESIGN ENGINEER, ENGINEER, their consultants, any subsidiaries or affiliates, and each of their directors, officers, employees, representatives, agents or volunteers. In addition, all the policies of Property Insurance required of CONTRACTOR in the Contract Documents shall be endorsed to include Subcontractors as additional insurers. The insurance afforded to these additional insurers shall be primary insurance. If the additional insurers have other insurance which might be applicable to any loss, the amount of insurance provided under CONTRACTOR's policies of insurance shall not be reduced or prorated by the existence of the other insurance.

5.2.8. All the policies of insurance so required of CONTRACTOR in this Article shall be endorsed to expand coverage as required in this Article, as supplemented in the Supplementary Conditions.

5.2.9. Deductible/self-insured retention amounts shall be subject to approval by TWA, and shall be reduced or eliminated upon written request from TWA. The insurer's cost of defense including attorney's fees (and attorney's fees on appeal) shall not be included within the policy coverage but shall remain the responsibility of insurer.

5.2.10 Nothing contained in these insurance requirements is to be construed as limiting the liability of CONTRACTOR or CONTRACTOR's insurance carriers. It is to be understood that TWA, ENGINEER and DESIGN ENGINEER do not in any way represent that the insurance (or the limits of insurance) specified in this Article (or in the Supplementary Conditions) is sufficient or adequate to protect CONTRACTOR's interests or liabilities, but are merely minimums.

5.2.11 Umbrella Liability Insurance shall not be more restrictive than the underlying insurance policy coverages.

5.2.12 All the policies of insurance (or the certificates or other evidence thereof) required to be purchased and maintained by CONTRACTOR in accordance with the Contract Documents will contain a provision that the coverage afforded will not be canceled or materially changed or renewal refused until at least thirty days' prior written notice has been given to TWA and ENGINEER by certified mail.

5.2.13 Certificate of Insurance shall be in the form as approved by Insurance Standards Office (ISO) and such certificate shall clearly state all the coverages required.

5.3 TWA's Insurance

TWA shall have the option of self-insuring or purchasing and maintaining its own insurance. If CONTRACTOR fails to obtain or renew insurance or fails to maintain insurance in a form required by the Contract Documents, or if any insurance company CONTRACTOR has procured insurance from declares bankruptcy, is declared bankrupt, or if the Insurer loses its "A" policyholder's rating or if its financial size category rating falls below Class XI in the most current A. M. Best's rating, TWA may procure insurance at CONTRACTOR's expense in the coverage amounts required by the Contract Documents and shall be entitled to deduct TWA'S resultant costs from the Contract Price by issuing a Change Order. In lieu of procuring insurance at CONTRACTOR's expense, TWA has the option to stop or suspend the Work or terminate CONTRACTOR's services as provided in Article 15.TWA's actions under this paragraph shall not entitle CONTRACTOR to an increase in Contract Price or an extension of Contract Time.

5.4 Worker's Compensation Insurance and Employer's Liability Insurance

CONTRACTOR shall obtain full Worker's Compensation Insurance coverage for no less than the statutory limits and Employer's Liability Insurance coverage in limits not less than the amounts set forth in the Supplementary Conditions, for all persons whom it employs or may employ in carrying out the Work under the Agreement. This insurance shall be in strict accordance with the requirements of the most current and applicable state Worker's Compensation laws.

5.5 Liability Insurance

5.5.1. CONTRACTOR shall purchase and maintain the liability insurance described herein to provide protection from claims arising out of or resulting from CONTRACTOR's performance of the Work and CONTRACTOR's other obligations under the Contract Documents, whether such performance is by CONTRACTOR, by any Subcontractor or Supplier, by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable.

5.5.2. The liability insurance shall include liability insurance applicable to CONTRACTOR's obligations under Articles 6 and 7. CONTRACTOR agrees to pay on behalf of TWA, and to provide and pay a legal defense for, all such claims applicable to CONTRACTOR's obligations under the indemnification provisions in said Articles. CONTRACTOR accepts

as adequate compensation for the contractual liability insurance the amount contained in the Contract Documents.

5.5.3. The liability insurance coverage shall include as a minimum each of the following types of insurance:

A. General Liability
   (1) Comprehensive Form.
   (2) Premises-Operations.
   (3) Explosion and Collapse Hazard.
   (4) Underground Hazard.
   (5) Products/Completed Operations Hazard.
   (6) Contractual Insurance.
   (7) Broad Form Property Damage Including Completed Operations.
   (8) Independent Contractors.
   (9) Personal Injury [with Employment Exclusion deleted.]
B. Automobile Liability
   (1) Comprehensive Form Including Loading and Unloading.
   (2) Owned.
   (3) Hired.
   (4) Non-Owned.

5.6 Property Insurance

5.6.1. CONTRACTOR shall purchase and maintain property insurance upon the Work at the site to the full insurable value thereof (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). This insurance shall insure against the perils of fire and extended coverage and shall include "all risk" insurance for physical loss and damage including, without duplication of coverage, lightning, windstorm, rain, hurricane, hail, explosions, riot, sinkholes, flood, theft, vandalism and malicious mischief, collapse and water damage, and such other perils as may be provided in the Supplementary Conditions, and shall include damages, losses and expenses arising out of or resulting from any insured loss or incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers, architects, attorneys and other professionals).

If not covered under the "all risk" insurance or otherwise provided in the Supplementary Conditions, CONTRACTOR shall purchase and maintain similar property insurance on portions of the Work stored on and off the site or in transit when such portions of the Work are to be included in an Application for Payment. The property insurance required in this paragraph may have a deductible clause, but said deductible shall not exceed $25,000.00 or the limit set forth, if any, in the Supplementary Conditions.

5.6.2. In the event of loss covered by Property Insurance, the proceeds of a claim shall be paid to TWA, which shall apportion the proceeds between TWA and CONTRACTOR as their interests may appear.

5.6.3. Where applicable, CONTRACTOR shall purchase and maintain adequate flood insurance for Work in designated flood hazard areas as defined by P.L. 93-234 (Flood Disaster Protection Act).

5.6.4. CONTRACTOR shall purchase and maintain such boiler and machinery insurance or additional property insurance as may be required by the Supplementary Conditions or Laws and Regulations.

5.6.5. The risk of loss within the deductible amount if any, in the Property Insurance purchased and maintained pursuant to this Article will be borne by CONTRACTOR.

5.7 Waiver of Rights

5.7.1. TWA and CONTRACTOR waive all rights against each other for all losses and damages caused by any of the perils covered by the policies of insurance provided in response to paragraph 5.6 and any other property insurance applicable to the Work, and also waive all such rights against the Subcontractors, ENGINEER, DESIGN ENGINEER, TWA's, ENGINEER's and DESIGN ENGINEER's consultants and all other parties named as insurers in such policies for losses and damages so caused. Each Sub-agreement between CONTRACTOR and a Subcontractor will contain similar waiver provisions by the Subcontractor in favor of TWA, CONTRACTOR, ENGINEER, DESIGN ENGINEER, TWA's, ENGINEER's and DESIGN ENGINEER's consultants and all other parties named as insurers. None of the above waivers shall extend to the rights that any of the insured parties may have to proceeds of insurance held by TWA, CONTRACTOR, or otherwise payable under any policy so issued.

5.7.2 TWA and CONTRACTOR intend that any policies provided in response to paragraph 5.6 shall protect all of the parties insured and provide primary coverage for all losses and damages caused by the perils covered thereby. Accordingly, all such policies shall contain provisions to the effect that in the event of payment of any loss or damage the insurer will have no rights of recovery against any of the parties named as insurers or additional insurers, and if the insurers require separate waiver forms to be signed by ENGINEER, DESIGN ENGINEER, or TWA's, ENGINEER's, or DESIGN ENGINEER's consultants TWA will obtain the same, and if such waiver forms are required by any Subcontractor, CONTRACTOR will obtain the same.

5.8 Owner May Object to Insurance

5.8.1. Neither TWA's review of the coverage afforded by or the provisions of the policies of insurance purchased and maintained by CONTRACTOR in accordance with this Article, nor TWA's decisions to raise or not to raise any objections about either or both, shall in any way relieve or decrease the liability of CONTRACTOR. If TWA elects to raise an objection to the coverage afforded by or the other provisions of the insurance furnished, CONTRACTOR shall promptly provide to TWA such additional information as TWA may reasonably request, and CONTRACTOR shall remedy any deficiencies in the policies of insurance at once.

5.8.2. TWA's authority to object to insurance shall not in any way whatsoever give rise to any duty on the part of TWA to exercise this authority for the benefit of CONTRACTOR or any other party.

ARTICLE 6 - CONTRACTOR'S RESPONSIBILITIES

6.1 Supervision and Superintendence

6.1.1. CONTRACTOR shall supervise and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents. CONTRACTOR shall be solely responsible for all means, methods, techniques, sequences and procedures of construction, for providing adequate safety precautions, for coordinating all portions of the Work under the Contract Documents, and for enforcement of order and cooperation among CONTRACTOR's employees and all Subcontractors and Suppliers and others having a Sub-agreement for a part of the Work. CONTRACTOR shall be responsible to see that the finished Work complies accurately with the Contract Documents.

6.1.2. CONTRACTOR shall keep on the Work at all times during its progress a competent resident superintendent, who shall not be replaced without written notice to ENGINEER except under extraordinary circumstances. TWA may, at its sole discretion, require replacement of the superintendent, in which case CONTRACTOR shall submit an acceptable replacement at no increase in Contract Price nor extension in Contract Time. The superintendent shall be CONTRACTOR's representative at the site and shall have authority to act on behalf of CONTRACTOR. All communications given to the superintendent shall be as binding as if given to CONTRACTOR. Whenever the superintendent is not present on any particular part of the Work where the ENGINEER may desire to inform the CONTRACTOR relative to interpretation of the plans and specifications or regarding disapproval or rejection of materials or work performed, the ENGINEER may so inform the foreman or other workers in charge of the particular part of the work in reference to which the information is given. Information so given shall be as binding as if given to the superintendent.

6.1.3. The superintendent and similar authorized representatives of any Subcontractor, Supplier or other person or organization shall attend all meetings pertaining to the Work, as requested by TWA or ENGINEER.

6.2 Personnel and Working Hours

6.2.1. CONTRACTOR shall at all times maintain good discipline and order at the site.

6.2.2. CONTRACTOR shall provide competent, qualified personnel to survey and lay out the work (in accordance with any additional provisions included in the General Requirements) and perform construction as required by the Contract Documents. CONTRACTOR is fully responsible to provide a sufficient number of skilled workers and supervisory personnel to perform the Work and insure that the Work is completed within the Contract Time. Failure to fully man the Project with supervisory personnel and skilled workers shall be cause for termination of CONTRACTOR.

6.2.3. Except in connection with the safety or protection of persons or the Work or property at the site or adjacent thereto, and except as otherwise indicated in the Supplementary Conditions, all Work at the site shall be performed during normal working hours, and CONTRACTOR will not permit overtime work or the performance of Work on Saturday, Sunday or any Holiday without TWA's written consent given after prior written notice to ENGINEER. Normal working hours shall be defined as the CONTRACTOR's normal eight hour working period occurring between the hours beginning at 7:00 a.m. and ending at 6:00 p.m., exclusive of Saturdays, Sundays, or Holidays. Work during other than normal

working hours may be scheduled by CONTRACTOR if he first obtains written permission from TWA.

The TWA observes the following holidays: New Year's Day, Martin Luther King Jr. Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day and Day after Thanksgiving, Christmas Eve and Christmas Day. Holidays falling on Saturday will be observed Friday, holidays falling on Sunday will be observed Monday.

6.2.4. TWA shall be entitled to deduct from the Contract Price, by issuing a Change Order, TWA's extra costs incurred in connection with CONTRACTOR's performance of WORK during hours other than normal working hours. Such costs may include, but shall not be limited to, ENGINEER'S charges to TWA while acting as TWA's representative (including charges outside of normal working hours for Construction Manager and Field Representatives) , TWA's costs incurred in the performance of TWA's responsibilities as set forth in the Contract Documents, and other related costs.

6.3 Apprentices

CONTRACTOR's utilization of apprentices shall conform to the provisions of Florida Statutes Chapter 446.

6.4 CONTRACTOR's Responsibilities for Furnishing

Unless otherwise specified in the Contract Documents, CONTRACTOR shall furnish and assume full responsibility for all materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, ventilation, cooling, telephone, water, sanitary facilities, temporary facilities and all other facilities and incidentals necessary for the furnishing, performance, testing, start-up and completion of the Work.

6.5 Items of Material or Equipment

6.5.1. All materials and equipment shall be of good quality and new, except as otherwise provided in the Contract Documents. If required by ENGINEER, CONTRACTOR shall furnish satisfactory evidence (including reports of required tests) as to the kind and quality of materials and equipment.

All materials and equipment shall be handled, stored, applied, installed, connected, erected, used, cleaned and conditioned in accordance with the instructions of the applicable Supplier except as otherwise provided in the Contract Documents; but no provision of any such instructions will be effective to assign to ENGINEER, or any of TWA's or ENGINEER's consultants, agents or employees, any duty or authority to supervise or direct the furnishing or performance of the Work or any duty or authority to undertake responsibility contrary to the provisions of Article 9 or Article 10.

6.5.2. Manufacturers' or Suppliers' warranties for all materials, products and equipment to be furnished by CONTRACTOR and to be incorporated into the completed Work shall be furnished to TWA through CONTRACTOR.

6.5.3. CONTRACTOR shall obtain from Suppliers of all materials, products and equipment, complete information as to any special condition or restriction to be applied in the use of these items. Should the manner or method of installation, specified performance or test results as set forth in the Specifications be contrary to the manufacturer's recommendations for use of the product, CONTRACTOR shall notify ENGINEER in writing of such conflict as soon as reasonably possible, but no later than the time of Shop Drawing

submittal including those products. Failure to provide such written notice before proceeding with the Work affected thereby shall be certification by CONTRACTOR that the Specification requirements will be met by the materials, products and equipment, and that the cost and time required to perform or complete the Work affected thereby have been included in the Contract Price and in the schedule for the performance of the Work within the Contract Time.

6.5.4. Data submitted on all equipment shall include complete operation and maintenance instructions (including preventive maintenance and operating requirement data) and parts lists in sufficient detail to facilitate ordering replacements. Such submittals shall conform to any additional requirements provided in the General Requirements.

6.6 Wood Products

Except as may be otherwise provided by Laws or Regulations, pursuant to Florida Statutes Chapter 225, lumber, timber and other forest products specified in the Contract Documents shall be produced and manufactured in Florida whenever such products are available, provided that price, fitness and quality are equal to other available products. This requirement does not apply where plywood is specified for monolithic concrete forms.

6.7 Equivalent Materials and Equipment

6.7.1. Whenever materials or equipment are specified or described in the Drawings or Specifications by using the name of a proprietary item or the name of a particular Supplier, the naming of the item is intended to establish the type, function and quality required. Unless the name is followed by words indicating that no substitution is permitted, materials or equipment of other Suppliers may be accepted by ENGINEER if (a) the proposed substitution was listed on the substitution list provided on the bid form; and b) sufficient information is submitted by CONTRACTOR to allow ENGINEER to determine that the material or equipment proposed is equivalent to that named. If the proposed substitution was not listed on the bid form, CONTRACTOR shall request in writing that TWA waive this requirement. TWA reserves the right to either maintain or waive this requirement. If TWA elects not to waive this requirement, CONTRACTOR shall take immediate action to provide the materials and equipment specified.

6.7.2. Requests for review of substitute items of material and equipment will not be accepted by ENGINEER from anyone other than CONTRACTOR. If CONTRACTOR wishes to furnish or use a substitute item of material or equipment CONTRACTOR shall, within adequate time to allow a proper review without impacting the schedule, make written application to ENGINEER for acceptance thereof, certifying that the proposed substitute will perform adequately the functions called for by the general design, be similar and of equal substance to that specified and be suited to the same use and capable of performing the same function as that specified. The application shall state whether or not acceptance of the substitute for use in the Work will require a change in the Drawings or Specifications to adapt the design to the substitute and whether or not incorporation or use of the substitute in connection with the Work is subject to payment of any license fee or royalty. All variations of the proposed substitute from that specified shall be identified in the application and available maintenance, repair and replacement service shall be indicated. The application shall also contain an itemized estimate of all increases or decreases in (1) the cost of, or the time required to perform any part of the Work, and the corresponding adjustments in Contract Price an Contract Time, resulting directly or indirectly from evaluation and acceptance of the proposed substitute, including, but not as a way of limitation, costs and delays associated with redesign, or claims of other contractors affected by the resulting substitute; and (2) increases or decreases in operating,

maintenance, repair, replacement or spare part costs, all of which will be considered by ENGINEER in evaluating the proposed substitute. ENGINEER may require CONTRACTOR to furnish, at CONTRACTOR's expense, additional data about the proposed substitute.

6.7.3. ENGINEER shall be the sole judge of acceptability, and no substitute shall be ordered or installed without ENGINEER's prior written acceptance. However, TWA reserves the right to reject any proposed substitute which would result in an increase in Contract Price or Contract Time, and TWA may require CONTRACTOR to furnish at CONTRACTOR's expense a special performance guarantee or other surety with respect to any substitute. If approval is given, CONTRACTOR shall not be excused from producing Work in conformity with Contract requirements.

6.7.4. ENGINEER will record time required by ENGINEER, DESIGN ENGINEER and their consultants in evaluating substitutions proposed by CONTRACTOR and in making changes in the Drawings or Specifications occasioned thereby. Whether or not ENGINEER accepts a proposed substitute, TWA shall be entitled to deduct from the Contract Price, by issuing a Change Order, TWA's costs including the charges of ENGINEER, DESIGN ENGINEER and their consultants for evaluating any proposed substitute.

6.7.5. The net difference in cost between the substitute item and that specified shall benefit TWA and CONTRACTOR in equal proportions if the substitution was listed on the Bid Form. If the substitution was not listed in the Bid Form, all of the savings will go to TWA. If ENGINEER estimates that the deduction proposed by CONTRACTOR does not, in its opinion, reflect the sharing of costs in the portions described above, this shall be adequate justification to reject the proposed substitution.

6.7.6. CONTRACTOR assumes sole responsibility for verifying that the proposed substitute items are in accordance with the requirements of the Contract Documents, and that the dimensions, arrangement, design and construction details, and all other features of substitute items are suitable for their intended purpose.

6.7.7. In the event that a substitute item differs materially from the specified item of material or equipment, and said difference was not expressly identified in CONTRACTOR's request for the substitution, or the incorporation of the substitute into the Work results in a change(s) to the Work or in the function or general design of the Project, ENGINEER will have authority to require the removal and replacement of said substitute.

6.8 Concerning Subcontractors, Suppliers and Others

6.8.1. CONTRACTOR shall not award Work to Subcontractors in excess of 50 percent of the Contract Price without prior written approval of TWA. CONTRACTOR shall not employ any Subcontractor, Supplier or other person or organization (including but not limited to those who are to furnish the principal items of materials or equipment), whether initially or as a substitute, against whom TWA or ENGINEER may have reasonable objection. A Subcontractor, Supplier or other person or organization identified in writing to TWA and ENGINEER by CONTRACTOR prior to the Notice of Award and not objected to in writing by TWA or ENGINEER prior to the Notice of Award will be deemed acceptable to TWA or ENGINEER. Acceptance of any Subcontractor, Supplier or other person or organization by TWA or ENGINEER shall not constitute a waiver of any right of TWA or ENGINEER to reject defective Work by CONTRACTOR or any Subcontractor, Supplier or any other person or organization. If TWA or ENGINEER after due investigation has reasonable objection to any Subcontractor, Supplier or other person or organization proposed by

CONTRACTOR after the Notice of Award, CONTRACTOR shall submit an acceptable substitute. Such Subcontractor, Supplier person or organization shall neither commence nor continue Work after TWA or ENGINEER objects to said entity. In the event that any such reasonable objection and acceptable substitute will cause additional expense or extend performance of the Work, or part thereof, beyond the Contract Time for the Work, or part thereof, CONTRACTOR may make a request for an adjustment in Contract Price or Contract Time. However, any changes in Contract Price made under this paragraph shall exclude any adjustments for any increases in CONTRACTOR's costs in connection with an increase in Contract Time resulting from the reasonable objection and acceptable substitute submitted pursuant to this paragraph. In any such case, the extension in Contract Time so granted, if any, shall be CONTRACTOR's sole and exclusive remedy for delay, disruption, interference, hindrance and costs thereto. CONTRACTOR shall not be required to employ any Subcontractor, Supplier or other person or organization against whom CONTRACTOR has reasonable objection.

6.8.2. CONTRACTOR shall give prompt written notice to TWA with copy to ENGINEER as to the identity and qualifications (in accordance with Article 10 of the Instructions to Bidders) of any Subcontractor, Supplier or other person or organization to whom CONTRACTOR intends to award Work that was not previously identified in accordance with the Instructions to Bidders, and of CONTRACTOR's intent to remove or replace a Subcontractor, Supplier or other person.

6.8.3. CONTRACTOR shall be fully responsible for all acts and omissions of his Subcontractors and Suppliers and of persons and organizations directly or indirectly employed by them and of persons and organizations for whose acts any of them may be liable to the same extent that CONTRACTOR is responsible for the acts and omissions of persons directly employed by CONTRACTOR. Nothing in the Contract Documents shall create any contractual relationship between TWA or ENGINEER and any Subcontractor or Supplier or other person or organization having a Sub-agreement with CONTRACTOR, nor shall it create any obligation on the part of TWA or ENGINEER to pay or to see to the payment due any Subcontractor, Supplier or other person or organization, except as may otherwise be required by law.

TWA or ENGINEER may furnish to any Subcontractor or other person or organization, to the extent practicable, evidence of amounts paid to CONTRACTOR on account of specific Work done. No Subcontractor, Supplier or other person or organization shall be a third party beneficiary of this Contract.

6.8.4. The divisions and sections of the Specifications and the identifications of any Drawings shall not control CONTRACTOR in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade. The divisions of the Specifications are complementary, and anything mentioned or shown in a division of the Specifications or in a specific trade Drawing shall be of like effect as if shown in all divisions of the Specifications and in all Drawings. In addition to other requirements in the Contract Documents, Shop Drawings of a specific trade shall be compared to and coordinated with those from other trades by CONTRACTOR before submission to ENGINEER.

6.8.5. All Work performed for CONTRACTOR by a Subcontractor, Supplier or other person or organization will be pursuant to an appropriate Sub-agreement between CONTRACTOR and the Subcontractor, Supplier or other person or organization which specifically binds the Subcontractor, Supplier or other person or organization to the applicable terms and conditions of the Contract Documents for the benefit of TWA.

6.8.6. If requested in writing by TWA, CONTRACTOR shall deliver to TWA a copy of each Sub-agreement with a Subcontractor, Supplier or other person or organization performing a part of the Work within seven (7) days of TWA's request.

6.9 Patent Fees and Royalties

CONTRACTOR shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product or device which is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product, or device is specified in the Contract Documents for use in the performance of the Work, and its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, it shall remain the responsibility of CONTRACTOR to assume all costs incident to the use in the performance of the Work or the incorporation in the Work of said invention, design, process, product or device.

Whenever CONTRACTOR is required or desires to use any design, device, material or process covered by letters, patent, trademark or copyright, the right for such use shall be provided for by suitable legal agreements with the patentee or owner, and a copy of this Agreement shall be filed with ENGINEER. However, whether or not such agreement is made or filed as noted, CONTRACTOR and CONTRACTOR's surety in all cases shall indemnify and hold harmless and defend TWA and ENGINEER and anyone directly or indirectly employed by either of them from and against all claims, damages, losses and expenses (including but no limited to charges of engineers, architects, other professionals and attorneys' fees and attorneys' fees on appeal and all costs of defense or appeal) arising out of any infringement of letters, trademark, patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product or device not specified in the Contract Documents, and shall defend all such claims in connection with any alleged infringement of such rights.

6.10 Permits

Unless otherwise provided in the Contract Documents, CONTRACTOR shall obtain and pay for all construction permits and licenses. CONTRACTOR shall pay all governmental charges and inspection fees necessary for the prosecution of the Work, which are applicable at the time of opening of Bids. CONTRACTOR shall pay all charges of utility service companies for utilities service to accomplish the Work. If CONTRACTOR fails to obtain or renew any permit or license required by this paragraph, TWA has the option of stopping or suspending the work or terminating the CONTRACTOR's services or procuring any permit or license directly. TWA shall be entitled to deduct TWA's resultant costs from the Contract Price by issuing a Change Order. CONTRACTOR shall meet all requirements of all permits and licenses.

6.11 Laws and Regulations

6.11.1 CONTRACTOR shall give all notices and comply with all Laws and Regulations applicable to the Work. If CONTRACTOR observes that the Contract Documents are at variance therewith, CONTRACTOR shall give ENGINEER prompt written notice thereof, and any necessary changes shall be adjusted by an appropriate Change Order (subject to the provisions of Articles 3, 10, and 11). If CONTRACTOR performs any Work knowing or having reason to know that it is contrary to such Laws or Regulations and without such notice to ENGINEER, CONTRACTOR shall bear all costs arising therefrom. CONTRACTOR shall indemnify and hold harmless TWA for all claims, fines, damages, losses and expenses (including but not limited to charges of engineers, architects, other professionals and attorneys' fees and attorneys' fees on appeal and all costs of defense or appeal) arising out of CONTRACTOR's failure to comply with the terms of this paragraph.

6.11.2 CONTRACTOR shall pay all sales, consumer, use and other taxes required to be paid by it in accordance with the Laws and Regulations of the place of the Project.

6.12 Use of Premises

6.12.1 CONTRACTOR shall confine construction equipment, the storage of materials and equipment and the operations of workmen to areas permitted by Laws and Regulations, rights-of-way, permits and easements or the requirements of the Contract Documents, and shall not unreasonably encumber the premises with construction equipment or other materials or equipment. CONTRACTOR shall assume full responsibility for any damage to any such property, or to the owner or occupant thereof or of any other property, caused or alleged to have been caused by or incident to the execution of this Work. CONTRACTOR shall promptly attempt to settle with such other party by agreement or otherwise resolve the claim by arbitration or at law. CONTRACTOR shall, to the fullest extent permitted by Laws and Regulations, indemnify, defend and hold TWA and ENGINEER harmless from and against all claims, damages, losses and expenses (including but not limited to charges of engineers, architects and other professionals, and attorneys' fees and attorneys' fees on appeal and all costs of defense or appeal) arising directly, indirectly or consequentially out of any action, legal or equitable, brought by any such other party against TWA, DESIGN ENGINEER or ENGINEER to the extent based on a claim arising out of CONTRACTOR's performance of the Work.

6.12.2 Notwithstanding the designation of Contract limits or the indication of temporary fences or barricades, the provisions of the Contract Documents governing certain phases or portions of the Work, such as trenching and landscaping, may require that certain operations be carried out beyond such limits. Those operations, if required beyond such designated limits, shall be scheduled in such a manner as to cause or occasion a minimum of inconvenience or disturbance to or interference with the normal operation of TWA abutters and the public. CONTRACTOR shall obtain TWA's prior approval and all necessary approvals from others, governmental entities and utility companies for such operations, and prosecute such operations expeditiously and restore the affected property to its original condition immediately upon completion of such operations, unless otherwise specified in the Contract Documents. All those areas on which temporary driveways or walks are routed shall be restored to their original condition, immediately when normal routing can be reinstated, unless otherwise specified in the Contract Documents. Pumping, draining and control of surface and groundwater shall be carried out so as to avoid endangering the Work or any adjacent facility or property, or interrupting, restricting or otherwise infringing or interfering with the use thereof.

6.12.3 Except as specifically arranged with the owners of adjacent premises, CONTRACTOR shall avoid any encroachment on adjacent premises. It is specifically agreed that CONTRACTOR shall repair and make good any damage to adjacent premises or improvements thereon caused by its operation, including any damage or loss to the tenant of such adjoining premises or to the owners thereof, whether to buildings, stocks of merchandise, trade fixtures, or otherwise.

6.12.4 During the progress of the Work, and as directed by the TWA or its representatives, CONTRACTOR shall keep the premises free from accumulations of waste materials, rubbish and other debris resulting from the Work. At the completion of the Work CONTRACTOR shall remove all waste materials, rubbish and debris from and about the premises as well as all tools, appliances, construction equipment and machinery, and surplus materials, and shall leave the site clean and ready for occupancy by TWA.

CONTRACTOR shall restore to original condition all property not designated for alteration by the Contract Documents.

6.12.5 CONTRACTOR shall not load or permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall CONTRACTOR subject any part of the Work or adjacent property to stresses or pressures that will endanger it.

6.13 Record Documents

Contractor shall maintain in a safe place at the site, one (1) record copy of all drawings, specifications, addenda, change orders, change requests, correspondence, field test records, contractor's daily reports and construction photographs, and written interpretations and clarifications in good order, and annotated to show all changes made during construction. These record documents, together will all approved samples and shop drawings will be available to ENGINEER for reference.

The record drawings shall be marked up as the work progresses to reflect current conditions and shall become the "as-built" plans. The revisions are to be indicated in a neat, well-organized manner and are to include the elevation and plan location of any utilities, structures, etc., encountered or installed. A "record" survey book will be kept and shall include the following items:

1. The location and elevation of all existing utilities, structures, etc. encountered.
2. The finished product location and elevation of all utilities and structures installed, including, but not limited to, fire hydrants, catch basin and manhole lids and inverts, and valve boxes.

All record notes shall be kept in book(s) designated "record" and no other survey notes will be kept in such books.

Contractor will be required to review with ENGINEER the status of the as-built plans and the "record" survey notes in connection with ENGINEER'S evaluation of an application for payment.

Failure to maintain record documents current shall be just cause to recommend withholding of payments for work performed.

Upon completion of the work, ENGINEER shall deliver to the Contractor a reproducible set of updated contract plans. CONTRACTOR will transfer all his as-built information to these reproducible's and deliver the resultant as-built set of plans, together with the record survey book to ENGINEER for TWA.

6.14 Safety and Protection

6.14.1 CONTRACTOR shall be solely and completely responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. CONTRACTOR shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to all employees on the Work and other persons (including but not limited to the general public) who may be affected thereby; all the Work and all materials or equipment to be incorporated therein, whether in storage on or off the site; and other property at the site, adjacent thereto, or utilized by CONTRACTOR including but not limited to trees, shrubs, lawns, walks, pavements, roadways, structures, Underground Facilities and utilities not designated for removal, relocation or replacement in the course of construction regardless of whether or not such other property is indicated in the Contract Documents. CONTRACTOR's duties and

responsibilities for the safety and protection of the Work shall continue until such time as ENGINEER issues a notice to TWA and CONTRACTOR that the Work is acceptable.

6.14.2 All damage, injury or loss to any property caused, directly or indirectly, in whole or in part, by CONTRACTOR, any Subcontractor, Supplier or anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, shall be remedied by CONTRACTOR at his sole cost, except damage or loss solely attributable to the fault of the Drawings or Specifications or the acts or omissions of TWA or ENGINEER or anyone employed by either of them or anyone for whose acts either of them may be liable.

6.14.3 CONTRACTOR shall comply with all applicable Laws and Regulations of any governmental entity having jurisdiction for the safety of persons or property or to protect them from damage, injury or loss including, but not limited to, OSHA (Public Law 91-596) and the Contract Work Hours and Safety Standards Act (Public Law 91-54); and shall erect and maintain all necessary safeguards for such safety and protection.

CONTRACTOR shall designate a responsible member of his organization at the site whose duties shall be preventing accidents and insuring compliance with all applicable safety regulations. This person shall be CONTRACTOR's superintendent unless otherwise designated in writing by CONTRACTOR to TWA.

6.14.4 When the performance of the Work requires the use of shoring, sheet piling and other special construction related to excavation, and when required by Laws or Regulations, CONTRACTOR shall cause the design of said shoring, sheet piling and other special construction to be performed by a registered professional engineer licensed in the State of Florida. CONTRACTOR shall submit, as a Shop Drawing, a certification by the registered engineer, stating that it has complied with this requirement. CONTRACTOR shall meet all requirements of such designs prepared by a registered engineer. In addition to any requirements imposed by law, CONTRACTOR shall shore up, brace, underpin, and protect as may be necessary, all foundations and other parts of all existing structures adjacent to and adjoining the site of the Work which are in any way affected by the excavations or other operations connected with the performance of the Work.

6.14.5 CONTRACTOR shall notify owners of adjacent property and of Underground Facilities and utility owners when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation and replacement of their property. Whenever any notice is required to be given by TWA or CONTRACTOR to any adjacent or adjoining landowner or other party before commencement of any Work, such notice shall be given by CONTRACTOR.

6.14.6 CONTRACTOR shall take reasonable care during construction to avoid damage to vegetation. Ornamental shrubbery and tree branches shall be temporarily tied back, where appropriate, to minimize damage. Trees which receive damage to branches shall be trimmed of those branches to improve the appearance of the tree. Tree trunks receiving damage from equipment shall be treated with a tree dressing.

6.14.7 At all times CONTRACTOR shall, and shall cause his Subcontractors and Suppliers to, carefully protect its and their Work, materials, equipment, and supplies against damage or injury from the weather. If in the opinion of ENGINEER any of the above has been damaged or injured by reason of failure on the part of CONTRACTOR, any Subcontractor or Supplier to perform according to the requirements of this provision, said Work, materials, equipment and supplies shall be removed and replaced at the expense of CONTRACTOR.

6.15 Emergencies

In emergencies affecting the safety or protection of persons or the Work or property at the site or adjacent thereto, CONTRACTOR, without special instruction or authorization from ENGINEER or TWA, is obligated to act to prevent threatened damage, injury or loss. CONTRACTOR shall give TWA prompt written notice if CONTRACTOR believes that any significant changes in the Work have resulted because of the action taken in response to an emergency. If TWA determines that changes are required, TWA shall authorize the changes by Change Order or Change Request. If the emergency was not due to the fault or negligence of CONTRACTOR, or any Subcontractor or Supplier or anyone for whose acts any of them may be liable and the changes cause an increase or decrease in CONTRACTOR's cost or the time required to perform any part of the Work, TWA shall make an adjustment in Contract Price or Contract Time, as provided in Articles 10 & 11.

6.16 Shop Drawings and Samples

6.16.1 After checking and verifying all field measurements and after complying with applicable procedures specified in the General Requirements, CONTRACTOR shall submit to DESIGN ENGINEER for review and approval in accordance with the accepted schedule of Shop Drawing submissions, five (5) copies for use by TWA, DESIGN ENGINEER and ENGINEER plus additional copies as required by CONTRACTOR (unless otherwise specified in the Contract Documents) of all Shop Drawings, which shall have been checked by and stamped with the approval of CONTRACTOR and identified as DESIGN ENGINEER and ENGINEER may require. CONTRACTOR shall submit a copy of the transmittal letter providing drawing numbers and titles for each item included in a Shop Drawing submittal to ENGINEER at the same time each submittal is made to DESIGN ENGINEER.

6.16.2 CONTRACTOR shall also submit to ENGINEER for review and approval, with such promptness as to cause no delay in the Work, all samples required by the Contract Documents. All samples shall have been checked by and stamped with the approval of CONTRACTOR, identified clearly as to material, manufacturer, any pertinent data such as catalog numbers and the use for which it is intended.

6.16.3 CONTRACTOR's stamp of approval on any Shop Drawing or sample shall specifically indicate in writing, or if not indicated in writing, shall constitute a representation that CONTRACTOR has either determined and verified all quantities, dimensions, field construction criteria, materials, catalog numbers, specified performance criteria, and similar data or assumes full responsibility for doing so, and that CONTRACTOR has reviewed or coordinated each Shop Drawing or sample with the requirements of the Work and the Contract Documents.

6.16.4 At the time of each submission, CONTRACTOR shall in writing call ENGINEER's attention to any deviations that the Shop Drawings or samples may have from the requirements of the Contract Documents, and, in addition, shall cause a specific notation to be made on each Shop Drawing submitted of each such variation.

6.16.5 DESIGN ENGINEER will review Shop Drawings and samples and return CONTRACTOR's submittals stamped with the following notation, as appropriate:

NO EXCEPTION TAKEN	[ ]
FURNISH AS CORRECTED	[ ]
REVISE AND RESUBMIT	[ ]
REJECTED	[ ]

Corrections or comments made on the shop drawings during this review do not relieve CONTRACTOR from compliance with requirements of the drawings and specifications. This check is only for review of the general conformance with the design concept of the project and general compliance with the information given in the contract documents. The contractor is responsible for: Confirming; and correlating all quantities and dimensions; selecting fabrication processes and techniques of construction; coordinating his or her work with that of all other trades and performing all work in a safe and satisfactory manner."

DESIGN ENGINEER's review and approval will be only for conformance with the design concept of the Project and for compliance with the information given in the Contract Documents and shall not extend to the accuracy of other matters that may be contained in the submittals, including but not limited to such matters as dimensions, quantities, performance of equipment and systems designed by CONTRACTOR, engineering design furnished by CONTRACTOR, CONTRACTOR's means, methods, techniques, sequences or procedures of construction (except where a specific means, method, technique, sequence, or procedure of construction is indicated in or required by the Contract Documents) or to safety precautions or programs incident thereto, the correctness of which shall remain the sole responsibility of CONTRACTOR. The review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.

CONTRACTOR shall make any corrections required by the DESIGN ENGINEER and shall return the required number of corrected copies of Shop Drawings and resubmit new samples for review. CONTRACTOR shall direct specific attention in writing to revisions other than the corrections called for by DESIGN ENGINEER on previous submittals.

6.16.6 DESIGN ENGINEER's review and approval of Shop Drawings or samples shall not relieve CONTRACTOR from responsibility for any variation from the requirements of the Contract Documents unless CONTRACTOR has in writing called DESIGN ENGINEER's attention to each such variation at the time of submission and DESIGN ENGINEER has given written approval of each such variation by a specific written notation thereof incorporated in or accompanying the Shop Drawing or sample approval; nor will any approval by DESIGN ENGINEER relieve CONTRACTOR from responsibility for errors or omissions in the Shop Drawings or from responsibility for having complied with the provisions of paragraph 6.16.3.

6.16.7 Where a Shop Drawing or sample is required by the Specifications, no related Work shall be commenced until the submittal has been returned by DESIGN ENGINEER and noted "No Exception Taken" or "Furnish As Corrected".

6.16.8 All costs incurred in connection with DESIGN ENGINEER's or ENGINEER's review and return of a particular Shop Drawing or sample submission after DESIGN ENGINEER's second time review shall be borne by CONTRACTOR, including DESIGN ENGINEER's charges to TWA under the terms of their agreements with TWA. TWA shall be entitled to deduct these costs from the Contract Price by issuing a Change Order.

6.16.9 In reviewing Shop Drawings or samples, DESIGN ENGINEER shall be allowed (thirty) 30 days from the date DESIGN ENGINEER receives the submittal or re-submittal from CONTRACTOR to return the submittal in accordance with this Article, unless otherwise provided in the Contract Documents. DESIGN ENGINEER's review and return of a Shop Drawing or sample within the time allowed shall not justify an increase in Contract Price or an extension in Contract Time. Any delay in connection with CONTRACTOR's submittal and any resubmittal of a particular Shop Drawing or sample shall represent delays under the control of CONTRACTOR and shall not justify an increase in Contract Price or an extension in Contract Time.

6.17 Continuing the Work

CONTRACTOR shall carry on the Work and maintain the Progress Schedule during all disputes or disagreements with TWA. No Work shall be delayed or postponed pending resolution of any disputes or disagreements, except as CONTRACTOR and TWA may otherwise agree in writing. Suspension of the Work by CONTRACTOR during any dispute or disagreement with TWA shall entitle TWA to terminate the CONTRACT for cause, except as otherwise provided in Article 15.

6.18 Indemnity

6.18.1 To the fullest extent permitted by law, CONTRACTOR shall indemnify, hold harmless and defend (provide and pay for legal defense) TWA, DESIGN ENGINEER, ENGINEER and their consultants, and each of their directors, officers, agents, and employees from and against all claims, damages, losses, expenses, and other costs, including costs of defense and attorneys' fees, and cost and attorney's fees on appeal, arising in any manner out of, or resulting from, or in connection with the performance of the Work, both on and off the job site, provided that any of the foregoing (1) is attributable to personal injury, bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom, and (2) is caused in whole or in part by any act or omission of CONTRACTOR, any Subcontractor, any Supplier, anyone directly or indirectly employed by any of them or anyone for whose acts or omissions any of them may be liable, regardless of whether or not caused in part by any act or omission of a party indemnified hereunder.

6.18.2 In any and all claims against the indemnified parties by any employee of CONTRACTOR, any Subcontractor, any Supplier, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, the indemnification obligation under paragraphs 6.18.1 and 6.18.4 shall not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable, by or for CONTRACTOR, or any Subcontractor, or any supplier, or other person under workers' compensation acts, disability benefit acts, or other employee acts.

6.18.3 The obligations of CONTRACTOR under paragraphs 6.18.1 and 6.18.4 shall not extend to the liability of DESIGN ENGINEER, ENGINEER and their consultants, and each of their directors, officers, employees, and agents arising out of, or resulting from, or in connection with the preparation or approval of maps, Drawings, opinions, reports, surveys, designs or specifications, providing that the foregoing were the sole and exclusive cause of the loss, damage, or injury.

6.18.4 CONTRACTOR shall also indemnify and hold harmless and defend (provide and pay for legal defense) TWA and ENGINEER and their consultants, and each of their directors, officers, employees, and agents from and against all losses, expenses, damages (including damages to the work itself), attorneys' fees, and other costs (including costs and attorney's fees on appeal), which any of them may incur with respect to the failure, neglect, or refusal of CONTRACTOR to faithfully perform the Work and/or the CONTRACTOR's obligations under the Agreement. Such costs, expenses, and damages shall include all costs including attorneys' fees and costs and attorneys' fees and costs on appeal incurred by the indemnified parties in any lawsuit to which they are a party.

6.18.5 At TWA's sole option and utilizing attorneys agreeable to TWA, CONTRACTOR shall defend all suits or claims as set out in this paragraph 6.18.

6.18.6 In the event that TWA incurs costs contrary to this indemnification agreement, TWA shall be entitled to deduct these costs from the Contract Price by issuing a Change Order.

6.19 Progress of the Work

6.19.1 If ENGINEER determines that CONTRACTOR is failing to maintain progress of the Work in accordance with the Progress Schedules and the General Requirements, CONTRACTOR shall take steps as may be necessary to improve his progress, and ENGINEER may require him to increase his work force, or hours, or days of work, or the amount of construction plant or all of them, and to submit to ENGINEER for approval such supplementary schedule or schedules as may be deemed necessary to demonstrate the manner in which the requisite progress will be regained and maintained, all without additional cost to TWA.

6.19.2 Failure of CONTRACTOR to comply with the requirements of ENGINEER under this Article shall be grounds for determination by ENGINEER that CONTRACTOR is not prosecuting the Work with such diligence as will insure completion within the time specified. ENGINEER will then so inform TWA. TWA may thereupon suspend the Work or terminate CONTRACTOR's services should CONTRACTOR fail to comply with the above paragraph.

6.20 Project Meetings

6.20.1 The CONTRACTOR along with appropriate subcontractors shall attend Project Meetings requested by ENGINEER or TWA for the purpose of discussing and resolving matters concerning the various elements of the Work. Representatives attending such meetings shall have the authority to bind their respective entities to any decisions made. CONTRACTOR shall prepare minutes of the meeting and distribute copies of such minutes within five (5) calendar days to each participant for review and approval.

Participants shall review the above mentioned minutes and, if a discrepancy is found notify the other participants in writing within one week of receipt of the minutes. If CONTRACTOR and/or his subcontractors fail to attend a meeting, TWA shall be entitled to deduct the costs of TWA, COUNTY, ENGINEER, and DESIGN ENGINEER representatives attending the meeting from the CONTRACT PRICE by issuing a Change Order.

6.20.2 CONTRACTOR shall submit for the Project Meeting a summary bar chart of the work activities anticipated for the following fourteen days. This schedule will be used by the ENGINEER for the planning of testing and inspection and shall be an item of discussion at the Project Meeting.

6.21 **CONTRACTOR** Not Agent of **TWA**

CONTRACTOR shall perform all Work under this Agreement as an Independent Contractor and shall not be considered an agent of TWA, nor shall CONTRACTOR's Subcontractors or Suppliers or employees be considered agents of TWA. CONTRACTOR and not TWA shall be solely responsible to any and all Subcontractors and Suppliers and all those employed by them for their costs, expenses, fees and profits, if any, in performing the Work.

6.22 Inspection and Audit

6.22.1 TWA shall have access to the Work and the right to audit all of CONTRACTOR's books, ledgers, records, correspondence, instructions, drawings, receipts, vouchers, memoranda, and other documents pertinent to all Cost and Pricing Data used by Contractor in the determination of CONTRACTOR'S Bid for the Work, in pricing, negotiating or costing Work covered by a Change Order, Change Request or claim, or otherwise relating to the Work,

and CONTRACTOR shall preserve and make available at CONTRACTOR's office at all reasonable times all such records for a period of five (5) years after Final Payment.

6.22.2 In the event of termination, the records relating to the Work, or part thereof, affected by such termination shall be made available for five (5) years after the termination. Records pertaining to claims, to litigation or the settlement of claims arising under or relating to the performance of the Work shall be made available until disposition of such appeals, litigation, or claims.

6.22.3 CONTRACTOR shall insert a provision containing all the requirements of paragraph 6.22, including this paragraph 6.22.3, in all Sub-agreements between CONTRACTOR and Subcontractors or Suppliers or other persons, altering the paragraph only as necessary to identify properly the contracting parties.

6.23 Truth-In-Negotiation

6.23.1 CONTRACTOR warrants that all bid line items are true, complete and accurate and include all costs, overhead, profit and all other amounts associated with such items and may be relied upon by TWA when making additions or deductions to the Contract Price. CONTRACTOR further warrants that all Cost and Pricing Data provided to ENGINEER and TWA during the term of the Agreement shall be complete, accurate and current when provided. Should there be any changes in the Cost and Pricing Data previously submitted, the CONTRACTOR shall notify and provide the new information to ENGINEER and TWA immediately. TWA shall be entitled to issue an appropriate Change Order to adjust the Contract Price and Contract Time on account of corrections to inaccurate or incomplete information provided by CONTRACTOR.

6.23.2 Despite any provisions in the Contract Documents to the contrary, any amounts paid by TWA to CONTRACTOR in excess of what it is entitled under the Contract Documents shall be reimbursed by CONTRACTOR to TWA. The making of Final Payment to Contractor shall not be a waiver of TWA's right to reimbursement from Contractor nor shall it discharge Contractor's obligation to refund the overpayment. The terms of paragraph 6.23 shall survive the TWA's making Final Payment.

6.23.3 CONTRACTOR shall insert a provision containing all the requirements if paragraph 6.23, including this paragraph 6.23.3, in all Sub-agreements between CONTRACTOR and Subcontractors or Suppliers or other persons, altering the paragraph only as necessary to identify properly the contracting parties.

6.24 Correspondence

All CONTRACTOR's correspondence shall have identification numbers assigned by CONTRACTOR. The identification numbers shall be sequential and assigned chronologically such that each CONTRACTOR's submission can be individually identified by reference to the assigned identification number. The numbering system must be approved by ENGINEER. Any correspondence not so identified may not be accepted by ENGINEER.

6.25 Protection of Historical Properties

6.25.1 CONTRACTOR shall comply with Florida's Archives and Historical Act (Florida Statutes Chapter 267) and the regulations of the local historic preservation board as applicable and protect against the potential loss or destruction of significant historical or archaeological data, sites, and properties in connection with the Work.

6.25.2 CONTRACTOR shall be responsible for reporting immediately to the governmental entity or agency with jurisdiction any archaeological features which are encountered or unearthed during the performance of the Work, and for protecting same to the satisfaction of such governmental entity or agency. CONTRACTOR shall absorb all related delay, extension or acceleration costs, however caused, except that if TWA and CONTRACTOR believe the delays require an extension in Contract Time, TWA shall authorize the necessary change in Contract Time only.

6.26 Responsibility for Connecting to Existing Services and Utilities

At all points where the Work constructed by CONTRACTOR connects to existing utilities and services, the actual Work of making the necessary connection to the existing service or utility shall be arranged for by CONTRACTOR at no expense to TWA (unless specifically indicated otherwise).

Services and utilities included within (but not limited to) this responsibility are roads, ditches, electrical, sewer, mechanical utilities, water, reuse, fencing, etc. Connections shall be made at a time that will result in the least possible interference with existing services.

6.27 Additional Provisions

6.27.1 CONTRACTOR shall be responsible for all cutting of masonry and other materials, and all fitting, drilling or patching which may be necessary to complete the Work or to make its several parts fit together properly, whether or not such Work is expressly specified in the Contract Documents.

6.27.2 CONTRACTOR shall be responsible for preparing and delivering to ENGINEER, on a daily basis, reports recording labor and equipment available and utilized, and materials and equipment received each day, on a form acceptable to ENGINEER. If CONTRACTOR fails to submit reports daily, ENGINEER may withhold approval of any Application for Payment until such time as CONTRACTOR submits the required information. CONTRACTOR shall make available any such records as requested by ENGINEER to verify that the reports are accurate.

6.27.3 CONTRACTOR shall submit to ENGINEER at the beginning of each work shift, a list of specific items requiring final inspection, monitoring, or witnessing by ENGINEER.

ARTICLE 7 - WORK BY OTHERS

7.1 Related Work At Site

7.1.1 TWA may perform other work at the site by TWA's own forces, provide for or allow other work to be performed by other owners, or let other direct contracts for other work. If the fact that such other work is to be performed was not noted in the Contract Documents, written notice thereof will be given to CONTRACTOR prior to starting any such other work.

7.1.2 CONTRACTOR shall afford each owner and contractor (or TWA, if TWA is performing the additional work with TWA's employees) proper and safe access to the site and a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such work, and shall properly connect and coordinate the Work with theirs. CONTRACTOR shall do all cutting, fitting and patching of the Work that may be required to make it integrate properly with such other work. CONTRACTOR shall not endanger any work of others by cutting, excavating or otherwise altering their work and will only cut or alter their work with the written consent of ENGINEER and the others whose work will be affected. The Contractor is not entitled to exclusive use of the site.

7.1.3 If any part of CONTRACTOR's Work depends for proper execution or results upon the work of TWA or any such other contractor or owner, CONTRACTOR shall inspect and promptly report to ENGINEER in writing any delays, defects or deficiencies in such work that render it unavailable or unsuitable for such proper execution and results. CONTRACTOR's failure to so report will constitute an acceptance of the other work as fit and proper for integration with CONTRACTOR's Work except for latent or nonapparent defects and deficiencies in the other work. Wherever Work to be performed by CONTRACTOR is dependent upon the work of any separate contractor, CONTRACTOR shall: (1) coordinate his Work with the dependent work; (2) provide necessary dependent data and requirements; (3) supply and/or install items to be built into dependent work of others; (4) make provisions for dependent work; (5) check and verify dependent dimensions of previously placed work; (6) notify ENGINEER of previously placed dependent work or dependent dimensions which are unsatisfactory or will prevent a satisfactory installation of any such Work; and (7) not proceed with any such Work until any unsatisfactory dependent conditions have been corrected. Installation of Work by CONTRACTOR or by a Subcontractor in any given area shall constitute acceptance by CONTRACTOR or by such Subcontractor of all previously placed dependent work, subject to the exceptions previously noted.

7.1.4 If TWA contracts with others for the performance of other work at the site, the person or organization with the authority and responsibility for coordination of the activities among the various prime contractors may be identified in the Supplementary Conditions, and the specific matters to be covered by such authority and responsibility may be itemized, and the extent of such authority and responsibilities may be provided, in the Supplementary Conditions. Unless otherwise provided in the Supplementary Conditions, coordination with other prime contractors will be the responsibility of each prime contractor and neither TWA nor ENGINEER shall have any authority or responsibility in respect of such coordination.

7.2 Mutual Duties and Responsibilities

7.2.1. Should CONTRACTOR cause damage to the work or property of any separate contractor or owner performing work at or contiguous to the site, or should any claim arising out of CONTRACTOR's performance of Work at or contiguous to the site be made by any separate contractor or utility owner against CONTRACTOR, TWA, ENGINEER, or DESIGN ENGINEER, CONTRACTOR shall promptly attempt to settle with such separate contractor or utility owner by agreement, or to otherwise resolve the dispute at equity or at law. CONTRACTOR shall, to the fullest extent permitted by Laws and Regulations, hold harmless, defend and indemnify TWA, ENGINEER, DESIGN ENGINEER, and their consultants, directors, officers, agents, and employees from and against all claims, damages, losses, costs and expenses (including attorney's fees and attorney's fees on appeal) arising directly, indirectly or consequentially out of any action, legal or equitable, or resulting from damage to the Work of others caused by CONTRACTOR's performance of the Work.

7.2.2. Should any separate contractor or owner cause damage to the Work or property of CONTRACTOR, or should the performance of work by any separate contractor or owner at or contiguous to the site give rise to any other claim by CONTRACTOR, CONTRACTOR shall promptly attempt to settle with such separate contractor or owner by agreement, or to otherwise resolve the dispute at equity or at law. CONTRACTOR shall not institute any action, legal or equitable, against TWA, ENGINEER, DESIGN ENGINEER, or their consultants directors, officers, agents, and employees or permit any action against them to be maintained and continued in its name or for its benefit in any court or before any arbiter which seeks to impose liability or recover damages from TWA, ENGINEER,

DESIGN ENGINEER or their consultants, directors, officers, agents, or employees on account of these.

7.2.3. In the event that TWA incurs costs contrary to the provisions of this paragraph, TWA will be entitled to deduct these costs from the Contract Price by using a Change Order.

7.3 Extensions in Contract Time

7.3.1. If CONTRACTOR is delayed at any time in performing or furnishing the Work by any act or neglect of another contractor or entity performing work at the site noted in the Contract Documents, CONTRACTOR may request an extension in Contract Time; if TWA believes that the delay requires an adjustment in Contract Time, TWA shall authorize the necessary extension of Contract Time. However, an extension in Contract Time(s), if so granted, shall be CONTRACTOR's sole and exclusive remedy with respect to TWA, ENGINEER, and DESIGN ENGINEER, and their consultants, agents and employees for any delay, disruption, interference, extension, acceleration or hindrance and associated costs, however caused, resulting from delays caused by others performing other work at the site.

7.4 Contract Time Coordination

7.4.1. CONTRACTOR shall give prompt written notice to TWA, ENGINEER and any other affected contractor(s) whenever CONTRACTOR anticipates a conflict in Contract Time(s) related to or simultaneous with associated contract time (s) in the work of others. Within seven (7) days thereafter, CONTRACTOR shall be required to deliver to ENGINEER proposed actions to either (a) prevent an adverse effect on the Progress Schedule of the other contractors arising from delays to the Work, or (b) prevent or overcome an adverse effect on the Progress Schedule for the Work arising from delays from another contract.

7.4.2. When Work is performed out of sequence and ahead of interfacing work, CONTRACTOR shall be responsible for taking reasonable steps to minimize damage or loss to the Work which may be caused by others during the performance of their work, including (but not limited to) furnishing written notice to ENGINEER and to the other contractors that Work has been performed out of sequence and ahead of interfacing work.

7.4.3. When work by others is performed out of sequence and ahead of interfacing Work, the said work shall be considered as if it had been shown on the Contract Documents. CONTRACTOR shall be responsible for protecting said work and shall replace, repair or otherwise settle with others any and all damage caused as a result of the performance of work out of sequence unless CONTRACTOR had no actual knowledge thereof or could not reasonably have known thereof.

ARTICLE 8 - TWA'S RESPONSIBILITIES

8.1 General

8.1.1. TWA shall generally issue all communications to CONTRACTOR through the Construction Manager.

8.1.2. In case of termination of the employment of ENGINEER, TWA shall appoint an engineer whose status under the Contract Documents shall be that of the former ENGINEER.

8.1.3. TWA shall furnish the data required of TWA under the Contract Documents promptly and shall make payments to CONTRACTOR promptly after they are due as provided in Article 14.

8.1.4. TWA's duties in respect of providing lands and easements and engineering surveys to establish reference points, and identifying and making available to CONTRACTOR copies of reports of explorations and tests of subsurface conditions at the site and in existing structures which have been utilized by DESIGN ENGINEER in preparing the Drawings and Specifications are set forth in Article 4.

8.1.5. TWA will issue unilaterally or negotiate, at its discretion, Change Orders and Change Requests as provided in Article 10.

8.1.6. TWA's responsibility in respect of certain inspections, tests and approvals is set forth in Article 13.

8.1.7. TWA may allow its consultants, agents, attorneys, employees, and others access to the site. CONTRACTOR shall cooperate with TWA in allowing such access.

ARTICLE 9 - ENGINEER'S AND DESIGN ENGINEER'S STATUS DURING CONSTRUCTION

9.1 TWA'S Representative

ENGINEER will be TWA's representative during the construction of the Work. The duties and responsibilities and the limitations of authority of ENGINEER as TWA's representative during construction are set forth in the Contract Documents and shall not be extended without written consent of TWA and ENGINEER.

9.2 Visits to Site

9.2.1. DESIGN ENGINEER may make visits to the site at intervals appropriate to the various stages of construction to observe the progress and quality of the executed Work and to determine, in general, if the Work is proceeding in accordance with the Contract Documents.

9.2.2. ENGINEER will make visits to the site at intervals appropriate to the various stages of construction to observe the progress and quality of the executed Work and to determine, in general, if the Work is proceeding in accordance with the Contract Documents.

9.3 Project Representation

TWA may furnish a Construction Manager and/or Field Representative(s) to represent the TWA and observe the performance of the Work.

9.4 Duties, Responsibilities and Limitations of Authority of Construction Manager:

9.4.1. Construction Manager or Field Representative will act as directed by the TWA and will confer with ENGINEER regarding his activities. Construction Manager, if assigned, will perform the duties and responsibilities described herein with the assistance of Field Representative(s). ENGINEER shall generally issue all communications to CONTRACTOR through Construction Manager, including but not limited to communications directed to CONTRACTOR, from TWA through ENGINEER. CONTRACTOR shall generally issue all communications to TWA, DESIGN ENGINEER and ENGINEER through Construction Manager or Field Representative.

9.4.2. Construction Manager will: provide instructions to Field Representative(s) on procedures to be followed and schedule inspections of the Work; review daily inspection reports

prepared by Field Representative(s); prepare draft Field Orders, Change Requests or Change Orders as required and review them with Field Representative(s),Design Engineer, ENGINEER or TWA, as applicable.

9.4.3. Construction Manager or Field Representative will attend meetings with CONTRACTOR, such as the Preconstruction Conference, Project Meetings and any other Project related meetings and review and circulate copies of minutes thereof.

9.4.4. Construction Manager will serve as DESIGN ENGINEER's liaison with CONTRACTOR, working principally through CONTRACTOR's superintendent, to assist in understanding the intent of the Contract Documents, and will serve as TWA's liaison with CONTRACTOR when CONTRACTOR's operations affect TWA's on-site operations, and when additional information is required from TWA for proper execution of the Work.

9.4.5. Construction Manager will advise CONTRACTOR, through or with the assistance of Field Representative(s), of the commencement of any Work requiring a Shop Drawing or sample, when it is observed that a submittal has not been reviewed by DESIGN ENGINEER.

9.4.6. Construction Manager will conduct on-site observations of the Work in progress and receive Field Representative(s)'s observation comments and non-conformance reports, to determine if the Work is proceeding in accordance with the Contract Documents.

9.4.7. Construction Manager will notify CONTRACTOR of disapproval or rejection of Work whenever Construction Manager or ENGINEER believe that any Work is defective, and will notify CONTRACTOR whether defective Work is to be corrected, or replaced.

9.4.8. Construction Manager will notify CONTRACTOR of any Work that is to be uncovered for observation, testing inspection or approval.

9.4.9. Construction Manager will accompany, through or with the assistance of Field Representative(s), visiting inspectors representing governmental or other agencies having jurisdiction over the Project, and record the results of the inspections and report to ENGINEER.

9.4.10 Construction Manager will transmit to CONTRACTOR clarifications and interpretations as issued by ENGINEER.

9.4.11 Construction Manager will consider and evaluate CONTRACTOR's proposed variations and the changes in the Work or the Contract Documents and report such proposals and evaluations to ENGINEER. Construction Manager will communicate decisions on such proposals to CONTRACTOR as issued by ENGINEER or TWA.

9.4.12 Construction Manager will report promptly to ENGINEER and TWA upon gaining knowledge of the occurrence of any accident at the site.

9.4.13 Construction Manager will prepare reports of the progress of the Work and of CONTRACTOR's compliance with the Progress Schedule.

9.4.14 Construction Manager will consult as appropriate with ENGINEER in advance of scheduled major tests, inspections or the commencement of important phases of the Work.

9.4.15 Construction Manager will review and evaluate CONTRACTOR's Application for Payment and advise ENGINEER accordingly.

9.4.16 Construction Manager will review and evaluate CONTRACTOR's notice that CONTRACTOR considers the Work (or part thereof) substantially complete and advise ENGINEER accordingly.

9.4.17 Construction Manager will observe whether all items on lists of items to be completed prior to Final Payment have been completed and make recommendations to ENGINEER concerning Acceptance.

9.4.18 During the course of the Work, the Construction Manager will verify that certificates, maintenance and operation manuals and other data required to be assembled and furnished by CONTRACTOR are applicable to the items actually installed and deliver this material to ENGINEER.

9.4.19 Construction Manager will not: (1) authorize any variation or change in the Work or in the Contract Documents or approve any equivalent material or equipment; (2) exceed the limitations of Construction Manager's authority as set forth in this document; (3) undertake any of the responsibilities of CONTRACTOR, Subcontractors or CONTRACTOR's superintendent, or expedite the Work; (4) inspect, advise on or issue directions relative to any aspect of the means, methods, techniques, sequences or procedures of construction unless such is specifically called for in the Contract Documents; (5) inspect, advise on or issue directions as to safety precautions and programs in connection with the Work; (6) certify Substantial Completion of the Work; or (7) participate in specialized field or laboratory tests.

9.5 Duties, Responsibilities and Limitations of Authority of Field Representative(s)

9.5.1. As requested by Construction Manager, Field Representative(s) will assist in obtaining from TWA additional details or information, when required at the job site for proper execution of the Work.

9.5.2. Field Representative(s) will advise Construction Manager and CONTRACTOR of the commencement of any Work requiring a Shop Drawing or sample submission if he observes that a submittal(s) has not been reviewed by DESIGN ENGINEER.

9.5.3. Field Representative(s) will conduct on-site observations of the Work in progress to assist Construction Manager in determining if the Work is proceeding in accordance with the Contract Documents and that completed Work will substantially conform to the Contract Documents.

9.5.4. Field Representative(s) will notify CONTRACTOR and report to Construction Manager for review and possible disapproval or rejection by ENGINEER or Construction Manager whenever he believes that any Work is defective.

9.5.5. Field Representative(s) will notify CONTRACTOR and report to Construction Manager for determination of necessary action by ENGINEER or Construction Manager when he believes Work should be uncovered for observation, testing, inspection or approval.

9.5.6. Field Representative(s) will verify that tests, equipment and systems start-ups and operating and maintenance instructions are conducted as required by the Contract Documents and in the presence of the required personnel and that CONTRACTOR maintains adequate records thereof; observe, record and report to Construction Manager appropriate details relative to the test procedures and start-ups.

9.5.7. Field Representative(s) will report to Construction Manager when clarifications and interpretations of the Contract Documents are needed or requested.

9.5.8. Field Representative(s) will keep a diary recording hours on the job site, weather conditions, data relative to questions of extras or deductions, lists of visiting officials and representatives of Suppliers, daily activities, decisions, observations in general and specific observations in more detail as in the case of observing test procedures. Field Representative(s) will summarize such information on the daily inspection report and submit copies to Construction Manager.

9.5.9. Field Representative(s) will assist Construction Manager with record keeping as directed by Construction Manager.

9.5.10 Field Representative(s) will report immediately to TWA, ENGINEER and Construction Manager upon gaining knowledge of the occurrence of any accident.

9.5.11 Field Representative(s) will assist Construction Manager with the review and evaluation of CONTRACTOR's Application for Payment, noting particularly their relation to the schedule of values, Work completed, and materials and equipment delivered at the site but not incorporated in the Work.

9.5.12 Field Representative(s) will prepare draft lists of items to be completed or corrected (punch lists) as directed by Construction Manager.

9.5.13 Field Representative(s) will not: (1) authorize any variation or change in the Work or in the Contract Documents or approve any equivalent material or equipment; (2) exceed the limitations of Field Representative(s)'s authority as set forth in this document; (3) undertake any of the responsibilities of CONTRACTOR, Subcontractors or CONTRACTOR's superintendent, or expedite the Work; (4) inspect, advise on or issue directions relative to any aspect of the means, methods, techniques, sequences or procedures of construction unless such is specifically called for in the Contract Documents; (5) inspect, advise on or issue directions as to safety precautions and programs in connection with the Work; (6) certify Substantial Completion of the Work; or (7) participate in specialized field or laboratory tests.

9.6 Clarifications and Interpretations

ENGINEER will issue with reasonable promptness such written clarifications or interpretations of the requirements of the Contract Documents (in the form of Drawings or otherwise) as ENGINEER may determine necessary, which shall be consistent with or reasonably inferable from the overall intent of the Contract Documents.

9.7 Authorized Variations in Work

ENGINEER may authorize minor variations in the Work from the requirements of the Contract Documents which do not involve an adjustment in the Contract Price or the Contract Time and are consistent with the overall intent of the Contract Documents and required to produce the intended result. These may be accomplished by a Field Order and will be binding on CONTRACTOR who shall perform the Work involved promptly.

9.8 Rejecting Defective Work

ENGINEER will have authority to disapprove or reject Work at any time during the construction of the Work, which ENGINEER believes to be defective. ENGINEER will also have authority to require

special inspection or testing of the Work, whether or not the Work is fabricated, installed, or completed. When CONTRACTOR has been notified by ENGINEER of disapproval or rejection of defective Work, CONTRACTOR shall take immediate action to correct or replace same.

9.9 Determinations of Quantities and Classifications of Unit Price Work

Field Representative or Construction Manager will determine the actual quantities of each classification of Unit Price Work. Field Representative or Construction Manager will review with CONTRACTOR, Field Representative or Construction Manager's preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). Field Representative or Construction Manager's written decisions thereon will be final and binding upon CONTRACTOR, unless, with seven (7) days after the date of any such decision, CONTRACTOR delivers to TWA written notice of a claim.

9.10 Decisions on Disputes

DESIGN ENGINEER will be the initial interpreter of the requirements of the Contract Documents, and in such capacity will render initial determinations in respect of the acceptability of the Work thereunder. Unless otherwise provided in the Contract Documents, notices, proposals or other matter relating to the acceptability of the Work or the interpretation of the requirements of the Contract Documents pertaining to the performance and furnishing of the Work will be referred initially to DESIGN ENGINEER in writing with a request for a formal decision in accordance with this paragraph, which DESIGN ENGINEER will render within a reasonable time. DESIGN ENGINEER's written determination thereon shall be final and binding on CONTRACTOR unless CONTRACTOR delivers to TWA written notice of a claim within seven (7) days of receipt of such decision.

9.11 Limitations on ENGINEER's and DESIGN ENGINEER's Responsibilities

9.11.1 Neither ENGINEER's or DESIGN ENGINEER's authority to act under this Article or elsewhere in the Contract Documents nor any decision or determination made by ENGINEER or DESIGN ENGINEER in good faith to exercise or not to exercise such authority shall give rise to any duty or responsibility of ENGINEER or DESIGN ENGINEER to CONTRACTOR, any Subcontractor, any Supplier, or any other person or organization performing any of the Work, or to any surety for any of them.

9.11.2 Whenever in the Contract Documents the terms "as ordered", "as directed", "as required", "as allowed", "as approved" or terms of like effect or import are used, or the adjectives "reasonable", "suitable", "acceptable", "proper" or "satisfactory" or adjectives of like effect or import are used to describe requirement, direction, review or judgment of ENGINEER or DESIGN ENGINEER as to the Work, it is intended that such requirement, direction, review or judgment will be solely to evaluate the Work for compliance with the Contract Documents (unless there is a specific statement indicating otherwise).

The use of any such term or adjective shall not be effective to assign to ENGINEER or DESIGN ENGINEER any duty or authority to supervise or direct the furnishing or performance of the Work or any duty or authority to undertake responsibility contrary to the provisions of this Article.

9.11.3 ENGINEER and DESIGN ENGINEER will not be responsible for CONTRACTOR's means, methods, techniques, sequences or procedures of construction, or the safety precautions and programs incident thereto, and ENGINEER and DESIGN ENGINEER will not be responsible for CONTRACTOR's failure to perform or furnish the Work in accordance with the Contract Documents.

9.11.4 ENGINEER and DESIGN ENGINEER will not be responsible for the acts or omissions of CONTRACTOR or of any Subcontractor, any Supplier, or of any other person or organization performing or furnishing any of the Work.

ARTICLE 10 - CHANGES IN THE WORK

10.1 Changes in the Work

10.1.1 Without invalidating the Agreement and without notice to any surety, TWA may, at any time, by duly executed Change Order or Change Request, order changes within the scope of the Agreement consisting of additions, deletions or other revisions in the Work. Upon receipt of that order, CONTRACTOR shall promptly proceed or continue with the Work involved (based on the conditions stated and other applicable conditions in the Contract Documents). If a change under this Article causes an increase or decrease in the Contract Price or any extension or shortening of the Contract Time, TWA will make an adjustment as provided in Article 11.

10.1.2 TWA or ENGINEER may present to CONTRACTOR an unsigned proposed Change Request requesting that CONTRACTOR submit a proposal for an adjustment in Contract Price or Contract Time for a proposed change in the Work. CONTRACTOR shall submit a proposed adjustment with all supporting data in accordance with Article 11 and the directions given in the Change Request within 14 days of receipt. Said proposed adjustment shall include an itemized estimate of all costs and time for the performance that will result directly or indirectly from the changes described. Estimates shall be prepared in accordance with the requirements of Article 11 and in sufficient detail and with documentation such that ENGINEER can (1) analyze all material, labor, equipment, subcontract, overhead costs and fees, and any other costs covering all aspects of the Work involved in the change, whether such was added, deleted, changed, or impacted; (2) determine that the proposal reflects all impacts on the Contract of the proposed change; and (3) establish that all Contract provisions have been complied with. Any amount proposed for Subcontractors or Suppliers shall be similarly supported.

10.1.3 TWA or ENGINEER may give instructions which may result in changes in the Work not involving an adjustment in the Contract Price or the Contract Time when such changes are necessary or expedient to the satisfactory performance and completion of the Work. These instructions shall be binding on CONTRACTOR.

Any instruction, direction, interpretation, or determination from TWA, ENGINEER or any other source which causes a change shall be treated as a change under this Article provided that CONTRACTOR gives ENGINEER written notice stating the date, circumstances, specific order, and that CONTRACTOR regards the instruction as a change.

Such written notification shall be given to ENGINEER within 7 days after receipt and before CONTRACTOR acts on said instruction, direction, interpretation, or determination. No claim, change or notice by CONTRACTOR will be allowed if asserted after work has commenced on, or if notice is not provided within the stated time limit provided after receipt of, the instruction, direction, interpretation, or determination from TWA, ENGINEER, or any other source.

10.1.4 In making changes under this Article, TWA may give consideration to a notice, proposal or claim from CONTRACTOR, provided the notice, proposal or claim is presented in accordance with the requirements of this Article and Article 11. CONTRACTOR shall

provide TWA or ENGINEER any additional or supplemental information requested for purposes of evaluation of CONTRACTOR's submittal, but such requests by the TWA or ENGINEER will not constitute acceptance of the notice, proposal or claim.

10.1.5 ENGINEER will evaluate a change notice, proposal or claim from CONTRACTOR, and TWA will review with CONTRACTOR the results of the evaluation before rendering a determination. If TWA, with the advice of ENGINEER, concurs that a change in the Work has occurred or been ordered, CONTRACTOR will be directed to submit a proposal for an adjustment in accordance with paragraph 10.1.2. If TWA concludes that a change has not occurred or been ordered, TWA's determination shall be final and binding on CONTRACTOR unless CONTRACTOR delivers to TWA written notice of a claim within 7 days from receipt of such decision.

10.1.6 If notice of any change affecting the general scope of the Work or change in the Contract Price is required by the provisions of any Bond to be given to the Surety, it shall be CONTRACTOR's responsibility to so notify the Surety, and the amount of each applicable Bond shall be adjusted accordingly. CONTRACTOR shall furnish proof of such adjustment to TWA if requested.

10.2 Change Orders and Change Requests

10.2.1 Contract Price or Contract Time shall be changed only by Change Order. The basis for a subsequent change in Contract Price or Contract Time may also be authorized by Change Request duly executed by the TWA.

10.2.2 A Change Order duly executed by TWA and CONTRACTOR provides for an all inclusive settlement for all changes and direct, supplemental, indirect, consequential and cumulative costs and delays, and CONTRACTOR's signature represents a waiver of any and all rights to file a claim on account of that instrument.

10.2.3 TWA and CONTRACTOR shall execute Change Orders covering changes in the Work (including any necessary adjustments in Contract Price or Contract Time) which are ordered or agreed to by the parties, changes in Contract Price or Contract Time which are agreed to in total or in part, or previously executed Change Requests with reasonable promptness. Adjustments to Contract Price resulting from changed work shall only be included in Applications for Payment after a Change Order has been duly executed.

10.2.4 When duly executed by TWA, TWA may use Change Requests to order changes in the Work, provide the basis for a subsequent adjustment in Contract Price or Contract Time, or authorize deviations in the Work. Amounts for work directed by a Change Request shall not be included in Applications for Payment until that Change Request has been incorporated into a Change Order.

10.2.5 A Change Order, or Change Request, duly executed by TWA, but not executed by CONTRACTOR, or executed by CONTRACTOR with a notice of reservation of rights to claim additional adjustments, shall become final and binding on CONTRACTOR, without consideration of the reservation of rights, unless CONTRACTOR delivers to TWA written notice of a claim within 7 days after receipt of that instrument.

10.2.6 An unsigned Change Request may be used by TWA and CONTRACTOR to negotiate changes in the Work, or in Contract Price or Contract Time. A Change Request will be the instrument used by TWA to direct Work on a cost of the Work basis as described in Article 11.

A Change Order will be issued to incorporate the instruction to proceed with a change on a cost of the Work basis into the Contract Documents after the actual cost of the work has been determined.

10.3 Waivers

10.3.1 No proposal or claim by CONTRACTOR for an adjustment under this Article shall be allowed if made after the date of Final Payment.

10.3.2 Additional Work performed without authorization of a Change Order or properly executed Change Request will not entitle CONTRACTOR to an increase in Contract Price or an extension of Contract Time, except in the case of an emergency as provided in Article 6.

10.3.3 CONTRACTOR acknowledges that there may be changes during the course of the Work and acknowledges that the probable effect of changes has been accounted for in the development of the Contract Price and Progress Schedule. Whenever CONTRACTOR makes a proposal or claim under Article 11 such proposal or claim shall include the total amount of adjustment in Contract Price and Contract Time to which the CONTRACTOR believes it is entitled. Except as TWA and CONTRACTOR may otherwise agree in writing, CONTRACTOR shall be deemed to have waived (1) any adjustment to which it might otherwise be entitled under Article 11 where such proposal or claim fails to request such adjustments, (2) any increase in the amount of adjustment additional to that requested in the proposal or claim, and (3) any claim for reimbursement of impact allegedly resulting from the cumulative effect of the number, nature, or extent of any changes.

ARTICLE 11-CHANGES IN CONTRACT PRICE OR CONTRACT TIME

11.1 Changes in Contract Price or Contract Time

The Contract Price constitutes the total compensation (subject to authorized adjustments) payable to CONTRACTOR for all duties, responsibilities, and obligations required to perform the Work. All duties, responsibilities, and obligations assigned or undertaken by CONTRACTOR shall be at its expense without change in the Contract Price or Contract Time except as set out below.

11.2 Proposals or Claims Substantiating Adjustments

11.2.1 Supporting data for any proposal or claim by the CONTRACTOR shall include at a minimum a complete and detailed breakdown of the proposed price and a detailed explanation of any time impact for the change. Said proposed price shall be based on the lowest reasonable cost consistent with sound construction practice. Such breakdown shall include itemizations by trade of all labor with man hours and hourly rates, equipment with hours of use and rates, and material by item with costs, all in sufficient detail to evaluate the cost of the individual components of the Work, including copies of purchase orders, invoices and subcontract change orders.

11.2.2 CONTRACTOR proposals or claims shall state in writing, and provide evidence that the amounts included cover all direct, supplemental, indirect, consequential, and cumulative costs and delays, as applicable, and that those costs and delays would be or were necessarily incurred, despite CONTRACTOR's reasonable, prudent and diligent efforts to mitigate them.

11.2.3 CONTRACTOR proposals and claim supporting data shall become due within fourteen (14) days of receipt of the unsigned Change Request or receipt by TWA of written notice of claim (unless ENGINEER allows an additional period), and shall remain firm for a period

of not less than sixty (60) days from receipt by ENGINEER of the proposal or supporting data. Any delay in the submittal of a proposal or claim will not justify or constitute basis for an increase in Contract Price or Contract Time. Proposals or claims shall be submitted on forms acceptable to TWA.

11.2.4 Failure of CONTRACTOR to comply with the time requirements for written notice or for submittal of supporting data shall be considered a waiver by CONTRACTOR of any claim for an addition to the Contract Price or an adjustment to the Contract Time and CONTRACTOR agrees that no additional compensation or time adjustments are due if the provisions of Article 10 and this Article are not complied with.

11.2.5 Where the change in Contract Price arises from changes in the schedule of all or part of the Work, or where a change in Contract Time is sought, the proposal shall be based on a detailed analysis of the Progress Schedule, and shall cover all applicable elements affecting the Work involved, including, but not limited to, labor crews, craft levels, equipment utilization, work during other than normal working hours, productivity and production rates, shop drawing preparation, submittal and review, material and equipment delivery, and testing and start-up times.

11.2.6 Proposals or claims shall cover all aspects of the Work involved, whether relating to deleted, added, revised, or impacted items of Work. Amounts for Subcontractors or Suppliers at any tier shall be equally supported.

11.2.7 No proposal or claim for an adjustment in Contract Price or Contract Time shall be valid unless submitted in accordance with Article 10 and this Article.

11.3 Methods for Determining Adjustments in Contract Price

11.3.1 The methods to be used to determine an adjustment in Contract Price necessitated by changes ordered or negotiated pursuant to these General Conditions, or Work covered by a proposal or a claim, collectively to be referred to as the "Work involved," are limited to the following:

11.3.2 Contract Unit Prices: Where the Work involved is covered or is of the same character as Unit Price Work, by application of those unit prices to the quantities of the items involved (subject to the provisions covering Unit Price Work). No additional allowances or charges shall be added to these unit prices.

11.3.3 Negotiated Unit Prices: Where the Work involved is not covered by unit prices contained in the Contract Documents, unit prices may be negotiated on the basis of costs calculated in accordance with this Article.

11.3.4 Negotiated Lump Sum: By mutual acceptance of a lump sum price negotiated on the basis of CONTRACTOR's itemized estimate of the anticipated Cost of the Work involved, determined as specified in this Article.

11.3.5 Cost of the Work: Where TWA and CONTRACTOR cannot agree on any of the methods described in paragraphs 11.3.2, 11.3.3, or 11.3.4, TWA may direct CONTRACTOR to proceed with the Work involved on the basis of actual costs in accordance with this Article. When the cost of the Work basis is directed by TWA, TWA shall prescribe the required procedures for accounting of the allowed costs. These procedures shall include daily accounting of the material and equipment used and labor employed. Failure to submit this information for acknowledgment by the ENGINEER within one (1) day after any part of the

Work is performed shall result in any discrepancy between ENGINEER's records and CONTRACTOR's records being resolved in favor of the ENGINEER's records.

11.3.6 Estimated Adjustment: Where TWA and CONTRACTOR cannot agree on any of the methods described in paragraphs 11.3.2, 11.3.3, or 11.3.4, and the TWA does not wish to proceed on a Cost of the Work basis as described in paragraph 11.3.5, TWA with the advice of ENGINEER shall determine a reasonable adjustment of the Contract Price for the Work involved on the basis as described in Article 10 and this Article. The adjustment in Contract Price and Contract Time will be issued by Change Request, incorporated into the Contract Documents by Change Order and CONTRACTOR shall be paid on that basis. TWA's determination shall be final and binding unless CONTRACTOR delivers to TWA written notice of a claim within seven (7) days of receipt of such determination.

11.3.7 Where the Work involved is not covered by any of the preceding methods, and when payment is to be determined by a court of competent jurisdiction, it is agreed that the cost of the WORK method shall be the appropriate method for determining the cost of the Work involved. Payroll, equipment, material and other costs will only be allowable when determined from daily time sheets which expressly correlate to the Work involved, were prepared while work was in progress, clearly list actual units and usage, and were submitted to ENGINEER as the work was performed.

11.3.8 Anticipated or actual costs computed for the Work involved means the sum of all incremental costs which would be, or actually were, necessarily incurred by CONTRACTOR in the proper performance of the Work. Those costs shall be in amounts no higher than those prevailing in the locality of the Project or as allowed elsewhere in these Contract Documents, and shall include only the appropriate items for labor, material, equipment, and supplemental costs specified below.

11.4 Determining Cost Adjustments to Changes in Contract Price

11.4.1 CONTRACTOR shall provide to ENGINEER, if requested, proof of any burdens, including insurance costs, added to base wages to determine payroll costs described in this Article.

11.4.2 Changes in the Contract Price made on the basis of the methods described in paragraph 11.3 shall be based upon the following:

11.4.2.1 Payroll costs for craft labor in the direct employ of CONTRACTOR assigned to the site and engaged in furnishing and incorporating materials or equipment in the Work involved. Payroll costs shall include wages plus the necessary labor burdens, which may include social security, unemployment, workers compensation, health and retirement benefits, vacation and Holiday pay, and other payments pursuant to union agreements but shall exclude profit sharing, bonuses, and similar remunerations. Labor charges shall be allowed only for hourly labor directly involved in the Work. Such personnel may include working foreman at the site. The cost of all salaried employees shall be considered as a part of allowances allowed in this Article. Labor rates shall be as actually paid based on certified payroll records or in accordance with general rates for various pay categories established by union agreements or by mutual agreement between TWA and CONTRACTOR prior to the commencement of the Work. The expenses of performing Work outside of normal working hours, on weekends or Holidays, shall be included in the above to the extent authorized by TWA as set out in the Contract Documents.

11.4.2.2 Payments by CONTRACTOR to Suppliers for all material and equipment in the Work involved, including transportation and storage costs, and necessary Suppliers field services. All cash deposits shall accrue to TWA, if TWA advances funds to CONTRACTOR

with which to make payments. All trade discounts, rebates and refunds and all returns from sale of surplus items shall accrue to TWA and CONTRACTOR shall make provisions so that they may be obtained.

When required by TWA, CONTRACTOR shall obtain competitive bids from Suppliers in order to achieve a reasonable price. When determining material and equipment costs, actual invoices segregating items associated with Work involved shall be the record upon which actual costs shall be based.

11.4.2.3 Payments by CONTRACTOR to Subcontractors for Work involved performed by Subcontractors. When required by TWA, CONTRACTOR shall obtain competitive detailed bids from Subcontractors in order to achieve a reasonable price.

When determining Subcontractor costs at any tier, the Subcontractor's Cost shall be determined in the same manner as CONTRACTOR's costs. All Subcontracts shall be subject to the provisions of this Article insofar as applicable.

11.4.2.4 Costs of field supplies consumed in the performance of the Work involved, and purchase costs of small tools used or consumed in the performance of the Work involved (and purchase cost less market value if used but not consumed) which are individually valued at less than $1,000.00. Consumables shall include such items as rags, nails, fasteners, weld rod, gases, lubricants, paper, grout, stakes, power and fuel for tools and equipment, chains, cables, hoses, water, and similar items normally used in the course of the Work. Costs of field supplies will be paid as a percentage of direct labor cost in an amount that shall not exceed the allowance shown in this Article.

11.4.2.5 Equipment costs required solely in connection with the Work involved reflecting rented or leased or owned equipment cost for individual construction equipment or machinery whose replacement value is in excess of $1,000.00. Transportation, loading and unloading, installation, dismantling and removal costs shall be included only if such equipment is or was transported to the site solely to perform the Work involved. All equipment costs shall cease when the equipment is no longer necessary to perform the Work involved. Payroll costs for craft labor operating the equipment shall be as in paragraph 11.4. Equipment costs shall be computed using the same accounting and estimating rules regardless of whether related to added or deleted items of Work.

11.4.2.5.1 Rented or owned equipment at the site, and not in actual use, shall be paid at the rates for rented equipment, or on the basis of fifty (50) percent of the rates for owned equipment, respectively, as specified below. In no event shall the idle time claimed in a day exceed the established normal working hours. Payments for idle equipment shall come due only as long as the equipment was idled solely by actions of TWA, and provided that the idle period exceeds that normally experienced for such equipment.

11.4.2.5.2 Except as provided below, for equipment rented or leased, CONTRACTOR shall be entitled to amounts based on negotiated rental or lease rates, but in no event shall the amounts allowed exceed an hourly rate based on the monthly rates, listed in the most current and most appropriate Rental Rate Blue Book (Blue Book) published by Dataquest, Inc. for the area where the Project is located (presently 3 volumes, relating to equipment of various ages) divided by 176 hours per month. Rates for equipment not included in the Blue Book shall be interpolated or extrapolated from the information contained therein. In addition to the rental or leasing rate, operating costs shall not exceed the estimated hourly operation rate in the Blue Book. For multiple shift Work, the allowable equipment rate for second or third shifts shall not exceed fifty (50) percent of the adjusted base rate.

11.4.2.5.3 For equipment rented or leased from lessor firms associated with or owned by CONTRACTOR, CONTRACTOR shall be entitled to reimbursement as though the equipment was owned equipment, as specified below.

11.4.2.5.4 For equipment owned by CONTRACTOR, CONTRACTOR shall be entitled to costs based on billings established by his normal accounting practices, but in no event shall those costs exceed the maximum allowable costs for rented or leased equipment.

11.4.2.6 Costs of special consultants who are not employees in the direct employ of CONTRACTOR or any of the Subcontractors or Suppliers, or special Subcontractors; provided that those costs are or were authorized by TWA prior to proceeding with the Work involved, and only if their activities are not covered by costs included under paragraph 11.4, or are not excluded by paragraph 11.9.

11.4.2.7 Sales, consumer, or similar taxes related to the Work involved, and for which CONTRACTOR is liable, royalty payments, and fees for permits and licenses, any of them related solely to the Work involved.

11.4.2.8 Deposits to be lost for causes other than negligence of CONTRACTOR, any Subcontractor or anyone directly or indirectly to be employed by any of them or for whose acts any of them may be liable, related solely to the Work involved.

11.4.2.9 Increased costs of premiums for Bonds and Insurance resulting solely because of the Work involved.

11.5 Costs Covered by CONTRACTOR's Allowances

11.5.1 Except as otherwise specifically provided in paragraph 11.9, the cost of the Work involved shall not include any of the following costs, all of which are considered to be covered by CONTRACTOR's Allowances:

11.5.2 Payroll costs and other compensation of personnel employed by CONTRACTOR whether at the site or in CONTRACTOR's principal or a branch office for management or administration of the Work, including, but not limited to, (a) CONTRACTOR's officers, executives, principals, general managers, project managers, construction managers, estimators, schedulers, detailers, claims consultants, attorneys, auditors, accountants, purchasing and contracting agents, expediters, and (b) resident superintendents, nonworking foremen, field engineers and architects, safety personnel, timekeepers, and clerks.

11.5.3 Expenses of CONTRACTOR's principal, branch and site offices except as authorized in writing by TWA prior to proceeding with the Work involved.

11.5.4 Any part of CONTRACTOR's capital expenses, including interest on CONTRACTOR's capital employed for the Work involved and charges for delinquent payments.

11.5.5 Costs due to the fault or negligence of CONTRACTOR, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to deposits to be lost, costs to correct defective Work, disposal of materials or equipment wrongly supplied and making good any damage to property.

11.5.6 Market value of small tools used but not consumed which remain in the property of CONTRACTOR.

11.5.7 Costs associated with the preparation of Change Orders or Change Requests (whether or not ultimately authorized by TWA), or the preparation or filing of claims.

11.5.8 Expenses of CONTRACTOR associated with anticipated lost profits or lost revenues, lost income or earnings, lost interest on earnings or unpaid retainage.

11.5.9 Costs derived from the computation of a "home office overhead" rate by application of the Eichleay, Allegheny, Burden Fluctuation, or other similar methods.

11.5.10 Costs of special consultants or attorneys, whether or not in the direct employ of CONTRACTOR, employed for services specifically related to the resolution of a claim, dispute, or other matter relating to the acceptability of the Work.

11.5.11 Over administrative expense or contingent costs of any kind, and the costs of any item not specifically and expressly included in Article 11.

11.6 Allowances for Changes to the Work

For changes and additions to the Work, CONTRACTOR and Subcontractor allowances, which include costs not directly chargeable under this Article including profit and expenses provided for in paragraph 11.5, shall not exceed the following percentages of the various portions of the Work involved. No other allowances in addition to these shall be allowed.

11.6.1 Work by CONTRACTOR. For any portion of the changed Work which is to be self-performed by CONTRACTOR, CONTRACTOR shall furnish to TWA a detailed itemized proposal prepared and signed by CONTRACTOR of the cost to self-perform the changed Work. At the option of TWA, a lump sum proposal of such cost may be accepted in lieu of the detailed itemized proposal. The combined costs for CONTRACTOR's overhead and profit shall not exceed fourteen and one-half (14.5) percent on the first $50,000; thereafter nine and one half (9.5) percent on the balance beyond $50,000, not including the cost of bonds and insurance for the changed or added Work. The proposals providing for the amount to be deleted from CONTRACTOR's portion of the work shall be ten (10) percent on the first $50,000; thereafter five (5) percent on the balance beyond $50,000 for overhead, profit and related savings of the deleted Work.

11.6.2 CONTRACTOR mark-up for Work by Subcontractor. When changed or added Work is performed by a Subcontractor, the CONTRACTOR shall add no more than four and one half (4.5) percent mark-up to the Subcontractor's total cost proposal for such Work, not including the cost of bonds and insurance for the changed or added Work.

11.6.3 CONTRACTOR mark-up for Work by Supplier. When changed or added Work is performed by a Supplier, no CONTRACTOR mark-up for overhead, profit, layout, supervision or bonds will be allowed for changed Work furnished by the Supplier.

11.6.4 Work by Subcontractor. For any portion of the changed Work which is to be performed by a subcontractor (any tier), the CONTRACTOR shall furnish to TWA a detailed itemized proposal prepared and signed by Subcontractor of the cost to Subcontractor for performing the changed Work. At the option of TWA, a lump sum proposal of such cost to Subcontractor may be accepted in lieu of the detailed itemized proposal. The combined costs for Subcontractor's overhead and profit shall not exceed ten (10) percent on the first $50,000; thereafter five (5) percent on the balance beyond $50,000. The proposals providing for the amount to be deleted from Subcontractor's portion of the work shall be ten (10) percent on the first $50,000; thereafter five (5) percent on the balance beyond $50,000 for overhead, profit and related savings of the deleted Work.

11.6.5 Subcontractor mark-up for Work by lower tier Subcontractors. When changed or added Work is performed by a lower tier Subcontractor, the Subcontractor may add no more than five (5) percent mark-up to the lower tier Subcontractor's total cost proposal for such Work.

11.6.6 Subcontractor mark-up for Work by Supplier. When changed or added Work is performed by a Supplier, no Subcontractor mark-up for overhead, profit, layout, supervision or bonds shall be allowed for changed Work furnished by the Supplier.

11.6.7 Work by Supplier. For changed work to be furnished by a Supplier, the CONTRACTOR shall furnish upon demand of TWA, a lump sum proposal of the cost of the items including taxes and cartage to the CONTRACTOR prepared by the Supplier. No Supplier mark-up for overhead, profit, layout, supervision, bonds and insurance costs shall be allowed for changed Work furnished by the Supplier.

11.7 Unit Price Work

11.7.1 Where the Contract Documents provide for Unit Price Work, the Contract Price stated in the Agreement will include for all Unit Price Work an amount equal to the sum of the unit prices for each item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement.

Each unit price will be deemed to include an amount considered by CONTRACTOR to be adequate to cover all costs, including supplemental and administrative costs. The estimated quantities of Unit Price Work indicated in the Agreement are given solely for the purpose of comparison of bids and determining the Contract Price for the Work as awarded.

11.7.2 CONTRACTOR shall promptly, after becoming aware of, and before proceeding with any significant quantities of affected Work, notify TWA in writing of any additional or reduced quantities for an item of Unit Price Work which will require a twenty (20) percent or higher adjustment in the as-awarded quantity for that item or an increase in Contract Price greater than five (5) percent.

11.7.3 TWA reserves the right to notify CONTRACTOR in writing of any variation in quantities meeting the criteria established in this paragraph.

11.7.4 Prior to Final Payment, or before the total amount paid exceeds the established Contract Price, an appropriate Change Order will be issued on the recommendation of ENGINEER, to adjust the estimated quantities for Unit Price Work and to correspondingly adjust the Contract Price.

11.7.5 If TWA determines that the additional or reduced quantities for an item of Unit Price Work justify an adjustment in the unit price, TWA shall authorize such an adjustment. No adjustment shall be provided under this paragraph unless the variation between actual and estimated quantities for all Unit Price Work result in an increase or decrease in Contract Price by more than twenty (20) percent. If TWA determines that the unit prices established in the Agreement are valid even for the additional or lower quantities, that decision shall be final and binding on CONTRACTOR unless CONTRACTOR delivers to TWA written notice of a claim within seven (7) days from receipt of such decision.

11.7.6 In re-evaluating unit prices contained in the Contract Documents, CONTRACTOR and TWA shall take into account increases or decreases in CONTRACTOR's supplemental and administrative costs for the performance of the Work solely as a result of the variation in

quantities, as opposed to as a result of CONTRACTOR's fault or negligence, or bid estimate errors.

11.8 Intentionally Omitted

11.9 Criteria for Determining Adjustments in Contract Time

11.9.1 The criteria to be used to determine an adjustment in Contract Time necessitated by changes ordered or negotiated pursuant to these General Conditions, or Work covered by a proposal or a claim, are limited to the following:

11.9.2 An extension in Contract Time will not be granted unless CONTRACTOR can demonstrate through an analysis of the Progress Schedule that the increases in the time to perform or complete the Work, or specified part of the Work, beyond the corresponding Contract Time(s) arise from unforeseeable causes beyond the control and without the fault or negligence of both CONTRACTOR and his Subcontractors, Suppliers or other persons or organizations, and that such causes in fact lead to performance or completion of the Work, or specified part in question, beyond the corresponding Contract Time. An adjustment in Contract Time will be based solely upon net increases in the time required for the performance or completion of parts of the Work controlling achievement of the corresponding Contract Time(s) at the time that the incident which causes the change occurs. However, even if the time required for the performance or completion of controlling parts of the Work is extended, an extension in Contract Time will not be granted until performance or completion of the controlling Work necessarily extends beyond the Contract Time in question despite CONTRACTOR's reasonable and diligent actions to guard against those effects.

Examples of unforeseeable causes include: (1) acts of God or of the public enemy; (2) acts of TWA or ENGINEER in its sovereign or contractual capacity; (3) acts of the Government or another Public Entity in its sovereign capacity; (4) acts of another contractor in the performance of a contract with the TWA or COUNTY, if not identified in the Contract; (5) fires, floods, epidemics, quarantine restrictions; (6) sink holes, archaeological finds; (7) strikes, freight embargoes; (8) unfavorable weather defined in 11.11; (9) a case of differing physical conditions; (10) a case of existing Underground Facilities owned by others.

11.9.3 Notwithstanding any provisions in the Contract Documents to the contrary, an extension of Contract Time shall be the sole remedy of CONTRACTOR for any delay of any kind. The only exception, under which an adjustment in Contract Price may be allowed, will be if the delay has been caused solely by: (1) an OWNER-initiated change order which results a specific change or addition to the scope of the Agreement requiring the CONTRACTOR to forego other third party work or remobilize; or (2) by acts constituting intentional interference by TWA or ENGINEER with CONTRACTOR's performance of the Work and such acts continue after CONTRACTOR's notice to ENGINEER of such interference. Intentional interference is an act or omission by the TWA or ENGINEER by which the TWA or ENGINEER intentionally, willfully, or knowingly delays job progress. The TWA's exercise of any of its rights under Article 10 and this Article regardless of the extent or number of the changes, or the TWA's exercise of its remedies of stopping the Work or requiring correction or re-execution of any defective work shall not under any circumstances be construed as intentional interference with the CONTRACTOR's performance of the Work. No adjustment in Contract Price under this paragraph shall be provided for any reason if: (1) performance would have been so extended by any one other cause, including fault or negligence of CONTRACTOR, or his Subcontractors, Suppliers, or other persons or organizations or; (2) an adjustment is provided or excluded under any other provision of the Contract Documents or; (3) delays merely prevent CONTRACTOR's achievement of

completion of the Work, or part in question, ahead of the corresponding Contract Time(s), including any authorized adjustments.

11.9.4 An adjustment in Contract Price, to complement an extension in Contract Time, on account of delays meeting the requirement for an adjustment in Contract Price under paragraph 11.9.3 shall be determined as follows subject to all applicable requirements of paragraph 11.9. Amounts shall only be allowed to the extent they were increased or decreased on account of such delays, and shall include only the appropriate amounts for CONTRACTOR and Subcontractors: labor, material and equipment costs, construction equipment costs, supplemental costs, and in accordance with paragraph 11.4, payroll costs, and travel and subsistence expenses, for the superintendent and other personnel classifications agreed by TWA, which shall not include any of the personnel listed in paragraph 11.9.2 (a), in the direct employ of CONTRACTOR and Subcontractors at the site; rental/lease costs of site office and temporary facilities, and costs of utilities, telephone service and sanitary facilities expended to maintain such facilities, and an allowance of fifteen (15) percent of the total of these costs for any other costs not directly chargeable (including overhead expense) and profit.

11.10 Waivers

CONTRACTOR's recovery (1) of acceleration costs incurred as an alternative to an extension in Contract Time on account of delays not meeting the requirements for extensions in Contract Time or an adjustment in Contract Price; (2) of escalation costs for any part of the Work; (3) of delay costs, except as otherwise specifically provided in this Article, shall be excluded.

11.11 Unfavorable Weather

The Contractor shall become familiar with and prepare for the unfavorable weather conditions existing in Osceola County, Florida. Unfavorable weather conditions are expected to impact the Work in numerous ways including but not limited to delays during and after periods of rainfall, temporary flooding and ponding, wet ground, high winds and debris. The Contractor acknowledges that its Bid Proposal and subsequent schedule anticipates and includes as a minimum the normally anticipated number of unfavorable weather days historically anticipated in Osceola County for the period of time covered by this Agreement. The consequences and impact of such unfavorable weather conditions are neither excusable nor compensable.

The Contractor acknowledges that the following conditions must all exist before unfavorable weather conditions may be found to exist:

(1) Unfavorable weather conditions actually existed at the Project Site as recorded by a TWA inspector using an on-site rain gauge for one or more work days in excess of the 15-year historical rainfall average for Osceola County, FL per the National Climatic Data Center's records (www.ncdc.noaa.gov).

ARTICLE 12 - SCHEDULES

12.1 Progress and Submittal Schedules

12.1.1 Types of Schedules

12.1.1.1 CONTRACTOR shall prepare and submit to ENGINEER for review, a Progress Schedule in accordance with Section 01310.

12.1.1.2 CONTRACTOR shall prepare and submit to ENGINEER for review, a schedule of Shop Drawing and sample submissions. This schedule shall consist of a list of the submittals

to be made over the course of the project; anticipated and actual dates of submittal and return for both initial and resubmissions; and the anticipated dates of submittal approval so as not to delay the Project. The schedule shall allow for review and processing time by DESIGN ENGINEER and ENGINEER.

12.1.1.3 CONTRACTOR shall prepare and submit to ENGINEER for review with the Project Schedule, manpower charts and cash flow projections contemplated or required by the schedule in a form acceptable to ENGINEER. Updated plan and actual expended manpower charts and cash flow projections shall be submitted with each monthly or interim schedule submission when requested by ENGINEER.

12.1.2. Submittal

12.1.2.1 CONTRACTOR shall enter on the Progress Schedules the actual progress on a monthly basis, or at such intervals as requested by ENGINEER, and shall deliver to ENGINEER five (5) copies of the schedule documentation.

12.1.2.2 Progress Schedules are to be submitted with each Application for Payment. An Application for Payment shall not be paid until the schedule submittal and any requested corrections or clarifications have been accepted by ENGINEER for inclusion into the Application for Payment. If additional updated schedules are requested by ENGINEER they are to be provided within seven days of the date of request, but do not constitute permission to submit additional Applications for Payment.

12.1.3. Review

12.1.3.1 ENGINEER shall review schedule submittals. If, in the opinion of ENGINEER, the schedule (1) does not accurately reflect CONTRACTOR's actual progress or work plan or, (2) is unreasonable or cannot be used to effectively evaluate CONTRACTOR's progress or, (3) is not in compliance with this Article and other appropriate sections of the Contract, it will be returned to CONTRACTOR for corrections or clarification.

CONTRACTOR shall make the necessary corrections and resubmit or shall respond in detail to ENGINEER's comments and request that the submittal be accepted without modification. Failure by CONTRACTOR to provide corrections or clarifications to schedule submittals as directed by ENGINEER shall constitute reason to withhold approval of any Application for Payment.

12.1.3.2 ENGINEER's review of schedule submittals shall not relieve CONTRACTOR from responsibility for any variation from the requirements of the Contract Documents unless CONTRACTOR has, in writing, called TWA's attention to each such variation at the time of submission and TWA has given written approval of each such variation; nor shall any approval by TWA or ENGINEER relieve CONTRACTOR from responsibility for compliance with any provision of the Contract Document.

12.1.4. Time of Performance

The Contract Time establishes the period and duration in which TWA expects the Work to be performed. Any schedule which shows completion ahead of the Contract Time shall include additional supporting data to explain the basis of the shorter time for performance. ENGINEER shall review the supporting data, and make recommendations to TWA as to the acceptability of the shorter schedule. TWA may (1) notify CONTRACTOR that the Contract Time is being adjusted by Change Order to reflect the shorter schedule duration or (2) elect not to adjust the present Contract Time and allow the use by all parties of the increased schedule flexibility that the shorter schedule

represents. In any case TWA shall not be responsible for any costs, actual or anticipated, resulting from any delay to CONTRACTOR that prevents completion of any part or all of the Work unless it prevents completion by the Contract Time(s); nor shall the TWA be obligated to incur any additional costs for administration or inspection of accelerated Work.

12.1.5. Changes

It is understood that revisions in the schedule are inherent in the nature of construction. This may require that changes be made in the schedule to reflect the dynamic nature of the design and the Work.

Actions by TWA, CONTRACTOR, ENGINEER or DESIGN ENGINEER that may affect the progress of any part or all of the Work shall make use of the flexibility in the Progress Schedule, often expressed as schedule float or slack time, and that which may result from changes in the sequencing of individual work items, to limit the impact of such actions. The concept of shared schedule flexibility shall not be limited by the inclusion of restraints, logic or imposed dates into the schedule that cannot be reasonably justified.

Excessive use of schedule flexibility by any party is contrary to this sharing concept and may be cause for denial of a request for an extension in Contract Time or, in the case of excessive use by the TWA, ENGINEER or DESIGN ENGINEER, may be cause for an extension in Contract Time if so allowed by Article 11.

12.1.6. As-Built Schedule

After Substantial Completion, but prior to Final Payment, CONTRACTOR shall submit an as-built schedule. The schedule shall reflect (1) all as-built critical paths, (2) all contract activities, including all added activities, with their actual start and finish dates, (3) the actual number of separate work days during which work was performed on each activity, and (4) the actual number of man-days that were required to complete each activity.

ARTICLE 13 - WARRANTY AND GUARANTEE, TESTS AND INSPECTIONS, CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK

13.1 Warranty and Guarantee

CONTRACTOR warrants and guarantees that all Work will be in accordance with the Contract Documents and will not be defective. All defective Work, whether or not in place, may be rejected, corrected or accepted as provided in this Article. The obligations of CONTRACTOR under this paragraph shall be in addition to and not in limitation of any obligation imposed upon him by special guarantees required by the Contract Documents or otherwise prescribed by Laws or Regulations.

13.2 Access to Work

TWA, ENGINEER, DESIGN ENGINEER, their representatives, testing agencies and governmental entities with jurisdiction shall be permitted access to the Work for their observation, inspection and testing. CONTRACTOR shall provide proper and safe conditions for such access.

13.3 Tests and Inspections

13.3.1 CONTRACTOR shall give ENGINEER timely notice of readiness of the Work for all required inspections, tests or approvals. Inspections, tests or observations by ENGINEER, DESIGN ENGINEER, TWA or their agents may be performed at their discretion to provide information to the TWA on the progress of the Work. However, such information is not

intended to fulfill the CONTRACTOR's obligations in accordance with the Contract Documents.

13.3.2 If any law, ordinance, rule, regulation, code or order of any public body, government entity or court having jurisdiction requires any Work (or part thereof) to specifically be inspected, tested or approved, CONTRACTOR shall assume full responsibility therefor, pay all related costs, schedule related activities at appropriate times, and furnish ENGINEER the required certificates of inspection, testing or approval. CONTRACTOR shall also be responsible for and shall pay all costs, in connection with any inspection or testing required in connection with TWA's or ENGINEER's acceptance of a proposed manufacturer, fabricator, supplier or distributor of materials or equipment proposed to be incorporated in the Work, or of material or equipment submitted for approval prior to CONTRACTOR's purchase thereof for incorporation of the Work. All inspections, tests or approvals shall be performed by persons or organizations acceptable to TWA and ENGINEER.

13.3.3 The CONTRACTOR shall perform sufficient testing and inspection of the Work to support the Warranty and Guaranty requirements.

13.3.4 Neither observations by ENGINEER or TWA nor inspections, tests or approvals by others shall relieve CONTRACTOR from his obligations to perform the Work in accordance with the Contract Documents.

13.3.5 If any testing, inspection or approval under this paragraph reveal defective Work, CONTRACTOR shall not be allowed to receive any associated costs and TWA shall be entitled to deduct from the Contract Price, by issuing a Change Order, TWA's costs arising out of the defective Work, including costs of repeated procedures, compensation for ENGINEER's and DESIGN ENGINEER's services and other related costs.

13.4 Uncovering Work

13.4.1 If any Work that is to be inspected, tested or approved is covered without written concurrence of ENGINEER, it must, if requested by ENGINEER, be uncovered for observation. Such uncovering shall be at CONTRACTOR's expense and will exclude the right to an increase in the Contract Price or Contract Time unless CONTRACTOR has given ENGINEER timely written notice of CONTRACTOR's intention to cover such Work and ENGINEER has not acted with reasonable promptness in response to such notice.

13.4.2 If ENGINEER considers it necessary or advisable that covered Work be observed by ENGINEER or inspected or tested by others, CONTRACTOR, at ENGINEER's request, shall uncover, expose or otherwise make available for observation, inspection or testing as ENGINEER may require, that portion of the Work in question, furnishing all necessary labor, material and equipment. If it is found that such Work is defective, CONTRACTOR shall bear all the expenses of such uncovering, exposure, observation, inspection and testing and of satisfactory reconstruction, including compensation for additional professional services, any additional expenses experienced by the TWA due to delays to others performing additional work, other contractual obligations, and attorneys' fees and TWA shall be entitled to issue an appropriate deductive Change Order. CONTRACTOR shall further bear the responsibility for maintaining the schedule and will not be allowed an increase in Contract Price or Contract Time due to the uncovering. If, however, such Work is not found to be defective, and paragraph 13.4.1 is not applicable, CONTRACTOR shall be allowed an increase in the Contract Price or the Contract Time, or both, directly attributable to such uncovering, exposure, observation, inspection, testing and reconstruction if it makes a claim therefor as provided in Article 10.

13.5 Correction or Removal of Defective Work

CONTRACTOR shall promptly, without cost to TWA and as specified by ENGINEER, either correct any defective Work, whether or not fabricated, installed or completed, or, if the Work has been rejected by ENGINEER, remove it from the site and replace it with conforming Work. The CONTRACTOR shall bear the cost of repairing or replacing all Work and property of the TWA or others destroyed or damaged or in any way impacted by such correction or removal.

13.6 Acceptance of Defective Work

If, instead of requiring correction or removal and replacement of defective Work, TWA prefers to accept it, TWA may do so. In such case, if acceptance occurs prior to Final Payment, TWA shall be entitled to issue a Change Order incorporating the necessary revisions in the Contract Documents, including appropriate reduction in the Contract Price. If the acceptance occurs after such Final Payment, an appropriate amount shall be paid by CONTRACTOR to TWA.

13.7 TWA May Correct defective Work

If CONTRACTOR fails within a reasonable time after written notice of ENGINEER to proceed to correct and to correct defective Work or to remove and replace rejected Work as required by ENGINEER in accordance with this Article, or if CONTRACTOR fails to perform the Work in accordance with the Contract Documents (including any requirements of the Progress Schedule), TWA may, after seven days written notice to CONTRACTOR, correct and remedy any such deficiency. In exercising its rights under this paragraph TWA shall proceed with reasonable promptness. To the extent necessary to complete corrective and remedial action, TWA may exclude CONTRACTOR from all or part of the site, take possession of all or part of the Work, and suspend CONTRACTOR's services related thereto, take possession of CONTRACTOR's tools, appliances, construction equipment and machinery at the site and incorporate in the Work all materials and equipment stored at the site or for which TWA has paid CONTRACTOR but which are stored elsewhere. CONTRACTOR shall allow TWA, TWA's representatives, agents and employees such access to the site as may be necessary to enable TWA to exercise its rights under this paragraph. All direct and indirect costs of TWA in exercising such rights shall be charged against CONTRACTOR in an amount documented by TWA, and TWA will be entitled to issue a Change Order incorporating the necessary revisions in the Contract Documents and a reduction in the Contract Price.

Such direct and indirect costs shall include, in particular but without limitation, all corrective or replacement costs, compensation for additional professional services required and all costs of repair and replacement of property of others destroyed, impacted or damaged by correction, removal or replacement of CONTRACTOR's defective Work. CONTRACTOR shall not be allowed an increase in the Contract Price or the Contract Time because of any delay in the performance of the Work attributable to the exercise by TWA of TWA's rights hereunder.

13.8 Warranty Period

13.8.1 The Warranty Period shall commence on the date of Substantial Completion of the entire Work, or a later date if so specified in the Contract Documents, and extend until expiration period may be prescribed by Laws or Regulations or by the terms of any applicable special guarantee or specific provision of the Contract Documents.

13.8.2 If within the designated Warranty Period, the Work, or any part of the Work, is discovered to be defective, CONTRACTOR shall promptly, without an adjustment in Contract Price and in accordance with TWA's or ENGINEER's written instructions, either correct that defective Work, or if it has been rejected by TWA or ENGINEER, remove it from the site and replace it with non-defective Work. If circumstances warrant it, including, but not limited to, in an emergency, TWA may have the defective Work corrected or the rejected

Work removed and replaced. In that event, CONTRACTOR shall not be allowed to recover any associated costs, and he shall reimburse TWA for all direct, indirect and consequential costs of TWA, or TWA shall be entitled to issue a Change Order to incorporate an appropriate decrease in Contract Price if prior to Final Payment. TWA shall reserve and retain all of its rights and remedies at law and equity against CONTRACTOR and its Surety for damages and for corrections of any and all latent defects.

13.9 Extended Warranties and Guarantees

13.9.1 TWA may at its sole discretion advance or defer the date of commencement of the Warranty Period, in which case CONTRACTOR shall maintain the warranties and guarantees in full force and effect until the revised date for commencement of the Warranty Period. If such advancement or deferral in the date for commencement of the Warranty Period causes an increase or decrease in the cost of the warranties and guarantees provided by CONTRACTOR, TWA shall make an adjustment in Contract Price or Contract Time, as provided in Articles 10 and 11.

13.9.2 In circumstances where TWA undertakes Partial Utilization of a portion of the Work which was specifically identified in the Contract Documents, CONTRACTOR shall maintain the warranties and guarantees in full force and effect during the period between the applicable commencement of Partial Utilization date, and the date of commencement of the Warranty Period, and for such warranties and guarantees CONTRACTOR shall receive no adjustment in Contract Price.

13.9.3 In special circumstances where CONTRACTOR fails to complete the Work, or a separable portion of the Work within the corresponding Contract Time, including any authorized adjustments, and TWA undertakes Partial Utilization, CONTRACTOR shall maintain the warranties and guarantees in full force and effect during the period between the applicable commencement of Partial Utilization date, and the date of commencement of the Warranty Period, and for such warranties and guarantees CONTRACTOR shall receive no adjustment in Contract Price.

13.10 Special Maintenance Requirements

In special circumstances where the Work, or a designated part, reaches Substantial Completion, but as provided in the Contract Documents, is not placed in continuous service until the commencement of the Warranty Period, CONTRACTOR shall maintain the Work, or designated part, in good order and in proper working condition, provide suitable drainage, and take all other actions as are necessary for its protection during the period between the applicable Substantial Completion date and the date of commencement of the Warranty Period, and for such maintenance CONTRACTOR shall receive no adjustment in Contract Price. In the event that Work suffers loss or damage, however caused, CONTRACTOR shall rebuild, repair, restore, and make good without an increase in Contract Price all losses or damages to any portion of any Work and shall without an increase in Contract Price provide suitable drainage and erect such temporary structures and take all other actions as are necessary for its protection. Suspension of Work or the granting of an extension in Contract Time for any cause shall not relieve CONTRACTOR of his responsibility for the Work, or designated part, as specified in this paragraph.

13.11 Extended Warranty Period Due to Defective Work

Any defective Work that is either corrected or rejected and replaced will be warranted and guaranteed for a period or one (1) year from the date of such correction or removal and replacement, even if it had previously been corrected or replaced, in accordance with the provisions

of this Article 13. If within such extended Warranty Period, that Work is once again found to be defective, TWA shall be entitled to all of TWA's rights and remedies under this Article.

ARTICLE 14 - PAYMENTS TO CONTRACTOR AND COMPLETION

14.1 Schedules

At least ten days prior to submitting the first Application for Payment, CONTRACTOR shall (except as otherwise specified in the General Requirements) submit to ENGINEER acceptable Progress and Shop Drawing Submittal Schedules, acceptable manpower and cash flow projections, and a final schedule of values of the Work. These schedules shall be satisfactory in type, form and substance to ENGINEER. ENGINEER may require the schedule of values to be adjusted if in its opinion the breakdown does not accurately reflect the true distribution of the Contract Price. Upon written approval of the schedule of values by ENGINEER, it shall be incorporated into a form of Application for Payment acceptable to TWA. After the first Application for Payment, Contractor shall submit a revised, updated Progress Schedule, satisfactory in type, form and substance to the ENGINEER with each subsequent Application for Payment. The Contractor will not be entitled to receive a Progress Payment until the revised Progress Schedule is approved by the ENGINEER.

14.2 Application for Payment

CONTRACTOR shall submit to ENGINEER not later than the first working day of each month an Application for Payment completed and signed by CONTRACTOR covering the Work completed during the previous month and accompanied by such supporting documentation as is required by the Contract Documents and also as ENGINEER may reasonably require. On each Application for Payment, CONTRACTOR shall (1) list the name and address of each of its Subcontractors and Suppliers who have performed Work or provided supplies or material during the time period of Work reflected by the Application and (2) submit certified payroll sheets for his own forces and all Subcontractors for the month preceding this application. After the first Application for Payment, CONTRACTOR shall include an affidavit stating that all previous progress payments received on account of the Work have been applied (1) to discharge CONTRACTOR's obligations and (2) to pay in full (less retainage) all amounts owed to its Subcontractors and Suppliers reflected in prior Applications for Payment. CONTRACTOR shall on the Application for Payment form note and explain when it has not discharged its obligations or paid in full (less retainage) all amounts owed as stated above. Neither TWA nor ENGINEER is under any duty or obligation whatsoever to any Subcontractor, Supplier, laborer or any other party to ensure that payments due and owing by CONTRACTOR to any of them are or will be made.

14.3 Materials on Site

14.3.1 TWA may, at its sole option, pay an amount equal to ninety percent (90%) of the value of materials and equipment not incorporated into the Work but delivered and suitably stored, less in each case the aggregate of payments previously made. In no event shall payments for materials and equipment stored on site exceed ninety percent (90%) of the value of the related cost for the specific item of work shown in the schedule of values regardless of the stated value of the material or equipment. TWA may, at its sole option, pay an amount equal to ninety percent (90%) of the value of materials and equipment not incorporated into the Work and stored off site if stored in a manner acceptable to TWA, as stated above for on-site stored materials. When payment to CONTRACTOR is made for stored material and equipment, CONTRACTOR shall submit invoices marked paid by the Supplier with the Application for Payment following payment to CONTRACTOR documenting that CONTRACTOR has paid for said materials and equipment or the previously paid amount shall be deducted from remaining payments or retainage for stored materials and equipment not so properly documented.

14.3.2 If payment is requested on the basis of materials and equipment not incorporated into the Work but delivered and suitably stored at the site or at another location agreed to in writing, the Application for Payment shall be accompanied by such data, satisfactory to TWA, as will establish TWA's title to the material and equipment and protect TWA's interest therein, including applicable insurance. In no event shall the quantity of material and equipment submitted for payment be in excess of the actual final installed quantity. TWA may deduct from the final Application for Payment amounts paid CONTRACTOR for material and equipment not finally installed in the Work.

14.4 CONTRACTOR's Warranty of Title

The CONTRACTOR warrants and guarantees that title to all Work, materials and equipment covered by any Application for Payment, whether incorporated in the Project or not, will pass to TWA at the time of payment free and clear of all liens, claims, security interests and encumbrances (hereafter referred to as "Liens").

14.5 Review and Payment

14.5.1 ENGINEER will, within twenty days after receipt of each Application for Payment, either indicate in writing a recommendation of payment and present the Application to TWA, or return the Application to CONTRACTOR indicating in writing ENGINEER's reasons for refusing to recommend payment. In the latter case, CONTRACTOR may make the necessary corrections and resubmit the Application.

TWA shall, within twenty days of presentation to it of the Application for Payment by ENGINEER, giving consideration to ENGINEER's recommendation, but not being bound thereby, pay CONTRACTOR the amount to which he is entitled.

14.5.2 ENGINEER's recommendation of any payment requested in an Application for Payment will constitute a representation by ENGINEER to TWA, based on on-site observations of the Work in progress and on ENGINEER's review of the Application for Payment and the accompanying data and schedules, that the Work has progressed to the point indicated; that to the best of ENGINEER's knowledge, information and belief, the quality of the Work is in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning Project prior to or upon Substantial Completion; to the results of any subsequent tests called for in the Contract Documents; or to any qualifications stated in the recommendation) and that CONTRACTOR is entitled to payment of the amount recommended. However, by recommending any such payment, ENGINEER will not thereby be deemed to have represented that any examination has been made to ascertain how or for what purpose CONTRACTOR has used the monies paid or to be paid to CONTRACTOR on account of the Contract Price, or that title to any Work, materials or equipment has passed to TWA free and clear of any lien.

14.5.3 ENGINEER may refuse to recommend the whole or any part of any payment if, in its opinion, it would be incorrect to make such representations to TWA. ENGINEER may also refuse to recommend any such payment, or, because of subsequently discovered evidence or the results of subsequent inspections or tests, nullify any such payment previously recommended to such extent as may be necessary in ENGINEER's opinion to protect TWA from loss or anticipated loss because: (1) the Work is defective, or completed Work has been damaged requiring correction or replacement or, (2) written claims have been made against TWA or Liens have been filed in connection with the Work or, (3) the Contract Price has been reduced because of Change Order or, (4) TWA has been required to correct defective Work or complete the Work or, (5) of CONTRACTOR's unsatisfactory prosecution of the Work in accordance with the Contract Documents or, (6) of

CONTRACTOR's failure to make payment to Subcontractors, Suppliers or for labor, or (7) of CONTRACTOR's failure to provide acceptable schedule submittals for inclusion into the Application for Payment or, (8) of CONTRACTOR's failure to properly maintain and submit with Application for Payment Record Documents.

14.6 Retainage

14.6.1 The value of each Application for Payment shall be equal to the total value of the work performed to date, less an amount retained, and less payments previously made and amounts withheld in accordance with this Article.

14.6.2 Payments will be made in an amount equal to ninety percent (90%) of the Work completed. Upon Substantial Completion of all of the Work, TWA may, at it sole option, pay an amount sufficient to increase total payments to CONTRACTOR to ninety-five percent (95%) of the value of the completed work.

14.7 Overpayment

Any overpayment by TWA to CONTRACTOR shall be promptly repaid to TWA upon demand.

14.8 Final Application for Payment

14.8.1 After CONTRACTOR has completed all corrections to the satisfaction of TWA and ENGINEER as verified by Final Inspection and delivered all maintenance and operating instructions, schedules, guarantees, warranties, Bonds, certificates of inspection, marked-up record documents, Certificates of Insurance and other documents, all as required by the Contract Documents and acceptable to TWA, and after ENGINEER has indicated that Work is acceptable, CONTRACTOR may make application for Final Payment following the procedure for Applications for Payment.

14.8.2 The final Application for Payment shall be accompanied by all documentation Called for in the Contract Documents and such other data and schedules as ENGINEER may reasonably require, together with complete and legally effective releases or waiver (satisfactory to TWA) of all Liens and claims arising out of or filed in connection with the Work. In lieu thereof and as approved by TWA, CONTRACTOR may furnish receipts or releases in full with an affidavit of CONTRACTOR that the releases and receipts include all labor, services, material and equipment for which a Lien or claim could be filed, and that all payrolls, material and equipment bills and other indebtedness in connection with the Work for which TWA might in any way be responsible, have been paid or otherwise satisfied. TWA shall require consent of the Surety to Final Payment.

14.9 Final Payment and Acceptance

14.9.1 If, on the basis of ENGINEER's observations of the Work during construction and Final Inspection, and ENGINEER's review of the final Application for Payment and accompanying documentation all as required by the Contract Documents, ENGINEER is satisfied that the Work has been completed and CONTRACTOR has fulfilled all of its obligations under the Contract Documents, ENGINEER will, within twenty days after receipt of the final Application for Payment, indicate in writing its recommendation of payment and present the Application to TWA for payment. Thereupon ENGINEER will give written notice to TWA and CONTRACTOR that the Work is acceptable.

Otherwise, ENGINEER will return the Application to CONTRACTOR, indicating in writing the reasons for refusing to recommend Final Payment, in which case CONTRACTOR shall

make the necessary corrections and resubmit the Application. If the Application and accompanying documentation are appropriate as to form and substance, TWA shall, within twenty days after receipt from ENGINEER, pay CONTRACTOR the amount due giving consideration to the recommendations of ENGINEER, but not being bound thereby.

14.9.2 After receipt of the ENGINEER's written notice that the Work is acceptable and prior to Final Payment, CONTRACTOR shall submit an affidavit, in a form acceptable to TWA, certifying that the Bonds and insurances required under Article 5 are in effect and will not be allowed to expire for the required period of time.

14.10 Waiver of Claims

14.10.1 The making and acceptance of Final Payment shall constitute:

14.10.2 A waiver of all claims by TWA against CONTRACTOR, except claims arising from unsettled Liens, from defective Work appearing after final inspection, from fraud or gross negligence amounting to fraud, or from failure to comply with the Contract Documents or the terms of any special guarantees specified therein or the terms of any Bonds; however, it shall not constitute a waiver by TWA of any rights in respect of CONTRACTOR's continuing obligations under the Contract Documents; and

14.10.3 A waiver of all claims by CONTRACTOR against TWA, ENGINEER, and DESIGN ENGINEER other than those enumerated in the Final Application for Payment.

14.11 TWA's Obligations

14.11.1 In no event shall any interest be due and payable to CONTRACTOR on any of the sums retained by TWA pursuant to any of the terms or provisions of any of the Contract Documents.

14.11.2 Any provision to the contrary notwithstanding, TWA shall not be obligated to make any payment to CONTRACTOR and may withhold partial payments if any one or more of the following conditions exists: (1) TWA has reason to believe CONTRACTOR is in default of any of its obligations or otherwise is in default under any of the Contract Documents; (2) Any part of such payment is attributable to Work which is defective, provided, however, payment shall be made for Work which is performed in accordance with the Contract Documents and is not defective; (3) CONTRACTOR has failed to make payments promptly to Subcontractors and Suppliers or for labor and material for which TWA has made payment to CONTRACTOR; (4) If TWA, in its good faith judgment, determines that the portion of the Contract Price remaining unpaid will not be sufficient to complete the Work in accordance with the Contract Documents; (5) CONTRACTOR has failed to maintain progress of the Work in accordance with the Progress Schedule or CONTRACTOR has failed to meet an interim completion date or the Substantial or Final Completion Date.

14.12 Partial Utilization

14.12.1 Use by TWA of completed portions of the Work may be accomplished at the option of TWA prior to Substantial Completion of all the Work subject to the following:

14.12.1.1 TWA at any time may request CONTRACTOR in writing to permit TWA to use any part of the Work which TWA believes to be substantially complete and which may be so used without significant interference with construction of the other parts of the Work. If CONTRACTOR agrees, CONTRACTOR shall certify to TWA that said part of the Work is

substantially complete and request ENGINEER to issue a certificate of Substantial Completion for that part of the Work. CONTRACTOR at any time may notify TWA and ENGINEER in writing when CONTRACTOR considers that a portion of the Work which has been identified in the Contract Documents as eligible for Partial Utilization is substantially complete. Within a reasonable time thereafter, TWA, CONTRACTOR, and ENGINEER shall make an inspection of that part of the Work to determine its status of completion. If ENGINEER does not consider that part of the Work to be substantially complete, ENGINEER will notify CONTRACTOR in writing giving the reasons therefor. If ENGINEER considers that part of the Work to be substantially complete, ENGINEER will execute and deliver to TWA and CONTRACTOR a certificate to that effect, fixing the date of Substantial Completion as to that part of the Work, and attaching a list of minor items as to that part of the Work to be completed or corrected before Final Payment.

14.12.1.2 Prior to issuing a certificate of Substantial Completion as to part of the Work, ENGINEER will deliver to TWA and CONTRACTOR a written recommendation as to the division of responsibilities pending Final Payment between TWA and CONTRACTOR with respect to security, operation, safety, maintenance, utilities, insurance and the Warranty Period for that part of the Work. TWA shall have the right to exclude CONTRACTOR from any part of the Work which ENGINEER has so certified to be substantially complete, but TWA shall allow CONTRACTOR reasonable access to complete or correct items described above.

14.12.1.3 In lieu of the issuance of a certificate of Substantial Completion as to part of the Work, TWA may take over operation of a facility constituting part of the Work whether or not it is substantially complete if such facility is functionally and separately useable; provided that prior to any such takeover, TWA and CONTRACTOR have agreed in writing as to the division of responsibilities between TWA and CONTRACTOR for security, operations, safety, maintenance, Warranty Period, utilities and insurance with respect to such facility. During such utilization and prior to Substantial Completion of that portion of the Work, TWA shall allow CONTRACTOR reasonable access to complete or correct items and to complete other related Work.

14.13 Substantial Completion

14.13.1 When CONTRACTOR considers the entire Work to have progressed to the point where it is substantially complete, CONTRACTOR shall, in writing to ENGINEER, certify that the entire Work is substantially complete, submit to ENGINEER all operation and maintenance manuals and instructions and spare parts required by the Contract Documents, and request that ENGINEER issue a Certificate of Substantial Completion. Within a reasonable time thereafter, TWA, CONTRACTOR and ENGINEER shall make an inspection of the Work to determine the status of completion. If ENGINEER does not consider the Work substantially complete, ENGINEER will notify CONTRACTOR in writing giving the reasons therefore. CONTRACTOR shall then accomplish the requisite Work and then recertify that the entire Work is substantially complete. If ENGINEER considers the Work substantially complete, ENGINEER will prepare and deliver to CONTRACTOR and TWA a Certificate of Substantial Completion which shall fix the date of Substantial Completion. There shall be attached to the certificate a list of items (which should be minor in scope and nature) to be completed or corrected before Final Payment. CONTRACTOR shall continue to be

responsible for maintaining the Work until the date of certification of Substantial Completion, or longer if so required by the Contract Documents.

The work will be substantially complete when all associated work as shown on the Drawings has been furnished, installed and accepted by TWA and any associated permits have been closed out by the Contractor.

14.13.2 TWA shall have the right to exclude CONTRACTOR from the Work, or specified part, after the date of Substantial Completion, but TWA shall allow CONTRACTOR reasonable access to complete or correct items on the list attached to the Certificate of Substantial Completion.

14.14 Final Inspection

Upon written notice from CONTRACTOR that the minor items described in the list attached to the Certificate of Substantial Completion have been completed, ENGINEER will make an inspection with TWA and CONTRACTOR and will notify CONTRACTOR in writing of the results of this inspection as to the items of the Work that appear to be incomplete, non-conforming or defective. CONTRACTOR shall immediately take such measures as are necessary to remedy such deficiencies, and notify ENGINEER upon completion. The Final Inspection by ENGINEER with TWA and CONTRACTOR will verify completion of all items.

14.15 CONTRACTOR's Continuing Obligation

CONTRACTOR's obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. Neither recommendation of any progress or Final Payment by ENGINEER, nor the issuance of a Certificate of Substantial Completion, nor any payment by TWA to CONTRACTOR nor any Partial Utilization by TWA nor any act of acceptance by TWA nor any failure to do so, nor any review and approval of the Shop Drawings or samples, nor any review of a Progress Schedule, nor the issuance of a notice of acceptability by ENGINEER, nor any correction of defective Work by TWA will constitute an acceptance of Work not in accordance with the Contract Documents or a release of CONTRACTOR's obligation to perform the Work in accordance with the Contract Documents except as provided in a waiver of claims at the time of making and acceptance of Final Payment.

ARTICLE 15 - SUSPENSION OF WORK AND TERMINATION

15.1 TWA May Stop the Work

If the Work is defective and the CONTRACTOR has been notified by ENGINEER or TWA, or if CONTRACTOR fails to furnish or perform the Work in such a way that the completed Work will conform to the Contract Documents, or if CONTRACTOR fails to supply sufficient supervisory personnel or skilled workmen or suitable materials or equipment, or if CONTRACTOR fails to obtain, maintain or renew insurance in conformance with the Contract Documents in a form acceptable to TWA, or if any insurance company CONTRACTOR has obtained insurance from declares bankruptcy or is declared bankrupt, or if CONTRACTOR fails to prosecute the Work without endangering persons or property, TWA may order CONTRACTOR to stop the Work, or any portion thereof, until the cause for such order has been eliminated. TWA's order to stop the Work may be communicated through ENGINEER or by TWA. This right of TWA to stop the Work shall not give rise to any duty on the part of TWA or ENGINEER to exercise this right for the benefit of CONTRACTOR or any other party. CONTRACTOR shall bear all direct, indirect, and consequential costs of such order to stop the Work (including but not limited to fees and charges of engineers, attorneys and other professionals, any additional expenses incurred by TWA due to delays to others performing work under a separate contract with TWA, and other obligations), and

CONTRACTOR shall further bear the responsibility for maintaining the Progress Schedule and shall not be entitled to any extension of Contract Time or increase in the Contract Price. TWA shall be entitled to deduct any expenses so incurred from the Contract Price by issuing a Change Order.

15.2 Suspension for Convenience

15.2.1 Without invalidating the Agreement, and without notice to any surety, TWA may, at any time, order CONTRACTOR in writing to stop, delay or interrupt Work for such a period of time as TWA may deem appropriate. Upon receipt of that order, CONTRACTOR shall immediately proceed in accordance with any specific provisions or instructions, protect and maintain the Work, and make reasonable and diligent efforts to mitigate costs associated with the suspension order.

15.2.2 If any suspension of Work under this paragraph causes an increase or decrease in CONTRACTOR's cost or the time required to perform or complete any part of the Work, TWA shall make a change in Contract Price or Contract Time, as provided in Article 10 and 11; except that no change in Contract Price or Contract Time will be made for any suspension of Work to the extent that performance would have been suspended anyhow by causes not meeting the criteria in Article 11, or for which an adjustment is provided or excluded under any other provision of the Contract Documents.

15.3 Termination for Cause

15.3.1 TWA may upon the occurrence of any one or more of the following events terminate the services of CONTRACTOR:

15.3.1.1 If a trustee, receiver, custodian or agent of CONTRACTOR is appointed under applicable law or under contract, whose appointment or authority to take charge of property of CONTRACTOR is for the purpose of enforcing a Lien against such property or for the purpose of general administration of such property for the benefit of CONTRACTOR's creditors;

15.3.1.2 If CONTRACTOR admits in writing an inability to pay its debts generally as they become due;

15.3.1.3 If CONTRACTOR fails to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers, sufficient supervisory personnel, or suitable materials or equipment or failure to adhere to the Progress Schedules);

15.3.1.4 If CONTRACTOR discontinues prosecution of the Work or any portion thereof;

15.3.1.5 If CONTRACTOR allows any final judgment against it to remain unsatisfied for a period of ten days;

15.3.1.6 If CONTRACTOR disregards laws, policies, court orders, or administrative directives, etc. of any governmental body, agency or court having jurisdiction;

15.3.1.7 If CONTRACTOR disregards the authority of ENGINEER;

15.3.1.8 If CONTRACTOR otherwise violates in any substantial way any provisions of the Contract Documents; or

15.3.1.9 If CONTRACTOR fails to promptly pay Subcontractors, Suppliers, Materialmen, Laborers, etc.

15.3.2 As it is recognized that if CONTRACTOR is adjudged bankrupt or makes a general assignment for the benefit of creditors or if a receiver is appointed on account of its insolvency, such could impair or frustrate CONTRACTOR's performance of the Work, therefore it is agreed that upon occurrence of any such event, TWA shall be entitled to request CONTRACTOR or its successor to provide adequate assurance of future performance in accordance with the terms and conditions of the Contract Documents.

Failure to provide said adequate assurance within seven (7) days of the delivery of the request shall entitle TWA to terminate CONTRACTOR. In all events pending receipt of adequate assurance of performance and actual performance in accordance herewith, TWA shall be entitled to proceed with the Work with its own forces or with their contractors on a time and material or other appropriate basis the cost of which will be back charged against CONTRACTOR. TWA shall be entitled to deduct these costs from the Contract Price by issuing a Change Order.

15.3.3 TWA may, after giving CONTRACTOR and surety seven (7) days written notice, and to the extent permitted by laws and regulations, terminate the services of CONTRACTOR, exclude CONTRACTOR from the site and take possession of the Work and of all CONTRACTOR's tools, appliances, construction equipment and machinery at the site and use the same to the full extent they could be used by CONTRACTOR (without liability to CONTRACTOR for trespass or conversion), incorporate in the Work all materials and equipment stored at the site or for which TWA has paid CONTRACTOR but which are stored elsewhere, and finish the Work as TWA may deem expedient. CONTRACTOR shall assign all of its interest in any or all Sub-Agreements to TWA upon TWA's request. In such case CONTRACTOR shall not be entitled to receive any further payment until the Work is finished. If the unpaid balance of the Contract Price exceeds the direct, indirect and consequential costs of completing the Work (including but not limited to fees and charges of engineers, architects, attorneys and other professionals and court and arbitration costs including costs for appellate proceedings) such excess will be paid to CONTRACTOR. If such costs exceed such unpaid balance, CONTRACTOR shall pay the difference to TWA. If CONTRACTOR leaves the site at any time during the seven day period, TWA shall have the right to secure the site to protect the property from damage and to insure the health and safety of the public.

15.3.4 Notwithstanding the above notice period, in the event of an emergency, the TWA may take over the site and perform any or all of the activities set out above immediately. TWA shall provide notice of such takeover within 24 hours after its occurrence.

15.3.5 Where CONTRACTOR's services have been terminated by TWA, the termination shall not affect any rights of TWA against CONTRACTOR then existing or which may thereafter accrue. Any retention or payment due CONTRACTOR by TWA will not release CONTRACTOR from liability.

15.3.6 TWA may, at its sole discretion, permit CONTRACTOR to continue to perform work when CONTRACTOR is in default, however caused. Such a decision by TWA shall in no way operate as a waiver on the part of TWA of any of its rights under the Contract Documents.

15.4 Termination for Convenience

15.4.1 TWA may, without prejudice to any other right or remedy, terminate this Contract in whole or in part at any time for its convenience by giving CONTRACTOR and surety seven (7)

days written notice. TWA shall have the right, in that event, to take over any or all of CONTRACTOR's materials, (whether stored on or off site) supplies, equipment, Sub-Agreements or other obligations to complete the Work and CONTRACTOR shall assign them to TWA upon TWA's request. CONTRACTOR shall proceed to complete any part of the Work, as directed by TWA, and shall settle all its claims and obligations under the Agreement.

15.4.2 In any such termination for the convenience of TWA, CONTRACTOR shall be paid for Work completed in accordance with the Contract Documents prior to receipt of the notice of termination, and for reasonable termination settlement costs relating to commitments which had become firm prior to the termination; however, payment to CONTRACTOR will exclude any and all anticipated supplemental costs, administrative expenses overhead and profit on uncompleted Work. CONTRACTOR shall justify its claims as requested by TWA with thorough, accurate records and data.

15.4.3 If, after notice of Termination for Cause of CONTRACTOR, it is determined that CONTRACTOR was not in default, the termination shall be deemed to have been for the convenience of TWA. In such event CONTRACTOR may recover from TWA payment in accordance with paragraph 15.4.2.

15.5 CONTRACTOR May Stop Work or Terminate

If, through no act or fault of CONTRACTOR, or a Subcontractor or their agents or employees or any other person for whose acts they may be responsible, the Work is suspended for a period of more than ninety (90) days by TWA or under an order of court or other public authority, or ENGINEER fails to act on any Application for Payment within forty-five (45) days after it is submitted, or TWA fails for forty-five (45) days to pay CONTRACTOR any sum finally determined to be due, then CONTRACTOR may, upon seven (7) days written notice to TWA and ENGINEER, terminate the Agreement and recover from TWA payment for all Work executed and any expense sustained plus reasonable termination expenses. In addition and in lieu of terminating the Agreement, if ENGINEER has failed to act on an Application for Payment or TWA has failed to make any payment as aforesaid, CONTRACTOR may upon seven (7) days' notice to TWA and ENGINEER stop the Work until payment of all amounts then due. Except as specifically provided in this paragraph, these provisions shall not relieve CONTRACTOR of the obligation under Article 6 to carry on the Work in accordance with the Progress Schedule and without delay during disputes and disagreements with the TWA.

ARTICLE 16 – INTENTIONALLY OMITTED

ARTICLE 17 - MISCELLANEOUS

17.1 Giving Notice

17.1.1 Whenever any provision of the Contract Documents requires the giving of written notice it shall be deemed to have been validly given as of the time of actual delivery if delivered in person; or if it is delivered by registered mail, delivery service, or telegram, charges prepaid, at the actual time of delivery at the last business address known to the giver of the notice.

17.1.2 Written notice to be delivered to TWA or ENGINEER or to any of its representatives by CONTRACTOR shall be delivered at the office stated in the Agreement, unless otherwise specified in writing to CONTRACTOR. Written notice to CONTRACTOR by TWA or ENGINEER shall be delivered to the individual or member of the firm or to an officer of the

corporation for whom it is intended at the office stated in the Agreement, or such other office or individual designated by CONTRACTOR in writing to TWA.

17.2 Notice to Other Agencies

CONTRACTOR shall notify all public and private entities or agencies in accordance with any and all ordinances, laws, agreements, licenses, and any other directions of construction activity, disruption of access or services. TWA or ENGINEER shall not be responsible for any such notification.

17.3 Computation of Time

When any period of time is referred to in the Contract Documents by days, it shall be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or on a Holiday, such day shall be omitted from the computation.

17.4 Claims for Injury or Damage to Person or Property

Should TWA or CONTRACTOR suffer injury or damage to person or property because of any error, omission or act of the other party or of any of the other party's employees or agents or others for whose acts the other party is legally liable, claim will be made in writing to the other party within a reasonable time from the first observance of such injury or damage. This provision shall not be construed as a substitute for or a waiver of the provisions of any applicable statute of limitations or repose.

17.5 No Conflict with Laws or Regulations

17.5.1 The duties, obligations, criteria or procedure imposed by these General Conditions and the rights and remedies made available are in addition to, and are not to be construed in any way as a limitation of any rights and remedies available to any or all of them which are otherwise imposed or available by Laws or Regulations, except that in the event that a specific part or detailed requirement of a provision, criterion or procedure in these General Conditions and a specific part or detailed requirement of a provision, criterion or procedure imposed or available by Laws or Regulations are in conflict the specific part or detailed requirement of Laws and Regulations shall govern. All other specific parts or detailed requirements in the provisions, criteria or procedures of the applicable Laws or Regulations and these General Conditions not in conflict shall remain in full force and effect and be read with the controlling specific part or detailed requirement.

17.5.2 The provisions of this paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right and remedy to which they apply.

17.5.3 Each and every provision of law and clause required by law to be inserted in the Contract Documents shall be deemed to be inserted therein and the Contract shall be read and enforced as though it were included therein.

17.6 Partial Invalidity

If any provision of this contract is held by a court of competent jurisdiction to be invalid or unenforceable, such invalidity or un-enforceability shall not affect the other parts of this Contract if the rights and obligations of the parties contained herein are not materially prejudiced and if the intentions of the parties can continue to be effectuated. To that end, this contract is declared severable.

17.7 No Waiver of Rights, Duties

17.7.1 Except as otherwise specifically provided in the Contract Documents, no action or failure to act by the TWA, ENGINEER, TWA's Representative(s), or CONTRACTOR shall constitute a waiver of any right or duty afforded any of them under the Contract Documents, nor shall any such action or failure to act constitute an approval of or acquiescence of any breach thereunder.

17.7.2 All representations, indemnities, warranties and guarantees required by the Contract Documents, including the Warranty Period shall survive Final Payment and termination or completion of this Agreement.

17.8 Advertising

No advertising shall be permitted upon any part of the site or structures located on the site. News or press releases pertaining to the services, work product(s), or performance of CONTRACTOR under this Agreement or the Project to which it relates shall be at the sole discretion of TWA.

17.9 Venue

The location of any litigation arising between the parties shall only be in the courts of Osceola County, Florida.

17.10 Recovery of Damages

In no event shall CONTRACTOR be entitled to recover from TWA any indirect, incidental, or consequential damages in any proceeding arising out of or relating to this Agreement or breach thereof.

END OF SECTION

SECTION 00800
SUPPLEMENTARY CONDITIONS

1. INTRODUCTION

These Supplementary Conditions amend or supplement the General Conditions of the Construction Contract and other provisions of the Contract Documents as indicated below.

2. CONTRACTOR'S INSURANCE

2.1 General Liability Insurance

Bodily injury coverage shall be for not less than $1,000,000 for each occurrence and not less than $1,000,000 aggregate.

Property damage coverage shall be for not less than $500,000 each occurrence and $500,000 aggregate.

Personal injury coverage shall be for not less than $1,000,000 aggregate.

or

Bodily injury, personal injury, and property damage coverage shall be in a combined single limit of not less than $1,000,000 each occurrence and $1,000,000 aggregate.

2.2 Automobile Liability

Bodily injury coverage shall be for not less than $1,000,000 for each person and not less than $1,000,000 for each accident, per each occurrence.

Property damage coverage shall be for not less than $500,000 for each occurrence.

or

Bodily injury and property damage coverage shall be in a combined single limit of not less than $1,000,000 for each occurrence and $1,000,000 aggregate.

2.3 Employer's Liability Insurance.

Bodily Injury coverage by accident shall be for not less than $500,000 for each employee and $500,000 for each accident.

Bodily Injury coverage by Disease shall be for not less than $100,000 for each employee and $100,000 for each aggregate disease.

END OF SECTION

SECTION 00910
NOTICE OF AWARD

_____ Effective Date_____
Contractor

Project: **OAKWOOD DR. GRAVITY SEWER REHABILITATION PROJECT**

Date of Proposal Opening:_____

You are hereby notified as of the date indicated above that you are the Successful Proposer on the Project noted above. Upon compliance with the conditions precedent to be fulfilled by you within the time specified, the Agreement will be executed and delivered to you.

The Bid selected was: ____ Base Bid ; ____ Alternative Bid; with a total of $_____

Enclosed are the following:

No. Copies	Item
3	Agreement Between TWA and Contractor
3	Performance Bond
3	Payment Bond
3	Notice of Award

Please take the following actions:

1. Execute Agreement.
2. Have your bonding company complete bond forms and attach notarized Acknowledgment of Authorized Representative.
3. Provide Certificates of Insurance per contract requirements.
4. Return all 3 copies of documents enclosed no later than fifteen (15) days after the date indicated above.

TOHOPEKALIGA WATER AUTHORITY
951 Martin Luther King Boulevard, 3rd Floor
Kissimmee, Florida 34741-4929

We will return a fully executed copy of the contract document to you along with a Notice to Proceed.

OWNER:
BY: _____
Robert F. Pelham, Director of Engineering

Tohopekaliga Water Authority
951 Martin Luther King Boulevard, 3rd Floor
Kissimmee, Florida 34741-4929

Acknowledge Receipt of Notice

By_____DATE_____
Contractor

END OF SECTION

SECTION 00920
NOTICE TO PROCEED

_____

_____

_____ Date:_____
Contractor

Project Name: OAKWOOD DR. GRAVITY SEWER REHABILITATION PROJECT

Project No. : _____

Contract No.:_____

Contractor is hereby notified to proceed with the work on the subject project as of the date _____, which shall constitute the date of the Commencement of the Contract Time.

Contractor shall mobilize and be working on site within 10 calendar days following this date, unless agreed to otherwise in writing.

Enclosed is one set of Conformed Contract Documents.

Date of Substantial Completion of the Work: _____

Amount of Liquidated Damages per day for non-completion of the work by date of Substantial Completion (unless agreed to otherwise in writing) $ 1,000.00

TOHOPEKALIGA WATER AUTHORITY

BY: _____
Robert F. Pelham, Director of Engineering
951 Martin Luther King Boulevard
Kissimmee, Florida 34741-4929

Acknowledged Receipt of Notice

BY:_____ DATE:_____
Contractor

END OF SECTION

SECTION 00930
CHANGE ORDER FORM
TOHOPEKALIGA WATER AUTHORITY (TWA)

CHANGE ORDER NO._____

DATE:_____ **CONTRACTOR:_____**

OWNER:_____ **AGREEMENT DATE:_____**

_____

The following changes are hereby made to the CONTRACT DOCUMENTS:

_____

ORIGINAL CONTRACT PRICE. . . . . $	
Current CONTRACT PRICE ADJUSTED by previous CHANGE ORDER. . . . . $	
The CONTRACT PRICE due to this CHANGE ORDER will increase/decrease by. . . . . $	

The new CONTRACT PRICE including this ORDER will be. . . . . $	
The new CONTRACT TIME due to this CHANGE ORDER will increase/decrease by. . . . . $	
The new CONTRACT TIME including this ORDER will be	
The date for SUBSTANTIAL COMPLETION of all work will be.	

CHANGES ORDERED:

I. GENERAL

This Change Order is necessary to cover changes in the work to be performed under this Contract. The GENERAL CONDITIONS SUPPLEMENTARY

CONDITIONS, SPECIFICATIONS, and all parts of the Project Manual listed in Article 1, Definitions, of the GENERAL CONDITIONS apply to and govern all work under this Change Order.

PROJECT:_____

PROJECT NO.:_____

II. WORK CHANGED BY CHANGE ORDER

1. Required Changes

2. Justification

3. Payment

III. ORIGINAL CONTRACT SCOPE IMPACTED BY THIS CHANGE ORDER

1. Required Changes/Impact

2. Justification

3. Payment

IV. PRIOR CHANGE ORDERS IMPACTED BY THIS CHANGE ORDER:

V. WAIVER

This Change Order constitutes full and mutual accord and satisfaction for the adjustment in Contract Price and/or Time as a result of increases or decreases in costs and time of performance caused directly and indirectly from the change. Acceptance of this waiver constitutes an agreement between TWA and CONTRACTOR that the Change Order represents an equitable adjustment to the Contract and that CONTRACTOR shall waive all rights to file a claim on this Change Order. Execution of this Change Order shall constitute CONTRACTOR's

complete acceptance and satisfaction that it is entitled to no more costs or time (direct, indirect, impact, etc.) pursuant to this Change Order.

IV. APPROVAL AND CHANGE AUTHORIZATION

Acknowledgments: The aforementioned change, and work affected thereby, is subject to all provisions of the original contract not specifically changed by this Change Order; and, It is expressly understood and agreed that the approval of the Change Order shall have no effect on the original other than matters expressly provided herein.

Change Order Request by: _____

Change(s) Ordered by: _____

RECOMMENDED BY:	ACCEPTED BY:
_____	_____
Construction Manager	Contractor
By_____	By_____
Signature	Signature
Title_____	Title_____
Date_____	Date_____

APPROVED BY:
TOHOPEKALIGA WATER AUTHORITY
(Owner)

By_____	By_____
Signature	Signature
Title_____	Title_____
Date_____	Date_____

END OF SECTION

SECTION 00940
APPLICATION FOR PAYMENT

ENGINEER'S PROJECT NO._____ Substantial Completion Date _____

Final Completion Date _____

Application No._____ Progress _____ Final _____

Project: **OAKWOOD DR. GRAVITY SEWER REHABILITATION PROJECT**

Contractor: _____ Contract Date: _____

Contract for: **Tohopekaliga Water Authority** (TWA)

Application Date: _____ For Period Ending: _____

Contract Amount

1. Original Contract _____
2. Change Orders (_ through_) _____
3. Total Contract _____

Analysis of Work Performed

1. Value of original contract performed to date _____
2. Value of approved Change Order performed to date _____
3. Sub Total _____
4. Less _____% Retainage _____
5. Sub Total _____
6. Plus Material Stored _____% of _____ _____
7. Total value of work performed to date _____
8. Less amount of previous payment _____
9. Balance due this estimate _____

Subcontractor and Supplier Listing.

List below the name and mailing address of each of your Subcontractors, Suppliers, Materialmen and Equipment Suppliers who have performed Work or provided materials, supplies, or equipment during the time period represented by this Application and with each the dollar amount of their work you are applying for. If more room is necessary, please attach another sheet of paper and put an "X" in this blank. Please attach another sheet of paper and put an "X" in this blank.

_____

_____

_____

Contractor's Affidavit: The undersigned hereby swears under penalty of perjury that (1) all previous progress payments received from the TWA on account of Work performed under the contract referred to above have been applied by the CONTRACTOR to discharge in full obligations of the CONTRACTOR incurred in connection with Work covered by prior Applications for Payment under said contract, being Applications for Payment numbered 1 through ____inclusive; (2) all materials and equipment incorporated in said Project or otherwise listed in or covered by this Application for Payment are free and clear of all liens, security interests and encumbrances; and (3) all previous progress payments have been applied by the CONTRACTOR to pay in full (less retainage) all amounts owed to its Subcontractors and Suppliers, reflected (and listed) in prior Applications for Payment, except as stated hereunder:

Name	$ Amount Unpaid	Reason for Nonpayment

If more room is necessary, please attach another sheet of paper and put an "X" in this blank _____ _____

Dated _____, 20____ (Contractor)

By_____
(Name and Title)

(*This portion intentionally left blank*)

State of FLORIDA}
ss}
County of _____}

Before me on this _____ day of _____, 20_____, personally appeared _____, known to me, who being duly sworn, deposes and says that (s)he is the_____ of the CONTRACTOR above mentioned; that (s)he executed the above Application for Payment and statement on behalf of said CONTRACTOR; and that all of the statements contained therein are true, correct and complete.

(Notarial Seal)

_____
Notary Public
My commission Expires:

Engineer's Recommendation

In accordance with the terms of the contract the undersigned recommends payment to the Contractor of the Balance Due as show above.

By_____ Date: _____
Title: CEI

OWNER'S APPROVAL:

By _____ Date: _____
Title: Construction Inspector

By _____ Date: _____
Title: Project Manager

By _____ Date: _____
Title: Director of Engineering

By _____ Date: _____
Title: Executive Director

END OF SECTION

SECTION 00950
REQUEST FOR INFORMATION

Project: **OAKWOOD DR. GRAVITY SEWER REHABILITATION PROJECT**

Project No._____

Contractor:_____

QUESTION

Reference: Specification Section:_____Drawing No._____

_____

_____

_____

_____

_____

Requested by:_____ Date:_____

REPLY

_____

_____

_____

_____

_____

_____

Requested by:_____ Date:_____

cc: _____

:_____

END OF SECTION

SCHEDULE OF VALUES

PROJECT: OAKWOOD DR. GRAVITY SEWER REHABILITATION PROJECT PAY ESTIMATE NO. _____

PREPARED BY _____ FOR PERIOD ENDING _____/20__ PAGE_____ OF _____

ITEM	DESCRIPTION	BID QUANTITY	UNIT	UNIT PRICE	BID AMOUNT	COMPLETE THROUGH LAST PERIOD QTY. %	COMPLETE THROUGH LAST PERIOD QTY. %	VALUE OF ITEMS COMPLETED

Quantity Approved by: _____ _____ Sub-Total _____ Total

END OF SECTION

SECTION 00980
CERTIFICATE OF SUBSTANTIAL COMPLETION

CONTRACT: Requested by:_____ Date:_____

PROJECT: Requested by:_____ Date:_____

CONTRACTOR:_____ Date:_____

CONTRACTOR FOR:_____ Date:_____

CONTRACT DATE:_____

This Certificate Substantial Completion applies to all Work under the Contract Documents or the following specified parts thereof:

TO:_____**TOHOPEKALIGA WATER AUTHORITY**_____
OWNER

AND TO:_____
CONTRACTOR

The Work to which this Certificate applies has been inspected by authorized representative of OWNER, CONTRACTOR, and ENGINEER, and that Work is hereby declared to be substantially complete in accordance with the Contract Documents on:_____
_____DATE OF SUBSTANTIAL COMPLETION

A tentative list of items to be completed or corrected is attached hereto. This list may not be all-inclusive, and the failure to include an item in it does not alter the responsibility of CONTRACTOR to complete all the Work in accordance with the Contract Documents. The items in the tentative list shall be completed or corrected by CONTRACTOR within 30 days of the above date of Substantial Completion.

This certificate does not constitute an acceptance of Work not in accordance with the Contract Documents nor is it a release of CONTRACTOR's obligations to complete the Work in accordance with the Contract Documents.

Executed by ENGINEER on_____, 20_____

_____

ENGINEER

BY:_____

CONTRACTOR accepts this Certificate of Substantial Completion on _____ 20____

_____

CONTRACTOR

BY:_____

OWNER accepts this Certificate of Substantial Completion on _____ 20_____

_____

OWNER

BY:_____

END OF SECTION

SECTION 00990
CERTIFICATE OF FINAL INSPECTION
TOHOPEKALIGA WATER AUTHORITY

Project: **OAKWOOD DR. GRAVITY SEWER REHABILITATION PROJECT**

Contract/Contract No. _____

TO: Contractor _____

Project Manager _____

Client Bureaus _____

A joint inspection of the work described in the Contract Documents has been made by the TWA and the Contractor on _____ (date) in accordance with Article 14 of the Contract General Conditions, and is accepted by the TWA, subject to the provisions of Article 13.11 of the Contract General Conditions, or for a period of warranty as otherwise agreed upon and attached.

Accepted by:

Contractor:

BY:_____ Date_____

BY:_____ Date_____

Approved:

_____ Date_____

_____ Date_____

END OF SECTION

SECTION 00995
CONTRACTOR'S RELEASE

BEFORE ME, the undersigned authority in said County and State, appeared _____ _____, who, being duly sworn, deposes and says that he is _____ of_____, a company and/or corporation authorized to do business under the laws of Florida, which is the contractor on_____, located in the County of _____, City of_____, Florida, with Tohopekaliga Water Authority, dated the _____ day of_____, 20___, that the deponent is duly authorized to make this affidavit by resolution of the Board of Director of said company and/or corporation; that deponent knows of his own knowledge that said contract has been complied with in every particular by said Contractor and that all parts of the work have been approved by the TWA's Engineer; that there are no bills remaining unpaid for labor, materials, or otherwise, in connection with said contract and work, and that there are no suits pending against the undersigned as Contractor or anyone in connection with the work done and materials furnished or otherwise under said contract. Deponent further says that the final estimate in the amount of $_____ which has been submitted to the TWA simultaneously with the making of this affidavit constitutes all claims and demands against the TWA on account of said contract or otherwise, and that acceptance of the sum specified in said final estimate in the amount of $_____ will operate as a full and final release and discharge of the TWA from any further claims, demands or compensation by Contractor under the above contract. Deponent further agrees that all guarantees under this contract shall start and be in full force from the date of this release as spelled out in the contract documents.

_____

Sworn and subscribed to

before me this _____ day of _____, 20___.

_____

Notary Public

WE, the _____, having heretofore executed performance and payment bonds for the above named Contractor covering project and section as described above in the sum of $_____ dollars ($_____) hereby agree that the TWA may make full payment of the final estimate, including the retained percentage, to said Contractor.

It is fully understood that the granting of the right to the TWA to make payment of the final estimate to said Contractor and/or his assigns, shall in no wise relieve this surety company of its' obligations under its' bond, as set forth in the specification, contract and bond pertaining to the above project.

(*This portion intentionally left blank*)

IN WITNESS WHEREOF, the _____ has caused this instrument to be executed on its behalf of its _____ and/or its duly authorized attorney in fact, and its corporate seal to be hereunto affixed, all on this____ day of _____, A.D., 20____.

_____
Surety Company

BY:_____
Attorney-in-Fact

(Power of Attorney must be attached if executed by Attorney-in-Fact.)

STATE OF FLORIDA
COUNTY OF _____

BEFORE ME, the undersigned authority, personally appeared _____ to me known as the person described in and who executed the foregoing instrument in the name of its _ _____ the said _____ acknowledged that he executed said instrument in the name of _____ as its and/or for the purpose therein expressed and that he had due and legal authority to execute the same on behalf of said _____, a corporation.

IN WITNESS WHEREOF, I have hereunto set my hand official seal at _____ this _____ day of _____, 20___.

_____
Notary Public
MY COMMISSION EXPIRES:

END OF SECTION

DIVISION I
GENERAL REQUIREMENTS

SECTION 01000

INDEX OF DRAWINGS

PART 1 – GENERAL

The following list of engineering drawings titled "TOHO WATER AUTHORITY OAKWOOD DR. GRAVITY SEWER REHABILITATION PROJECT", are incorporated into the Contract Documents by reference.

1.01 INDEX OF DRAWINGS

Sheet Number	Drawing Number	Title
1	G-00	COVER
2	G-01	GENERAL NOTES
3	G-02	GENERAL NOTES & ABBREVIATIONS
4	G-03	WIFIA NOTES
5	G-04	WIFIA NOTES
6	G-05	WIFIA NOTES
7	C-01	LS # 1 HERMOSILLO TRIBUTRARY AREA
8	C-02	LS # 1 HERMOSILLO TRIBUTRARY AREA
9	S-01	GENERAL STRUCTURAL NOTES & MASONARY WALL REPAIR
10	C-501	STANDARD DETAILS
11	C-502	STANDARD DETAILS
12	C-503	STANDARD DETAILS
13	C-504	STANDARD DETAILS
14	C-505	MOT DETAILS
15	C-506	MOT DETAILS
16	C-507	MOT DETAILS

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01010

SUMMARY OF WORK

PART 1 – GENERAL

1.01 LOCATION

A. The work described by these specifications is located on property, easements, or right-of-way, owned or leased by the Tohopekaliga Water Authority, Osceola County in Osceola County, Florida.

1.02 DESCRIPTION

A. The Work to be done consists of furnishing all labor, equipment, materials and services required to rehabilitate gravity sewer mains, laterals and manholes by various rehabilitation methods, removing and replacing existing facilities, or installing new facilities within the Tohopekaliga Water Authority service area. Additional work includes asphalt road repair, bypass pumping, complete restoration and all other associated work.

B. **<u>Phasing</u>: The Contractor is required to submit a phasing plan for the Owner's review and approval prior to commencement of construction. The Contractor must coordinate with other Contractor(s) as necessary to ensure that all point repair work is completed prior to associated lining efforts. Contractor coordination efforts may include, but are not limited to; CIPP lining work coordination, phasing of the work, work zone coordination, work phasing pending the timing of CIPP lining and manhole rehabilitations being completed by others, MOT coordination, MOT phasing, permit submittals and approval timing, restoration coordination, coordination with the Owner, the Engineer and other jurisdictional agencies, coordination with sub-contractors and other workers, public involvement coordination, coordination for notifications, and all other necessary coordination efforts to properly sync the project construction for point repairs and subsequent lining of the gravity sewer mains and laterals and for manhole work. The Contractor must coordinate their point repair work to be completed prior to lining work and rehabilitation work being completed by others. Additional costs, claims, or change orders to the Owner will not be acceptable due to lack of coordination and proper phasing of the Work on the part of the Contractor.**

C. Contractor's Duties:

1. Cooperate with the Owner or Owner's Representatives.
2. Adequately phase and coordinate the project and all associated work efforts to avoid delays or project issues.
3. Except as specifically noted, provide and pay for:
   a. Labor, materials, and equipment.
   b. Tools, construction equipment, and machinery.
   c. Water and utilities required for construction.

d. Other facilities and services necessary for the proper execution and completion of the Work.

4. Secure and pay for, as necessary for the proper execution and completion of the Work, and as applicable at time of receipt of bids:
   a. Surveying
   b. Permits.
   c. Government fees.
   d. Licenses.
5. Give required notices.
6. Comply with codes, ordinances, rules, regulations, orders, and other legal requirements of public authorities that bear on performance of Work.
7. Promptly submit written notice to Engineer of observed variance of Contract Documents from legal requirements.
8. Enforce strict discipline and good order among employees. Do not employ on Work persons not skilled in their assigned task.
9. The Contractor shall furnish personnel and equipment that will be efficient, appropriate, and large enough to secure a satisfactory quality of work and a rate of progress that will ensure the completion of the work within the time stipulated in the Proposal. If, at any time, such personnel appears to the Engineer to be inefficient, inappropriate or insufficient for securing the quality of work aforesaid, he may order the Contractor to increase the efficiency, change the character or increase the personnel and equipment, and the Contractor shall conform to such order. Failure of the Engineer to give such order shall in no way relieve the Contractor of his obligations to secure the quality of the work and rate of progress.
10. The Contractor shall be responsible for restoring all disturbed private property, resulting from his construction activities, or the activities of his sub-consultants, at no additional cost to the Owner.
11. The Contractor shall confine his activities to the site(s) designated by the Owner for the Work or for materials storage.
12. The Contractor shall follow all WIFIA requirements including but not limited to:

Disadvantaged Business Enterprise (DBE)

1. All borrowers are required to complete, and ensure that its prime contractor completes, the six Good Faith Efforts below to ensure that DBEs have the opportunity to compete for contracts

2. The six Good Faith Efforts:

   a. Ensure DBEs are made aware of contracting opportunities to the fullest extent practical through outreach and recruitment activities. For Tribal, State and Local

Government Recipients, this will include placing DBEs on solicitation lists and soliciting them whenever they are potential sources.

b. Make information on forthcoming opportunities available to DBEs. Posting solicitations for bids or proposals for a minimum of 30 calendar days in a local newspaper, before the bid opening date.

c. Consider in the contracting process whether firms competing for large contracts could subcontract with DBEs.

d. Encourage contracting with a group of DBEs when a contract is too large for one firm to handle individually.

e. Use the services of the SBA and/or Minority Business Development Agency (MBDA) of the US Department of Commerce.

f. If the prime contractor awards subcontracts, require the prime contractor to take the above steps.

3. Borrowers must negotiate a "Fair Share Objective" with EPA

a. A "Fair Share Objective" is an objective based on the capacity and availability of qualified, certified MBEs and WBEs in the relevant geographic market for the procurement categories of construction, equipment, services and supplies compared to the number of all qualified entities in the same market for the same procurement categories, adjusted, as appropriate, to reflect the level of MBE and WBE participation expected absent the effects of discrimination

b. This is not a quota

c. Borrowers may use Fair Share Objectives already negotiated with EPA or may use the State negotiated objective

4. Borrowers must report MBE/WBE accomplishments on EPA Form 5700-52A

a. Must submit quarterly

5. Borrowers must ensure that its prime contractors do the following:

a. Pay its subcontractor for satisfactory performance no more than 30 days from the prime contractor's receipt of payment from the recipient

b. Notify borrower in writing prior to any termination of a DBE subcontractor for convenience by the prime contractor

c. If a DBE subcontractor fails to complete work under the subcontract for any reason, the prime contractor must employ the six good faith efforts if soliciting a replacement subcontractor

d. Employ the six good faith efforts even if the prime contractor has achieved its fair share objectives

6. A borrower must ensure that each procurement contract it awards contains the following term and condition: "The contractor shall not discriminate on basis of race, color, national origin or sex in the performance of this contract. The contractor shall carry out applicable requirements of 40 CFR part 33 in the award and administration of contracts awarded under EPA financial assistance agreements. Failure by the contractor to carry out these requirements is a material breach of this contract which may result in the termination of this contract or other legally available remedies."

7. Borrowers must maintain proper records and keep a bidder's list

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01041

PROJECT COORDINATION

PART 1 - GENERAL

1.01 WORK INCLUDED

Furnish personnel and equipment that will be efficient, appropriate and large enough to secure a quality of work that is acceptable to the Owner/Engineer and a rate of progress that will ensure the completion of the work within the Contract Time. If at any time such personnel appears to the Engineer to be inefficient, inappropriate or insufficient for securing the quality of work aforesaid, he may order the Contractor to increase the efficiency, change the personnel or increase the personnel and equipment, and the Contractor shall conform to such order at no additional cost to the Owner. Failure of the Engineer to give such order shall in no way relieve the Contractor or his obligations to secure the quality of the work and rate of progress.

PART 2 - PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.01 CONSTRUCTION COORDINATION

A. The Contractor is required to coordinate construction activities to maintain the project schedule and complete the work within the Contract Time. Locations of work must be approved by TWA prior to installation.

B. The Contractor shall coordinate and obtain site surveying for all project locations prior to commencement of construction.

C. All work by others for CIPP lining or other rehabilitation efforts by others must be coordinated by the Contractor throughout the duration of the project, including but not limited to, phasing of work efforts to ensure that project sequencing and work is properly performed without rework, delays, added costs, or circumstances that could have been avoided if adequate coordination and sequencing/phasing of the project was performed.

D. Where horizontal or vertical pipe penetrations are indicated on the Drawings, Contractor shall identify the source of the penetration and coordinate with Owner. If the source of the penetration is identified as another utility, Contractor shall coordinate with Owner and other utility owner to complete repair without damaging services.

E. The Contractor shall be responsible for coordinating all sub-contractors and trades and incorporating the work of all subcontractors or trades where necessary and as required.

F. Cutting and patching, drilling and fitting shall be carried out where required by the trade or subcontractor having jurisdiction; however, the Contractor shall be solely responsible for this work.

3.02 PROTECTION OF CONSTRUCTION AND EQUIPMENT

A. All newly constructed work shall be carefully protected from damage in any way. All portions damaged shall be reconstructed by the Contractor at his expense.

B. Protect all structures in a suitable manner to prevent damage. Should any part of a structure become heaved, cracked or otherwise damaged, all such damaged portions of the work shall be completely repaired and made good by the Contractor at his own expense and to the satisfaction of the Engineer. If in the final inspection of the work, any defects, faults or omissions are found, the Contractor shall cause the same to be repaired or removed and replaced by proper materials and workmanship without extra compensation for the materials, labor and equipment required. Further, the Contractor shall be fully responsible for the satisfactory maintenance and repair of the construction and other work undertaken herein and any damages caused by the performance of the Work, for at least the warranty period described in the Contract.

C. The Contractor shall completely restore all pavement, sidewalk, curbing, landscaping, swales, culverts, and all other areas disturbed by construction activities.

END OF SECTION

SECTION 01050

FIELD ENGINEERING AND CONTROLS

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. It is the intent of this specification that all surveying work at each of the project sites will provide a clear and detailed record of all existing site features prior to commencement of construction. It shall be the Contractor's responsibility to ensure the accuracy and content of each of the surveyed locations meets this requirement. Furthermore, a detailed record of all improvements must be provided for as-built drawing production.

B. Provide field engineering services for the project:

1. Survey work required for each work site by the Contractor prior to commencement of construction.

2. Survey work required throughout the duration of the project to field verify existing conditions.

3. Survey work required for final as-built drawing production.

B. Survey Control

1. Contractor shall retain the services of a registered land surveyor licensed in the State of Florida to perform a pre-construction survey of the limits of all work to be performed and establish control points to be used during construction which in the land surveyor's judgement are necessary for the Contractor to proceed with his work.

2. Contractor shall retain the services of a registered land surveyor licensed in the State of Florida to locate existing control points as established during the pre-construction survey and maintain a survey during construction. Project grades, lines and levels shall be established from the existing reference points. The method of field staking for the construction of the Work shall be at the option of Contractor.

3. The method and material of field staking shall be the Contractor's option. The accuracy of any method of staking shall be the responsibility of Contractor. All engineering for vertical and horizontal control shall be the responsibility of Contractor.

4. Contractor shall keep an accurate record of site surveying meeting the requirements of specification Section 01720 – Project Record Documents and used in the production of as-built record drawings.

PART 2 - PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.01 IMPLEMENTATION

A. Qualifications of Surveyor

1. A Florida Registered Land Surveyor, acceptable to the TWA and the Engineer. Submit name and address of surveyor to Engineer prior to field services being performed.

B. Project Survey Requirements

1. Locate and protect existing control points prior to starting site work. Preserve all control points and reference marks throughout construction. Establish site control points, lines and levels, by appropriate means. The location of these points should minimize the number of sightings necessary to control the work, and the likelihood of the points being disturbed.

a. Record locations, with horizontal and vertical data, on Project Record Documents.

b. Make no changes or relocations without prior written notice to Engineer.

c. Report to Engineer when any control point is lost or destroyed, or requires relocation because of necessary changes in grades or locations.

d. Surveyor is to replace points that have been lost or destroyed based on original control.

2. Use survey control points to layout such work tasks as the following:

a. Clearing, grubbing and work limits.

b. Tree protection requirements.

c. Existing pavement, curbing, sidewalk elevations and spot shots to accurately represent existing site grades and conditions.

d. All existing utility infrastructure improvements within each work area.

e. Batter boards for structures.

f. Site improvements:

i. Stakes for grading, fill and topsoil replacement.

ii. Utility slopes and invert elevations.

iii. All new features such as manholes, cleanouts, rigid couplings/connectors (of various types and materials), piping, concrete pads, etc.

g. Control points, lines and elevations required for any other project work.

h. Other work items as necessary

3. Periodically, verify layouts by same methods.

4. Records and Submittals

a. Maintain a complete, accurate log of all control and survey work as it progresses.

b. At contract closeout submit a signed and sealed as-built survey and reproducible 24"x36" sheets verifying; invert and rim elevations at manholes, existing utilities, fittings (including coupling/connector locations), piping materials and sizes, all work limits, separations between existing utilities and facilities and all other work within each project site for a complete and accurate representation of all work at each location.

c. If computer aided design and drafting methods were used in the preparation of the project, a copy of the (.dwg or .dxf) file shall be provided in accordance with specification Section 01720 – Project Record Documents.

d. On request of Engineer, submit documentation to verify accuracy of field engineering and surveying work.

END OF SECTION

SECTION 01070

ABBREVIATIONS

PART 1 - GENERAL

1.01 GENERAL

Wherever in these Specifications and Contract Documents the abbreviations, or pronouns in place of them are used, the intent and meaning shall be interpreted as specified herein.

1.02 ABBREVIATIONS

AA	-	Aluminum Association
AASHTO	-	American Association of State Highway and Transportation Officials
ACI	-	American Concrete Institute
ACPA	-	American Concrete Pipe Association
AEIC	-	Association of Edison Illuminating Companies
AFBMA	-	Anti-Friction Bearing Manufacturers Association
AGMA	-	American Gear Manufacturers Association
AIEE	-	American Institute of Electrical Engineers
AISC	-	American Institute of Steel Construction
AISI	-	American Iron and Steel Institute
ANSI	-	American National Standards Institute
APHA	-	American Public Health Association
API	-	American Petroleum Institute
ASCE	-	American Society of Civil Engineers
ASHRACE	-	American Society of Heating, Refrigeration, and Air Conditioning Engineers
ASME	-	American Society of Mechanical Engineers
ASTM	-	American Society for Testing and Materials
AWS	-	American Welding Society
AWWA	-	American Water Works Association
CFR	-	Code of Federal Regulations
CRSI	-	Concrete Reinforcing Steel Institute
EIA	-	Electrical Industries Association

EPA	-	Environmental Protection Agency
FDER	-	Florida Department of Environmental Regulation
FDOT	-	Florida Department of Transportation
FMHA	-	Farmers Home Administration
FS	-	Federal Specifications
IEEE	-	Institute of Electronic and Electrical Engineers
IES	-	Illuminating Engineering Society
IPCEA	-	Insulated Power Cable Engineers Association
ISA	-	Instrument Society of America
NBS	-	National Bureau of Standards
NRMA	-	National Ready-Mix Association
NEC	-	National Electric Code
NEMA	-	National Electrical Manufacturers Association
OSHA	-	Occupational Safety and Health Administration
PCA	-	Portland Cement Association
SBC	-	Southern Building Code
SSPC	-	Steel Structures Painting Council
UBC	-	Uniform Building Code
UL	-	Underwriters Laboratories
USDC	-	United States Department of Commerce
USDHUD	-	United States Department of Housing and Urban Development

END OF SECTION

SECTION 01150

MEASUREMENT AND PAYMENT

PART 1 – GENERAL

1.01 GENERAL INFORMATION

A. Refer to Section 01010 for a description of the work required for completion of the Work.

B. Subject to the provisions in the Contract General Conditions, all work and payment for the work is represented by the Total Base Bid amount shown on the Bid Form.

1.02 PAYMENT

A. Work under this contract will be paid for on a unit price and/or lump sum price basis as outlined on the Bid Form. The amount of payment will be as defined in the Standard Form of Agreement between Owner and Contractor, Article 5 of Payment Procedures.

B. The prices shown on the Bid Form establish a total price cost for completing the Work in its entirety. Furnish all materials, equipment, transportation, tools, labor, services and supplies, plus any miscellaneous items and services that may not be specifically identified in the Contract Drawings and Specifications but that can be inferred from the Contract Drawings and Specifications and are necessary to produce a completed Work that is usable in a manner for which it was intended. If any items for a complete work are omitted or not shown, the Contractor shall furnish and install them without additional cost to the Owner. No separate payment will be made for another Payment Item required to complete the work of a lump sum item.

C. The Contractor shall prepare and submit an Application for Payment no more often than each month.

D. Retainage shall apply to all Contractor payments prior to final acceptance as provided for in the Contract General Conditions.

1.03 MEASUREMENT FOR PAYMENT

A. Measurement for Lump Sum bid items shall be based on the percent of actual completion as determined by the Contractor and agreed upon by the Engineer.

B. Measurement for Unit Price bid items shall be based on the actual quantity installed and accepted by the Engineer.

C. Measurement of volumes shall be the actual "as-built" volume pertinent to payment items. Quantities on the Bid Form are estimated and may be increased or decreased without limit.

1.04 PAYMENT ITEMS

A. Separate payment will be made for the Unit Price and Lump Sum Items listed on the Bid Form. Related work not specifically listed or identified, but evidently necessary for satisfactory completion of the Item, shall be considered to be included.

B. No separate payment will be made for the following Work and its cost shall be included in appropriate Payment Items:

1. Record drawings.

2. Field office(s) and storage facilities.

3. Clean up.

4. Testing materials and apparatus.

5. Appurtenant work.

6. Contractor fees associated with the performance of the Work.

7. Project phasing and coordination.

8. Bypass system pumping

9. Work required outside of normal work hours (nights, weekends or holidays, etc.) No work is allowed on holidays unless approved by TWA and all other required jurisdictional authorities.

10. Submitting and obtaining all necessary permit approvals, including fees.

11. Storm preparation and associated demobilization and remobilization.

C. The following will clarify the work included for bid items in the Pay Item Sheet:

1. Mobilization and Demobilization (10%) (Bid Item No. 1):

a. Measurement of various items for Mobilization and Demobilization will not be made for payment and all items shall be included in the lump sum price.

b. Payment for Mobilization and Demobilization will be made at the Contract lump sum price for the item, which price and payment shall be full compensation for the preparatory work and operations in mobilizing for beginning work on the Project and demobilizing for ending work on the Project, as well as any storm preparation and required demobilization and remobilization during work on the Project. The establishment and maintenance/use of field offices, buildings, safety equipment, first aid supplies, sanitary and other facilities, as required by these Specifications,

State and local laws and any other preconstruction expense necessary for the state of the Work; all coordination and Contractor coordination for work being done by others such as CIPP lining work being done by others, all public relations work including door hangers and public meetings in advance of the work and notifications for the various project areas, the cost of field engineering, including proper disposal of all debris, permits and all permit fees, construction schedules, project phasing and coordination, construction photographs, project signs, shop drawings, cleaning or maintaining the work areas, temporary facilities, lay down storage area, construction aids, all erosion control measures, work associated with Contractor support during Owner/Engineer testing, reviews and inspection, re-inspection and any rework resulting from same, progressive monthly project as-builts and asset tables by a licensed PSM, record documents, operating and maintenance data. The Contractor shall submit invoices substantiating the cost of mobilization with each pay request. Ten percent of the cost for mobilization and demobilization will be withheld until acceptance and final payment.

2. General Requirements, Bonds, and Permits (Bid Item No. 2):

   a. Measurement for various items covered under General Requirements, Bonds, and Permits will not be made for payment, and all items shall be included in the lump sum price.

   b. Payment for General Requirements, Bonds, and Permits shall include all insurance requirements costs, the costs of all bonds, permits, and all administrative costs associated with acquiring and maintaining the necessary insurance coverage and permit issuance as described in the Contract Documents. This item will be paid upon each payment request made by the Contractor. The Contractor shall attach with the payment request invoices to substantiate that appropriate insurance and bonds have been obtained by the Contractor.

3. Indemnification (Bid Item No. 3):

   a. In consideration of the Contractor's indemnity agreement as set out in the Contract Documents, the Owner specifically agrees to give the Contractor a minimum of $100.00 and other good and valuable consideration, receipt of which is acknowledged upon signing of the Agreement.

4. Maintenance of Traffic (2.5%) (Bid Item No. 4):

   a. Measurement of various items for Maintenance of Traffic will not be made for payment, and all items shall be included in the lump sum price.

   b. Payment for Maintenance of Traffic will be made at the Contract lump sum price for the item, which price and payment shall be full

compensation for the preparation and implementation of a vehicular, pedestrian, school goers/students and emergency services MOT plan which includes construction and maintenance of any necessary detour facilities, stabilized roadways for traffic relocations; phased MOT, adjustments to MOT throughout the project as the work progresses or as project phases are implemented, the providing of necessary facilities for access to residences, businesses, students or schools, etc., along the project; the furnishing, installing and maintaining of traffic control, barricades, railings, warning lights, ITS or message boards, and all other safety devices during construction, the control of dust, providing the services of flagmen and uniformed off-duty police officers, and other special requirements for the safe and expeditious movements of traffic as called for in the Specifications and as required by the various governing jurisdictions. MOT shall also include signed and sealed drawings by a PE registered in the State of Florida, all required permit submittals, resubmittal and permit fees, and coordination with all agencies having jurisdiction over the ROW limits and obtaining all required permit approvals.

5. Locate Utilities in Advance of Construction (Bid Item No. 5):

a. Contractor shall furnish all labor, materials, and equipment necessary to physically locate all utilities in the immediate area of proposed work using non-destructive digging equipment, supplies and personnel experienced in the use of ground penetrating radar (GPR) and subsurface utility engineering (SUE) to determine precise horizontal and vertical positions of utilities, specified herein, and/or as directed by the Engineer. The Contractor shall perform utility locates at least 72 hours in advance of construction in order to request clarification if required from the Engineer. Contractor construction scheduling shall allow all necessary decisions to be made prior to the Contractor's crews reaching the work area(s) and prevents delay and/or a crew mobilization/demobilization claim.

b. The work includes equipment to locate, paint/mark the approximate position of the underground utility, vacuum excavation equipment that includes air tools (water jet, air lance) to break up the surface and soil and dewatering as required to visually identify the utilities. The vacuum excavation equipment involves removing the disturbed soil and temporarily storing it. If grouting is required to fill the SUE, all costs for grouting are to be included in this item. The exposed underground utility is examined and pertinent data such as size(s), type, material, and depth is gathered. A marker such as an iron rod and cap or nail and disk are placed next to the test hole and the depth measurement is taken to this point. The stored soil is then returned to the excavated test hole and the surface is returned to its original state; asphalt patch is tamped into the hole when applicable. Markings such as paint and/or lathe and ribbon

are left near the hole for future identification. Assume all lines to be located are active lines and service must be maintained at all times.

6. Pre-Construction Survey (Bid Item No. 6)

   a. Measurement of various items for the Pre-Construction Survey will not be made for payment and all items shall be included in the lump sum price.

   b. Payment for Pre-Construction Survey will be for full compensation to furnish a pre-construction survey for each work area in order to provide a clear and detailed record of all existing site features prior to submittal for right of way use and MOT permitting and commencement of construction.

7. As-Built Survey (Bid Item No. 7)

   a. Measurement of various items for the As-Built Survey will not be made for payment and all items shall be included in the lump sum price.

   b. Payment for As-Built Survey will be for full compensation to furnish a signed and sealed (in CAD, hard copy and pdf formats) as-built survey meeting TWA requirements for each work area and an asset table at the completion and acceptance of work. In addition, for furnishing monthly/progressive as-builts and redlined drawings with pay applications.

8. Clean and CCTV (15” to 24” Diameter Mains) (Bid Items No. 8):

   a. Measurement for sewer cleaning and CCTV shall be measured in linear feet of piping cleaned and video inspected for various diameters and types of pipes as shown on the plans.

   b. Payment for sewer cleaning and CCTV will be for furnishing all labor, materials and equipment for each linear foot of piping cleaned, including but not limited to, furnishing and installing and set up of all equipment required to pre and post clean and CCTV the piping to confirm the proposed work required to rehabilitate the sewer, completely clean the sewer by whatever means possible including heavy cleaning and multiple passes with various types of equipment, chipping out or removal of concrete or other solid debris, plugs for isolation of piping and manholes, bypass piping and pumping, protection of downstream sewers, proper handling of equipment and materials, hauling and disposal of all removed material, copies of pre and post cleaning inspection videos to document the proposed rehabilitation work in a NASSCO compliant database and all other labor, materials and equipment to complete the work to the satisfaction of TWA, including removal of all mineral deposits, grease, debris, roots including mechanical cutting or removal of all roots and

immediate application of chemical root treatment, debris or other foreign objects that would hinder the normal operation of, or the future application or installation of future sewer rehabilitation or maintenance operations, including removal of all grease and debris from the sewer and proper disposal. The clean and CCTV pay item is a separate item and shall not be applied in conjunction with CIPP liner (Bid Item Nos. 9a through 9c).

9. Furnish and Install Cured In Place Pipe (CIPP) Liner for Various Pipe Diameters (Bid Item Nos. 9a through 9c):

   a. Measurement and payment for full length CIPP liner, except as otherwise specified, will be based on the laying length of the pipe in linear feet actually lined as measured along the centerline of the completed pipe between the limits shown on the Drawings. Payment for this item will be released after the post-installation PACP CCTV videos and reports are reviewed and accepted.

   b. Payment for CIPP liner will be for furnishing all labor, materials and equipment to properly install full length CIPP liners into the mains as shown on the drawings; including but not limited to, draining of piping, grouting and grouting repairs as needed to halt infiltration as long as necessary to install the CIPP liner, properly disposing of contents at an approved disposal facility, cleaning including heavy or mechanical cleaning and multiple passes with various types of equipment for obtaining a clean pipe, removal of roots, dye-testing and all other equipment and methods for locating and identifying all existing laterals including the determination of active and inactive laterals, finishing CIPP lining at all lateral connections, all resins, including advanced resins, needed based on the pipe material being lined, curing materials, management and treatment of regulated resin chemicals in discharge waters including any associated fees or permitting, all fittings, plugs for isolation of piping, bypass piping and pumping including sound attenuation to meet specification and jurisdictional requirements, other incidental repairs for liner installation, removal of all obstructions, including but not limited to, concrete or other solid debris to install liners as necessary, manhole reconnections, all testing, post-installation PACP CCTV and inspection results submitted in a NASSCO compliant database, updated monthly/progressive as-built and asset table submittals to TWA, providing surveyed record drawings per TWA standards, and appurtenances and accessories. This item also includes the proper disposal of removed materials and complete restoration after completion of construction operations.

      Payment for all trenchless rehabilitation will be made after review and acceptance of the post-rehabilitation CCTV reports and videos. Contractor shall submit these reports and videos in groups on the first day of a pay period in order to ensure payment on the following estimate.

No payment will be made for CIPP liner installation until CCTV reports and videos have been submitted and accepted. Point repairs are not for payment as part of CIPP lining item.

10. Remove and Replace Existing Gravity Sewer Main with New Gravity Sewer Main (Bid Item Nos. 10a through 10c): ❸

a. Measurement and payment for pipe, except as otherwise specified, will be based on the laying length of the pipe in linear feet actually furnished and installed as measured along the centerline of the completed pipe and not including lengths for couplings, fittings or other appurtenances.

b. Payment for pipe removal and replacement will be made at the contract unit price per linear foot of pipe replaced and payment shall be full compensation for removal and disposal of the existing pipe, furnishing and installing new pipe from manholes (or as indicated on the drawings) in all directions of existing pipe with rigid couplings/connectors (of various types and materials) and including point repair work and other appurtenances as shown on the contract drawings, SDR 35 PVC or SDR 26 PVC piping per TWA specifications, all clearing, grubbing, excavation, dewatering, pipe bedding, sheeting, shoring and bracing, trench boxes, protecting and supporting of all existing utilities and stormwater infrastructure. stormwater concrete collars, hiring of power company to hold and support power poles, removing and resetting guy wires for existing utility poles, tree and vegetation protection, pre and post installation CCTV inspections of sewer mains, submittal of NASSCO compliant database, backfill and compaction and grading/re-grading, excavatable flowable fill, pipe identification tape, core boring/enlarging existing manhole penetrations, bypass pumping design and flow control, implementation, and monitoring including sound attenuation to meet specification and jurisdictional requirements, all testing, site cleanup and disposal of debris, site restoration, including sodding, landscaping removal and replacement, root pruning, disposal of unsuitable materials, tree trimmings, vegetation removal, and all equipment and all other work necessary to complete the installation and restore the impacted limits as specified.

11. Remove and Replace Existing Gravity Sewer Main with New Gravity Sewer Main at Point Repairs (Bid Item Nos. 11a through 11c): ❸

a. Measurement and payment for pipe, except as otherwise specified, will be based on the removal of existing pipe and laying length of the new pipe in linear feet actually furnished and installed as measured along the centerline of the completed pipe and not including lengths for couplings, fittings or other appurtenances.

b. Payment for pipe removal and replacement will be made at the contract unit price per linear foot of pipe replaced and payment shall be full

compensation for removal and disposal of the existing pipe, furnishing and installing new pipe from manholes (or as indicated on the drawings) in all directions of existing pipe with rigid couplings/connectors (of various types and materials) and including point repair work and other appurtenances as shown on the contract drawings, SDR 35 PVC or SDR 26 PVC piping per TWA specifications, all clearing, grubbing, excavation, dewatering, pipe bedding, sheeting, shoring and bracing, trench boxes, protecting and supporting of all existing utilities and stormwater infrastructure, stormwater concrete collars, hiring of power company to hold and support power poles, removing and resetting guy wires for existing utility poles, tree and vegetation protection, pre and post installation CCTV inspections of sewer mains, submittal of NASSCO compliant database, backfill and compaction and grading/re-grading, excavatable flowable fill, pipe identification tape, core boring/enlarging existing manhole penetrations, bypass pumping design and flow control, implementation, and monitoring including sound attenuation to meet specification and jurisdictional requirements, all testing, site cleanup and disposal of debris, site restoration, including sodding, landscaping removal and replacement, root pruning, disposal of unsuitable materials, tree trimmings, vegetation removal, and all equipment and all other work necessary to complete the installation as specified.

12. Sanitary Sewer Lateral Removal and Replacement (Bid Item No. 12):

a. Measurement of Sanitary Sewer Lateral Connections will be based on the actual number laterals removed and replaced on various sized mains and of various diameters.

b. Payment for Sanitary Sewer Lateral replacement will be made at the Contract unit price, which price and payment shall be full compensation for all labor, materials and equipment to properly remove and replace sanitary sewer laterals of various diameters on various size gravity mains for single and double laterals; including but not limited to, protection and support of existing utilities, field verification of existing utilities, coordination with existing utility facility owners, coordination with property owners, draining of piping, properly disposing of contents at an approved disposal facility, furnishing and installing the connections to the main, service, pipe, dewatering, removal and disposal of existing service and service connections, cleaning, plugging, bypass pumping design and flow control, implementation, and monitoring including sound attenuation, pre and post CCTV inspections, submittal of NASSCO compliant database, all tees, wyes, couplings and fittings, manhole reconnections, excavation, sheeting, shoring and bracing, backfill, excavatable flowable fill, compaction and grading, site restoration, including sodding, landscaping removal and replacement, root pruning, tree trimmings, vegetation removal, all testing, , and all other appurtenances, accessories and incidentals necessary to complete the item. Contractor is to coordinate the sewer lateral connection location

with each property owner. Contractor is to replace lateral piping from the gravity main to the Right-of-Way line for each lateral replaced. Laterals shall be assumed to have a maximum length between the main and ROW of 75 feet.

13. Install/Replace Sanitary Sewer Clean-out (Bid Item Nos. 13a through 13b)

    a. Measurement for installing new sanitary sewer clean-outs shall be measured based on the actual number of sanitary sewer clean-outs installed depending upon surface type, regardless of the lateral diameter or depth.

    b. Payment for installing new sanitary sewer clean-outs shall be full compensation for furnishing all labor, materials and equipment necessary to install the sanitary sewer cleanout including excavation, sheeting, shoring and bracing, dewatering, backfill, excavatable flowable fill, coordination with existing utility facility owners, coordination with property owners, hiring of power company to hold and support power poles, removing and resetting guy wires for existing utility poles, protecting and supporting of all existing utilities and stormwater infrastructure. stormwater concrete collars, compaction and grading, sodding, landscaping removal and replacement, root pruning, disposal of unsuitable materials, all pipe, all fittings, wyes, bends, sleeves, and plugs necessary to provide a watertight access, locator balls, concrete collars/pads and reinforcement, underdrains and restoration of all underdrain piping impacted including but not limited to piping, concrete collars, couplings or sleeves (of various types and materials), fittings, filter fabric and rock for a complete underdrain restoration, proper disposal of the existing pipe materials including all piping and fittings, protection of existing utilities and property, restoration and clean-up. This item also includes the removal and replacement of fences and gates, mailboxes, landscape beds, trees, shrubs, sodding, irrigation sprinklers, any specialty materials (pavers, brick, stamped concrete, etc.) and other obstructions for equal or better and complete restoration within the work limits.

14. Replace Existing Sanitary Sewer Manhole (Bid Item Nos. 14a through 14b):

    a. Measurement of removal and replacement of manholes will be based on actual number of manholes removed and replaced of varying depths and diameters.

    b. Payment for each manhole removed and replaced of varying depths and diameters will be made at the Contract unit price for each of the items, which price and payment shall be full compensation for locating, protecting and supporting of all existing utilities and stormwater infrastructure, stormwater concrete collars, field verification of existing utilities, coordination with existing utility facility owners, coordination

with property owners, hiring of power company to hold and support power poles, removing and resetting guy wires for existing utility poles, tree and vegetation protection, removal and disposal of the existing manhole, frame and cover, bypass pumping, dewatering, excavation, sheeting, shoring and bracing, backfill, excavatable flowable fill, compaction and grading/re-grading, disposal of unsuitable materials, furnishing, and installing the new manhole complete with penetrations, flexible connections, boots, frame and cover, adjustments to match existing grade, sealant, coating or liner (including cast-in liners, as specified in drawings), core concrete restoration and remedial work, benching, concrete collars or brick adjustments, site restoration, including sodding, landscaping removal and replacement, root pruning, tree trimmings, vegetation removal, and No. 57 stone,), underdrains or storm drainage piping and restoration of all underdrain or storm drainage piping impacted, including but not limited to, piping, concrete collars, couplings or sleeves, fittings, filter fabric and rock for a complete underdrain restoration, pavement removal and replacement of various materials to meet City, County and TWA standards, and appurtenances and accessories, utility marker posts, etc. for a full and complete installation.

15. Seal and Coat Manhole (Bid Item No. 15):

a. Measurement for coating of manholes shall be measured in vertical feet of manhole depth for each manhole sealed and coated, regardless of manhole type or diameter. Manhole depth shall be defined as the manhole rim to the lowest manhole invert.

b. Payment for coating of manhole will be for furnishing all labor, materials and equipment for each manhole cleaned, sealed and coated with approved products per TWA standards included in specification Appendix A for existing or new manholes per vertical feet as shown on the drawings.

The work shall include all surface preparation, leak repair, crack repair, plugging infiltration, channel reconstruction, removal and replacement of existing benching and re-benching of flow channels, pressure or mechanical cleaning, grouting and grouting repairs or injections, installation of the coating in accordance with the manufacturer's recommendations and requirements, final MACP CCTV inspection and submittal in NASSCO compliant database, testing of the finished coating system and as-built and asset table submittals, protecting all existing features such as mailboxes, signage, landscaping beds, etc., , and disposal of unsuitable material. . This item also includes the proper disposal of removed materials and complete restoration.

16. Line Manhole (Bid Item No. 16):

a. Measurement for lining of manholes shall be measured in vertical feet of manhole depth for each manhole lined, regardless of manhole type or diameter. Manhole depth shall be defined as the manhole rim to the lowest manhole invert.

b. Payment for lining of manhole will be for furnishing all labor, materials and equipment for each manhole cleaned, sealed and lined with approved products per TWA standards included in specification Appendix A for existing or new manholes as shown on the drawings. The work shall include all surface preparation, leak repair, crack repair, plugging infiltration, removal and replacement of existing benching and re-benching of flow channels, pressure or mechanical cleaning, grouting and grouting repairs or injections, installation of the lining in accordance with the manufacturer's recommended specifications, final MACP CCTV inspection and submittal in NASSCO compliant database, testing of the finished coating system and as-built and asset table submittal in accordance with specifications , and disposal of unsuitable material. This item also includes the proper disposal of removed materials and complete restoration.

17. Re-bench Flow Channels (Bid Item No. 17):

a. Measurement for reconstructing aprons and flow channels shall be measured based on the actual number of manholes reconstructed regardless of manhole type or diameter.

b. Payment for reconstruction of aprons and flow channels will be for furnishing all labor, materials and equipment for each manhole apron removed and reconstructed, and cleaned as shown on the Drawings. The work shall include all plugs for isolation of piping and manholes, bypass piping and pumping including sound attenuation, surface preparation, leak repair, crack repair, plugging infiltration, channel reconstruction or re-benching, pressure or mechanical cleaning, removal and proper disposal of debris, grouting and final inspection of the finished manhole.

18. Install Interior Drop Connection (Bid Item No. 18):

a. Measurement for furnishing and installing interior drop connection as shown in the Drawings shall be measured based on the actual number of installed regardless of pipe diameter.

b. Payment for reconstruction of interior drop connection will be for furnishing all labor, materials and equipment for each interior drop connection identified and detailed on the Drawings. The work shall include all plugs for isolation of piping and manholes, bypass piping and pumping including sound attenuation, surface preparation, leak repair, crack repair, plugging infiltration, channel reconstruction or re-benching, pressure or mechanical cleaning, piping, fittings, removal and proper

disposal of debris, grouting and final inspection of the interior drop connection.

19. Asphalt Open Cut Restoration (Bid Item No. 19)

    a. Measurement of this item will be the actual square yards of the surface cover placed within the limits shown on the Drawings. No payment for restoration outside of limits.

    b. Payment for Asphalt Open Cut Restoration will be made at the Contract unit price per square yard which price and payment shall be full compensation for all surveying to match existing elevations, cutting, removing, disposal, replacement of base and sub-base, removal and replacement of brick with asphalt over brick, excavatable flowable fill, temporary paving prior to mill and resurfacing, protecting and replacing disturbed existing pavement, and matching all thicknesses in kind (if existing is greater than the minimum required thickness). All pavement replaced shall meet the requirements of the jurisdiction for which the roadway is located.

20. Asphalt Mill and Resurfacing (Bid Item No. 20):

    a. Measurement of this item will be the actual square yards of the surface cover placed within the limits shown on the Drawings. No payment for resurfacing outside limits. A full overlay for any asphalt necessitating replacement will be required.

    b. Payment for Asphalt Mill and Resurfacing will be made at the Contract unit price per square yard which price and payment shall be full compensation for all milling, removing of existing surface (of various types), disposal, asphalt overlay, removal and replacement of speed humps, striping, reflectors, and all necessary items to match existing and to meet all jurisdictional requirements when restored, meeting FDOT standards and specifications, protecting and replacing disturbed existing pavement.

21. Concrete Sidewalk, Driveway Removal and Replacement (Bid Item No. 21):

    a. Measurement of this item will be the actual square yard of concrete sidewalk and driveway (including specialty materials) removed and replaced. The removal line shall be extended to the next joint, each way for all concrete removal.

    b. Payment for this item will be made at the Contract unit price per square yard which price and payment shall be full compensation for all cutting, removing, disposal, expansion joint material, protecting and replacing disturbed existing sidewalk and driveways of varying materials and types. All sidewalk and driveway replaced shall meet the requirements of the

Americans with Disabilities Act (ADA), City of Kissimmee, Osceola County, Polk County and FDOT and match the existing in kind and type including specialty materials such as stamped concrete, pavers, colored concrete and other types.

22. Demolition of Existing Masonry Screen Wall & Installation of New Masonry Screen Wall Components (Bid Item No. 22):

    a. Measurement of this item will be the actual linear feet of the wall removed and installed. It is anticipated that there will be approximately 20 linear feet of wall to be removed and installed. This price shall include all materials, equipment and labor necessary to remove the existing concrete footing and masonry wall and the installation of the masonry screen wall footing and wall itself with painted stucco finish to match the existing. Any additional wall linear footage must be agreed to prior to commencement of construction and will not be paid without prior authorization.

    b. Payment for Demolition of Existing Masonry Screen Wall & Installation of New Masonry Screen Wall will be made at the Contract unit price per linear foot, which price and payment shall be full compensation for the demolition and installation of the masonry screen wall.

23. Remove and Replace Existing Water Main (Bid Items No. 23a through 23b):

    a. Measurement and payment for pipe, except as otherwise specified, will be based on the laying length of the pipe in linear feet actually furnished and installed as measured along the centerline of the completed pipe.

    b. Payment for pipe removal and replacement will be made at the contract unit price per linear foot of pipe replaced and payment shall be full compensation for protecting and supporting of all existing utilities and stormwater infrastructure, stormwater concrete collars, field verification of existing utilities, coordination with existing utility facility owners, coordination with property owners, hiring of power company to hold and support power poles, removing and resetting guy wires for existing utility poles, tree and vegetation protection, removal and disposal of the existing pipe, excavation, sheeting, shoring and bracing, backfill, excavatable flowable fill, compaction and grading/re-grading, sodding, landscaping removal and replacement, root pruning, disposal of unsuitable materials, furnishing and installing new water main pipe (PVC or DIP) including other appurtenances, all fittings, sleeves and couplings, tracer wire, pipe identification tape, connections and reconnections, clearing, grubbing, excavation, dewatering, pipe bedding, disinfection and all associated testing, necessary thrust restraint including restraint for new and existing piping, mechanical joint restraints, restraining of existing piping, site cleanup and disposal of debris, site restoration, including sodding, landscaping, tree trimmings, vegetation removal, and

all equipment and all other work necessary to complete the installation as specified.

24. Remove and Replace Existing Storm Drain Pipe (Bid Items No. 24a through 24d):

a. Measurement and payment for various pipe material types and sizes will be based on the laying length of the pipe in linear feet actually furnished and installed as measured along the centerline of the completed pipe.

b. Payment for various material types and sizes of storm drain pipe removal and replacement will be made at the contract unit price per linear foot of pipe replaced and payment shall be full compensation for locating, protecting and supporting of all existing utilities and stormwater infrastructure, stormwater concrete collars, field verification of existing utilities, coordination with existing utility facility owners, coordination with property owners, hiring of power company to hold and support power poles, removing and resetting guy wires for existing utility poles, tree and vegetation protection, removal and disposal of the existing pipe, removal and disposal of concrete filled piping, furnishing and installing new drainage pipe including other appurtenances, mitered end sections and associated concrete, concrete collars, all fittings for reconnections of dissimilar piping, connections and reconnections, headwalls, underdrains/tie-ins, all clearing, grubbing, excavation, dewatering, pipe bedding, sheeting, shoring and bracing, backfill, excavatable flowable fill, compaction, grading/re-grading, bypass pumping and flow control, implementation, monitoring and noise attenuation, all testing, coordination with the Owner and operations staff, , site cleanup and disposal of debris, site restoration, including sodding, landscaping, tree trimmings, root pruning, vegetation removal, and all equipment and all other work necessary to complete the installation as specified.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01152

APPLICATIONS FOR PROGRESS PAYMENTS

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

A. Submit Applications for Progress Payments to Engineer in accordance with the schedule established by Conditions of the Contract and Agreement between Owner and Contractor.

1.02 RELATED REQUIREMENTS

A. Agreement between Owner and Contractor.

B. Conditions of the Contract: Progress Payments, Retainages and Final Payment.

C. Section 01150: Measurement and Payment.

D. Section 01310: Project Scheduling Using CPM Network Analysis.

E. Section 01370: Schedule of Values.

F. Section 01720: Project Record Documents.

1.03 FORMAT AND DATA REQUIRED

A. Submit applications typed on forms provided by the Owner.

B. Supporting Data

1. To receive approval for payment for materials stored but not incorporated in to the work, submit the following appended to the application for payment.

a. Copies of delivery tickets.

b. Copies of vendor invoices (which match delivery tickets) included with the application for payment in which the materials first appear.

c. Copies of paid vendor invoices from the previous application showing that Contractor has paid for stored materials. Owner may deduct amounts from current Application for Payment where Contractor fails to provide proof of payment for stored materials claimed in previous applications.

d. Unless covered and included by a Change Order, the quantities of materials listed on the Bid Form represent the maximum payable for stored materials.

e. Updated copy of the Progress Schedule.

1.04 SUBSTANTIATING DATA FOR PROGRESS PAYMENTS

A. When the Owner or the Engineer requires substantiating data, Contractor shall submit suitable information, with a cover letter identifying:

1. Project

2. Application number and data

3. Detailed list of enclosures

4. For stored products:

a. Item number and identification as shown on application.

b. Description of specific material.

B. Submit one copy of data and cover letter for each copy of applications.

C. In addition, the Contractor's up-to-date mark-up set of contract drawings, as specified in Section 01720, will be made available for review. If the mark-up set is not up-to-date, it will be considered cause for withholding payment.

1.05 PREPARATION OF APPLICATION FOR FINAL PAYMENT

A. Fill in Application form as specified for progress payments.

B. Use continuation sheet for presenting the final statement of accounting.

1.06 SUBMITTAL PROCEDURE

A. Submit Application for Payment to Engineer at the times stipulated in the Agreement.

B. Number: Seven copies of each application, all originally signed.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 01200

PROJECT MEETINGS

PART 1 – GENERAL

1.01 WORK INCLUDED

A. Owner will schedule and administer a preconstruction conference, monthly project meetings, public involvement meetings, and any specially called meetings throughout the progress of the Work. Owner or its representatives will:

1. Prepare and distribute Notification of meeting to attendees for meetings.

2. Prepare and distribute agenda with Notification.

3. Make physical arrangements for meetings.

4. Preside at meetings

5. Prepare and distribute minutes of pre-construction conference and specially called meetings.

B. Representatives of Contractor, subcontractors and suppliers attending meetings shall be qualified and authorized to act on behalf of the entity each represents. Contractor will be required to come prepared to all meetings and to furnish items listed herein. Any additional meetings such as public involvement or other meetings as required by the Owner or other stakeholders will be at no additional cost to the Owner.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 IMPLEMENTATION

A. Preconstruction Conference

1. The preconstruction conference will be scheduled by Owner as outlined in the General Conditions.

2. Location: A central site, convenient for all parties, designated by Owner.

3. Attendance (as applicable).
   a. TWA and Engineer representatives, and their professional consultants.
   b. Design Engineer representatives and their professional consultants.
   c. Other agency representatives (DER, EPA, TWA, City, Counties, etc.).

d. Contractor's representative and Contractor's professional consultants.
e. Contractors and Suppliers
f. Others as appropriate

4. Suggested Agenda:
   a. Introduction of Attendees
   b. Explanation of each party's responsibilities.
   c. Formal notification of any items in the Contract that are to be announced at this time (name of Engineer, etc.).
   d. Other agency requirements (EPA, DER, Water Management District, Corps, etc.).
   e. Discussion of Construction Site
      i. Mobilization - Contractor's office
      ii. Engineer's office
      iii. Site access-storage and lay down areas
      iv. Temporary Utilities
      iv. Clean-up
   f. Project Layout, Survey and Controls
   g. Contract Data
      i. Date of Notice to Proceed
      ii. Date of Substantial Completion
      iii. Date of Final Completion
      iv. Liquidated damages
   h. Submittals prior to Construction
   i. Preliminary schedule
      i. Schedule of Shop Drawing Submissions
      ii. Schedule of Values
   j. Permits
      i. ROW Use Permits
      ii. MOT Permits
      iii. Other Permits obtained by Contractor
   k. Hours of Work and Holidays
   l. Correspondence - All correspondence will be addressed to the Construction Manager with copy addressed to: TWA PROJECT MANAGER as follows (may be changed to the field office, Contractor will be notified):
      Tohopekaliga Water Authority
      951 Martin Luther King Boulevard, 3rd Floor
      Kissimmee, Florida 34741-4929
   m. Contractor Submissions
      i. Daily Force Reports
      ii. Substitutions
      iii. Shop Drawings - No work until approved
      iv. Phasing Plan
      v. MOT Plan
      vi. Bypass Plan
   n. Construction Schedule
   o. Record Documents
   p. Application for Payments

q. Schedule and review requirements for Progress Meetings
r. Procedures and processing of:
    i. Field decisions
    ii. Proposal requests
    iii. Change Orders and Change Authorizations
    iv. Requests for Information
s. Substantial Completion and Final Inspection
t. Safety and First Aid
u. Adequacy of distribution of Contract Documents
v. Emergency Contact List
w. Security
x. Project Inspection requirements
    i. Threshold Inspection if necessary
    ii. City or County Bureau of Building Inspection
y. Labor requirements.
z. Laboratory testing of material requirements.
aa. Inventory of material stored on site.
ab. Requirements of utility owners and other organizations.
ac. Housekeeping procedures.
ad. Posting of signs.
ae. Traffic Plan
af. Check of required Bond and Insurance certifications.
ag. Guarantee on completed work.

B. Project Meetings

1. Engineer will schedule regular meetings. The project meetings will be held monthly at a minimum or as required by progress of the work.

2. Location of the meetings: A central site, convenient for all parties, designated by Engineer.

3. Attendance:
    a. Engineer and other TWA Representatives as needed.
    b. Contractor and his consultants as needed.
    c. DESIGN Engineer and his professional Consultants as needed.
    d. Subcontractors as appropriate to the agenda.
    e. Suppliers as appropriate to the agenda.
    f. Others as appropriate.

4. Suggested Agenda:
    a. Review and approval of minutes of previous meeting.
    b. Review of work progress since previous meeting.
    c. Field observations, problems, and conflicts.
    d. Problems which impede design and construction schedule.
        i. Labor
        ii. Material Deliveries

iii. Equipment
iv. Sub-agreements

e. Review of off-site fabrication and delivery schedules and expediting status.
f. Corrective measures and procedures to regain projected schedule.
g. Revisions to schedule.
h. Progress schedule during succeeding work period.
i. Coordination of schedules.
j. Contractor Submissions
   i. Shop drawings
   ii. Working drawing
   iii. Certificates of Compliance
   iv. Test results or Catalogue cut sheets
k. Maintenance of quality standards.
l. Pending changes and substitutions.
m. Review proposed changes for:
   i. Effect on Construction Schedule and completion date.
   ii. Effect on other contracts of the Project.
n. Maintenance of Contract Documents
o. Other business.
p. Action Assignments
   i. Recap, previously assigned unaccomplished tasks
q. Location and time of next meeting.
   i. Recap new assignments from this meeting

5. Contractor representative is to attend the project meetings and have the authority to act on behalf of the entity he represents on field related matters. Contractor representative is to study previous meeting minutes and current agenda items, in order to be prepared to discuss pertinent topics such as minutes correction, deliveries of materials and equipment, progress of the Work, etc.

6. The Contractor is to provide a current submittal log at each progress meeting in accordance with the General Conditions.

7. The Contractor is to provide a two week schedule at each project meeting in accordance with the General Conditions.

C. Special meetings as may be called by Engineer.

1. Agenda: As necessary.

2. Attendance: As appropriate.

END OF SECTION

SECTION 01310

PROJECT SCHEDULE USING CPM NETWORK ANALYSIS

PART 1 - GENERAL

1.01 DESCRIPTION

A. The Contractor's progress schedule shall consist of a network analysis system as described herein. In preparing this system the scheduling of the construction is the responsibility of the Contractor. Conventional Critical Path Method (referred to as CPM) techniques must be utilized to satisfy both time and cost applications. The principles and definitions of the terms used herein shall be as set forth in the AGC publication "The Use of CPM in Construction", but the provisions of this Section shall govern.

B. The primary objectives of the CPM scheduling requirements are:

1. To ensure adequate planning and execution of the Work by the Contractor;

2. To assist the TWA in evaluating progress of the Work;

3. To provide for optimum coordination by Contractor of his trades and Subcontractors for his Work, and for the work or services provided by any separate Contractors;

4. To permit the timely prediction or detection of events or occurrences which any affect the timely prosecution of the Work; and

5. To provide a mechanism or tool for use by the TWA, Engineer and Contractor in determining and monitoring any actions of the Contractor which may be required in order to comply with the requirements of the Contract Documents relating to the completion of the various portions of the Work in the Contract Time specified in the Contract Documents.

C. Contractor is responsible for determining the sequence of activities, the time estimates of the detailed construction activities and the means, methods, techniques and procedures to be employed. The Construction Schedule shall represent the Contractor's best judgment of how he will prosecute the Work in compliance with the Contract Documents. Contractor shall ensure that the Construction Schedule is current and accurate and is properly and timely monitored, updated and revised as Project conditions and the Contract Documents may require.

D. Contractor shall consult with his Subcontractors (and suppliers) relating to the preparation of his construction plan and Construction Schedule. Contractor shall also consult with other Contractor(s) as necessary to comply with project phasing requirements related to associated CIPP lining efforts. Subcontractors and other Contractor(s) shall receive copies of those portions of Contractor's Construction Schedule

which relate to their work and shall be continually advised of any updates or revisions to the Construction Schedule as the Work progresses.

When Contractor submits his Construction Schedule to the Engineer or makes any proposed updates or revisions to such Schedule, it will be assumed by the TWA and Engineer that Contractor has consulted with and has the concurrence of his Subcontractors. Contractor shall be solely responsible for ensuring that all their portions of the Work.

E. It is understood and agreed that the Construction Schedule is to represent Contractor's best plan and estimate for the Work; however, Contractor acknowledges that the Construction Schedule may have to be revised from time-to-time as progress proceeds. Contractor further acknowledges and agrees that the TWA and Engineer do not guarantee that:

1. Contractor can start work activities on the "early start" or "late start" dates or complete work activities on the "early finish" or "late finish" dates shown in the Schedule, or as same may be updated or revised;

2. Contractor can proceed at all times in the sequence established by the utilization of only the resources and manpower it initially planned for the performance of the Work;

3. Contractor's Construction Schedule will not have to be modified or changed by direction of the TWA and the Engineer. Any changes, modifications or adjustments made by Contractor to the Construction Schedule shall be in full compliance with all requirements of the Contract Documents.

F. The Contractor acknowledges and agrees that its Construction Schedule must be flexible in order to accommodate and allow for his coordination with the operation of the TWA and the work of separate Contractors relating to the Project. The Engineer will review the Contractor's Construction Schedule for compatibility with TWA operations and, if appropriate, the work of separate Contractors. Contractor agrees to hold meetings with the TWA and separate Contractors to resolve any conflicts and to revise his Construction Schedule as reasonably required.

PART 2 - PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.01 The Contractor may utilize Primavera Project Planner and Primavision software as supplied by Primavera Systems, Inc., Bala Cynwyd, PA, or Microsoft Project by Microsoft Corporation, CA. The software shall be compatible with computers using WINDOWS operating systems. No other scheduling software systems are acceptable.

3.02 The format of the CPM network analysis schedule shall consist of time scaled network logic diagrams and accompanying schedule reports generated by the Primavera systems software, a computer, printer and plotter.

3.03 The plots of the logic diagrams shall be nominal size of 24 inches by 36 inches with title block on each sheet. The computer generated schedule reports shall be on either 11 x 17 inch paper or full width computer paper at the selection of the Engineer.

3.04 The logic diagrams shall show the order and interdependence of activities and the sequence in which the Work is to be accomplished as planned by the Contractor. The Basic concept of network analysis diagram shall be followed to show how the start of a given activity is dependent on the completion of preceding activities and how its completion restricts or restrains the start of following activities.

In addition to construction activities, detailed network activities shall include the submittal process, the procurement of materials and equipment, the receipt of materials with procurement costs, and testing. All activities of the TWA that affect progress and required dates for completion of all or parts of the Work shall be shown. Activities indicating TWA furnished materials and equipment shall be shown. Detailed networks shall be time-scaled and plotted to show continuous flow from left to right with no arrows from right to left. The following information shall be shown on the diagrams for each activity:

(1) Predecessor and successor activity numbers.

(2) Description of the activity.

(3) Total float in work days.

Numbering shall be assigned so that predecessor activity numbers are smaller numerically than the successor activity numbers. Skip numbering shall be used on the network to allow insertion of additional activities for change orders and logic changes. The activities shall be arranged and sorted in keeping with the activity codes describe in Article 2.4 of this Specification Section.

3.05 The computer generated schedule reports shall include a tabulation of each activity shown on the detailed network diagrams.

The following information shall be furnished as a minimum for each activity:

(1) Predecessor and successor activity numbers.

(2) Activity description.

(3) Original duration of activity (work days).

(4) Early start date (by calendar date).

(5) Early finish date (by calendar date).

(6) Actual start date (by calendar date).

(7) Actual finish date (by calendar date).

(8) Late start date (by calendar date).

(9) Late finish date (by calendar date).

(10) Total float (work days).

(11) Budget amount of activity.

(12) Percentage of activity completed.

(13) Contractor's earnings based on percentage of activity completion.

(14) Area Code identifying the area in the Project for each activity. An example of Area Codes might be Headwords, Oxidation Ditch, Yard Piping at Headwords, etc.

(15) Responsibility Code for each activity identifying the various subcontracted work by Subcontractor and the work being done by the Contractor directly.

(16) Phase Code for each activity identifying the various work phases such as structure, finishes, earthwork, pipe, etc.

3.06 All Schedule submittals including revisions and updates shall include one copy of the schedule data on CD or DVD with label(s) identifying the file name and appropriate project information. The CD/DVD shall be properly packaged and shipped so as to prevent damage or loss to the data.

3.07 Within ten calendar days after Notice of Award, Contractor shall designate and submit to the Engineer the qualifications of his Lead Scheduling Representative for the Contract. Contractor's Lead Scheduling Representative shall have the capability to perform the work required by these specifications, and shall have the necessary experience in similar type projects and critical path scheduling to execute the work as outlined and as evidenced by a qualifications resume.

3.08 Activity durations shall be in whole working days. No activity except procurement duration shall exceed 15 working days without the Engineer's approval.

3.09 Float or slack time is not for the exclusive benefit of either the TWA or Contractor. Extensions of time for performance as specified in the Contract Documents will be granted only to the extent that equitable time adjustments for the network activity or activities affected exceed the total float or slack time along the affected network paths as shown in the graphic arrow diagram and computer printout report in effect at the instant of either: (a) a notice to proceed with a change, (b) a notice of suspension of Work, or (c) detection of subsequently acknowledged differing site condition.

Further, use of float time in the Schedule, or the allocation of float time to activities by means of special logic restraints or imposed dates, shall be shared to the benefit of the TWA and the Contractor.

3.10 The currently accepted Schedule shall have legal status as long as it is used by Contractor for planning, organizing, directing, managing, and executing the Work in accordance with the Contract Documents. Legal status will also imply that Contractor will use the Schedule to report progress and for determining delays in achieving the Project completion dates(s) stipulated in the Agreement subject to the requirements of this Specification Section. Contractor acknowledges and agrees that actual slippage to the activities shall not be the basis for an adjustment in Contract Time unless the causes of slippage are excusable as per Specification Section 00700, Article 14, and such slipped activities are on the critical path of the currently accepted work plan and result in a delay achieving the Project completion date(s) specified in the Agreement.

3.11 PRELIMINARY & COMPLETE SUBMITTAL AND ACCEPTABLE

A. Preliminary Meeting: If requested by the Engineer, the Contractor shall participate in a preliminary meeting to discuss the proposed Schedule and requirements of this Section prior to submission of the network.

B. Preliminary Schedule: A preliminary time-scaled network and printouts defining the Contractor's planned operations during the first 90 calendar days shall be submitted within 30 calendar days after receipt of Notice of Award but no later than the Preconstruction Conference. The Contractor's general approach for the balance of the Project shall be indicated. Cost of activities expected to be completed or partially completed before submission and acceptance of the Complete Schedule should be included. Both the Preliminary Network Diagrams and Required Reports listed in paragraph 3.1.4 shall be submitted. The Preliminary Schedule may be used for requesting progress payments for a period not to exceed 90 calendar days after receipt of Notice of Award. Payment requests after this first 90 calendar day period must be based upon the accepted Complete Schedule.

C. The budget dollar value for each activity shall be the cost of the work of the activity including labor, materials, and pro rata contribution of overhead and profit. The sum of all activity costs shall equal the total Contract Price. The Contractor shall review this schedule of values as necessary to gain the acceptance of the Engineer. The schedule of values shall, in the best judgment of the Contractor, represent a fair, reasonable and equitable dollar (cost) allocation for each activity on the Construction Schedule.

D. Required Reports: The following reports are to be furnished by the Contractor with each required submission including updates:

1. Schedule Report listing the current status of all activities sorted by the predecessor activity number from lowest to highest and then in the order of the successor activity number.

2. Total Float Report listing all uncompleted activities sorted first by the total float then by early start date.

3. Cost Earned Report listing all activities sorted first by Area Code; then by activity number.

4. Successor/predecessor Report (Precedence Diagram Method only).

5. A cumulative cash flow curve shall be plotted with time in months versus projected progress payments. Each update shall include the original submittal cash flow curve and a curve showing actual cumulative approved monthly progress payments including retention.

6. A cost earned summary report showing the total budget and earned amounts for each Pay Item in the Bid Proposal.

7. Two sixty day look ahead reports for all uncompleted activities. One report shall be sorted by Area Codes then late start, and the other report sorted by Responsibility Codes then by late start.

8. A time scaled logic diagram as per Paragraph 2.3 of this Section.

3.12 Complete Schedule: The Complete Schedule network analysis showing all activities in the Work Shall be submitted within 60 calendar days after receipt of Notice of Award.

3.13 The Contractor shall participate in meetings to discuss the Engineer's review and evaluation comments on the proposed Preliminary and Complete Schedule network diagrams and reports as well as any Schedule updates. Any necessary revisions shall be submitted in the requisite format and number of copies as required for the original submission for review by the Engineer.

Once reviewed and accepted, the Schedule shall then be used by the Contractor for planning, organizing, and directing the Work, reporting progress, demonstrating the impact of changes, and requesting payment for work accomplished. If the Contractor thereafter desires to make changes to activity data or the schedule logic or to add or delete activities other than the routine changes made monthly to update progress, the Engineer shall be notified in writing prior to the next schedule update stating the reasons for the changes. If the Engineer considers these changes to be of a major nature, the Contractor may be required to submit revise time-scaled network logic diagrams, required reports, and data diskettes for review by the Engineer at no additional cost. A change is considered major in nature if it is not readily apparent that the change could have no effect on the projected completion date for all or any portion of the Work.

3.14 The Contractor's Preliminary Network and Complete Network submittals shall be certified by an officer of the Contractor by signing the following certification:

3.15 Submittals which show completion ahead of the Contract Time shall include additional supporting data to explain the basis of the shorter time for performance. Such supporting data must include, but not be limited to, the following: any deviations from the Contract Documents; production rates; hours per shift which are proposed; the work days per week; and a listing of the major items of construction equipment planned for used on the Work. The equipment listing shall include type, number of units, unit capacities, and a schedule showing the proposed time each piece of equipment shall be on the Work keyed to the activities on which the equipment will be used. Activities which may be expedited and accelerated by use of overtime or additional shifts shall be identified. Upon receipt of supporting data, the Engineer will review and either concur or disagree with the submittal.

Concurrence will recognize that the earlier finish date has float time with respect to the Contract Time, which float shall be shared as required in Article 2.9, but it will not constitute a basis for a change in Contract Price or Contract Time. However, should Contractor assert his right-to-finish early and allow that the earlier completion be used as the date from which to assess damages for delay, then TWA will issue a Change Order introducing an revised completion date and associated damages for delays if the Work is not completed within the time specified in the revised completion date.

3.16 SCHEDULE UPDATES

A. At the end of each month interval, the Contractor and the Engineer shall jointly make entries on the preceding Schedule Report to show actual progress, to identify those activities started and those completed during the previous period, to show the estimated duration (in work days) required to complete each activity started but not yet completed, to indicate the percentage of the activity's cost payable to the Contractor and to reflect any changes in the network diagrams. Change Orders shall be shown on the update report.

B. The Contractor shall produce from the marked-up Schedule Report the updated Required Reports for the Project and will use the accumulated cost for completed and partially completed activities as the basis for requesting progress payments, pursuant to these specifications

C. The Contractor shall also submit a narrative report describing current and anticipated problem areas and/or delaying factors with their impact together with an explanation of corrective actions taken or proposed.

D. Contract status shall be evaluated on the basis of projected completion date(s) relative to the contractual completion date(s). The TWA shall have the right to withhold additional retainage from progress payments upon receipt of updated schedules if any projected completion date is beyond the required completion date pending receipt of an acceptable revised schedule showing completion within the contract time

E. Each update schedule submission shall be signified by an officer of the Contractor signing the following certification:

> "The undersigned Contractor certifies that the Schedule Documents displayed on sheets dated _____ and the computerized reports dated _____reflects Contractor's present progress on the Work; and that all changes to the logic, duration, codes, calendar or activities in the previous schedule have been specifically identified and described in a prior accepted submittal and in the narrative dated _____ which accompanies the schedule sheets and reports."

3.17 ANALYSIS FOR CHANGE ORDERS, DELAYS, AND Contractor REQUESTS

A. When Change Orders are proposed or issued, delays are experienced, or the Contractor desires to revise the Project Schedule, the Contractor shall submit to the Engineer a written Time Impact Analysis illustrating the influence of each Change Order (whether

proposed or issued), delay, or Contractor request on the Contract Time. Each Time Impact Analysis shall include a fragmentary network (Network analysis) demonstrating how the Contractor proposes to incorporate the proposed or issued Change Order, delay or Contractor request into the Project Schedule. The Time Impact Analysis shall demonstrate the time impact based on the date the change order is given to the Contractor or the date the delay occurred; the status of construction at that point in time; and the time computation of all affected activities. The event times used in the Time Impact Analysis shall be those included in the latest Project Schedule Update or as adjusted by mutual agreement.

B. Activity delays shall not automatically mean that an extension of the Contract Time is warranted or due the Contractor. It is possible that a Change Order or delay will not affect existing critical activities or cause non-critical activities to become critical. A Change Order or delay any result in only absorbing a part of the available total float that may exist within an activity chain of the Schedule Network, thereby not causing any effect on the Contract Time.

C. In the event of a work delay, the Time Impact Analysis shall be submitted within 30 calendar days after occurrence of the delay or after issuance of any unilateral Change Order. The Analysis shall be submitted concurrently with the supporting data for a proposed Change Order.

D. Upon review by the Engineer without notes of exception, the Time Impact Analysis shall be returned to the Contractor and incorporated into the Project Schedule at the next monthly Schedule update.

E. The Time Impact Analysis related to an extension of any Change Order shall be incorporated into and attached to the applicable Change Order(s).

3.18 START-UP SCHEDULE SUBMITTAL

A. At least 90 calendar days prior to the date of Substantial Completion, Contractor shall submit a time-scaled graphic diagram detailing the work to take place in the period 90 days prior to Substantial Completion and up through Final Acceptance together with a supporting narrative. The Engineer shall have 10 calendar days after receipt of the submittal to respond with comments. Upon receipt of Engineer's comments, Contractor shall make the necessary revisions and submit the revised Schedule within ten calendar days. If Contractor fails to provide an acceptable Start-up Schedule Submittal, he will be deemed not to have provided a basis upon which progress may be evaluated which will be reason for refusing to recommend payment.

B. At the Contractor's option the Startup Schedule may not be combined with the Complete Schedule. The Startup Schedule is intended to show much greater detail for the start-up activities than the Complete Schedule. Typical information required includes, but is not limited to: the Site visits of vendor representatives, pre-op testing, individual equipment startups, TWA training, and performance certification testing.

C. Contractor will be required to continue the requirement for Required Reports. In preparing these reports, Contractor must assure that the Startup Schedule is consistent with the progress and activities noted in the Complete Schedule.

D. In addition, Contractor will be required to submit a revised copy of the startup graphic diagram on a monthly basis with a startup narrative. This revised diagram shall highlight percentages of completion, actual start and finish dates, and remaining durations as applicable. Activities not previously included in the accepted Complete Schedule shall be added in these submittals except that contractual completion dates shall not be changed except by Change Order. Reviews of these submittals by Engineer will not be construed to constitute concurrence with the time frames, durations or sequence of work for each added activity.

END OF SECTION

SECTION 01340

SHOP DRAWINGS AND SUBMITTALS

PART 1 - GENERAL

1.01 SCOPE

A. In accordance with the General Conditions Contractor shall submit a detailed list of data on items for which shop drawings, construction drawings, and samples are to be submitted. Included in this list shall be the names of all proposed Suppliers furnishing specified items. Review of this list by Engineer shall not relieve Contractor from submitting complete drawings and data and providing materials, equipment, etc., fully in accordance with the Contract Documents.

PART 2 - PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.01 IMPLEMENTATION

A. Contractor Responsibility:

1. All submittals shall be in accordance with the General Conditions and accompanied by a transmittal letter prepared in duplicate containing at least the following information:

a. Date.

b. Project Title and Number.

c. Contractor's name and address.

d. The number and revision of each drawing submitted.

e. Notification of Deviations from Contract Documents.

f. Submittal Log Number.

g. Specification title and number.

2. Be responsible for and bear costs of damages which may result from the ordering of material or from proceeding with any part of work prior to the completion of the review by Engineer of the necessary submittals unless otherwise authorized by Engineer in writing.

3. Notify Engineer of the need for making any changes in or manner of the installation which may be required by the materials/equipment which Contractor proposes to supply, both as it concerns his own work, or any work affected under other parts, headings, or divisions of drawings and specifications.

B. ENGINEER'S REVIEW

1. Submittals will be reviewed in accordance with the General Conditions.

2. Re-submittals will be handled in the same manner as first submittals. On resubmittals Contractor shall direct specific attention, in writing or on resubmitted drawings, to revisions other than the corrections requested by Engineer on previous submissions. Contractor shall make any additional corrections or clarifications required by Engineer.

3. If Contractor considers any correction indicated on the drawings to constitute a change to the Contract Documents, Contractor shall give written notice thereof to Engineer.

4. No partial submittals will be reviewed. Submittals not complete will be returned to Contractor for resubmittal.

5. All drawings, schematics, manufacturer's product data, certifications and other drawing submittals required for a system specification shall be submitted at one time as a package to facilitate interface checking.

C. SHOP DRAWINGS AND DATA

1. Shop Drawings, as defined in the General Conditions, shall complement design and construction drawings, but shall contain sufficient detail to clearly define all aspects of the construction. These drawings shall be complete and detailed.

2. Contractor or Supplier's catalog sheets, brochures, diagrams, illustrations and other standard descriptive data shall be clearly marked with specification title and numbers to identify pertinent materials, product or models. Delete information which is not applicable to the Work by striking or cross-hatching.

3. Each Shop Drawing shall have a blank area located adjacent to the title block. The title block shall display the following:

a. Project Title and Number

b. Number and title of the shop drawing

c. Date of Shop drawing or revision

d. Name of Contractor and subcontractor submitting drawing

e. Supplier/Manufacturer

f. Separate detailer when pertinent

g. Specification title and number

h. Drawing number

4. If shop drawings show variations from Contract requirements because of standard shop practice or for other reasons, Contractor shall describe such variations in his letter of transmittal. If acceptable, proper adjustment in the Contract shall be implemented where appropriate. If Contractor fails to describe such variations, Contractor shall not be relieved of the responsibility for executing the Work in accordance with the Contract, even though such drawings have been reviewed.

5. Data on materials and equipment shall include, without limitation, materials and equipment lists, catalog data sheets, cuts, performance curves, diagrams, verification of conformance with applicable standards or codes, materials of construction and similar descriptive material. Materials and equipment lists shall, for each item, give: the name and location of the Supplier or manufacturer, trade name, catalog reference, size, finish and all other pertinent data.

6. For all mechanical and electrical equipment furnished, Contractor shall provide a list including the equipment name, address and telephone number of the Supplier's representative and service company so that service and/or spare parts can be readily obtained.

7. Contractor will obtain an installation list from suppliers and equipment suppliers who propose to furnish equipment or products for submittal to Engineer along with the required shop drawings. The installation list shall include at least five installations where identical equipment has been installed and has been in successful operation for a period of at least one year.

8. Contractor shall submit surveying work for each of the project sites to provide a clear and detailed record of all existing site features prior to commencement of construction. It shall be the Contractor's responsibility to ensure the accuracy and content of each of the surveyed locations. Furthermore, a detailed record of all improvements be provided for as-built drawing production.

D. CONSTRUCTION DRAWINGS

1. The term "construction drawings" shall be considered to mean Contractor's plan for temporary structures such as temporary construction fencing, support of open cut excavation, support of utilities, ground water control systems, forming and false work; for underpinning; and for such other work as may be required for construction but which does not become an integral part of the project.

2. Copies of construction drawings shall be submitted to Engineer at least 30 calendar days (unless otherwise specified by Engineer) in advance of their being required for work. Contract drawings shall include surveying work for each of the

project sites. It shall be the Contractor's responsibility to ensure the accuracy and content of each of the surveyed locations.

3. Construction drawings shall be signed by a registered Professional Engineer or Architect, currently licensed to practice in the State of Florida, and shall convey or be accompanied by, calculations or other sufficient information to completely explain the structure, machine, or system described and its intended manner of use. Prior to commencing such work, construction drawings must have been reviewed without specific exceptions by Engineer, which review will be for general conformance and will not relieve Contractor in any way from his responsibility with regard to the fulfillment of the terms of the Contract. All risks to new or existing work are assumed solely by Contractor. Engineer review of the construction drawing assumes no responsibility for construction drawing design or implementation by Engineer or TWA.

E. SAMPLES

1. Contractor shall furnish, for the approval of Engineer, samples required by the Contract Documents or as may be reasonably requested by Engineer. Samples shall be delivered to Engineer as directed. Contractor shall prepay shipping charges on samples. Materials or equipment for which samples are required shall not be used in Work until approved by Engineer.

2. Provide two of each requested sample, unless directed otherwise. Samples shall be of sufficient size to clearly illustrate:

   a. Functional characteristics of the product, with integrally related parts and attachment devices.

   b. Full range of color, texture and pattern.

3. Each sample shall have a label indicating:

   a. Name of Project.

   b. Name of Contractor and subcontractor.

   c. Material or equipment represented.

   d. Place of origin.

   e. Name of producer and brand (if any).

   f. Location in Project.

   g. Specification title and number.

   h. Submittal number.

Note: Samples of finished materials shall have additional marking that will identify them under the finish schedules.

4. Contractor shall prepare a transmittal letter, in triplicate for each shipment of samples, containing the information required in paragraph II.E.3. Contractor shall enclose a copy of this letter with the shipment and send a copy of this letter to Engineer. Approval of a sample shall be only for the characteristics or use named in such approval and shall not be construed to change or modify any Contract requirements.

5. Approved samples not destroyed in testing shall be sent to Engineer or stored at the site of the Work. Approved samples of the hardware in good condition will be marked for identification and may be used in the Work. Materials and equipment incorporated in the work shall match the approved samples. Samples which failed testing or were not approved will be returned to Contractor at his expense, if so requested at time of submission.

END OF SECTION

SECTION 01370

SCHEDULE OF VALUES

PART 1 - GENERAL

1.01 SCOPE

A. In accordance with the General Conditions and this Section, Contractor shall prepare and submit a Schedule of Values. The Schedule of Values shall be used only as the basis of Contractor's Application for Payment.

PART 2 - PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.01 IMPLEMENTATION

A. SUBMITTALS:

1. Contractor shall submit Schedule of Values on forms provided by TWA or, if none provided, on 8-1/2 inch by 14 inch white paper. Identify the schedule with:

a. Contract Title and Project Name, if applicable.

b. Name and Address of Contractor.

c. Date of submission.

2. The Schedule of Values shall list items of Unit Price Work as listed on the Bid Form and incorporated in the Contract, with additional spaces for entry of actual quantity completed and price of Work completed.

3. The Schedule of Values shall list the installed value of the component parts of Lump Sum Work in sufficient detail to serve as a basis for computing values for Progress Payments during construction:

a. The division of lump sum items into component parts shall be chosen to accommodate measuring actual progress in the field, such that progress measurement can be objective and verifiable. Appropriate units shall be used for each line item. For example, use units such as: backfill - per cubic yard; sidewalk installed - per square foot; cable pulled - per linear foot; foundation pilings - each; etc.

b. Identify each component part with the number and title of the respective major section of the Specifications. For each major component part list

sub-component values of major products, operations or work areas under the item.

c. For each of the various component parts of the Work, include a directly proportional amount of Contractor's overhead and profit. No separate line items shall be allowed for Contractor's field or home office overhead or profit.

4. Engineer will review for approval and return Schedule of Values submittals in accordance with the General Conditions. If requested by Engineer, Contractor shall support amounts indicated on the Schedule of Values with data such as executed Sub-agreements, which will substantiate the correctness of the values, or revise values Engineer deems inappropriate.

5. Contractor shall revise and resubmit, and Engineer shall review for approval, the Schedule of Values to incorporate Change Orders executed by the TWA.

END OF SECTION

SECTION 01380

CONSTRUCTION PHOTOGRAPHS AND PRE-CONSTRUCTION AUDIO-VIDEO

PART 1 - GENERAL

1.01 DESCRIPTION

This Section outlines in general the work necessary to provide a continuous color audio-visual DVD recording covering the entire area of the proposed project prior to construction to serve as a record of pre-construction conditions and periodic color photographs during the course of construction.

1.02 RELATED REQUIREMENTS

A. Section 01010: Summary of Work

1.03 QUALIFICATIONS

A. Preconstruction record information shall consist of audio-video recordings on DVD. Construction progress information shall consist of photographs and digital photographs on a recordable CD.

B. The pre-construction audio-visual DVD shall be of a professional quality that will clearly log an accurate visual description of existing conditions. The audio-visual DVD shall clearly show the date and time of recording. Any portion of the video not acceptable for the determination of the existing condition shall be re-recorded at no additional cost to the Owner.

C. Employ competent photographer to take color construction record photographs periodically during course of the work.

1.04 SCHEDULING

A. The audio-visual DVD shall be completed and furnished to the Owner prior to placement of materials or equipment in any of the construction or construction access areas. Construction shall not start until preconstruction video recordings are submitted and accepted by the Engineer. In addition, no progress payments shall be made until the preconstruction video recordings are accepted by the Engineer.

1.05 PHOTOGRAPHY REQUIRED

A. Construction photographs taken to satisfy the requirements of the Specifications shall be submitted with each scheduled Application for Payment.

B. Provide photographs taken at each major stage of construction.

1. Prior to starting construction/modifications.

2. Completion of site clearing and fencing.

3. During well grouting operations (equipment set-up).

4. During test pumping operations (pump equipment & metering apparatus).

5. Completion of construction.

C. Negatives & Memory Cards

1. Remain property of photographer.

2. Require that photographer maintain negatives and/or memory cards for a period of two years from Date of Substantial Completion of entire Project.

3. Photographer shall agree to furnish additional prints to Owner and Engineer at commercial rates applicable at time of purchase.

D. Prints

1. Color:

a. Finish: Smooth surface, glossy.

b. Size: 5 in. x 7 in.

c. Owner reserves the right to require in addition to prints digitized photos for electronic filing.

2. Identify each print on front: location and orientation of view

3. Identify each print on back, listing:

a. Name of Project.

b. Orientation of view.

c. Date and time of exposure.

d. Name and address of photographer.

e. Photographer's numbered identification of exposure.

1.06 COSTS OF PHOTOGRAPHY

A. Contractor shall pay costs for specified photography and prints. Parties requiring additional photography or prints will pay photographer directly.

PART 2 - PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.01 PRECONSTRUCTION AUDIO-VIDEO DVD

A. Technique

1. Factual presentation.

2. Correct exposure and focus.

a. High resolution and sharpness.

b. Maximum depth-of-field.

c. Minimum distortion.

B. Coverage

Audio-video recording for pipe line project shall be completed over the pipe trench and all other areas impacted by the construction.

The coverage shall include all features including but not limited to structures, buildings, sidewalks, ditches, pavement, landscape or other structures located in the vicinity of the proposed construction and site access. All visible structural cracks, areas with visible depressions should be recorded and narrated.

The engineering drawings shall be used as a reference for stationing in the audio portion of the recording for location identification.

C. Visibility

The pre-construction video shall be recorded, and photographs taken, during a time of good visibility. Video recording or photographs will not be made during periods of precipitation or when conditions are obscured.

D. Video DVD Identification and Security

1. All DVDs shall be permanently labeled with the project title.

2. To preclude the possibility of tampering or editing in any manner, all video recordings must, by electronic means, display continuously and simultaneously generated transparent digital information to include the date and time of recording. The date information shall contain the month, day and year. The time information shall consist of hours, minutes and seconds, separated by colons. For example, 13:24:10. This transparent information shall appear on the screen.

E. Video Camera Operation

1. Camera Height and Stability: When conventional wheeled vehicles are used as conveyances for the recording system, the vertical distance between the camera lens and the ground shall not exceed 10 feet. The camera shall be firmly shock mounted such that the transport of the camera during the recording process will not cause an unsteady picture.

2. Camera Control: Camera pan, tilt, zoom-in and zoom-out rates shall be sufficiently controlled such that recorded objects will be clearly viewed during video tape playback. In addition, all other camera and recording system controls, such as lens focus and aperture, video level, pedestal, chrome, white balance, and electrical focus shall be properly controlled or adjusted to maximize picture quality.

3. Viewer Orientation Technique: The audio and video portions of the recording shall maintain viewer orientation through the entire area of proposed construction.

3.02 CONSTRUCTION PHOTOGRAPHS

A. Photograph Views

Photograph from locations to adequately illustrate condition of construction. Consult with Engineer at each period of photography for instructions concerning views required.

3.03 DELIVERY OF PRINTS AND DVD

A. Two complete sets of pre-construction audio-video shall be delivered to the Engineer on DVD for the permanent and exclusive use of the Engineer and the Owner prior to the start of any construction on the project.

B. Deliver two prints of each view and a copy of digital photographs on a recordable CD to Engineer to accompany each Application for Payment.

END OF SECTION

SECTION 01410

TESTING AND TESTING LABORATORY SERVICES

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. TWA will employ and pay for services of an independent testing laboratory to perform certain inspection and testing as required by the Contract Documents. This may include, but is not limited to, testing of soil, concrete, or structural connections and other such tests which TWA deems necessary.

B. Contractor shall cooperate with the laboratory to facilitate the execution of its required services.

C. Contractor to provide testing of manholes and piping including, but not limited to, CCTV of pipe and manholes, low pressure air tests, hydrostatic tests, and other tests as indicated in the specifications.

PART 2 - PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.01 IMPLEMENTATION

A. TWA RESPONSIBILITY

1. TWA will retain a testing laboratory for the on-site testing of soil, asphalt, concrete and any other material processes or activities deemed necessary, or as required, by the Contract Documents. TWA will decide what off-site testing is required.

2. On-site testing laboratory services will be supplied by, and evaluated by, TWA.

B. LABORATORY RESPONSIBILITIES

1. Meet “Recommended Requirements for Independent Laboratory Qualifications” latest edition, published by American Council of Independent Laboratories and be authorized /certified to perform work in the state of Florida.

2. Cooperate with Engineer and Contractor; provide qualified personnel promptly on notice.

3. Perform specified inspections, sampling, cylinder breaks and testing of materials and methods of construction:

   a. Comply with specific standards; ASTM, and other recognized authorities.

   b. Ascertain compliance with requirements of Contract Documents.

4. Promptly notify Engineer and Contractor of irregularities or deficiencies of work which are observed during performance of services.

5. Promptly submit originals in quintuplicate of sealed and signed reports of inspections and tests to Owner, Engineer and other designated officials, including:

   a. Date issued.

   b. Project title and Engineer's job number.

   c. Testing laboratory name and address.

   d. Name and signature of inspector.

   e. Date of inspection or sampling.

   f. Record of temperature and weather.

   g. Date of test.

   h. Identification of product.

   i. Location in project.

   j. Type of inspection or test.

   k. Observations regarding compliance with Contract Documents.

6. Perform additional services as required by TWA.

7. Laboratory will not be authorized to:

   a. Release, revoke, alter, or enlarge on requirements of Contract Documents.

   b. Approve or accept any portion of work.

   c. Perform any duties of the Contractor.

C. CONTRACTOR'S RESPONSIBILITIES

1. Cooperate with laboratory personnel; provide access to work, and to Subcontractor's and Suppliers operations.

2. Secure and deliver to the laboratory adequate quantities of representational samples of materials proposed to be used and which require testing.

3. Provide to the laboratory the preliminary design mix proposed to be used for concrete, and other materials mixes which require control by the testing laboratory.

4. Materials and equipment used in the performance of work under this Contract are subject to inspection and testing at the point of manufacture or fabrication. Standard specifications for quality and workmanship are indicated in the Contract Documents. Engineer may require Contractor to provide statements or certificates from the manufacturers and fabricators that the materials and equipment provided by them are manufactured or fabricated in full compliance with the approved specifications for quality and workmanship. All costs of this testing and providing statements and certificates shall be a subsidiary obligation of the Contractor, and no extra charge to the TWA shall be allowed on account of such testing and certification.

5. Furnish incidental labor and facilities:

    a. To provide access to work to be tested.

    b. To obtain and handle samples at the project site or at the source of the material or product to be tested.

    c. To facilitate inspections and tests.

    d. For storage and curing of test samples.

6. Notify laboratory and Engineer sufficiently in advance of operations to allow for laboratory assignment of personnel and scheduling of tests.

END OF SECTION

SECTION 01500

CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

PART 1 - GENERAL

1.01 CONSTRUCTION UTILITIES

A. The Contractor shall arrange with the power and telephone companies, if necessary, to obtain temporary electrical service for construction purposes.

B. The Contractor shall pay all power and telephone company installation and use charges for the telephone service and electrical energy utilized for temporary power and light.

C. The Contractor shall make his own arrangements at his own expense for obtaining the water supply and sanitary facilities necessary for construction purposes, and he shall acquire and pay for all water consumed during construction.

1.02 TEMPORARY BUILDINGS

A. The Contractor shall not build or move onto the site temporary buildings or other structures for storing (tools or machinery and supplies).

1.03 CLEAN-UP

A. Upon completion of the work, all excess material and rubbish shall be removed from the job site, and any off-site locations used, and disposed of in a lawful manner and in accordance with the Contract Documents. The surrounding construction area, easements, and any other affected grounds shall be left in a condition as good or better than existed prior to construction. Any remedial actions, measures or reconstruction of damaged properties shall be accomplished at the Contractor's expense.

1.04 USE OF PREMISES

A. The Contractor shall confine his apparatus, the storage of materials and the operations of his workers to the limits defined by laws, ordinances, permits, or directions of the Engineer and shall not unduly encumber the premises with his materials.

B. The Contractor shall enforce the instructions of the Engineer regarding signs, advertisements, fire, and safety.

1.05 SOIL EROSION

A. The Contractor shall take all required and necessary actions as outlined in Section 01568, to minimize siltation and soil erosion during construction.

1.06 ACCESS ROADS

A. Streets, roads, and drives used by the Contractor for access to and from the site of the work shall be protected from damage. Any such damage done shall be repaired and left in good condition at the end of the construction period. Upon completion of construction, access areas and temporary easements shall be restored to the pre-construction condition at no additional cost to the Owner.

1.07 MAINTENANCE DURING CONSTRUCTION

A. The Contractor shall maintain, at his expense, the work during construction and until final acceptance of all work under the contract.

B. In the event the Contractor fails to remedy any unsatisfactory situation within twenty-four (24) hours after receipt of written notice from the Engineer describing the unsatisfactory conditions, the Owner may immediately proceed with adequate forces and equipment to maintain the project, and the entire cost of this maintenance will be deducted from the monies otherwise due the Contractor under the Contract.

C. As an alternative to the above specified maintenance, the cost of all of the items that are not properly maintained may be deducted at the Contract Prices from the current partial payment request even if such items have been paid for in previous estimates.

1.08 SANITARY FACILITIES

A. The Contractor shall provide and maintain temporary sanitary accommodations for the use of his employees, the Engineer, and those of his subcontractors as may be necessary to comply with health requirements and regulations and as directed by the Engineer. No nuisance will be permitted from these accommodations.

B First-aid facilities: All first-aid facilities are to be provided by the Contractor. Nearest hospital shall be listed in the Contractor's Health & Safety Plan.

PART 2 - PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 01568

TEMPORARY EROSION AND SEDIMENTATION CONTROL

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Contractor shall design, provide, maintain and remove temporary erosion and sedimentation controls as necessary to ensure compliance to limits established by TWA, Federal, State or Local agencies having jurisdiction over the work. Contractor is responsible for erosion and sedimentation control during construction or until final controls become effective.

B. Temporary controls will be implemented to prevent soil erosion from the site surface. This includes erosion caused by rainfall or storm runoff. These control measures include, but are not limited to:

1. Mulching, seeding, chemical binders, rip-rap or tack coats on site surfaces.

2. Providing drainage and runoff controls at those locations which will prevent or maintain within acceptable limits, scour or gully erosion.

3. Scheduling work in areas of the site that will be susceptible to erosion so that they are not left unprotected during times of heavy rainfall.

C. Temporary sedimentation controls will be implemented to limit soil transport and prevent sediment pollution outside the limits of work. These controls include, but are not limited to; terracing, contouring, dams, screens, traps, basins, barriers, or other appurtenances located on, or at the foot of, sloped surfaces.

PART 2 - PRODUCTS

2.01 EROSION CONTROL

A. Seeding and mulching or solid sodding shall meet requirements established by Engineer.

B. Covering fabric shall be fabricated of material acceptable to Engineer.

C. Silt Screens shall be fabricated of material acceptable to Engineer.

2.02 SEDIMENTATION CONTROL

A. Bales shall be synthetic hale only.

B. Netting shall be fabricated of material acceptable to Engineer.

C. Filter stone shall be crushed stone conforming to Florida Department of Transportation (FDOT) Specifications.

D. Concrete block shall be hollow, non-load bearing type.

E. Concrete shall be exterior grade not less than one inch thick.

F. Silt Screens shall be fabricated of material acceptable to Engineer.

PART 3 – EXECUTION

3.01 EROSION CONTROL

A. Minimum procedures for seeding are:

1. Scarify slopes to a depth of not less than six inches and remove large clods, rocks, stumps, roots larger than ½ inch in diameter and debris.

2. Sow seed by hydro or mechanical methods within twenty-four (24) hours after ground is scarified.

3. Apply mulch loosely and to a thickness of between 3/4 inch and 1½ inches.

4. Roll and water seeded areas in a manner which will encourage sprouting of seeds and growing of grass. Reseed areas which exhibit unsatisfactory growth. Backfill and seed eroded areas.

3.02. SEDIMENT CONTROL

A. Install and maintain effective sediment controls. Straw or synthetic hay bale dikes, sediment traps or basins shall be constructed in accordance with the FDOT drainage manual.

B. Performance

Should any of the temporary erosion or sediment control measures employed by Contractor fail to produce results which comply with the requirements of the State of Florida, TWA, Engineer or other regulatory agencies with jurisdiction, Contractor shall immediately take whatever steps are necessary to correct the deficiency at no cost to TWA.

C. Removal

When final permanent controls become effective or when directed by Engineer, Contractor shall remove temporary erosion and sedimentation controls and restore surfaces to preconstruction conditions or as required by the Contract Documents.

END OF SECTION

SECTION 01570

TRAFFIC REGULATION

PART 1 - GENERAL

1.01 DESCRIPTION

This section covers procedures for developing and implementing traffic control and regulation measures and maintenance of traffic in and around the construction area to provide for safe and efficient protection and movement of vehicular and pedestrian traffic/through and adjacent to the construction site areas.

1.02 REFERENCES

A. Codes, Specifications, and Standards

Codes, specifications, and standards referred to by number or title shall form a part of this Specification to the extent required by the reference thereto. Latest revisions shall apply, unless otherwise shown or specified.

B. Florida Department of Transportation (FDOT) Standards

FDOT Manual	State of Florida Manual of Traffic Control and Safe Practices for Street and Highway Construction, Maintenance and Utility Operations.
FDOT Specifications	Florida Department of Transportation Standard Specifications for Road and Bridge Construction.
FDOT Standards	Florida Department of Transportation Roadway and Traffic Design Standards.

1.03 SUBMITTALS

A. Before closing or restricting traffic flow through any thoroughfare, the Contractor shall give written notice to and, if necessary, obtain a permit or permits from the duly constituted public authority having jurisdiction over the thoroughfare. Contractor shall also notify the applicable law enforcement, fire, and emergency services having jurisdiction in the area. Notice shall be given no less than 72 hours in advance of the time when it may be necessary in the process of construction to close or restrict traffic to such thoroughfare, or as may be otherwise required by the governing authority.

1.04 SITE CONDITIONS

A. The Contractor shall plan construction operations such that existing local traffic access can be maintained and shall maintain during the construction such barricades, lights, flagmen, and other protective devices as appropriate, whether specified for the project or required

by the local governing authority. Traffic control devices used for maintenance of traffic shall comply with the FDOT Manual.

B. The Contractor shall conduct his work in such manner as not to unduly or unnecessarily restrict or impede normal traffic through the streets of the community. Insofar as it is practicable, excavated material and spoil banks shall not be located in such manner as to obstruct traffic. The traveled way of all streets, roads, and alleys shall be kept clear and unobstructed insofar as is possible and shall not be used for the storage of construction materials, equipment, supplies, or excavated earth, except when and where necessary.

If required by duly constituted public authority, the Contractor shall, at his own expense, construct bridges or other temporary crossing structures over trenches so as not to unduly restrict traffic. Such structures shall be of adequate proper construction and shall be maintained by the Contractor in such manner as not to constitute an undue traffic hazard. Private driveways shall not be closed except when and where necessary, and then only upon due advance notice to the TWA and for the shortest practicable period of time consistent with efficient and expeditious construction. The Contractor shall be liable for any damages to persons or property resulting from his work.

C. The Contractor shall make provisions at cross streets for the free passage of vehicles and foot passengers, either by bridging or otherwise, and shall not obstruct the sidewalks, gutters, or streets, nor prevent in any manner the flow of water in the latter, but shall use all proper and necessary means to permit the free passage of surface water along the gutters. The Contractor shall immediately cart away all offensive matter, exercising such precaution as may be directed by the TWA. All material excavated shall be so disposed of as to inconvenience the public and adjacent tenants as little as possible and to prevent injury to trees, sidewalks, fences, and adjacent property of all kinds. The Contractor may be required to erect suitable barriers to prevent such inconvenience or injury.

D. Unless otherwise required by the governing authority, maintenance of traffic in and around the construction zone shall conform to Section 102 of the FDOT Specifications, and 600 Series Roadway Design Standards drawings of the FDOT Standards, as applicable.

PART 2 - PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 01580

PROJECT SIGNS

PART 1 GENERAL

1.01 DESCRIPTION

A. Scope of Work:

1. Furnish, install and maintain project signs.

2. Remove signs on completion of construction.

3. Allow no other signs to be displayed.

B. Related Requirements Described Elsewhere:

1. Summary of Work: Section 01010.

1.02 PROJECT SIGN

A. One (1) painted sign with lettering, size, color and construction in accordance with the requirement of the Tohopekaliga Water Authority (minimum 4 feet x 8 feet).

B. Erect on the project site at a location of high public visibility, as approved by the Engineer and the Owner.

C. Information:

1. Tohopekaliga Water Authority Sign:

a. Tohopekaliga Water Authority title and logo;

b. TWA Council members and TWA Administrator;

c. Project name;

d. Contractor;

e. Consultant.

1.03 QUALITY ASSURANCE

A. Sign Painter: Professional experience in type of work required.

B. Finishes, Painting: Adequate to resist weathering and fading of rescheduled construction period.

PART 2 PRODUCTS

2.01 SIGN MATERIALS

A. Structure and Framing: May be new or used, wood or metal, in sound condition, structurally adequate and suitable for specified finish.

B. Sign Surfaces: Exterior softwood plywood with medium density overlay, standard large sizes to minimize joints.

1. Thickness: As required by standards to span framing members, to provide even, smooth surface without waves or buckles.

C. Rough Hardware: Galvanized.

D. Paint: Exterior quality, as specified in Section 09900.

E. Color: Refer to Owner's selection of colors.

PART 3 EXECUTION

3.01 PROJECT IDENTIFICATION SIGNS

A. Paint exposed surface of supports, framing and surface material; one coat of primer and one coat of exterior paint.

B. Paint graphics in styles, sizes, and colors selected.

3.02 MAINTENANCE

A. Maintenance signs and supports in a neat, clean condition; repair damages to structures, framing or signs.

3.03 REMOVAL

A. Remove signs, framing, supports and foundations at completion of Project.

END OF SECTION

SECTION 01600

MATERIALS AND EQUIPMENT

PART 1 - GENERAL

1.01 SCOPE OF WORK

Contractor is responsible for furnishing and installing the material and equipment as required by the Contract Documents. Proper approval of submittals and substitutions are required. Furnished material and equipment shall be properly transported, handled, stored and protected in accordance with manufacturer's instructions; federal, state or local regulations, or as approved by Engineer.

A. Material and equipment incorporated into the Work:

1. Shall not be defective.

2. Shall comply with size, make, type and quality as specified in the Contract Documents, or as specifically approved in writing by Engineer.

3. Shall not be used for any purpose other than that for which it is designed or is specified.

B. Manufactured and fabricated products:

1. Design, fabricate and assemble in accordance with the best engineering and shop practices.

2. Manufacture like parts of duplicate units to standard sizes and gauges, to be interchangeable.

3. Two or more items of the same kind shall be identical, supplied by the same manufacturer.

4. Products shall be suitable for service conditions.

5. Equipment capacities, sizes and dimensions shown or a specified shall be adhered to unless variations are specifically approved in writing.

C. APPROVAL OF MATERIALS

1. Only new materials and equipment shall be incorporated in the Work unless otherwise specified in the Contract Documents or approved by Engineer. All materials and equipment furnished by Contractor shall be subject to the inspection and approval of Engineer. No material shall be delivered to the Work without prior written approval of Engineer.

2. Facilities and labor for handling and inspection of all materials and equipment shall be furnished by Contractor. If required by the Contract Documents or as requested by Engineer, either prior to beginning or during the progress of the Work, Contractor shall submit samples of materials for such special tests as may be necessary to demonstrate that they conform to the approved specifications. Such samples shall be furnished, in accordance with the General Conditions. Except as otherwise noted, Engineer will make arrangements for and pay for the tests.

3. In order to demonstrate the proficiency of workmen or to facilitate the choice among several textures, types, finishes and surfaces, Contractor shall provide such samples of workmanship or finish as may be required.

4. The materials and equipment used on the Work shall correspond to the approved samples or other data.

PART 2 - PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.01 IMPLEMENTATION

A. TRANSPORTATION AND HANDLING

1. Arrange deliveries of products in accordance with construction schedules; coordinate to avoid conflict with work and conditions at the site.

a. Deliver products in undamaged condition in manufacturer's original containers or packaging, with identifying labels intact and legible.

b. Immediately upon delivery, inspect shipments to assure compliance with requirements of Contract Documents and approved submittals, and that products are properly protected and undamaged.

2. Provide equipment and personnel to handle products by methods to prevent soiling or damage to products or packaging.

B. STORAGE AND PROTECTION

1. All materials and equipment to be incorporated in the Work shall be handled and stored by Contractor before, during and after shipment in a manner to prevent warping, twisting, bending, breaking, chipping, rusting, and any injury, theft or damage of any kind whatsoever to the material or equipment.

2. Cementitious and other products sensitive to moisture damage shall be stored under a roof, off the ground and shall be kept completely dry at all times. All structural and miscellaneous steel, and reinforcing steel shall be stored off the

ground to prevent accumulations of dirt or grease, and in a position to prevent accumulations of standing water and to minimize rusting.

3. All materials which, in the opinion of Engineer, have become so damaged as to be unfit for the use intended shall be promptly removed from the site of the Work, and Contractor shall receive no compensation for the damaged material, its removal or its replacement.

4. Arrange storage in a manner to provide easy access for inspection. Make periodic inspections of stored products to assure that products are maintained under specified conditions, and free from damage or deterioration.

5. Contractor shall be responsible for all material, equipment and supplies sold and delivered to TWA under this Contract until final inspection of the Work and acceptance by the Engineer. In the event any such material, equipment and supplies are lost, stolen, or become defective prior to final inspection and acceptance, Contractor shall replace same without additional cost to TWA.

6. Should Contractor fail to take proper action on storage and handling of equipment supplied under this Contract within ten days after written notice to do so has been given, TWA retains the right to correct all deficiencies noted in previously transmitted written notice and deduct the cost associated with these corrections from Contractor's next progress payment. These costs may be comprised of expenditures for labor equipment usage, administrative, clerical, engineering and any other costs associated with making the necessary corrections.

END OF SECTION

SECTION 01700

CONTRACT CLOSEOUT

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

Comply with requirements stated in Conditions of the Contract and in the Specifications for administrative procedures in closing out the Work.

1.02 RELATED REQUIREMENTS

A. Conditions of the Contract. Fiscal provisions, legal submittals and additional administrative requirements.

B. Section 01720: Project Record Documents.

C. The respective sections of Specifications: Submittals Required.

1.03 SUBSTANTIAL COMPLETION

A. When Contractor considers the Work is substantially complete, he shall submit to the Engineer:

1. A written notice that the Work is substantially complete.

2. A list of items to be completed or corrected.

B. Within a reasonable time after receipt of such notice, the Engineer will make an inspection to determine the status of completion.

C. Should the Engineer determine that the Work is not substantially complete:

1. The Engineer will promptly notify the Contractor in writing, giving reasons therefore.

2. Contractor shall remedy the deficiencies in the Work and send a second written notice of substantial completion to the Engineer.

3. The Engineer will reinspect the Work.

D. When the Engineer finds that Work is substantially complete, he will:

1. Prepare and deliver to Owner a tentative Certificate of Substantial Completion with a tentative list of items to be completed or corrected before final payment.

2. After consideration of any objections made by the Owner as provided in Conditions of the Contract, and when the Engineer considers the Work substantially complete, he will execute and deliver to the Owner and the Contractor a Certificate of Substantial Completion with a revised tentative list of items to be completed or corrected.

1.04 FINAL INSPECTION

A. When Contractor considers the Work is complete, he shall submit written certification that:

1. Contract Documents have been reviewed.

2. Work has been inspected for compliance with Contract Documents.

3. Work has been completed in accordance with Contract Documents.

4. The work has been tested as required by the Specification and in the presence of the Owner's representative and is operational.

5. Work is completed and ready for final inspection.

B. The Engineer will make an inspection to verify the status of completion with reasonable promptness after receipt of such certification.

C. Should the Engineer consider that the Work is incomplete or defective:

1. The Engineer will promptly notify the Contractor in writing, listing the incomplete or defective work.

2. Contractor shall take immediate steps to remedy the stated deficiencies and send a second written certification to the Engineer that the Work is complete.

3. The Engineer will reinspect the Work.

D. When the Engineer finds that the Work is acceptable under the Contract Documents, he shall request the Contractor to make closeout submittals.

1.05 REINSPECTION FEES

A. Should the Engineer perform more than one reinspection due to failure of the Work to comply with the claims of status of completion made by the Contractor:

1. Owner will compensate the Engineer for such additional services.

2. Owner will deduct the amount of such compensation from the final payment due to the Contractor.

1.06 CONTRACTOR'S CLOSEOUT SUBMITTALS TO ENGINEER

A. Evidence of compliance with requirements of governing authorities.

B. As-built drawings.

C. Evidence of Payment and Release of Liens in accordance with requirements of General and Supplementary Conditions.

1.07 FINAL ADJUSTMENT OF ACCOUNTS

A. Submit final statement of accounting to the Engineer.

B. Statement shall reflect all adjustments to the Contract Sum:

1. The original Contract Sum

2. Additions and deductions resulting from:

a. Previous Change Orders

b. Allowances

c. Unit Prices

d. Deductions for uncorrected Work

e. Deductions for liquidated damages

f. Deductions for reinspection payments

g. Other adjustments

3. Total Contract Sum, as adjusted

4. Previous payments

5. Sum remaining and due to Contractor

C. The Engineer will prepare a final Change Order reflecting approved adjustments to the Contract Sum that were not previously made by Change Orders.

1.08 FINAL APPLICATION FOR PAYMENT

Contractor shall submit the final Application for Payment in accordance with procedures and requirements stated in Section 01150 and in the Conditions of the Contract.

PART 2 PRODUCTS (NOT USED)
PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01710

PROJECT HOUSEKEEPING

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Maintain construction cleanliness during progress of the Work and perform final cleaning at completion of the Work, and as required by conditions of the Contract. Conduct cleaning and disposal operations to comply with codes, ordinances, regulations, and anti-pollution laws.

B. Materials

1. Use only those cleaning materials which will not create hazards to health or property and which will not damage surfaces.

2. Use only those cleaning materials and methods recommended by manufacturer of the surface material to be cleaned.

3. Use cleaning materials only on surfaces recommended by cleaning material manufacturer.

PART 2 - PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.01 IMPLEMENTATION

A. DURING CONSTRUCTION

1. Execute daily cleaning to keep the Work, the site, access ways, streets and adjacent properties free from accumulations of waste materials, rubbish and windblown debris, resulting from construction operations.

2. Provide on-site containers for the collection of waste materials, debris and rubbish containers must be emptied daily or as frequently as necessary to contain disposals

3. Remove waste materials, debris and rubbish from the site periodically and dispose of at legal disposal areas away from the site.

4. Schedule operations so that dust and other contaminants resulting from cleaning process shall not fall on wet or newly-coated surfaces.

B. FINAL CLEANING

1. Employ skilled workmen for final cleaning.

2. Remove grease, mastic, adhesives, dust, dirt, stains, fingerprints, labels, and other foreign materials from sight-exposed interior and exterior surfaces.

3. Prior to final completion, or TWA occupancy, Contractor shall conduct an inspection of all work areas, to verify that the entire Work is clean.

END OF SECTION

SECTION 01720

PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.01 DESCRIPTION

A. The Contractor shall maintain at the site for the Owner one record copy of:

1. Drawings.

2. Specifications.

3. Addenda.

4. Change orders and other modifications to the Contract.

5. Engineer field orders or written instructions.

6. Approved shop drawings, product data and samples.

7. Field test records.

8. As Built Drawings.

B. Related Requirements:

1. General Conditions

2. Section 01150: Measurement and Payment

3. Section 01200: Project Meetings

4. Section 01340: Shop Drawings and Submittals

5. Section 01500: Construction Facilities and Temporary Controls

6. Appendix C: Coordinate Asset Table Template

1.02 MAINTENANCE OF DOCUMENTS AND SAMPLE

A. The Contractor shall store record documents, As-Builts, and samples apart from documents used for construction.

1. Provide files and racks for storage of documents.

2. Provide locked cabinet or secure storage space for storage of samples.

B. Documents shall be maintained in a clean, dry, legible condition and in good order. Do not use As-Built Documents for construction purposes.

C. Documents and samples shall be available at all times for inspection by the Engineer.

1.03 MARKING DEVICES

A. The Contractor shall provide suitable permanent marking pens for recording information in the color code designated by the Engineer.

1.04 RECORDING

A. Each document shall be labeled "AS BUILT" in large printed letters, and shall include the Contractor's name and the name of the person responsible for the As Built Drawings.

B. As-Built information shall be kept current with construction progress.

C. As-Built Drawings:

1. The Contractor shall keep an accurate record of the location, size, and material for all piping, pipe casings and changes in equipment dimensions and any other variations between the work actually provided and that shown on the Contract Drawings. The representation of such variations shall conform to standard drafting practice and shall include such supplementary notes, legends and details as may be necessary for legibility and clear portrayal of the construction.

2. Final alignment, elevations, invert elevations and locations are to be supplied by the Contractor. Final location of buried facilities shall be identified in state plan coordinates and reference to at least two permanent above-grade structures.

3. Do not conceal any work until required information is recorded.

1.05 SUBMITTAL

A. Sketches showing the As-Built information shall be made available to the Engineer for review monthly with the Application For Progress Payment. As Built Drawings shall be reviewed with the Engineer monthly as part of the Application for Progress Payment review process.

B. Upon completion of the work, Engineer shall deliver to the Contractor a reproducible set of updated contract drawings. Contractor will transfer all his as-built information to these reproducibles and deliver the resultant as-built set of drawings, together with the record survey book to Engineer for TWA.

C. At Contract close-out, deliver a two (2) complete set of As Built Documents which have been signed and sealed by a Professional Land Surveyor registered in THE STATE OF FLORIDA to the Engineer , and one (1) Auto Cad electronic copy for the Owner. As-Built information shall comply with and contain the following:

- The Contractor shall be responsible for recording information onto the APPROVED PLANS concurrently with the construction progress in the field.

- All drawings shall be tied to the following horizontal and vertical control datum:

  Horizontal - State Plane, Florida East Zone (901), Transverse Mercator projection, NAD 1983 (90) Adjusted.

Vertical - NAVD 1988

- The ¼ Section, Township, Range shall be displayed on lower right-hand corner of the cover sheet, as NE¼ T25S R29E.

- All privately maintained utilities shall be clearly marked "PRIVATE" and the limits of privately maintained areas shown on RECORD DRAWINGS.

- As-Built Drawings shall be legibly marked to record actual construction.

- As-Built Drawings shall show actual location and elevations of water, reuse, wastewater piping, fittings and related appurtenances. All changes to piping location including horizontal and vertical locations of utilities and appurtenances shall be clearly shown and referenced to permanent surface improvements or any structure within 20' of the installation. Record Drawings shall also show actual installed pipe material, class, etc. Pressure pipe locations and elevations shall be shown at a maximum of 100' intervals with finished grade also shown at each location.

- As-Built Drawings shall clearly show all field changes of dimension and detail including changes made by field order or by change order.

- As-Built Drawings shall clearly show all details not on original contract drawings but constructed in the field. All equipment and piping relocation shall be clearly shown. All pump station data and pump curves shall be provided.

- Location of all manholes, hydrants, valves, and valve boxes shall be shown at its correct location on Record Drawings.

- Dimensions between all manholes shall be field verified and shown.

- The inverts and grade elevation of all manholes shall be shown on the Record Drawings and Coordinate Asset Table.

- Plan and profile are required for all mains. As-Built Drawings of plan and profile drawings shall show elevations of all piping at all crossings and borings.

- As-Built Drawings shall be submitted with changes conforming to all items in this section noted on the approved drawings.

- Construction Plans simply stamped “AS-BUILT DRAWINGS” and lacking information requested in Section 11.6, of Toho’s latest Standards and Specification 2017 ed will be returned to the Contractor. The Project Acceptance Certificate will not be issued until correct RECORD DRAWINGS and all support information have been submitted and approved.

D. Accompany submittal with transmittal letter in duplicate, containing:

1. Date.

2. Project title and number.

3. Contractor's name and address.

4. Title and number of each As Built Document.

5. Certification that each document as submitted is complete and accurate.

6. Signature of the Contractor or his authorized representative.

E. RECORD DRAWING deliverables:

1. Deliver one set of certified, full size, hard copy of RECORD DRAWINGS, based on as-built information provided by a Florida Registered Surveyor and Mapper (PSM).

2. Deliver digital RECORD DRAWINGS in all the following formats:

a. AutoCAD (dwg) format. Include all associated files and xrefs.
b. Adobe © Protected Document File (pdf) format.

F. COORDINATE ASSET TABLE (Appendix ‘C’).

Horizontal locations and vertical elevations shall be per Minimum RECORD DRAWING Accuracies per Asset (Water, Wastewater, Reclaimed Water and Existing). See Appendix ‘B’.

Deliver one certified hard copy of COORDINATE ASSET TABLE signed and sealed, on each page, by a Florida Registered Surveyor and Mapper (PSM). See Appendix ‘C’.

Deliver electronic database of COORDINATE ASSET TABLE.

G. SPECIFIC PURPOSE SURVEY for water, sanitary sewer or reuse piping and appurtenant facilities.

1. If water, sanitary sewer or reuse piping and appurtenant facilities, are not constructed within a dedicated right of way, platted tract or existing easement, a SPECIFIC PURPOSE SURVEY shall be required and included in the conveyance document.

2. The SPECIFIC PURPOSE SURVEY shall be a survey, map and report certified by a Florida Registered Surveyor and Mapper (PSM) of an easement with water, wastewater and/or reclaimed water pipes maintained by Toho Water Authority. The report shall be required if the locations where the pipe centerline was not constructed within two feet of the centerline of the easement.

3. Deliver two sets of the certified survey in hard copy and a scanned version of the hard copy in Adobe © Protected Document File (pdf) format.

H. BOUNDARY SURVEY for Pump Stations

1. If new pump station/s are not constructed within a dedicated platted tract, a BOUNDARY SURVEY shall be required and included in the conveyance document.

2. Deliver two hard copies of the certified survey of the pump station property and a scanned version of the hard copy in Adobe © Protected Document File (pdf) format.

I. PROJECT INFORMATION SHEET/S

1. The PROJECT INFORMATION SHEET/S shall be full sized blank sheets in AutoCAD (dwg) format. For an example, see 'PROJECT INFORMATION SHEET .pdf as an example. The 'PROJECT INFORMATION SHEET shall contain legible scanned copies of:

   a. All approved permit pages showing signatures.
   b. Special Purpose Surveys and Boundary Surveys.
   c. Recorded Easements.
   d. Certified Engineer's Cost Estimate.
   e. Signed and sealed Hydraulic Calculations.
   f. Lift station pump curve data.
   g. Contractor's and Sub-Contractor's License.

2. Each sheet/s shall be signed and sealed on the lower right hand corner of each sheet by the Engineer of Record. The PROJECT INFORMATION SHEET/S shall be attached to front sheet of the RECORD DRAWINGS.

J. CONTRACTOR'S DEMOLITION SHEETS

1. Demo Sheets, showing abandoned or demolished piping and/or structures shall be added to the PROJECT INFORMATION SHEETS along with the RECORD DRAWINGS. Lengths of existing piping and/or structures abandoned or demolished, and the method used shall be clearly be indicated on the Demo Sheets.

K. SURVEYORS AS-BUILT SURVEY

1. One full sized hard copy of signed and sealed AS-BUILT SURVEY with the RECORD DRAWINGS.

APPENDIX 'B'
Record Drawing Accuracy Table

Date

Asset	Horizontal Accuracy (feet)	Elevation Accuracy (feet)	Location: horizontal center and vertical top, unless otherwise specified
Bench Marks / Control	N/A	0.01	Point
Horizontal Control	0.01	N/A	Point
Easement and Tracts	*	N/A	Survey Monuments
Hydrants	1.0	N/A	Operating Nut
Hydro Guard	1.0	N/A	Top Center of Cover
Blow Off Valves	1.0	N/A	Valve Enclosure
Air Release Valves	1.0	N/A	Valve Enclosure
System Valves	1.0	0.1	Operating Nut and Valve Body / (Give Elev. Of Valve Box / "Give distance between")
Master Meter	1.0	N/A	Register / (Give Finish Grade / "Give distance between")
Master Backflow	1.0	N/A	Top of Main Body / (Give Finish Grade / "Give distance between")
Meter Box	1.0	0.1	Top of Meter Box
Clean-out	1.0	0.1	Top of Clean-out
Pump Stations	1.0	0.01	Top Center of Wet Well, Bottom of Wet Well, All Pipe Inverts and Discharge Pipe
Manholes Cover	1.0	0.1	Top Center of Cover
Manholes Inverts	N/A	0.01	All Pipe Inverts
Grease Taps	1.0	0.1	Top Center of Waste Tank
Vault	1.0	0.1	Top Center of Cover
Monitoring Wells	1.0	0.1	Top of Monitoring Well
Wells	1.0	N/A	Top of Main Body

Fittings	1.0	0.1	Top of Fitting / (Give Finish Grade / "Give depth to Fitting")
Piping at 100' Max Intervals	1.0	0.1	Top of Pipe / (Give Finish Grade / "Give depth to Piping")
Restrained Pipe	1.0	0.1	Top of Pipe, Joint and Limits
Connection to Existing Utilities	1.0	0.1	Top of Pipe
Directional Drill or Bore & Jack Casing	1.0	0.1	Top of Casing, Carrier Pipe and Limits of Crossing
Existing Utilities (See Note)	1.0	As Required	As Required
(*) Shall conform to the requirements of the "Chapter 61G17-6, "Minimum Technical Standards"			
Note: Construction shall provide X, Y, and Z coordinates for ALL existing utilities including but not limited to Water, Wastewater, and Reclaimed Water.			

Appendix C
COORDINATE ASSET TABLE

Asset Type[1]	ID Number[2]	UTILITIES Asset Number[3]	UTILITIES Asset Coordinates		
			X	Y	Elevation

Notes:

[1] Asset type shall correspond to those listed in APPENDIX 'B'.

[2] ID number shall be as shown on the RECORD DRAWINGS provided by the DEVELOPER's Engineer.

[3] UTILITIES' asset number to be assigned by TOHO WATER AUTHORITY after submittal of the Coordinate Asset Table.

END OF SECTION

SECTION 01740

WARRANTIES AND BONDS

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Contractor's responsibility shall be to:

1. Compile warranties and bonds, as required in the Contract Documents and as specified herein.

2. Co-execute submittals when requested by Engineer.

3. Review submittals to verify compliance with Contract Documents.

4. Submit Warranties and Bonds to Engineer for review and transmittal to TWA.

PART 2 - PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.01 IMPLEMENTATION

A. SUBMITTAL REQUIREMENTS

1. Assemble warranties, bonds and service and maintenance contracts, executed by each of the respective manufacturers, suppliers, and subcontractors.

2. Quantity: Two original signed copies are required.

3. Table of Contents: Neatly typed, in orderly sequence. Provide complete information for each item.

a. Product of work item.
b. Firm, with name of principal, address and telephone number.
c. Scope.
d. Date of beginning of warranty, bond or service and maintenance contract.
e. Duration of warranty, bond or service maintenance contract.
f. Contractor, name of responsible principal, address and telephone number.

B. FORMAT OF SUBMITTALS - Prepare in duplicate packets:

1. Paper: Size 8 ½ inches x 11 inches, punch sheets for standard three-post binder.

   a. Fold larger sheets to fit into binders.

2. Cover: Identify each packet with typed or printed title WARRANTIES AND BONDS'. List:

   a. Title of Project.
   b. Name of Contractor.

3. Binders: Commercial quality, three-post binder, with durable and cleanable plastic covers and maximum post width of two inches.

C. WARRANTIES AND BONDS

1. For all major pieces of equipment, submit a warranty from the equipment manufacturer. The manufacturer's warranty period shall be concurrent with Contractor's for one (1) year, unless otherwise specified, commencing at the time of final acceptance by the Engineer of each Phase. Durations of systems' (i.e. moisture protection, conveyance, etc.) warranties shall be as specified elsewhere in the Contract Documents.

2. Contractor shall be responsible for obtaining certificate for equipment warranty for all major equipment provided which has at least 1 hp motor or which lists for more than $1,000. Engineer reserves the right to request warranties for equipment not classified as major. Contractor shall still warrant equipment not considered to be "major" in Contractor's one-year warranty period even though certificates of warranty may not be required.

3. In the event that the equipment manufacturer or supplier is unwilling to provide a one-year warranty commencing at the time of TWA final acceptance of each Phase, Contractor shall obtain from the manufacturer a two year warranty commencing at the time of equipment delivery to the job site. This two-year warranty from the manufacturer shall not relieve Contractor of the one-year warranty.

4. Contractor shall be responsible for all costs of repairs of work which becomes defective during construction and the following warranty period.

5. Warranty shall cover all necessary labor, equipment and replacement parts resulting from faulty or inadequate design, improper assembly or erection, defective workmanship and materials, leakage, breakage or other failure of any or all equipment and components furnished by the manufacturer.

END OF SECTION

DIVISION II
SITEWORK

SECTION 02050

DEMOLITION AND MAINTENANCE OF SERVICE DURING CONSTRUCTION

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work:

1. This Section includes furnishing all labor, materials, permits, notifications, equipment and incidentals required for the demolition and disposal of all materials and equipment designed for removal. Such materials and equipment and include manholes, pumps, pipe, valves, supports, and other related appurtenances.

2. These Specifications call attention to certain activities necessary to maintain and facilitate operation during and immediately following construction and do not purport to cover all of the activities necessary. The Contractor shall exercise due care to maintain continuous operation of the existing facilities and minimize operation inconvenience. In accordance with this requirement, a Demolition and Removal Plan shall be developed and submitted in accordance with Paragraph 1.06 herein, Specification 02516 - Collection System Bypass and Section 01310 – Project Schedule Using CPM Network Analysis.

3. Demolition includes, but is not limited to:

a. Removal of manholes, piping, valves, pavement, and other items as shown on the Drawings or necessary to complete the Project.

b. Off-site disposal of non-salvageable and excess unacceptable materials.

c. Removal and proposal disposal of all wastewater contents.

4. The Contractor shall examine the Contract Documents, visit the project site and determine the extent of the work affected therein, and all conditions under which the work will be performed.

1.02 PERMITS AND NOTICES

A. Permits and Licenses: Contractor shall obtain all necessary permits and licenses for performing the work and shall furnish a copy of same to the Owner prior to commencing the Work. The Contractor shall comply with the requirements of the permits.

B. Notices: Contractor shall issue written notices of planned demolition at least one month prior to any demolition to all residence in surrounding subdivision, along with companies or local authorities owning utility conduit, wires or pipes running to or through the project

site. Notices to residences shall include a project description, estimated duration and anticipated traffic constriction for the project. Drafts of said notices shall be submitted to the Engineer.

C. Utility Services: Contractor shall notify utility companies or local authorities furnishing gas, water, electrical, telephone, cable television, or sewer service to remove any equipment owned by them in structures to be demolished and to remove, disconnect, cap, or plug their services to facilitate demolition.

1.03 CONDITIONS AND STRUCTURES

A. Conditions existing at the time of inspection for bidding purposes will be maintained by the Owner insofar as practicable, however, minor variations within the structure may occur prior to the start of demolition work.

1.04 RULES AND REGULATIONS

A. The Florida Building Code and applicable codes shall control demolition, modification, or alteration of the existing buildings or structures.

B. No blasting shall be done on site. The Contractor shall not bring or store any explosives on site.

C. Disposal of wastewater contents shall be in accordance with FDEP rules and regulations.

1.05 DISPOSAL OF MATERIAL

A. Salvageable material shall become the property of the Owner, if the Owner requests any specific item. The Contractor shall dismantle all the materials to such a size that they can be readily handled, and deliver any of the salvageable materials requested by the Owner to a designated storage area on-site, as directed by the Owner.

B. The following examples are the types of material of which the Owner may maintain ownership:

1. Valves greater than 3 inches in diameter.

C. Any material that the Owner rejects shall become the Contractor's property and must be removed from the site, transported, and disposed of by the Contractor.

D. Concrete, concrete block, and unsalvageable bricks shall be hauled to a waste disposal site by the Contractor.

E. The storage of or sale of removed items on the site shall not be allowed.

1.06 SUBMITTALS

A. Submit to the Engineer within twenty (20) days after the Notice-to-Proceed for approval, five (5) copies of the proposed Demolition and Removal Plan for the structures and modifications as shown on the Drawings or as specified herein prior to the start of Work. Include a detailed schedule showing the coordination of bypassing, shutoff, capping and continuation of utility service as required. The Demolition and Removal Plan shall include as a minimum, the following:

1. A detailed sequence of demolition and removal work to ensure the continued conveyance of wastewater service and compliance with regulatory agency requirements, as well as the expeditious completion of the Contractor's work.

2. A list of all activities, including Owner activities, bypass activities and shutdowns, required to complete the work.

3. Evidence (by signature) of review of the lift station manager of the work plan.

4. The sequence of demolition and renovation of existing facilities shall be in accordance with the approved Demolition and Removal Plan as specified in this Section. The Contractor is solely responsible for construction and demolition sequencing of the Work.

5. Submit signed and sealed demolition/shoring drawings and calculations prepared by a professional engineer, registered in the State of Florida.

B. Before commencing demolition work, all modifications necessary to bypass the affected structure shall be completed as detailed in Section 02516: Collection System Bypass. Contractor shall coordinate with the Owner’s personnel to determine the locations of the affected equipment, valves and fittings at least 48 hours in advance of any demolition work.

C. The above procedure shall be followed for each individual demolition operation.

1.07 TRAFFIC AND ACCESS

A. Conduct demolition and modification operations, and the removal of equipment and debris to ensure minimum interference with roads, streets, and sidewalks both on-site and off-site and to ensure minimum interference with occupied or used facilities.

B. The Contractor shall at all times maintain safe and convenient access to the existing site.

C. Do not close or obstruct streets or walks without permission from the Owner and Engineer. Provide alternate traffic routes around closed or obstructed access ways.

D. Special attention is directed towards maintaining safe and convenient access to the existing facilities remaining in service by Authority personnel. Relocation of the Contractor's materials or equipment due to uncoordinated interruption will be at the Contractor's expense.

1.08 DAMAGE

A. Promptly repair damage caused to adjacent facilities by demolition operations at no cost to the Owner.

1.09 UTILITIES

A. Maintain existing utilities to remain in service and protect against damage during demolition and construction operations.

B. Do not interrupt existing utilities serving occupied or used facilities, except when authorized by the Owner and the Engineer. Provide temporary service during interruptions to existing utilities as acceptable to the Owner.

C. The Contractor shall cooperate with the Owner to shut off utilities serving structures as required by demolition operations.

D. The Contractor shall be solely responsible for making all necessary arrangements and for performing any necessary work involved in connection with the discontinuance or interruption of all public and private utilities or services under the jurisdiction of the utility companies.

E. All utilities being abandoned shall be disconnected and terminated at the service mains in conformance with the requirement of the utility companies or the municipality owning or controlling them.

1.10 POLLUTION CONTROL

A. For pollution control, use water sprinkling, temporary enclosures, and other suitable methods as necessary to limit the amount of dust and dirt rising and scattering in the air to the lowest level of air pollution practical for the conditions of work. Comply with the governing regulations.

B. Take all necessary measures and means to provide dust, dirt, debris and paint abatement methods to prevent damage to surrounding properties, on-site structures, and private property.

C. Clean on-site structures and improvements of all dust, dirt and debris caused by demolition operations as directed by the Engineer. Clean or repair all off-site property as shown on the Drawings and specified herein. Return areas to conditions existing prior to the start of work.

1.11 QUALITY CONTROL

A. Protect all existing materials and equipment to be salvaged or reused from damage.

B. No above-ground pipes, junction boxes, conduits, or wires are to be left abandoned.

C. Leave all exposed ends of all pipe and conduit or junction boxes covered and safe.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.01 SEQUENCE OF WORK

A. The sequence of demolition and renovation of existing facilities shall be in accordance with the approved demolition and removal plan.

B. The Contractor shall have a basic understanding of the operation of the existing facilities before preparation of the Demolition and Removal Plan to maintain facility operation and reliability during the demolition process where required by the Owner.

C. Show the complete sequence of construction by activity and by structure. Utilize proposed sequence of work as a basis for the detailed sequence of construction.

3.02 REMOVAL OF EXISTING EQUIPMENT, PIPING, AND APPURTENANCES

A. Subject to the constraints of maintaining the existing facility in operation, existing equipment, non-buried valving and piping, and appurtenances not necessary for the operation of the new facility shall be removed as shown or indicated on the Drawings.

B. All equipment, piping, and appurtenances shall be cleaned, flushed, and drained. Equipment to be retained by the Owner as specified in Paragraph 1.05 above shall be dismantled sufficiently to permit thorough cleaning and draining. All valves shall be left open.

3.03 BURIED PIPING

A. Remove all demolished and abandoned below grade piping encountered during excavation unless otherwise directed by Engineer.

END OF SECTION

SECTION 02080

ABANDONMENT, REMOVAL, AND SALVAGE OR DISPOSAL OF EXISTING PIPE

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work: This section specifies the furnishing of all labor, materials, equipment, and incidentals required to abandon, remove, salvage, and/or dispose of existing pipelines and appurtenances as shown on the Drawings and as specified herein

1.02 QUALITY ASSURANCE

A. Permits and Licenses: Contractor shall obtain and pay respective fees for all necessary permits and licenses for performing the Work and shall furnish a copy of same to the Owner prior to commencing the Work. The Contractor shall comply with the requirements of the permits. All removal, abandonment or disposal of asbestos pipe material shall be performed by a licensed asbestos abatement Contractor or Subcontractor registered in the State of Florida.

B. Notices: Contractor shall issue written notices of planned Work to companies or local authorities owning utility conduit, wires, or pipes running to or through the project site. Copies of said notices shall be submitted to the Owner.

C. Standards:

1. Florida Administrative Code, Chapter 62-204.800.

2. National Emission Standards Hazardous Air Pollution (NESHAP), 40 CFR Part 61, Subpart M, latest revision.

3. Occupational Safety and Health Act, 29 CFR.

4. The Environmental Protection Agency (EPA) Asbestos Abatement Worker Protection Rule.

5. Florida Statute 455.300.

6. Asbestos pipe handling best management practices.

D. Quality Control:

1. It shall be the responsibility of the Contractor to provide supervision and inspections to ensure that the existing piping is removed and disposed, salvaged, or abandoned as designated in the Drawings and as specified herein or as needed for piping requiring removal for the work effort.

2. Asbestos Pipe

a. All removal, abandonment or disposal of pipe material containing asbestos shall be performed by a licensed asbestos abatement Contractor or Subcontractor.

b. The asbestos abatement Contractor or Subcontractor shall contact the Orange Owner Environmental Protection Division (407-836-1400) prior to removal or abandonment of any asbestos material and shall obtain all required permits and licenses and issue all required notices as required by the Orange Owner Environmental Protection Division. The Contractor shall be responsible for all fees associated with permits, licenses, and notices to the governing regulatory agencies.

c. The asbestos abatement Contractor shall perform Work in accordance with all applicable standards referenced in paragraph 1.02.C of this section.

d. The asbestos abatement Contractor shall have experience performing asbestos removal similar to this Project.

1.03 SHOP DRAWINGS AND SUBMITTALS

A. Shop Drawings:

1. Submittals shall be submitted to the Owner for review and acceptance prior to construction in accordance with the General Conditions and specifications Section 01340.

2. Shop Drawings shall be submitted to the Owner for review and acceptance prior to construction in accordance with these specifications for the following:

a. Grout

b. Caps and plugs

c. Credentials of licensed asbestos abatement Contractor including current certification.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.01 REMOVAL, ABANDONMENT, SALVAGE, AND DISPOSAL

A. General: Existing piping designated on the Drawings to be removed shall be exposed and removed by the Contractor.

B. Removal and Disposal

1. Pipe designated to be removed shall be completely drained and the contents properly disposed. The piping system including fittings and valves shall then be completely removed from the site.

2. Existing services and/or connections associated with other piping to be removed and not shown on the Drawings shall be removed in accordance with this section at no additional cost. Existing live services encountered shall be maintained.

3. Asbestos: Pipe material containing asbestos shall be removed and disposed of by a licensed asbestos abatement Contractor or Subcontractor.

4. Structures shall be removed in accordance with Section 02050 "Demolition and Maintenance of Service During Construction."

C. Removal of Material to be Salvaged

1. Pipe designated on the Drawings to be removed and salvaged shall be completely drained and the contents properly disposed. The pipe shall then be thoroughly pressure washed, palletized on wooden skids to a dimension not exceeding the recommendation of the manufacturer, and conveyed to the Owner at the location designated by the Owner.

2. Items to be salvaged:

   a. Air release valves

   b. Sanitary manhole rings and covers

   c. Isolation valves

   d. Valve boxes

   e. Fire hydrant and valve assemblies

   f. Other items as directed by the Owner.

D. Abandonment

1. Pipe designated on the Drawings to be abandoned (or retired in place) shall be left in place, drained, and its contents properly disposed. Abandoned pipe requires end caps or plugs. All air release valves and vaults, valve boxes, fire hydrants, manholes, and manhole rings and covers shall be removed and disposed of or salvaged as specified above. Other items may be required to be salvaged as directed by the Owner.

2. All pipe 4-inches or larger to be abandoned in place shall be completely filled with grout and each end of the pipe shall be plugged in a manner acceptable to the Owner.

3. Grout: Where designated on the Drawings, pipe to be abandoned shall be filled with grout approved by the Engineer.

4. Plugs: Pipe to be abandoned shall be capped or plugged with a mechanical joint fitting that will prevent soil or other deposits from entering the pipe.

E. Asbestos Pipe Handling Best Management Practices

1. Projects will require worker documentation before entering the regulated Work area. A copy of: their current training certificate (workers and their supervisor); current medical condition showing the doctor approved their working with asbestos and wearing a respirator; signed acknowledgment forms; and current record (6-months) of each workers respirator fit test will be required from all workers.

2. Projects also require air monitoring. OSHA will accept historic data on air monitoring within 12-months of the Project, provided the data is from a project of like material and conditions with a crew of the same experience, supervision, and training. Otherwise, monitoring is required throughout the Project. OSHA requires two (2) types of personnel air monitoring, full shift and 30-minute excursion level (when highest levels are anticipated).

3. Some provisions should be made for worker showering or otherwise washing following work before removing respirators, etc. Even if direct exposure is not anticipated, and at a minimum, a source of water to rinse the respirators, wash workers faces and hands, and (in the event of unanticipated direct exposure) some place to shower is required. The workers will also need a change room and some place to keep their street clothes and personal possessions.

4. Proposals to remove asbestos pipe sections by cutting must address how the cutting debris will be captured and kept from becoming airborne. Soil that could be considered contaminated may also have to be removed.

5. Licensed asbestos abatement Contractors or Subcontractors should have a pollution endorsement in their liability insurance in case of asbestos fiber release.

   A contingency plan, in case the project does not run as smoothly as expected, should be developed and include emergency phone numbers kept on site during the Project.

6. Daily logs of the asbestos removal work should be kept, and should include sign in sheets for the workers and whatever air monitoring was done. Accident reports and other reports or correspondence if something unusual happened should also be included.

7. Waste receipts must be kept through all stages of transport from the site to, and including, the acceptance at the dumpsite where the material will be abandoned. Amount of material removed must be equal to the amount of material to be turned into to the dump.

8. The primary Contractor will give "approval for tear down" at project completion, indicating that all asbestos removal operations are complete and whether there is a need for any air monitoring. Air monitoring, if not required by any governing agency or approved permit as discussed previously, may also be required by the Owner if documentation to the general public pertaining to contamination is deemed necessary. This air monitoring is normally done by collecting area samples downwind of the project at the barrier tape or just inside it. It requires a source of electricity to run the pumps, which is often provided by a generator.

END OF SECTION

SECTION 02110

CLEARING, GRUBBING, AND STRIPPING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work: This section describes the work included in clearing, grubbing, stripping, and otherwise preparing the project site for construction operations.

B. Related Work Specified Elsewhere:

1. Excavating, Backfilling, and Compaction: Section 02220.

C. Clearing: Remove and dispose of shrubs, brush, limbs, and other vegetative growth. Remove all evidence of their presence from the surface including sticks and branches. Remove and dispose of trash piles and rubbish that currently is scattered over the construction site or collects there during construction. Protect trees, shrubs, vegetative growth, and fencing which are not designed for removal. Clearing operations shall be conducted so as to prevent damage to existing structures and installations, and to those under construction, so as to provide for safety of employees and others.

D. Grubbing: Grubbing shall consist of the complete removal of all stumps, roots larger than 1-1/2 inches in diameter, matted roots, brush, timber, logs, and any other organic or metallic debris remaining after clearing not suitable for foundation purposes, resting on, under or protruding through the surface of the ground to a depth of 18 inches below the subgrade. All depressions excavated below the original ground surface for or by the removal of such objects, shall be refilled with suitable materials and compacted to a density conforming to the surrounding ground surface.

E. Stripping: Remove and dispose of all organics and sod, topsoil, grass, and grass roots, and other objectionable material remaining after clearing and grubbing from the areas designated to be stripped. Grass and grass roots in areas to be excavated or filled upon shall be stripped off to a depth of 4 inches. In areas so designated, topsoil shall be stockpiled. Topsoils so stockpiled shall be protected until it is placed as specified. Any topsoil remaining after all work is in place shall be disposed of by the Contractor unless directed otherwise by the Engineer.

PART 2 - PRODUCTS

2.01 GENERAL

A. Trees and Shrubbery: Existing trees, shrubbery, and other vegetative material may not be shown on the Drawings.

Inspect the site as to the nature, location, size, and extent of vegetative material to be removed or preserved, as specified herein. Preserve, in place, trees that are specifically shown on the Drawings and designated to be preserved.

B. Preservation of Trees, Shrubs, and Other Plant Material:

1. All plant materials (trees, shrubbery, and plants) beyond the limits of clearing and grubbing shall be saved and protected from damage resulting from the work. No filling, excavating, trenching, or stockpiling of materials will be permitted within the drip line of these plant materials. The drip line is defined as a circle drawn by extending a line vertically to the ground from the outermost branches of a plant or group of plants. To prevent soil compaction within the drip line area, no equipment will be permitted within this area.

2. When trees are close together, restrict entry to area with drip line by fencing. In areas where no fence is erected, the trunks of all trees 2 inches or greater in diameter shall be protected by encircling the trunk entirely with boards held securely by 12-gauge wire and staples. This protection shall extend from ground level to a height of 6 feet. Cut and remove tree branches where such cutting is necessary to affect construction operation. Remove branches other than those required to affect the work to provide a balanced appearance of any tree. Scars resulting from the removal of branches shall be treated with a tree sealant.

PART 3 - EXECUTION

3.01 GENERAL

A. Clearing and Grubbing Limits: All excavation areas associated with routing of utility installation, repair or replacement shall be cleared and grubbed to a depth of one (1) foot below the completed surface.

B. Disposal of Clearing and Grubbing Debris: Do not burn combustible materials. Remove all cleared and grubbed material from the work site and dispose of in accordance with all local laws, codes, and ordinances, the cost of which shall be included in the contract price.

C. Areas to be Stripped: All excavation and embankment areas associated with new structures, slabs, walks, and roadways shall be stripped. Stockpile areas shall be stripped.

D. Disposal of Strippings: Remove all stripped material and dispose off-site, unless otherwise directed to stockpile material, the cost of which shall be included in the contract price.

END OF SECTION

SECTION 02140

DEWATERING

PART 1 – GENERAL

1.01 DESCRIPTION

A. Scope of Work

The Work to be performed under this section shall include furnishing all equipment and labor necessary to remove storm or subsurface waters from excavation areas in accordance with the requirements set forth, as shown on the Drawing, including obtaining jurisdictional agency approval for such activities.

1.02 QUALITY ASSURANCE

A. The dewatering of any excavation areas and the disposal of the water shall be in strict accordance with the latest revision of all local and state government rules and regulations.

B. The Contractor shall obtain all required permits from the appropriate Water Management District(s), and shall comply with all conditions of such permits issued by the District(s).

1.03 SUBMITTALS

A. Submit proposed dewatering construction methods to the Water Management District (and other jurisdictional permitting agencies) with copy to Engineer.

B. Notify Water Management District at least (minimum) seven (7) days prior to beginning dewatering operations. Notify other jurisdictional permitting agencies in accordance with the requirements of the respective agency.

C. Submit records showing daily withdrawals to the permitting agency(ies) within seven (7) days after completing all dewatering operations.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.01 GENERAL

A. Known FDEP registered contaminated sites near the project areas are shown in Appendix F of these specifications. The Contractor is required to follow all FDEP and local jurisdictional requirements when dewatering in or around a contaminated site. No additional payment will be made to the Contractor for meeting all regulatory criteria and properly handling

contaminated dewatering discharges within the project limits, or contaminated plumes within the project limits; including but not limited to all sampling, treatment, permitting and approvals, as well as all protective measures to properly control and dispose of dewatering discharges.

B. Construct temporary infiltration basins, turbidity barriers and other devices as specified, shown on the plans or as required by the permitting agency(ies).

C. Install flow measurement equipment in compliance with jurisdictional permitting agencies.

D. Notify jurisdictional permitting agency(ies) prior to beginning dewatering operations (Section 1.03B above).

E. Protect abutting properties from construction and dewatering operations (see Division 1 - General Requirements).

3.02 DEWATERING

A. Provide adequate equipment for the removal of storm or subsurface waters which may accumulate in the excavation.

B. If subsurface water is encountered, utilize suitable equipment to adequately dewater the excavation so that it will be dry for work and pipe laying. A wellpoint system or other dewatering method approved by the respective jurisdictional agency(ies) shall be utilized if necessary to maintain the excavation in a dry condition for preparation of the trench bottom and for pipe laying.

C. Dewatering by trench pumping will not be permitted if migration of fine-grained natural material from bottom, sidewalls, or bedding material will occur.

D. In the event that satisfactory dewatering cannot be accomplished due to subsurface conditions or where dewatering could damage existing structures, obtain the Engineer's approval of wet trench construction or procedure before commencing construction.

3.03 DISPOSAL

A. Discharge water as required by permits.

B. Discharge from contaminated sites must adhere to FDEP and all other regulatory requirements.

C. Discharge to temporary infiltration pits or to partially backfilled trenches.

D. Discharge to storm sewers, canals, stream, or wetlands only if specifically allowed by the jurisdictional agency.

E. In no case, shall discharge result in turbidity reaching wetlands or any waterways.

F. If turbidity exceeds limits allowed by jurisdictional permitting agency(ies), stop all activities, install additional erosion and sedimentation control.

G. Construct temporary culverts, barricades and other protective measures to prevent damage to property or injury to any person or persons.

H. Flooding of streets, roadways, driveways, or private property will not be permitted.

I. Engines driving dewatering pumps shall be equipped with residential type mufflers.

END OF SECTION

SECTION 02220

EXCAVATION, BACKFILLING, AND COMPACTION

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work: The work included under this Section consists of dewatering, excavating, trenching, sheeting/shoring, grading, backfilling, and compacting those soil materials required for the construction of the structures, piping, ditches, utility structures and appurtenances as shown on the Drawings and specified herein.

B. Definitions:

1. Maximum Density: Maximum weight in pounds per cubic foot of a specific material.

2. Optimum Moisture Content: The optimum moisture content shall be determined by ASTM D 1557 specified to determine the maximum dry density for relative compaction. Field moisture content shall be determined on the basis of the fraction passing the 3/4-inch sieve.

3. Rock Excavation: Excavation of any hard natural substance which requires the use of special impact tools such as jack hammers, sledges, chisels or similar devices specifically designed for use in cutting or breaking rock, but exclusive of trench excavating machinery.

4. Suitable: Suitable materials for fills shall be classified as A-1, A-3 or A-24 in accordance with AASHTO Designation M-145 and shall be free from vegetation, organic material, marl, silt or muck. Not more than 10 percent (10%) by weight of fill material shall pass the No. 200 Sieve. The Contractor shall furnish all additional fill material required.

5. Unsuitable: Unsuitable materials are classified as A-2-5, A-2-6, A-2-7, A4, A-5, A-6, A-7, and A-B in accordance with AASHTO Designation M145.

C. Plan for Earthwork:

1. The Contractor shall be responsible for having determined to his satisfaction, prior to the submission of his bid, the conformation of the ground, the character and quality of the substrata, the types and quantities of materials to be encountered, the nature of the groundwater conditions, the prosecution of the work, the general and local conditions and all other matters which can in any way affect the work under this Contract according to the General Conditions.

D. Trench Safety Act: The Contractor shall comply with all of the requirements of the Florida Trench Safety Act (Chapter 90-96, CS/CB 2626, laws of Florida). The Contractor shall acknowledge that included in various items of his bid proposal and in the total bid price are costs for complying with the provisions of the Act. Failure to comply with the provisions of the Act shall result in a per item penalty of $1,000 per day that the work is out of compliance.

1.02 APPLICABLE PUBLICATIONS

A. All publications and standard specifications referred to herein are the latest or current issue of that publication or specification as of the specification date.

1.03 QUALITY ASSURANCE

A. A soil compaction test shall be performed at every 300-feet of pipework at each 12-inch lift of compaction. A soil compaction test shall also be performed around structures for a minimum of every 12” lift, max 100 SF of fill placed.

1.04 TESTING

A. Determination of laboratory moisture-density relationship and maximum density shall be by the Modified Proctor Method of ASTM D-1557. At least one (1) test per soil type shall be made.

B. Compaction shall be deemed to comply with the Specifications when no tests fall below the specified relative compaction (98%). The Contractor shall pay the costs of any retesting of work not conforming to the Specifications.

C. Relative compaction is defined as the ratio, expressed as a percentage, of the in-place density to the laboratory maximum density.

D. Density tests will be made for determination of specified compaction by an independent testing laboratory provided by the Contractor as approved by the Engineer. Tests will be made in locations reviewed and approved by the Engineer. If any tests are unsatisfactory, re-excavate and recompact the fill or backfill until the specified compaction is obtained. Additional compaction tests will be taken to each side of an unsatisfactory test at locations approved by the Engineer to determine the extent of re-excavation and recompaction necessary.

1.05 FEDERAL AND STATE REGULATORY REQUIREMENTS

A. All trench excavations which exceed 4 feet in depth shall comply with the applicable trench safety standards as stated in the OSHA excavation safety standards 29 CFR S. 1926.650 Subpart P as regulated and administered by the Florida Department of Labor and Employment Security as the "Florida Trench Safety Act."

1.06 JOB CONDITIONS

A. If, in the opinion of the Engineer, conditions encountered during construction warrant a change in the footing elevation, or in the depth of removal of unsuitable material from that indicated in the soils report, an adjustment will be made in the contract price, as provided in the General and Special Conditions.

1.07 SUBMITTALS

A. Submit to the Engineer for review the proposed methods of construction, including dewatering, excavation, bedding, filling, compaction and backfilling for the various portions of the work. Review shall be for method only. The Contractor shall remain responsible for the adequacy and safety of the methods.

PART 2 - PRODUCTS

2.01 MATERIALS

A. General:

1. All fill material from on and off-site sources shall be subject to the approval of the Engineer.

2. All fill material shall be unfrozen and free of organic material, trash, or other objectionable material. Excess or unsuitable material as designated by the Engineer shall be removed from the job site by the Contractor.

B. Common Fill Material:

1. Common fill shall be sand not containing stones, rock, concrete or other rubble larger than 2 inches in diameter. It shall have physical properties which allow it to be easily spread and compacted.

2. The Contractor shall utilize as much excavated material as possible for reuse in accordance with the contract drawings and specifications or as directed by the Engineer.

3. The Engineer shall direct the Contractor on the type of material allowed in certain sections of the earthwork operations.

C. Structural Fill: Structural fill shall be well graded sand to gravelly sand having the following gradation:

U.S. Sieve Size	Percent Passing By Weight
1 - inch	100
No. 4	75-100
No. 40	15-80
No. 100	0-30
No. 200	0-10

D. Class I Soils[1]: Manufactured angular, granular material, 1/4 to 1-1/2 inches (6 to 40 mm) in size, including materials having significance such as crushed stone or rock, broken coral, crushed slag, cinders, or crushed shells. Sieve analysis for crushed stone is given below separately.

1. Crushed Stone: Crushed stone shall consist of clean mineral aggregate free from clay, loam or organic matter, conforming with ASTM C33 stone size No. 89 and with particle size limits as follows:

U.S. Sieve Size	Percent Passing By Weight
1/2	100
3/8	90-100
No. 4	20-55
No. 8	5-30
No. 16	0-10
No. 50	0-5

E. Class II Soils[2]:

1. GW: Well-graded gravels and gravel-sand mixtures, little or no fines. Fifty (50) percent or more retained on No. 4 sieve. More than 95 percent retained on No. 200 sieve. Clean.

2. GP: Poorly graded gravels and gravel-sand mixtures, little or no fines. Fifty (50) percent or more retained on No. 4 sieve. More than 95 percent retained on No. 200 sieve. Clean.

3. SW: Well-graded sands and gravelly sands, little or no fines. More than fifty (50) percent passes No. 4 sieve. More than 95 percent retained on No. 200 sieve. Clean.

---

1 Soils defined as Class I soils are not defined in ASTM D2487.

2 In accordance with ASTM D2487, less than 5 percent pass No. 200 sieve.

4. SP: Poorly graded sands and gravelly sands, little or no fines. More than fifty (50) percent passes No. 4 sieve. More than 95 percent retained on No. 200 sieve. Clean.

F. Coarse Sand: Sand shall consist of clean mineral aggregate with particle size limits as follows:

U.S. Sieve Size	Percent Passing By Weight
No. 10	100
No. 20	0-30
No. 40	0-5

G. Other Material: All other material, not specifically described, but required for proper completion of the work shall be selected by the Contractor and approved by the Engineer.

PART 3 - EXECUTION

3.01 PREPARATION

A. Clearing and Grubbing:

1. Strip and dispose of topsoil off-site, unless otherwise directed to stockpile the material by the Engineer.

2. Clear the site of all shrubs, brush, vegetation growth, and relocate all shrubbery marked for relocation on the drawings.

3.02 PROTECTION

A. Sheeting and Bracing:

1. Furnish, put in place, and maintain sheeting and bracing as required to support the sides of excavations, to prevent movement which could in any way diminish the width of the excavation below that necessary for proper construction, and to protect adjacent structures, and to protect workers from hazardous conditions or other damage. Such support shall consist of braced steel sheet piling, braced wood lagging and soldier beams or other approved methods. If the Owner is of the opinion that sufficient or proper supports have not been provided, he may order additional supports be installed at the expense of the Contractor, and compliance with such order shall not relieve or release the Contractor from his responsibility for the sufficiency of such supports. Care shall be taken to prevent voids beside the sheeting, but if voids are formed, they shall be immediately filled and compacted. Where soil cannot be properly compacted to fill a void, lean concrete shall be used as backfill at no additional expense to the Owner.

2. The Contractor shall construct sheeting outside the neat lines of the foundation unless deemed otherwise for his method of operation. Sheeting shall be plumb and securely braced and tied in position. Sheeting and bracing shall withstand all pressure to which the structure or trench will be subjected. Any deformation shall be corrected by the Contractor at his own expense so as to provide the necessary clearances and dimensions.

3. Where sheeting and bracing is required to support the sides of excavations for structures, the Contractor shall engage a Professional Geotechnical Engineer, registered in the State of Florida, to design the sheeting and bracing. The sheeting and bracing installed shall conform to the design, and certification of this shall be provided by the Professional Structural Engineer.

4. The installation of sheeting, particularly by driving or vibrating, may cause distress to existing structures. The Contractor shall evaluate the potential for such distress and, if necessary, take all precautions to prevent distress of existing structures because of sheeting installation.

5. The Contractor shall leave in place to be embedded in the backfill, all sheeting and bracing not shown on the Drawings but which the Owner directs him in writing to leave in place at any time during the progress of the work for the purpose of preventing injury to structures, utilities, or property, whether public or private. The Owner may direct that timber used for sheeting and bracing be cut off at any specified elevation.

6. All sheeting and bracing not left in place shall be carefully removed in such manner as not to endanger the construction, or other structures, utilities, or property. All voids left or caused by withdrawal of sheeting shall be immediately refilled with sand by ramming with tools especially adapted for that purpose, or otherwise directed by the Owner.

7. The right of the Owner to order sheeting and bracing left in place shall not be construed as creating any obligation on his part to issue such orders, and his failure to exercise his right to do so shall not relieve the Contractor from liability for damages to persons or property occurring from or upon the work occasioned by negligence or otherwise, growing out of a failure on the part of the Contractor to leave in place sufficient sheeting and bracing to prevent any caving or moving of the ground.

8. No wood sheeting is to be withdrawn if driven below mid-diameter of any pipe, and under no circumstances shall any wood sheeting be cut off at a level lower than 1 foot above the top of any pipe.

B. Pumping and Drainage:

1. The Contractor shall at all times during construction provide and maintain proper equipment and facilities to remove all water entering excavations, and

shall keep such excavations dry so as to obtain a satisfactory undisturbed subgrade foundation condition until the fills, structures or pipes to be built thereon have been completed to such extent that they will not be floated or otherwise damaged by allowing water levels to return to natural levels.

3.03 EXCAVATION

A. Excavating for Structures and Utilities:

1. Excavation work shall be performed in a safe and proper manner with appropriate precautions being taken against all hazards. Excavations shall provide adequate working space and clearances for the work to be performed therein and for installation and removal of concrete forms. In no case shall excavation faces be undercut for extended footings.

2. Excavation shall be made to such dimensions as will give suitable room for bracing and supporting, for pumping and draining, for installing the pipelines, and for all other work required.

    a. Excavation for precast or prefabricated structures shall be carried to an elevation two (2) feet lower than the proposed outside bottom of the structure to provide space for the backfill material.

    b. Excavation for structures constructed or cast-in-place in dewatered or dry excavations shall be carried down to the 2-feet below the bottom of the structure where dewatering methods are such that a dry evacuation bottom is exposed and the naturally occurring material at this elevation leveled and left ready to receive construction. Material disturbed below the founding elevation in dewatered excavations shall be replaced with Class B concrete.

3. Immediately document the location, elevation, size, material type and function of all new subsurface installations, and utilities encountered during the course of construction.

4. Excavation equipment operators and other concerned parties shall be familiar with subsurface obstructions as shown on the Drawings and should anticipate the encounter of unknown obstructions during the course of the work.

5. Encounters with subsurface obstructions shall be hand excavated.

6. Excavation and dewatering shall be accomplished by methods which preserve the undisturbed state of subgrade soils. Subgrade soils which become soft, loose, "quick" or otherwise unsatisfactory for support of structures as a result of inadequate dewatering or other construction methods, shall be removed and replaced by crushed stone as required by the Engineer at the Contractor's expense.

7. The bottom of excavations shall be rendered firm and dry before placing any structure or pipe. Excavated material not suitable for backfill shall be removed from the site and disposed of by the Contractor in a legal manner. The bedding schedule for pipes shall be as shown in Table 02220B.

8. Excavated material shall be stockpiled in such a manner as to prevent nuisance conditions. Surface drainage shall not be hindered.

9. All structure and pipe locations and elevations as required herein must be permanently documented by the Contractor, on the Record Drawings prior to the Engineer's approval of the Application for Payment for that work.

3.04 DRAINAGE

A. The Contractor shall at all times during construction provide and maintain proper equipment and facilities to remove promptly and dispose of properly all water entering excavations, and keep such excavations dry so as to obtain a satisfactory undisturbed subgrade foundation condition.

B. Trenches across roadways, driveways, walks, or other trafficways adjacent to drainage ditches or water courses shall not be backfilled prior to completion of backfilling the trench on the upstream side of the trafficway to prevent impounding water after the pipe has been laid. Bridges and other temporary structures required to maintain traffic across such unfilled trenches shall be constructed and maintained by the Contractor. Backfilling shall be done so that water will not accumulate in unfilled or partially filled trenches. All material deposited in roadway ditches or other water courses crossed by the line of trench shall be removed immediately after backfilling is completed and the original sections, grades, and contours of ditches or water courses shall be restored. Surface drainage shall not be obstructed longer than necessary.

3.05 UNDERCUT

A. If the bottom of any excavation is below that shown on the Drawings or specified because of Contractor error, convenience, or unsuitable subgrade due the Contractor's excavation methods, he shall refill to normal grade with fill at his own cost. Fill material and compaction method shall be as directed by the Engineer.

3.06 STABILIZATION

A. Subgrades for concrete structures and trench bottoms shall be firm dense, and thoroughly compacted and consolidated; shall be free from mud and muck; and shall be sufficiently stable to remain firm and intact.

B. Subgrades for concrete structures or trench bottoms which are otherwise solid, but which becomes mucky on top due to construction operations, shall be reinforced with one or more layers of crushed rock or gravel.

Not more than 1/2 inch depth of mud or muck shall be allowed to remain on stabilized trench bottoms when the pipe bedding material is placed thereon. The finished elevation of stabilized subgrades for concrete structures shall not be above subgrade elevations shown on the Drawings.

C. All stabilization work shall be performed by and at the expense of the Contractor.

3.07 FILL AND COMPACTION

A. Materials:

1. To the maximum extent available, excess earth obtained from structure and trench excavation shall be used for the construction of fills and embankments.

2. Materials used as backfill shall be free from rocks or stones larger than 2 inches in their greatest dimension; brush, stumps, logs, roots, debris, and organic or other deleterious materials; and must be acceptable to the Engineer.

3. Backfilling and construction of fills and embankments during freezing weather shall not be done except by permission of the Engineer. No backfill, fill, or embankment materials shall be installed on frozen surfaces, nor shall frozen materials be in any backfill, fill or embankment.

B. Placement and Compaction:

1. Backfill materials shall be placed in approximately horizontal layers as shown on Table 02220-A. Material deposited in piles or windrows by excavating and hauling equipment shall be spread and leveled before compaction.

2. Each layer of material being compacted shall have the best practicable uniform moisture content to ensure satisfactory compaction. The Contractor will be required to add water and harrow, disc, blade, or otherwise work the material in each layer to ensure uniform moisture content and adequate compaction. Each layer shall be thoroughly compacted by rolling or other method acceptable to the Engineer to 98 percent of relative density at optimum moisture content as determined by Modified Proctor Method, ASTM D1557, (latest).

3. Whenever a trench passes through a backfill or embankment, material shall be placed and compacted to an elevation 12 inches above the top of the pipe before the trench is excavated.

C. Compact and backfill excavations and construct embankments for structures according to the schedule listed in Table 02220-A. Backfill schedule for pipes is listed in Table 02220-B. (Modified Proctor shall be ASTM D-1557, latest):

D. Pipe shall be laid in open trenches unless otherwise indicated on the Drawings or elsewhere in the Contract Documents. Pipeline trenches shall be compacted from the bottom of the trench to the grade in 8-inch layers to a density of not less than 98-percent of modified Proctor Dry Density as determined by ASTM D1557 (latest).

E. Excavations shall be backfilled to the original grade or as indicated on the Drawings. Deviation from this grade because of settling shall be corrected. Backfill operation shall be performed to comply with all rules and regulations and in such a manner that it does not create a nuisance or safety hazard and vertical sidewalls are obtained at least from an elevation one foot above the top of the installed pipe to the bottom of the trench, and that trench alignment is such that pipe when accurately laid to specified alignment will be centered in the trench with adequate clearance between the pipe and sidewalls of the trench. Undercutting the trench sidewall to obtain clearance will not be permitted.

F. Pavement Cutting:

1. Cuts in concrete pavement, asphalt pavement, and asphalt base pavements shall be no larger than necessary to provide adequate working space for proper installation of pipe and appurtenances. Cutting shall be started with an asphalt or concrete saw in a manner which will provide a clean groove for the full depth of pavement along each side of the trench and along the perimeter of cuts for structures.

2. Asphalt pavement and asphalt base pavement over trenches excavated for pipelines shall be removed so that a shoulder not less than 6 inches in width at any point is left between the cut edge of the pavement and the top edge of the trench. Trench width at the bottom shall not be greater than at the top and no undercutting will be permitted. Pavement cuts shall be made to and between straight or accurately marked curved lines which, unless otherwise required, shall be parallel to the centerline of the trench.

3. Pavement removed for connections to existing lines or structures shall not be greater than necessary for the installation as determined by the Engineer.

G. Artificial Foundations in Trenches: Whenever so ordered by the Engineer, the Contractor shall excavate to such depth below grade as the Engineer may direct and the trench bottom shall be brought to grade with such material as the Engineer may order installed. All piling, concrete, or other foundations made necessary by unstable soil shall be installed as directed by the Engineer. Compensation for extra excavation and piling, concrete, or other foundations, except where provided by contract unit prices, shall be made in accordance with the contract provisions for extra work.

H. Bell Holes: Bell holes shall provide adequate clearance for tools and methods used in installing pipe. No part of any bell or coupling shall be in contact with the trench bottom, trench walls, or granular embedment when the pipe is jointed.

3.09 EXCESS EXCAVATED MATERIALS

A. Insofar as needed, suitable excavated materials shall be used in fills and embankments shown on the Drawings. All suitable excess excavated material shall be placed at an on-site stockpile area as directed by the Owner.

B. The Contractor shall segregate different types of excavated materials (i.e. sands, clayey sands) as possible in the stockpile area. All unsuitable materials shall be disposed of by the Contractor offsite in a legal manner.

C. The Contractor shall slope and compact the stockpile with a light roller type vehicle to maintain stability.

D. The Contractor shall maintain proper soil and erosion control measures.

3.10 SETTLEMENT

A. The Contractor shall be responsible for all settlement of backfill, fills, and embankments which may occur within the correction period stipulated in the General Conditions.

B. The Contractor shall make, or cause to be made, all repairs or replacements made necessary by settlement within 30 days after notice from the Engineer or Owner.

END OF SECTION

TABLE 02220-A

COMPACTION AND BACKFILL SCHEDULE FOR STRUCTURES

Area	Material	Compaction	
Beneath structures, foundations, slabs, and pavements (minimum 5-foot depth below concrete foundation).	Structural Fill (Para. 2.01 C)	8-inch lifts,	compacted to 98% Modified Proctor maximum dry density. Fill should not be placed over any in-place soils until those layers have been compacted to 95% Modified Proctor maximum dry density.
Around structures, foundations and slabs (minimum 5-foot spacing).	Structural Fill (para. 2.01 C)	12-inch lifts,	compacted to 98% Modified Proctor maximum dry density. Use light rubber-tired or vibratory plate compactors.
From cleared existing surface to subgrade for paved, stabilized dirt, and gravel roadway surfaces.	Common Fill (Para. 2.01 B)	12-inch lifts,	compacted to 98% Modified proctor maximum dry density.
Pipeline trenches from the bottom of the trench to the grade	See Table 02220-B	8-inch lifts,	compacted to 98% Modified Proctor maximum dry density

END OF SECTION

TABLE 02220-B
BACKFILL SCHEDULE FOR GRAVITY AND PRESSURE PIPING

				PIPE ENVELOPE				
				PRIMARY ZONE		SECONDARY ZONE		
Pipe Material	Pipe Size	Trench Condition	Bedding Material	Material	Depth[c]	Material	Depth	Others
Ductile Iron, Stainless Steel, Culvert Pipe and Prestressed Concrete Cylinder Pipe	<16"	Normal[a]	Compacted Common Fill	Coarse Sand	0.5 O.D.	Coarse Sand	0.5 O.D.+12"	
		Special[b]	Class I	Coarse Sand	0.5 O.D.	Coarse Sand	0.5 O.D.+12"	
	≥16"	Normal[a]	Class II	Common Fill	0.25 O.D.	Common Fill	--	
		Special[b]	Class I	Common Fill	0.25 O.D.	Common Fill	--	Class II Material should not have stones size >2". Organic content <1.1% by wt.
Fiberglass, PVC and Other Plastic Pipe	<16"	Normal[a]	Coarse Sand	Coarse Sand	0.7 O.D.	Coarse Sand	0.3 O.D.+12"	
		Special[b]	Class I	Coarse Sand	0.7 O.D.	Coarse Sand	0.3 O.D.+12"	
	≥16"	Normal[a]	Class II	Class II	0.7 O.D.	Class II	0.3 O.D.+12"	
		Special[b]	Class I	Class II	0.7 O.D.	Class II	0.3 O.D.+12"	
R.C.P.	<48"	Normal[a]	Class II	Class II	0.5 O.D.	Common Fill	0.5 O.D.+12"	
and		Special[b]	Class I	Class II	0.5 O.D.	Common Fill	0.5 O.D.+12"	
C.C.P.	≥48"	Normal[a]	Class II	Class II	0.25 O.D.	Common Fill w/max. stone size ≤2	0.75 O.D.+12"	
		Special[b]	Class I	Class II	0.25 O.D.		0.75 O.D.+12"	

TABLE 02220-B (Continued)
BACKFILL SCHEDULE FOR GRAVITY AND PRESSURE PIPING

Pipe Material	Pipe Size	Trench Condition	Bedding Material	PIPE ENVELOPE: PRIMARY ZONE Material	PIPE ENVELOPE: PRIMARY ZONE Depth[c]	PIPE ENVELOPE: SECONDARY ZONE Material	PIPE ENVELOPE: SECONDARY ZONE Depth	Others
Pipe laid in rock (min. trench requirements) except for fiberglass and PVC pipe		Rock	Class I	Class II	0.5 O.D.	Common Fill with max. stone size ≤2"	0.5 O.D.+12"	
Gravity pipe (not specified above)		Normal	Coarse Sand	Coarse Sand	0.5 O.D.	Common Fill	0.50 O.D.+12"	
Pressure pipe (not specified above)		Normal	Suitable Undisturbed Earth or Compacted Common Fill	Common Fill with max. stone size ≤2"	0.5 O.D.	Common Fill with max. stone size ≤2"	0.50 O.D.+12"	

a Dry soils.
b Saturated soils.
c Outside Diameter of pipe = O.D.

Notes:

1. No Special bedding shall be required in case of suitable undisturbed earth type trench bottom.
2. Bedding thickness shall be 12 inches unless specified otherwise.
3. The backfill shall be compacted to 95% Modified Proctor maximum dry density and shall be placed in 6-inch lifts for pipe envelope and in 12-inch lifts from secondary zone to grade. Common fill shall be used as final backfill material.
4. It is intended that additional excavation be conducted to remove unsuitable material below the pipe bedding level which prevents bedding compaction as required herein and replace such materials with suitable materials. Over excavation, geotextile fabric, gravel blanket, granular fill and other acceptable stabilization method shall be placed within 4 feet of the bedding level or within 10 feet of the existing ground (whichever is greater depth) at no additional cost to the Owner. Construction required beyond these limits shall be executed in accordance with the General Conditions. When indicated on the Drawings, the Contractor shall remove unsuitable material below bedding level to the limits indicated and replace with coarse sand or other acceptable stabilization method up to the bedding level without any additional cost to the Owner.

SECTION 02516

COLLECTION SYSTEM BYPASS

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. The Work covered by this section consists of providing all temporary bypassing to perform all operations in connection with the flow of wastewater around pipe segment(s) or pump stations. The purpose of bypassing is to prevent wastewater overflows and provide continuous service to all wastewater customers. The Contractor will maintain wastewater flow in the construction area in order to prevent backup and/or overflow and provide reliable wastewater service to the users of the wastewater system at all times.

1.02 SUBMITTALS

A. Prior to implementation of any bypass, the Contractor will submit and receive Owner acceptance of a bypass plan. The Contractor will submit to the Owner a comprehensive written plan for approval and acceptance that describes the intended bypass for the maintenance of flows during construction. The Contractor will also provide a sketch showing the location of bypass pumping equipment for each pump station or line segment(s) around which flows are being bypassed. The plan will include proposed tanker(s), pump(s), bypass piping, sound attenuation equipment, backup plan and equipment, work schedule, monitoring log for bypass pumping, monitoring plan of the bypass pumping operation, and maintenance of traffic plan.

PART 2 - PRODUCTS

2.01 GENERAL

A. The Contractor will provide and maintain adequate equipment, piping, tankers, and other necessary appurtenances in order to maintain continuous and reliable wastewater service in all wastewater lines as required for construction. The Contractor will have tankers, backup pump(s), piping, and appurtenances ready to deploy immediately.

B. All piping will be designed to withstand at least twice the maximum system pressure or a minimum of 50-psi, whichever is greater.

C. When bypassing a pump station, one (1) back-up pump equal to the primary unit will be provided by the Contractor. Bypass pumps shall have a maximum rating of 55 decibels for sound attenuation.

PART 3 - EXECUTION

3.01 GENERAL

A. The Contractor shall have all materials, equipment and labor necessary to complete the repair, replacement, or rehabilitation on the job site prior to isolating the gravity main segment, manhole, or pump station. The Contractor will demonstrate that the temporary bypass pumping system is in good working order and is sufficiently sized to successfully handle flows by performing a test run for a period of 24-hours prior to beginning the Work.

3.02 TRAFFIC CONSIDERATIONS

A. The Contractor shall locate bypass pumping suction and discharge lines so as to not cause undue interference with the use of streets, private driveways, and alleys, to include the possible temporary trenching of piping at critical intersections. Additional traffic maintenance requirements are to follow the regulatory agencies requirements for the owner having jurisdiction over the Right-of-Way limits.

3.03 BYPASS OPERATION

A. The Contractor shall submit a bypass plan to the Owner and the bypass plan must be approved before the bypass is operational to perform the Work. Contractor shall maintain the wastewater system flow and no surcharging will be allowed to occur out of the system.

B. Where Work requires the main or pump station to be taken out service after normal working hours and bypass pumping is being used; the Contractor shall be responsible for monitoring the bypass operation 24-hours per day, 7-days per week. Any electronic monitoring in lieu of on-site monitoring must be detailed in the comprehensive written bypass plan and approved by the Owner.

C. The Contractor shall ensure that no damage will be caused to private property as a result of bypass pumping operations. The Contractor will complete the Work as quickly as possible and pass all tests and inspections before discontinuing bypassing operations and returning flow to the wastewater manhole, main, or pump station.

D. During bypassing, no wastewater will be leaked, dumped, or spilled in or onto, any area outside of the existing wastewater system.

E. The Contractor shall immediately notify the Owner should a sanitary sewer overflow (SSO) occur. The Contractor shall take the necessary action to wash down, clean up and disinfect the spillage area to the satisfaction of the Owner and all governmental agencies having jurisdiction over the SSO.

F. The Contractor shall cease bypass operations and return flows to the new and/or existing sewer when directed by the Owner. When bypass operations are complete, all bypass piping shall be drained into the wastewater system prior to disassembly.

3.04 CONTRACTOR LIABILITY

A. The Contractor shall be responsible for all required pumping, equipment, piping, sound attenuation and appurtenances to accomplish the bypass and for any and all damage that results directly or indirectly from the bypass pumping equipment, piping and/or appurtenances. The Contractor shall also be liable for all Owner personnel labor and equipment costs, penalties and fines resulting from SSOs. It is the intent of these specifications to require the Contractor to establish adequate bypass pumping as required regardless of the flow condition.

END OF SECTION

SECTION 02574

PAVEMENT/OTHER REMOVAL AND REPLACEMENTS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work: Work included under this Section consists of cutting, removing, protecting and replacing existing pavements, driveways, sidewalks, curb and combination curb and gutter of the various types encountered. This section also includes driveway or other specialty materials such as pavers, stamped or colored concrete, etc., within the work limits to be restored to equal or better condition.

B. Protection of Existing Improvements: The Contractor shall be responsible for the protection of all pavements, sidewalks and other improvements within the work area. All damage to such improvements, as a result of the Contractor's operations, beyond the limits of the work of pavement replacement as described herein, shall be repaired by the Contractor at his expense.

C. Related Work Described Elsewhere:

1. Excavating, Backfilling and Compaction: Section 02220.

1.02 DEFINITIONS

A. Surface Cap: A ½-inch thick crust of sprayed asphalt over the backfilled open cut area with sand spread over the sprayed surface.

B. Surface Patch: A temporary asphalt surface with a minimum 1-inch of thickness as specified in Paragraph 3.01.A.1.d.

C. Complete Replacement/Overlay: A complete resurfacing of the entire area of work as required by the contract drawings. Minimum depth of replacement/overlay shall match the existing roadway as provided in Appendix E – “Geotechnical Report” or 1 ½ -inches thick, whichever is greater.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Materials, including stabilized subgrade, base, bituminous prime and tack coat, and asphaltic concrete for the above work shall meet the requirements established herein.

1. Stabilized subgrade shall conform to Section 160 of the Florida Department of Transportation (FDOT) Standard Specification of Road and Bridge Construction (latest edition).

2. Base material shall be limerock conforming to Section 200 of the FDOT Standard Specification of Road and Bridge Construction (latest edition).

3. Bituminous prime and tack coat materials shall conform to Section 300 of the FDOT Standard Specification of Road and Bridge Construction (latest edition).

4. Asphalt concrete shall be Type SP 9.5 or 12.5 depending on thickness required or to match existing and conform to Section 333 of the FDOT Standard Specification of Road and Bridge Construction (latest edition).

5. Portland cement concrete shall conform to Section 350 of the FDOT Standard Specification of Road and Bridge Construction (latest edition).

PART 3 - EXECUTION

3.01 PERFORMANCE

A. Removals:

1. Pavement Removal:

a. Where existing pavement is to be removed, the surfacing shall be mechanical saw cut prior to trench excavation, leaving a uniform and straight edge, with minimum disturbance to the remaining adjacent surfacing. The width of cut for this phase of existing pavement removal shall be minimized.

b. Immediately following the specified backfilling and compaction, a temporary sand seal coat surface or temporary asphalt surface shall be applied to the cut areas. This temporary surfacing shall provide a smooth traffic surface with the existing roadway and shall be maintained until final restoration. Said surfacing shall remain for 10 days in order to assure the stability of the backfill under normal traffic conditions. Following this period and prior to 15 days after application, the temporary surfacing shall be removed and final roadway surface restoration accomplished.

c. In advance of final restoration, the temporary surfacing shall be removed and the existing pavement mechanically sawed straight and clean to the dimensions specified in the drawings. Following the above operation, the Contractor shall proceed immediately with final pavement restoration in accordance with these requirements.

2. Sidewalk, Driveway & Curb Removal:

a. Concrete sidewalks, curbs, combination curb and gutter, walks, drive ribbons, or driveways shall be removed by initially sawing the structure, with a suitable power saw, as specified above for pavement. The removal line shall be extended to the next joint, each way. After sawing, the material shall be removed. Temporary paths of travel shall be provided to maintain pedestrian traffic. Particular attention should be given to providing accessible routes to the disabled. Sidewalks shall meet ADA requirements.

b. All open-cut driveways are to be restored within 24-hours with an all-weather asphaltic paver to permit temporary property access until final restoration is completed. Driveways shall meet their respective jurisdictional requirements.

B. Restorations:

1. All existing grades and features are to be matched unless jurisdictional requirements dictate otherwise to meet local, State or Federal codes and compliance. Contractor is to perform surveying for driveway tie-ins and other features as needed to ensure that existing grades all existing features are matched with all restoration efforts.

2. General: Street or roadway pavement cut and removed in connection with trench excavation shall be replaced or restored in equal or better condition than the original and as shown on the Drawings. Street or roadway pavement restoration shall begin immediately upon completion of backfill and compaction or curing of flowable backfill. The Drawings indicate minimum requirements and at a minimum existing asphalt thickness as shown in Appendix E – "Geotechnical Report" shall be matched.

3. Asphalt Pavement Restoration: Restoration of existing pavement shall be in accordance with the provisions of Section 333 of the FDOT Standard Specifications for Road and Bridge Construction (latest edition). All pavement replaced shall meet the requirements of the jurisdiction for which the roadway is located and FDOT with pavement thicknesses matched in kind.

4. Asphalt Driveway Restoration: Driveway pavement with base cut and removed in connection with trench excavation shall be replaced or restored as specified above for street or roadway pavement, except the new base course shall equal the existing base course in thickness, except that in no case shall new driveway base course be less than 8 inches in thickness and the asphaltic concrete shall be Type 12.5, 3 inches thick. Muck or unsuitable material found under existing driveway construction will not be removed and replaced.

5. Specialty Driveway Restoration: Specialty driveway materials shall be replaced or restored in kind with specialty materials such as pavers, stamped or colored concrete, decorative concrete, etc., within the work limits. All restoration is to be to equal or better condition. Impacted work limits may require the entire driveway to be restored for consistency of new materials.

6. Concrete, Sidewalk, Walkway, Driveway Ribbon and Curb Restoration:

   a. Concrete sidewalks, walkways, driveways, driveway ribbons and curbs required to be removed for the installation of facilities under this Contract shall be restored. Class B concrete shall be used in all cases.

   b. Replaced portions of these items shall conform to the lines, grades, and cross sections of the removed portions. Concrete sidewalks and walkways subject to vehicular traffic shall be of 6-inch thickness; concrete sidewalks and walkways not subject to vehicular traffic shall be of 4-inch thickness; concrete driveways and driveway ribbons shall be 6-inch thickness. Replaced concrete curb and/or gutter shall extend the next control joint, each way. All curb replaced shall meet the requirements of the jurisdiction for which the roadway is located and FDOT. All sidewalk and driveway replaced shall meet the requirements of the Americans with Disabilities Act (ADA), City of Kissimmee, Osceola County, Polk County and FDOT.

7. Concrete Pavement Restoration: Rigid pavement shall be replaced in kind with Class B concrete, using high early strength cement. The base course for rigid pavement shall be replaced in kind and compacted to a thickness to match the existing base.

8. Asphaltic Concrete Surface course Overlay:

   a. The work under this section includes asphaltic concrete surface course overlay paving as and where directed by the Engineer. Where this paving is directed it shall take the place of asphaltic concrete pavement restoration as specified herein above. This surface course overlay shall extend over the reconstructed base course and the existing pavement to the limits directed by the Engineer, which generally shall be the full width of the roadway.

   b. After the base course construction in the trench area has been completed and primed, the asphalt pavement surface shall be tack coated and a 1-1/2 inch compacted thickness of Type S-III asphaltic concrete shall be constructed in accordance with the requirements specified above for pavement restoration.

9. Brick Road Restoration:

a. All brick road restoration shall be in accordance with FDOT standard specification 526, or the agency having jurisdictional control over the right-of way limits.

END OF SECTION

SECTION 02761

CLEANING SANITARY SEWER SYSTEMS

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. The Work covered in this section consists of cleaning sewer lines and manholes prior to the internal television inspection(s) for new or existing wastewater systems.

B. Gravity Main and Sewer Lateral Cleaning: The intent of gravity main cleaning is to remove all debris and all obstructions that may be causing a reduction in flow capacity, potential sewer backups, or that limits the ability to evaluate the structural condition of the pipe segment. On all sewers, the Contractor shall perform sewer-cleaning work to an acceptable level as necessary to perform a thorough television inspection of the sewer. An acceptable level is defined as the removal of all debris all obstructions throughout the pipe segment cleaned. Cleaning may require multiple passes and various nozzles and/or mechanical equipment. If the pipe condition is such that cleaning may cause a potential collapse, then the pipe shall be televised without attempting to clean it pending approval by the Owner.

C. Water for Cleaning: The Contractor will be responsible for obtaining a transient water meter and paying for water used during course of cleaning.

D. Recovering of Equipment: The Contractor will be responsible for recovering any equipment that becomes lodged or lost in the pipeline. The Contractor will be responsible for all costs associated with required evacuation, restoration of roads and easements, and repairs to pipes and manholes as needed to restore the pipeline and appurtenances back to their original conditions.

1.02 CLEANING EQUIPMENT

A. Hydraulically Propelled Equipment: The equipment used shall be of a movable dam type and be constructed in such a way that a portion of the dam may be collapsed at any time during the cleaning operation to protect against flooding of the sewer. The movable dam shall be equal in diameter to the pipe being cleaned and shall provide a flexible scraper around the outer periphery for grease removal. Special precautions to prevent flooding of the sewers and public or private property shall be taken at all times.

B. High-Velocity Jet (Hydro-Cleaning) Equipment: All high-velocity sanitary sewer cleaning equipment shall be constructed for ease and safety of operation. The equipment shall have a selection of 2 or more high-velocity nozzles. The nozzles shall be capable of producing a scouring action from 15° to 45° (degrees) in all size mains. Equipment shall also include a high-velocity gun for washing and scouring manhole walls and floor. The

gun shall be capable of producing flows from a fine spray to a solid stream. The equipment shall carry its own water tanks, auxiliary engines, pumps, and hydraulically driven hose reel.

C. Mechanically Powered Equipment: Bucket machines shall be in pairs with sufficient power to perform the Work in an efficient manner. Machines shall be belt operated or have an overload device. Machines with direct drive that could cause damage to the pipe will not be used. A power rodding machine shall be either a sectional or continuous rod type capable of holding a minimum of 750-feet of rod. The rod shall be heat-treated steel. To ensure safe operation, the machine shall be fully enclosed and have an automatic safety clutch or relief valve.

D. Vacuum machines may be used for removal of materials from manholes when other cleaning equipment is used to dislodge and transport material to the access point.

E. Combination Cleaner: For cleaning small and large diameter sewer, the Contractor may use a combination hydraulic high volume water and solids separation system. Water volume of up to 250-gpm at or above 2,000-psi will move solids to the downstream manhole in high flow conditions. The separation system will dewater solids to 95 % (passing a paint filter test) and transfer them to a dump truck, if needed, for transport to a water reclamation facility, approved landfill, or other location specified by the Owner or designee. Wash water will be filtered to a point where it can be used in the pump for continuous cleaning. No bypassing of sewer flows will be necessary. The unit shall be capable of 24-hour operation and the unit shall not leave the manhole until a section is fully cleaned.

1.03 SHOP DRAWINGS AND SUBMITTALS

A. Submittals shall be submitted to the Owner for review and acceptance prior to construction in accordance with the General Conditions and specifications Section 01340.

B. A daily log shall be maintained to record the location of the manholes and sewer lines, lengths of the lines cleaned, method of cleaning, line sizes, identify type of cleaning and number of passes and types of debris moved. Observations are to be recorded on a cleaning report form.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 GENERAL

A. All material supplied shall be one of the products specified in Appendix A as appended to these specifications.

B. The equipment shall remove dirt, grease, rocks, sand, roots, concrete, all debris and obstructions, including any other materials from the sewer mains, laterals, and manholes.

C. A high-velocity sewer cleaner will be used for the majority of the cleaning work. Other equipment, such as bucket machines, rod machines, hydraulic root cutters, vacuum trucks and balling equipment shall be available and shall be used to ensure that the mains are properly cleaned.

3.02 CLEANING PRECAUTIONS

A. All necessary precautions shall be taken to protect the sewer from damage during all cleaning and preparation operations. Precautions shall also be taken to ensure that no damage is caused to public or private property adjacent to or served by the sewer or its branches. The Contractor shall pay for and restore, at no additional costs to the Owner, any damage caused to public or private property because of such cleaning and preparation operations.

B. Satisfactory precautions shall be taken in the use of cleaning equipment. When hydraulically propelled cleaning tools (which depend upon water pressure to provide their cleaning force) or tools which retard the flow in the sewer line are used, precautions shall be taken to ensure that the water pressure created does not damage or cause flooding of public or private property being served by the sewer. No fire hydrant shall be obstructed in case of a fire in the area served by the hydrant. All requirements shall be met when accessing a fire hydrant including but not limited to meters, backflow preventers, and properly trained personnel. It shall be the Contractor's responsibility to meet all state and local requirements.

3.03 CLEANING

A. If cleaning of an entire sewer section cannot be successfully performed from one manhole, the equipment shall be set up on the other manhole and cleaning attempted again. If results of the cleaning are favorable, the Contractor will proceed with the TV inspection. All debris, concrete, roots, sludge, dirt, sand, rocks, and all other solid or semisolid materials resulting from the cleaning operation shall be removed from the downstream manhole of the section being cleaned. The Contractor shall advise the Owner prior to removing mortar or other material that is securely attached to the pipe walls, pipe joints, or manhole inverts.

B. Materials shall be disposed of from the site at least once at the end of each workday. The Contractor will be responsible for the disposal of materials removed from the sewer system. All sewer-cleaning efforts shall require documentation of all quantities and types of materials removed during cleaning.

C. The designated sewer manhole sections shall be cleaned using hydraulically propelled, high-velocity jet, or mechanically powered equipment approved by the Owner. Cleaning shall consist of normal hydraulic jet cleaning to facilitate the internal CCTV inspection.

1. Types of cleaning of sanitary sewers:

    a. Cleaning consists of varying levels of cleaning ranging from light to heavy cleaning using various equipment, including mechanical equipment when necessary, to remove all debris and all obstructions and to provide a properly cleaned pipe which is restored to the original inside pipe diameter.

    b. Descaling of Ductile Iron pipe: Multiple passes with mechanical equipment to remove scale build up to restore pipe to original inside diameter.

2. Selection of the equipment used shall be based on the conditions of lines at the time the Work commences. The equipment and methods selected shall be satisfactory to the Owner and shall not impact the existing piping. The equipment shall be capable of removing dirt, grease, rocks, sand, roots, concrete, all debris, including all other materials, and obstructions from the sewer lines, laterals, and manholes.

3. If cleaning of an entire section cannot be successfully performed from one manhole, the equipment shall be set up on the other manhole and cleaning again attempted. The intent of preparatory cleaning is to provide sufficient cleaning to ensure camera passage and the internal conditions of the pipeline can be fully assessed.

4. If the Owner establishes that a particular section of the pipeline cannot be adequately cleaned due to broken, collapsed, or void areas, then the inspection will be attempted up to the obstruction.

3.04 ROOT REMOVAL

A. Roots shall be removed in the designated sections and manholes where root intrusion is a problem and where authorized by the Owner. Special attention should be used during the cleaning operation to remove roots from the joints. Any roots that could prevent the proper application of chemical sealants, or could prevent the proper seating and application of cured-in-place liners shall be removed. Procedures may include the use of mechanical equipment such as, rodding machines, bucket machines, winches using root cutters, porcupines, and equipment such as high-velocity jet cleaners or other equipment as necessary to properly clean the piping and to remove roots. Chemical root treatment shall be used before or following the root removal operation, depending on the manufacturer's recommendation. The Contractor shall capture and remove all roots from the line.

3.05 CHEMICAL ROOT TREATMENT

A. To aid in the removal of roots, manhole sections that have root intrusion shall be treated with an acceptable herbicide. The application of the herbicide to the roots shall be done in accordance with the manufacturer's recommendations and specifications in such a manner to preclude damage to surrounding vegetation.

Any damaged vegetation, so designated by the Owner, shall be replaced by the Contractor at no additional cost to the Owner. All safety precautions as recommended by the manufacturer shall be adhered to for handling and application of the herbicide.

3.06 ACCUMULATED GREASE

A. To aid in the removal of grease, Contractor shall apply acceptable grease releasing agents in the sewer as needed. The application of the releasing agent to the sewer shall be done in accordance with the manufacturer's recommendations and specifications in such a manner to preclude damage to surroundings.

Any damaged caused by the grease releasing agent, so designated by the Owner, shall be repaired by the Contractor at no additional cost to the Owner. All safety precautions as recommended by the manufacturer shall be adhered to for handling and application of the agent.

3.07 PROTRUDING TAP TRIMMING

A. Service laterals that protrude into the sewer main as indicated on the Contract Drawings shall be trimmed by remote device.

B. Cut protruding taps so that protrusions are no greater than ¾ inch. If a protruding tap cannot be removed by the remote cutting device, the Owner and Engineer shall be notified immediately.

3.08 MATERIAL REMOVAL AND DISPOSAL

A. All debris, concrete, roots, sludge, dirt, sand, rocks, and all other solid or semisolid materials resulting from the cleaning operation shall be removed from the downstream manhole of the section being cleaned. Contractor shall provide appropriate screening to stop passing of materials into downstream sewers. All solid or semisolid materials dislodged during cleaning operations shall be removed from the sewer by Contractor at the downstream manhole of the sewer section being cleaned. The passing of dislodged materials downstream of the sewer segment being cleaned shall not be permitted. In such an event, as observed or detected by the Owner or any third party, Contractor shall be responsible for cleaning the affected downstream sewers in their entirety, at no additional cost to the Owner.

B. These materials shall become the property of the Contractor, shall be removed from the site at the end of each workday, and shall be disposed of by the Contractor. Copies of records of all disposals shall be furnished to the Owner, indicating disposal site, date, amount, and a brief description of material disposed. Disposal manifests from the licensed disposal facility shall be submitted with invoices.

C. The Contractor shall keep his haul route and work area(s) neat, clean, and reasonably free of odor, and shall bear all responsibility for the cleanup of any spill.

3.09 ACCEPTANCE OF CLEANING OPERATION

A. Acceptance of sanitary sewer cleaning shall be made upon the successful completion of the television inspection and shall be to the satisfaction of the Owner. If television inspection shows the cleaning to be unsatisfactory, the Contractor shall be required to re-clean and re-inspect the sewer line at no additional cost until the cleaning is shown to be satisfactory.

B. In addition, on all sanitary sewers which have sags or dips, to an extent that the television camera lens becomes submerged during the television inspection, the Contractor shall use a high pressure cleaner to draw the water out of the pipe, bypass piping and pumping, or other means, to allow the full circumferential view of the pipe and identification of pipe defects, cracks, holes, and location of service connections.

END OF SECTION

SECTION 02762

TELEVISING SANITARY SEWER SYSTEMS

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. The Work covered within this Section is for the internal closed circuit television (CCTV) inspection of sanitary sewer pipes. The Contractor shall perform sewer-televising work as necessary to thoroughly document the condition of all sewers, service lateral connections, and manhole corbel, barrel and cone-sections in the study area. The sanitary sewer and service laterals shall be carefully inspected to determine alignment, grade variations, separated joints, location and extent of any deterioration, breaks, obstacles, obstructions, debris, quantities of infiltration/inflow and the locations of service connections.

B. The quality of all Work specified in this Section shall meet or exceed the requirements of the National Association of Sewer Service Companies (NASSCO) Recommended Specifications for Sewer Collection System Rehabilitation (latest edition), except as described in this Section. Applicable portions of this Section that inadvertently fall below those standards shall be corrected and maintained at the NASSCO standards as a minimum requirement, at no additional cost to the Owner.

1.02 REQUIREMENTS

A. The Contractor shall inspect the sewer interior using a color closed circuit television camera (CCTV) and document the inspection on a digital recorder. All inspection video shall be captured in either MPEG or Windows Media Video (.WMV) file format and saved portable hard drives for submittal. Each inspected main line sewer reach, referenced manhole to manhole, and each inspected sewer lateral referenced to the property address and corresponding sewer main should have an associated MPEG or WMV file. Digital photographs (.JPG files), inspection reports (.PDF files) and any handwritten inspection logs or field maps shall accompany the video inspections for each sewer reach (manhole-to-manhole) or lateral inspected.

B. Contractor shall provide inspection video, data and reports in accordance with the requirements specified herein. Contractor shall provide all video on portable hard drive as specified. All Work will conform to current NASSCO Pipeline Assessment Certification Program (PACP) coding conventions and all software used by the Contractor will be PACP compliant. An electronic database will be provided by the Contractor in a PACP exported format approved by the Owner.

C. The Contractor shall provide comments as necessary to fully describe the existing condition of the sewer on the inspection forms.

D. Contractor shall be responsible for modifications to equipment and/or inspection procedures to achieve report material of acceptable quality.

E. No Work shall commence prior to approval of the submitted material by the Owner. Once accepted, the report material shall serve as a standard for the remaining Work.

1.03 QUALITY ASSURANCE

A. Qualifications: Firms regularly engaged in the cleaning and televising of sewer systems for not less than 5 years. Firms shall submit references at the request of the OWNER.

B. Each CCTV field inspection supervisor shall be NASSCO PACP certified. Use of PACP certified technicians to review/document defects in the office (post process) is not acceptable.

C. The inspection Contractor must have an internal quality assurance/quality control program in place and all inspection data shall be subjected to the procedures prior to submittal to the Owner. The Owner will perform QA/QC audits on submitted data.

D. QA/QC shall be performed by NASSCO PACP certified personnel.

1.04 SCOPE OF WORK

A. Submittals shall be submitted to the Owner for review and acceptance prior to construction in accordance with the General Conditions and specifications Section 01340.

B. The following deliverables shall be submitted on a portable hard drive at the completion of inspection:

1. Inspection videos saved in MPEG format or Windows Media video format.

2. Electronic version (.pdf) of the pipe inspection reports.

3. PACP export pipe inspection database (.mdb).

4. Inspection digital photographs in JPEG format.

5. Map of sub area depicting area inspected, inspection status, asset identification numbers and mark ups.

6. QA/QC report.

C. The above deliverables shall be submitted monthly to the Owner for approval. Application for payment shall be made after review and approval by the Owner.

D. The sewer inspection video, report documents, and sewer inspection database shall be in accordance with Owner data standards and NASSCO PACP.

1.05 NOTIFICATION

Contractor shall notify the Owner a minimum of 72-hours prior to performing any inspection work. No payment will be made for inspections performed without proper notification.

PART 2 - PRODUCTS

2.01 EQUIPMENT

A. Closed Circuit Television Camera: The television camera used for the inspection shall be one specifically designed and constructed for sanitary sewer inspection. Lighting for the camera shall be suitable to allow a clear picture of the entire periphery of the pipe. The camera shall be operative in 100 % humidity/submerged conditions. The CCTV camera equipment will provide a view of the pipe ahead of the equipment and of features to the side of the equipment through turning and rotation of the lens. The camera shall be capable of tilting at right angles along the axis of the pipe while panning the camera lens through a full circle about the circumference of the pipe. The lights on the camera shall also be capable of panning 90° (degrees) to the axis of the pipe.

The radial view camera must be solid-state color and have remote control of the rotational lens. The camera shall be capable of viewing the complete circumference of the pipe and manhole structure, including the cone-section or corbel. Cameras incorporating mirrors for viewing sides or using exposed rotating heads are not acceptable. The camera lens shall be an auto-iris type with remote controlled manual override.

If the equipment proves to be unsatisfactory, it shall be replaced with adequate equipment. The camera unit shall have sufficient quantities of line and video cable to inspect 2 complete, consecutive sewer reaches with access approximately 750-feet apart.

The camera, television monitor, and other components of the video system shall be capable of producing picture quality to the satisfaction of the Owner. The television camera, electronic systems and monitor shall provide an image that meets the following specifications, or approved equal:

1. The gray scale shall show equal changes in brightness ranging from black to white with a minimum of five stages.

2. With the monitor control correctly adjusted, the 6-colors; Yellow, Cyan, Green, Magenta, Red, and Blue, plus black and white shall be clearly resolved with the primary colors in order of decreasing luminance. The gray scale shall appear in contrasting shades of gray with no color tint.

3. The picture shall show no convergence or divergence over the whole of the picture. The monitor shall be at least 13-inches diagonally across the picture tube.

4. The live picture on the CCTV monitor shall be capable of registering a minimum of 470 lines horizontal resolution and be a clear, stable image with no interference.

5. Lighting intensity shall be remote controlled and shall be adjusted to minimize reflective glare. Lighting and camera quality shall provide a clear in-focus picture of the entire inside periphery of the sewers and laterals for all conditions except submergence. Under ideal conditions (no fog in the sewer) the camera lighting shall allow a clear picture up to 5 pipe diameter lengths away for the entire periphery of the sewer. The lighting shall provide uniform light free from shadows or hot spots.

6. The camera light head shall include a high-intensity side viewing lighting system to allow illumination of internal sections of lateral sewer connections.

7. Camera focal distance shall be remotely adjustable through a range of 6-inches to infinity.

8. Picture quality and definition shall be to the satisfaction of the Owner.

9. The monitor and software shall also be able to capture and save screen images of typical sewer details and all defects. Screen images shall be embedded into the pipe inspection report document submitted with the inspection video.

10. The video camera shall be capable of displaying on screen data as specified in paragraph 3.08 herein.

11. Depth gage: The camera shall have a depth gage or approved method to measure deflection in the pipe and joint separation approved by the Owner.

12. The camera shall have zoom capabilities to be able to view the entire depth of a 20-foot deep manhole from the bottom during inspection.

B. Lateral Video Camera

Lateral cameras may be push type or launched from the sewer main line. Lateral cameras shall be color, shall be self-leveling, and equipped with a footage counter to provide on-screen display of footage measurement. Monitor resolution shall be as specified above in paragraph 2.01 A Close Circuit Television Camera, or approved equal.

C. Video Capture System

The video and audio recordings of the sewer inspections shall be made using digital video equipment. A video enhancer may be used in conjunction with, but not in lieu of, the required equipment. The digital recording equipment shall capture sewer inspection on

DVD disks or hard drive, with each sewer reach inspection recorded as an individual movie file (.MPEG, .MPG, or .WMV) or approved equal. The video files will be named in accordance with the Owner file naming convention contained in paragraph 3.11 herein.

1. The video file names will be referenced in the inspection database and in an inspection report generated in PDF format. The pipeline collection and real time video capture and data acquisition systems shall be provided.

2. The system shall use the most current PACP compliant application software and shall be fully object oriented or approved equal. It shall be capable of printing pipeline inspection reports with captured images of defects or other related significant visual information on a standard color printer.

3. The imaging capture system shall store digitized color picture images and be saved in digital format on a DVD, hard drive or approved equal. Also, this system shall have the capability to supply the Owner with inspection data reports for each line segment.

4. The Contractor shall have the ability to store the compressed video files in industry standard and approved Owner format and be transferable with the PACP compliant inspection database.

5. The Contractor's equipment shall have the ability to "Link". "Linking" is defined as storing the video time frame code with each observation or defect with the ability to navigate from/to any previously recorded observation or defect instantaneously.

6. The system shall be able to produce data reports to include, at a minimum, all observation points and pertinent data. All data reports shall match the defect severity codes in accordance with PACP naming conventions

7. The data-sorting program shall be capable of sorting all data stored using generic sort key and user defined sort fields.

8. Camera footage, date & manhole numbers shall be maintained in real time and shall be displayed on the video monitor as well as the video character generators illuminated footage display at the control console.

9. Digital video shall be defined as ISO-MPEG Level 1 (MPEG-1) coding having a resolution of 352 pixels (x) by 240 pixels (y) (minimum) and an encoded frame rate of 29.97 frames per second. The digital recording shall include both audio and video information that accurately reproduces the original picture and sound of the video inspection. The video portion of the digital recording shall be free of electrical interference and shall produce a clear and stable image. The audio portion shall be sufficiently free of background and electrical noise so as to produce an oral report that is clear and discernible.

10. Inspection software shall be PACP compliant versions of CUES Granite XP, WinCan, Flexidata, or approved equal.

11. The CCTV equipment/software shall be capable of producing digitized images of all sewer line defects, manhole defects, and sewer line service connections in .jpeg format. Contractor shall plan to take digital still images of each defect, construction features and service connection to clearly depict it. More images may be necessary depending upon the condition of the pipe.

2.02 REPORTING CAPABILITIES

A. The CCTV system shall be capable of printing pipeline inspection reports with pipeline schematics and captured images of defects and other related significant visual information. The system shall have the ability to display any combination of the following formats and features simultaneously.

The following information is mandatory for all inspections:

1. Inspection Information: Refers to the area of pipe to be inspected between 2 manholes or the address of the lateral to be inspected.

   a. Project Name
   b. Surveyed by (Operator/Surveyor's name)
   c. Operator/Surveyor Certificate number
   d. System Owner
   e. Date
   f. Drainage Area (tributary pump station number)
   g. Time
   h. Sheet number (report sheet number
   i. Street Name and Number
   j. Locality (Owner)
   k. Additional Location Information (e.g. backyard, parking lot, etc)
   l. Upstream Manhole Number (Owner standard Asset Number)
   m. Upstream MH rim to invert (depth)
   n. Downstream Manhole Number (Owner standard Asset Number)
   o. Downstream MH rim to invert (depth)
   p. Direction of inspection (Upstream or Downstream)
   q. DVD Identification Number
   r. Flow control (e.g. plugged, lift station, bypassed, not controlled)
   s. Type of Pipe
   t. Pipe Height
   u. Pipe Width
   v. Pipe Shape
   w. Pipe Material
   x. Lining Material (for lined sewers)
   y. Pipe Joint Length
   z. Purpose of Inspection (new line, year-end warranty, CIP R/R project, etc.)
   aa. Pre Cleaning (jetter, heavy cleaning, no pre-cleaning)
   bb. Media Number (Video file name)
   cc. Weather
   dd. Additional information/Comments

2. Observation Data: Refers to the portion of pipe where an observation is discovered. Observations shall be noted by text descriptions and defect code number using PACP defects codes, still frame pictures and video clips captured and recorded. Each observation shall include the following:

   a. Actual observation footage
   b. Video reference
   c. Location of defect; clock position
   d. Code (Group/Descriptor/Modifier/Severity)
   e. Whether it is a continuous defect
   f. Whether the defect occurs at a joint
   g. Severity level
   h. DVD Identification number
   i. DVD counter
   j. Final footage
   k. Video clip ID for each observation
   l. Image reference (file name of photos)
   m. Remarks (as appropriate or needed)

3. Formats: Standard and/or custom designed reports shall have the following formats available and shall be able to be produced in hard copy or viewed on the monitor.

   a. Site Observation: Displays detailed site observation reports in landscape or portrait views.

   b. Directory Report: Displays a list of all the projects sorted by pump station number and manhole number.

   c. Picture Reports: Displays site data and include full size single photos or half size double photos of discrepancies.

   d. Pipe Run: Displays a graphical display of the site indicating footage, observations, and comments.

   e. Project Data: Displays the project, client, and Contractor information.

   f. Custom Sort: Creates user-defined reports of selected site, project, and observation data.

PART 3 - EXECUTION

3.01 GENERAL

A. Prior to inspection the Contractor shall obtain pipe and manhole asset identification numbers from the Owner to be used during inspections. Inspections performed using identification numbers other than the Owner assigned numbers will be rejected.

B. Inspection shall not commence until the sewer section to be televised has been completely cleaned in conformance with Specification Section 02761 "Cleaning Sanitary Sewer Systems."

C. Inspection of newly installed sewers (not yet in service) shall not begin prior to completion of the following:

1. Pipe air testing.

2. All manhole work, including installation of inverts.

3. Installation of all lateral services.

4. Vacuum tests of all manholes.

D. After the sewer main and/or lateral cleaning operation is completed, the line sections shall be visually inspected internally by means of color closed-circuit television. The television inspection shall be performed one line section at time.

E. CCTV inspection shall require a minimum of 2 certified personnel with PACP certifications.

1. One (1) person shall have PACP certification that will lead or supervise each field CCTV crew for inspection and a minimum of 2-years in the role of a lead person.

2. One (1) person shall have PACP certification serving in the role as a QA/QC management supervisor.

F. Contractor shall perform sewer-televising work within 24-hours of said sewer being cleaned. If said sewer is not televised within the required 24-hour time limit, the sewer shall be re-cleaned prior to televising at no additional expense to the Owner.

G. The Contractor shall also inspect and document all manholes included in this Work. The video recording shall begin as the camera is lowered down the manhole all the way to the preset footage and continuously throughout the pipe reach until the downstream manhole is reached.

H. The Contractor shall lower the camera into the start manhole and record the camera entry into the sewer, observing the manhole as the camera enters.

I. The camera shall pan the periphery of the start and finish manhole from casting to invert. To achieve this, the CCTV camera operator shall pan and zoom the manhole to obtain the best possible image of the manhole, including the wall, cone and chimney section(s).

J. The depth of each manhole shall be measured to the nearest 1/10th of a foot and documented on the inspection forms. Estimates of manhole depths will not be accepted.

K. The CCTV camera shall be positioned as close to the spring line as possible while maintaining the required equipment stability.

L. Wherever possible the inspections shall be performed in the upstream to downstream direction. All sewer segments shall be recorded in a logical order in the same direction they are cleaned and televised.

M. In the event that access to some manholes is restricted, permission may be granted by the Owner to direct the camera through the sewer in an upstream direction, against the flow.

N. When sewer conditions prevent forward movement of the camera, the camera shall be withdrawn, and Contractor shall televise the line from the opposite direction.

O. The camera shall be directed through the sewer in a downstream direction, with the flow, at a uniform, slow rate. In no case will the video camera record while moving at a speed greater than 30-feet per minute. If, during the course of the Project, the inspection is rejected due to camera speeds exceeding 30-feet per minute, the inspection recordings shall be redone, at no additional cost to the Owner.

P. If a new manhole is discovered in the field that was not on current maps, a new manhole identification number will be assigned by Owner. The Owner shall assign the manhole the next number above the highest manhole number within the sub area. The data / video files shall then be re-named to include the new MH ID, and a new CCTV inspection shall be started from the new MH ID. Contractor shall consult with the Owner for assignment of new manhole identification numbers. Contractor shall note in the inspection form comments that a new manhole ID has been assigned as well as provide a marked up map indicating the newly found manhole and assigned manhole ID.

Q. Flow levels within existing sewers to be inspected shall not exceed 5% of the pipe diameter. If water levels prevent adequate televising of the sewer, then conducting the Work during low flow periods or other methods like plugging and bypass pumping shall be implemented.

R. For inspection of new sewers (not yet in service), the Contractor shall introduce clean water into the upstream manhole and keep water flowing until flow is observed at the downstream manhole location.

S. The survey unit shall be slowed, stopped, or backed up to perform detailed inspections of significant features. The camera shall be stopped at all defects, changes in material, water level, size, side connections, manholes, junctions, or other unusual areas. When stopped at the defect or feature, the operator shall pan the camera to the area and along the circumference of the pipe.

T. The camera unit shall be paused long enough at areas suspected of leaking to determine if a leak exists currently or if deposits have occurred.

U. The operator shall also record audio of the type of defect or feature, clock position, footage, extent or other pertinent data.

V. Digital photographs or screen captures shall be taken at all laterals; defects and general condition photographs shall be taken at least every 200-feet.

W. At the Contractor's discretion or direction of the Owner, the camera shall be stopped or backed up (when conditions allow) to view and analyze conditions that appear to be unusual or uncommon for a sound sewer. The lens and lighting shall be readjusted, if need be, in order to ensure a clear, distinct, and properly lighted feature.

X. Audio shall be recorded during each inspection by the operating technician, electronic voice text recognition or approved equal on the inspection video as the sewer is inspected and shall include the sewer location, identification of beginning and terminating manholes including location (address or cross streets), inspection direction, length of inspection, side sewer identification, flow information, complete descriptions of the sewer line conditions as they are encountered, description of the rehabilitation work, reason for termination, and other relevant commentary to the inspections. Voice descriptions should be made:

1. At points of pipe failure or weakness.

2. At points of infiltration.

3. At the location of service connections.

4. At points where unusual conditions are noted, and

5. At points where digital still photos are taken.

In addition, the audio reports shall include the distance traveled on the specific run, a description of abnormal conditions in the sewer and side sewer connections as they are encountered, explanations for pausing, backing up, or stopping the survey, and the final measured center to center distances between consecutive manholes. The audio portion of the composite video shall be sufficiently free from electrical interference and background noise to provide complete intelligibility of the oral report. Audio dubbing after the inspection is prohibited.

Y. Video recordings shall include a continuous video display/readout of similar information, as described in paragraph 3.08 herein. A separate digital video file shall be made for each pipe reach inspected.

Z. Contractor shall coordinate with the Owner prior to commencement of Work to ensure inspection is accomplished in a manner acceptable to the Owner.

AA. If the video and/or audio recording is of poor quality, the Owner has the right to require a re-submittal of the affected sewer sections and no payment will be made until an

acceptable video and audio recording is made, submitted to, and accepted by the Owner.

BB. Measurement for location of defects and actual length of pipe shall be by means of a calibrated meter on the camera with a digital readout on the video monitor. This readout shall be included in the video recording. Marking on cable, or the like, which would require interpolation for depth of manhole, will not be allowed. Measurement will be accurate to 1-foot per 100-feet of inspected pipe.

CC. The Contractor inspection units shall be equipped with adequate back up equipment and spare parts so field repairs to equipment can be made and down time is minimized.

DD. The Contractor shall be responsible for all traffic control measures required to perform the Work.

EE. Lateral inspections shall be performed from the main line using a lateral launch camera or shall be pushed from cleanouts to the sewer main using sewer rods. Lateral camera travel measurements shall be displayed on screen and on the captured video.

FF. If lateral inspections are performed from the sewer main as part of the main line inspection, the lateral shall be logged in the main line inspection report per PACP requirements and the "comment" field of the main line inspection report shall be used to document the lateral identification number, defects observed, footage of all lateral defects, connecting pipes and clean outs. If lateral inspections are not performed as part of the main sewer inspection, a separate PACP pipe inspection record shall be created for each lateral. Refer to paragraph 3.10 for numbering requirements.

3.02 PRE-CONSTRUCTION INSPECTION

A. Procedure

1. Prior to any repair work, the entire sewer line (from manhole to manhole) shall be televised. The pre-construction inspection shall be used to determine whether the line has been cleaned sufficiently; to confirm the location and nature of defects; and to confirm that the proposed method of repair is proper method for the defects observed.

2. The camera shall be moved through the line in either direction at a moderate rate, stopping when necessary to permit documentation of the sewer's condition. In no case will the television camera be pulled at a speed greater than 30-feet per minute. Manual winches, power winches, TV cable, and power rewinds or other devices that do not obstruct the camera view or interfere with proper documentation of the sewer conditions shall be used to move the camera through the sewer line. If, during the inspection operation, the television camera will not pass through the entire manhole section, the Contractor shall set up his equipment so that the inspection can be performed from the opposite manhole (reverse set-up).

3. When manually operated winches are used to pull the television camera through the line, telephones, radios or other suitable means of communication shall be set up between the 2 manholes of the section being inspected to insure good communication between members of the crew.

4. The importance of accurate distance measurements is emphasized. The location of defects shall be within ± 2 feet.

5. During the internal inspection the television camera shall be temporarily stopped at each defect along the line. The Contractor shall record the nature and location of the defect. Where defects are also active infiltration sources, the rate of infiltration in gallons per minute shall be estimated by the Contractor and recorded. The camera shall also be stopped at active service connections where flow is discharging. Flows from service connections that are determined to be infiltration/inflow shall also be recorded.

B. Documentation of Television Inspection

1. Television Inspection Logs: Printed location records shall be kept by the Contractor and will clearly show the location in relation to an adjacent manhole of each infiltration point observed during inspection. In addition, other points of significance such as locations of building sewers, unusual conditions, roots, storm sewer connections, broken pipe, presence of scale and corrosion, and other discernible features will be recorded and a copy of such records will be supplied to the Owner. The Contractor shall record all visuals observations on a "Television Inspection Report" form.

2. Once recorded, the digital data shall be labeled and become the property of the Owner. The Contractor shall have all readings and necessary playback equipment readily accessible for review by the Owner during the Project.

3.03 POST CONSTRUCTION INSPECTION

A. Procedure

1. After the sewer line rehabilitation has been completed, the entire sewer line from manhole to manhole shall be televised. The post construction inspection shall be used to determine whether or not all of the approved sewer line defects and infiltration sources previously located have been fully repaired to the satisfaction of the Owner.

2. The camera shall be moved through the line in either direction at a moderate rate, stopping when necessary to permit documentation of the sewer's condition. In no case will the television camera be pulled at a speed greater than 30-feet per minute. Manual winches, power winches, TV cable, power rewinds or other devices that do not obstruct the camera view or interfere with proper documentation of the sewer conditions shall be used to move the camera through the sewer line. If, during the inspection operation, the television camera will not pass through the entire manhole section, the Contractor shall set up his

equipment so that the inspection can be performed from the opposite manhole or direction.(reverse-setup)

3. When manually operated winches are used to pull the television camera through the line, telephones, radios or other suitable means of communication shall be set up between the 2 manholes of the section being inspected to insure good communication between members of the crew.

4. The importance of accurate distance measurements is emphasized. The location of defects shall be within 1-foot.

5. During the internal inspection the television camera shall be temporarily stopped at each repair. The camera shall also be stopped at any unnoticed or non-repaired point source of infiltration.

3.04 SEWER BYPASSING AND DEWATERING

Contractor shall be responsible for bypassing sewer flow around his work and dewatering of sewer lines in accordance with the requirements of Section 01516 "Collection System Bypass". Where sags or submerged sections of the sewer are encountered during TV inspection, the Contractor shall first complete inspection of the entire reach to determine the extent of such areas prior to dewatering the sewer. Dewatered sections of the sewer shall then be TV inspected.

On all sewer mains which have sags or dips, to an extent that the television camera lens becomes submerged during the television inspection, the Contractor shall use a high pressure cleaner to draw the water out of the pipe, or other means, to allow inspection of the pipe and identification of pipe defects, cracks, holes and location of service connections.

3.05 LINEAR MEASUREMENT

The CCTV camera location footage counter shall be zeroed at the beginning of each inspection. The survey unit location entered on the footage counter at the start of the inspection shall allow for the distance from the accepted start of the length of the sewer to the initial point of observation of the camera (pre-set footage). In the case of resuming an inspection at an intermediate point within a sewer reach, the footage counter shall be set to start at the distance from the upstream maintenance hole to that point, as previously recorded by the counter. The Contractor shall ensure that the footage counter starts to register immediately when the survey unit starts to move.

The lateral camera shall be pushed from cleanouts to the sewer main and be equipped with a footage counter to display and record inspection footage. Maximum rate of travel shall be 30-feet per minute when recording.

Prior to commencing inspections, the Contractor shall demonstrate compliance with the linear measurement tolerance specified below:

A. The equipment shall measure the location of the camera unit in 1-foot increments from the beginning (upstream end) of each continuous section. This footage location must be displayed on the CCTV monitor and recorded on the videotapes.

B. The accuracy of the measured location shall be within + 0.5% of the actual length of the sewer-reach being surveyed, or 1-foot, whichever is greater.

3.06 MEASUREMENT OF SAGS

The CCTV camera shall be equipped with a measuring device capable of accurately measuring the depth of standing water up to 3-inches. The measuring device shall be mounted to the front of the unit and be capable of being read as the unit advances through the pipe.

3.07 CCTV MONITOR DISPLAY

The images displayed on the CCTV monitors will be a view of the pipe above the water surface as seen by the CCTV camera as the unit is conveyed through the sewer.

The camera lighting shall be fixed in intensity prior to commencing the survey and the white balance set to the color temperature emitted. In order to ensure color constancy, no variation in illumination shall take place during the survey.

The video equipment shall be checked using an approved test card with a color bar prior to commencing each day's survey. The camera shall be positioned centrally and parallel to the test card at a distance where the full test card just fills the monitor screen. The card shall be illuminated evenly and uniformly without any reflection.

3.08 DATA DISPLAYS

A. The CCTV images shall include an initial data display that identifies the sewer reach being surveyed and a survey status display that provides continuously updated information on the location of the survey unit as the survey is being performed. These data displays shall be in alphanumeric form. The size and position of the data shall not interfere with the main subject of the monitor picture.

B. The on-screen display should be white during inspections where the background behind the display is dark and, conversely, black where the background is light.

C. At the beginning of each reach of sewer being inspected, the following information shall be electronically generated and displayed on the CCTV monitors as well as included in the audio track:

1. Date of survey.
2. Inspection company name and inspector.
3. Street name or location.
4. Manhole number to manhole number (in order of inspection).
5. Direction of survey (upstream or downstream).
6. Time of start of survey.

D. During inspections, the following information shall be electronically generated, automatically updated, and displayed on the CCTV monitors:

1. Survey unit location in the sewer line in feet and tenths of feet from adjusted zero.

2. Sewer diameter.

3. Upstream and downstream manholes reference numbers as per approved Drawings or Owner GIS.

4. During Lateral inspections the video display shall contain the lateral location and the footage of the camera within the lateral.

3.09 PHOTOGRAPHS

During CCTV inspections, screen captures will be taken from the monitor images and saved electronically by the in-sewer inspection crew of typical conditions every 200-feet and at all defects, construction features, manholes and laterals. The screen capture shall have the pipe reach (identified by the upstream and downstream manholes), survey direction, footage, and date when photograph was taken. The annotation shall be clearly visible and in contrast to its background, shall have a figure size no greater than 1/4-inch, and shall be type-printed. The annotation shall be positioned on the front of the photograph so as to not interfere with the subject of the photograph. Photograph files shall be named by the video capture system and automatically referenced to the logged defect.

The image of the sewer shall fill the photographic image. Photographs must clearly and accurately show what is displayed on the monitor, which shall be in proper adjustment. Where significant features exist within 6-feet of each other, 1 photograph shall be made to record these features. Where there is a continuous feature, photographs shall not be taken at intervals of less than 6-feet unless absolutely necessary to show a change in the feature.

The images shall be kept electronically, copied to a hard drive, and submitted with the inspection videos, database and reports.

3.10 MANHOLE NUMBERING, INSPECTION FORMS AND DEFECT CODES

A. The Contractor will be required to use the manhole numbering as shown on sewer maps provided by the Owner when performing the inspections for this project.

B. The Owner inspection forms and standard defect codes shall be used. The defect codes, inspection forms, inspection database and inspection protocols shall be in accordance with the National Association of Sewer Service Companies (NASSCO) Pipeline Assessment and Certification Program (PACP) and Manhole Assessment and Certification Program (MACP).

C. When lateral inspections are performed as part of the main sewer inspection, lateral numbers shall be referenced in the "comment" field of the main sewer PACP report. The lateral number shall be as follows:

<Upstream Manhole ID>_<footage>_<clock position>_<L>

Example: 39550020_212_02_L

D. When lateral inspections are not performed as part of the main sewer inspection, the main sewer inspection shall be performed first to obtain the footage and clock positions needed to identify the lateral.

3.11 DELIVERABLES

The Contractor will be required to submit the following deliverables at the completion of the post construction video inspection. The pre-construction video inspection deliverables shall be as defined in 3.02 of this specification.

A. Inspection Reports to include:

1. Inspection session header information (see required fields above)

2. Defect log report including photo captures from CCTV video

3. Schematic drawing of pipe showing defects

4. Format:

a. Adobe Acrobat PDF files: 1 report PDF per pipe
b. Main sewer inspection report file name:

<upstream MH ID>_<downstream MH ID>_<Date (year_mo_day format)>.PDF

Example: 30060002_30060001_2010_02_16.pdf

c. Lateral inspection report file name:

<upstream MH ID>_<footage>_<clock position>_<L>_<Date (year_mo_day format)>.PDF_

Example: 30060002_210_02_L_2010_02_16.pdf

B. Inspection video files on portable hard drive, typed labels shall be attached to the face of each hard drive. The typed index labels shall include the following information:

1. Content (CCTV).
2. Contractor name.

3. Purpose of Survey.
4. Tributary Pump station number.

5. Reaches included (from Manhole Number ## to Manhole Number ##).
6. Date of survey.
7. Contract Number / Delivery Order Number (if applicable).

C. Main sewer video files shall be MPEG or Windows Media File named according to the following standard:

<Upstream MH ID>_<Downstream MH ID>-<Inspection>_<Date (year month day)>.wmv

Example: 39540008-39540007_20090805.wmv

In instances where a reverse set up is necessary to perform or complete the inspection the file name shall incorporate an "R" at the end of the file name to indicate "reverse" direction. Using the file example above, if the inspection from the upstream end was halted due to an obstruction and the pipe was televised from the opposite end, the video file from the downstream to upstream direction would be assigned the following file name:

Example:39540008-39540007_20090805_R.wmv

D. Lateral connection inspection video files shall be MPEG or Windows Media File named according to the following standard:

<Upstream MH ID>_<footage>_<clock position>_<L>_<date (year_mo_day format)>.wmv

Example: 39540008_145_10_L_2009_08_05.wmv

E. Electronic Inspection Data stored and exported in a NASSCO Pipeline Assessment and Certification Program (PACP) compliant Microsoft Access database (.MDB) version 4.4 or newer delivered on DVD or portable hard drive.

F. Inspection photograph digital files (jpeg) indexed to NASSCO PACP compliant database.

G. Map of sub area depicting area inspected, inspection status, asset identification numbers and mark ups,

H. Acceptable media for the video recordings portable hard drive.

I. Inspection data noted above shall be provided to the Owner weekly throughout the inspection work.

J. Contractor Quality Control report detailing data validation performed, pipe inspection records reviewed and results.

K. All inspection data shall be submitted on a portable hard drive. Each hard drive shall be filled with as much data as practical to minimize the number of hard drives submitted. Sections of a single segment of sewer main shall not be recorded to more than 1 hard drive. Video footage of recorded segments shall be grouped by area and shall be submitted in sequential order relating to the area mapping designation.

L. Upon approval by the Owner of all, or portions of, the data delivered via the portable hard drives, the approved CCTV data shall be delivered to the Owner on a portable hard drive labeled with project information. The hard drive shall clearly indicate the date of the inspection, the designated segment(s) of sewer mains(s) contained on the disk, the name of the project, the project CIP number, the pump station number, and Contractor name. The hard drive shall contain separate digital files for each manhole-to-manhole section.

M. The database shall be comprehensive for the entire project, and additional data shall be added to the database each week.

3.12 ACCEPTANCE

A. Inspection deliverables will be validated to check conformance with the specified requirements for file names, formats, quantity, resolution, data table references, in addition to checks for null fields, asset numbers, duplicate records, connectivity, material, size, and depth. Any data not passing the data validation checks will be returned to the Contractor for resubmittal.

B. Inspection submittals will be reviewed for quality control. A minimum of 5% of the submitted inspections will be randomly reviewed. A quality control check will be performed for each CCTV operator and each operator must exceed 90% accuracy. Throughout the duration of the project, should the Owner discover inaccuracies in data or quality issues with any of the videos, Contractor shall re-inspect those segments at no additional cost to the Owner.

The Owner will provide comments regarding acceptance of the data within 21-days of receiving the data from the Contractor. Neither the CCTV inspections nor the WORK inspected is accepted by the Owner until such time that an acceptance letter is issued by the Owner.

END OF SECTION

SECTION 02763

TELEVISING SANITARY SEWER LATERALS

PART 1 - GENERAL

1.01 WORK INCLUDED

A. The Work consists of furnishing all labor, materials, accessories, equipment, tools, transportation, services and technical competence for performing all operations required to execute the internal closed circuit television (CCTV) inspection to inspect service lateral after lateral clean outs have been installed where lateral lining or replacement is indicated on the Contract Drawings.

B. The CCTV inspection shall show all defects and determine amount of infiltration entering the service laterals.

C. The post CCTV lateral inspection shall only be required to be performed for any laterals after the laterals have been lined or replaced.

1.02 GENERAL

A. After cleaning as specified in Section 02761 "Cleaning Sanitary Sewer Systems" (including special cleaning involving the mechanical removal of roots, grease, and/or tuberculation where authorized), and before and after repair/replacement work, the lateral shall be visually surveyed by means of closed circuit television. The CCTV inspection shall be performed one (1) lateral at a time.

B. Pre and post construction survey video shall be delivered to the Owner on DVD or portable hard drive accompanied with the corresponding TV logs for sewer laterals surveyed. The video shall be direct from a live video source into a video file, MPEG or Windows Media File format and of good quality for viewing. The recording of multiple laterals on a single DVD or hard drive is acceptable.

1.03 SOFTWARE

A. The Contractor shall utilize a NASSCO Pipeline Assessment Certification Program (PACP compliant software to capture the lateral inspections), unless otherwise approved by the Owner.

1.04 EQUIPMENT

A. The television camera used for the lateral survey shall be one specifically designed and constructed for such survey. Lighting for the camera shall be suitable to allow a clear

picture of the entire periphery of the pipe. The camera shall be operative in 100% humidity conditions. The camera, television monitor, and other components of the video system shall be capable of producing a minimum 700-line resolution color video picture. The Contractor shall maintain the camera in clear focus at all times. Picture quality and definition shall be to the satisfaction of the Owner, and if unsatisfactory, equipment shall be removed and replaced with adequate equipment at no additional cost to the Owner.

B. The camera used from a cleanout shall be able to be launched from the cleanout and travel down to the sewer mainline up to 100-feet. The camera system shall be able to inspect 3, 4, and 6-inch lateral connections.

C. The video camera shall include a titling feature capable of displaying on the video the following information:

- Owner
- Date/Time
- Contractor's Name
- Pipe Size (Diameter) and Material
- Lateral ID (provided by Owner)
- On-going Footage Counter

1.05 SHOP DRAWINGS AND SUBMITTALS

A. Submittals shall be submitted to the Owner/Professional for review and acceptance prior to construction in accordance with the General Conditions and specifications Section 01340.

B. The Contractor's submittals shall include description of the software to be used and a sample of the video titles to be used, along with a sample of the television survey log to be used.

1.06 QUALIFICATIONS

A. Submittals shall be submitted to the Owner/Professional for review and acceptance prior to construction in accordance with the General Conditions and specifications Section 01340.

B. The qualifications of the CCTV Contractor shall be submitted and shall include detailed descriptions of the following:

1. Name, business address and telephone number of the CCTV Contractor.

2. Name(s) of all supervisory personnel to be directly involved with this Project.

3. NASSCO PACP certification of on-site operator performing inspections or subject to Owner approval, resume of proposed CCTV operator displaying similar inspection experience.

4. The Contractor shall sign and date the information provided and certify that to the extent of his knowledge, the information is true and accurate, and that the supervisory personnel will be directly involved with and used on this Project. Substitutions of personnel and/or methods will not be allowed without written authorization of the Owner.

5. Specialty technicians shall be certified by the equipment manufacturer and/or its authorized representative. Certifications shall be submitted to the Owner.

PART 2 - PRODUCTS

2.01 MATERIALS

A. All material supplied shall be one of the products specified in Appendix A as appended to these technical specifications.

B. All inspection information and data (including video) shall be written to digital media (DVD or portable hard drive).

PART 3 - EXECUTION

3.01 PRE-CONSTRUCTION SURVEY

A. Procedure

1. Prior to any lateral repair work, the entire service lateral (from mainline to property line or cleanout, whichever is farther from the mainline) shall be televised.

2. Measurement for location of defects shall be above ground by means of a meter, roll-a-tape, or other suitable device. Linear footage shall be shown on screen during recording.

3. Movement of the television camera shall be temporarily halted for a minimum of 10-seconds at each visible defect or point of flow until the source and flow rate from that point are determined.

4. The inspection shall be performed from either the main sewer or the cleanout with the proper equipment.

B. Field Documentation

1. Television CCTV Logs: The Contractor shall obtain lateral identification numbers from the Owner. All inspection logs shall reference the applicable lateral ID. In addition, the upstream manhole number, distance from the upstream manhole, lateral connection to the main line (left, center or right), and address of the customer serviced by the lateral shall be noted on the television survey log. Inspections shall be recorded in NASSCO PACP/Lateral Assessment Certification Program compliant software unless otherwise approved by the Owner. Reports shall be generated from the software. Printed and electronically stored location records shall be kept by the Contractor and will clearly show the location in relation to the cleanout or the mainline of each infiltration point observed during survey. Footage shall be shown on the log. In addition, other points of significance such as unusual conditions, roots, broken pipe, presence of scale and corrosion, and other discernible features will be recorded and a copy of such records will be supplied to the Owner.

2. Photographs: Digital photographs of the television picture of problems shall be taken by the Contractor upon request of the Owner.

3. Video Recordings: Individual video files shall be created for each lateral inspected. Each file shall be in MPEG or Windows Media video format. Video files shall be named with the lateral ID and date of inspection. Video files shall be submitted on DVD or portable hard drive. The purpose of video recording shall be to supply a visual and audio record of problem areas in the lines which may be replayed. Once recorded, the video shall become the property of the Owner.

4. Audio: All lateral inspection videos shall have an audio record. As a preamble, at the beginning of the inspection, the Contractor shall state the following "(Contractor's Name) is performing a pre/post TV survey of laterals for (each sub area)". State date, time, operator's name, area, pipe size and material, upstream Owner asset manhole number, and depth. The Contractor shall verbally state the position of the lateral with respect to the upstream manhole and describe defects. At the end of each line, state: "end of line and total linear footage".

3.02 POST CONSTRUCTION SURVEY

A. Procedure

1. After any lateral repair work, the entire service lateral (from mainline to property line or cleanout, whichever is farther from the mainline) shall be televised.

2. The same procedure shall be used as indicated in sub-section "3.01 Preconstruction Survey."

3. In addition, the Contractor shall stop the camera at all point repairs and inspect entire repaired pipe sections.

4. The Contractor shall invert white foreground to black as needed in line sections with light background.

5. In the case of a post liner survey, the Contractor shall fully televise both ends of the liner so that the fit of the liner to the host pipe can be evaluated.

6. The post liner and/or replaced lateral and/or point repaired lateral CCTV inspection shall be done within 2-weeks of installation.

B. Documentation

The same documentation shall be provided as indicated in paragraph 3.01 "Preconstruction Survey" of these specifications.

END OF SECTION

SECTION 02764

TELEVISING EXISTING MANHOLES

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. The Contractor shall perform visual inspections of the existing manholes and record any defect discovered. NASSCO standards shall be followed for all inspections per the requirements herein. The visual inspection shall include surface photo, manhole cover and frame, chimney, walls, invert, and all appurtenances.

B. The nature of the inspections shall be to verify the physical condition of the manhole and to provide a permanent record of the existing condition as it relates to dimensions, materials, obstructions, breakage, connections, and deterioration. Inspections may be performed by personnel entry or from the surface utilizing pole mounted camera equipment to visually inspect the chimney, cone, wall, bench, pipe seals and invert conditions, and conditions of connecting pipes.

1.02 REQUIREMENTS

A. The Contractor shall inspect the manhole surroundings and the manhole interior before and after manhole rehabilitation using visual means and a digital camera for documentation.

B. All inspections shall be recorded.

C. All inspection forms shall be scanned and submitted as .PDF files.

D. All inspection data shall be entered into a NASSCO Manhole Assessment Certification Program (MACP) compliant database. The database shall be submitted along with the scanned .PDF files and all digital photographs in .JPG format.

E. The inspection photographs, report documents, and inspection database shall be in accordance with the Owner's data standards and NASSCO MACP. Where discrepancies exist between MACP and the Owner's standards, the Owner shall be consulted for direction as to which standards shall be used.

F. Contractor shall maintain a copy of all report materials. The Contractor shall provide comments as necessary to fully describe the existing condition of the manhole on the inspection forms.

G. Contractor shall be responsible for modifications to equipment and/or inspection procedures to achieve Owner report requirements.

H. No Work shall commence prior to approval of the submitted materials by the Owner. Once accepted, the report materials shall serve as a standard for the remaining work.

1.03 QUALIFICATIONS AND CERTIFICATIONS

A. Each inspection supervisor shall be NASSCO PACP/MACP certified. Use of PACP/MACP certified technicians to review/document defects in the office (post process) is not acceptable.

B. The CCTV Contractor must have an internal quality assurance/quality control (QA/QC) program in place and all inspection data shall be subjected to the procedures prior to submittal to the Owner. The Owner will perform QA/QC audits on submitted data.

C. A QA/QC shall be performed by NASSCO MACP and PACP certified personnel.

1.04 SHOP DRAWINGS AND SUBMITTALS

A. Submittals shall be submitted to the Owner for review and acceptance prior to construction in accordance with the General Conditions and specifications.

B. The following deliverables shall be submitted at the completion of inspection:

1. Electronic version (.pdf) of the manhole inspection reports.

2. Populated Standard manhole inspection database (.mdb or Excel) saved on CD-R's, DVD, or portable hard drives.

3. Inspection digital photographs in JPEG format saved on CD-Rs, DVD or portable hard drives.

4. QA/QC report.

C. The above deliverables shall be submitted to the Owner for approval.

D. The manhole inspection reports and database shall be in accordance with Owner data standards and NASSCO MACP.

1.05 NOTIFICATION

The Contractor shall notify the Owner a minimum of 48-hours prior to performing any inspection work. The Owner may be present during part or all of the inspections. No payment will be made for inspections performed without proper schedule notification.

PART 2 - PRODUCTS

2.01 GENERAL

A. All material supplied shall be one of the products specified in Appendix A as appended to these technical specifications.

2.02 DIGITAL CAMERA FOR REMOTE INSPECTIONS

All manhole photographs required as part of this specification shall be obtained using a minimum 2-megapixel digital camera with strobe flash capable of producing digital images with minimum resolution of 640 x 480.

PART 3 - EXECUTION

3.01 GENERAL

A. The inspection crew shall mobilize to the site of the manhole inspection and immediately establish traffic control measures per Florida Department of Transportation (FDOT) standards and specifications and meeting all jurisdictional agencies having authority over the Right-of-Way (ROW) limits, as well as any measures required to protect pedestrians. The crew shall inspect each manhole and record required information.

B. All manhole structures shall be located. Metal detectors shall be used to locate buried manholes. Once a buried manhole has been located, it shall be marked with paint and/or flagging, if necessary. All pertinent information available shall be recorded including area photo, address, etc. The Owner shall be advised and the Contractor will be required to excavate or saw cut the existing pavement as necessary to inspect the manhole and perform necessary pavement restoration.

3.02 MANDATORY INSPECTION HEADER INFORMATION

A. Once the manhole is located, the following mandatory information shall be recorded on the inspection form (template is located in the forms section). Note that the mandatory fields noted below are more inclusive than the MACP requirements. All available information shall be collected and recorded for those manholes that are buried, could not open, surcharged, etc.

1. Manhole Number (Asset Number)
2. Sheet number
3. Purchase Order No.
4. Date
5. Time
6. Surveyor's Name
7. Certification Number

8. System owner
9. Locality
10. Drainage area (tributary Pump Station Number)
11. Map number
12. Location (street number and name)
13. Downstream pipe length (feet)
14. Rim to grade (nearest 0.1 foot)
15. Pre-cleaning method (using approved MACP codes)
16. Location code (using approved MACP codes)
17. Manhole surface type (using approved MACP codes)
18. Potential for runoff (using approved MACP codes)
19. Access point type (using approved MACP codes)
20. Inspection status (using approved MACP codes)
21. Area photo image reference (using standard naming convention)
22. Internal photo image reference(using standard naming convention)

3.03 MANHOLE COMPONENT OBSERVATIONS

A. The inspection crew shall complete all fields within the manhole component/ observation section of the inspection form. The following information shall be collected:

1. Cover type (solid, vented, bolted)
2. Cover size (top surface diameter in inches)
3. Cover material
4. Number of vent holes
5. Cover/Frame fit (cover to frame fit, MACP codes)
6. Cover condition (MACP codes)
7. Cover insert type
8. Cover insert condition
9. Frame condition
10. Frame seal condition
11. Frame offset distance
12. Frame seal inflow
13. Wall material
14. Interior wall coating
15. Wall diameter
16. Bench present
17. Channel installed
18. Additional remarks relevant to the manhole
19. Any evidence of prior rehabilitation and type of rehab performed

3.04 MANHOLE INTERIOR INSPECTION

A. The inspection crew shall determine the types of defects within the manhole, document each defect on the manhole form and take a photograph of each defect. The manhole chimney, cone, wall, bench, and channel shall be inspected for structural integrity, signs of I/I and the presence of roots. All documentation shall follow NASSCO MACP standards. Each defect will be documented on the inspection form with the following information:

1. Defect number.
2. Component of manhole containing defect.
3. Defect code (using approved MACP codes).
4. Image Reference (using approved file naming structure).

3.05 CONNECTING PIPE DETAILS

A. Each pipe entering and exiting the manhole shall be photographed where possible and inspected to determine diameter, pipe material, debris levels, and rim to invert distance (to 0.1-feet). The pipe inspection will include the following information:

1. Pipe photo (using approved file naming structure).
2. Pipe direction (incoming or outgoing).
3. Pipe clock positions (6:00 position = outgoing).
4. Pipe diameter.
5. Pipe material (using PACP codes).
6. Rim to invert distance (measured to nearest 1/10th of a foot).
7. Pipe special condition (drops, force mains, etc. using approved MACP codes).
8. Debris depth.
9. Connecting structure number; if manhole or cleanout, service line clock position, stubout clock position, etc.
10. Pipe seal condition (using approved MACP codes).
11. Pipe seal roots (using approved MACP codes).
12. Observed pipe defects, obstructions, roots, etc. (using PACP codes).

3.06 MANHOLE SKETCH, MAP UPDATE, AND NOTES

A. The inspection crew shall complete the manhole plan view sketch noting all connecting pipes. Any special observations or notes may be added to the profile sketch on the field form.

B. Influent and effluent lines in each manhole shall be compared to the existing map and corrections noted in the sketch section of the field form.

3.07 NOTIFICATION OF EMERGENCY CONDITIONS

Inspection crews shall immediately notify the Owner and/or on-site inspector of any defects posing imminent danger to the public (missing lids, covers broken during inspection, sink holes, etc.) and any observed pipe blockages or potential overflow conditions.

3.08 COMPLETION

A. Once the inspection is complete the field crew shall make certain the ring is clean and does not have any debris preventing a proper cover fit. The manhole lid shall be replaced and any displaced items moved back into place.

B. A list of manholes that could not be fully inspected, along with the problem explanation, shall be forwarded to the Owner weekly throughout the inspection work.

C. The Contractor should perform their due diligence prior to work efforts such that remobilization efforts are not required for inspection purposes. There will be no additional compensation for remobilizations to manholes.

D. Any map updates shall be consolidated and forwarded to the Owner with the submitted inspections.

3.09 PHOTOGRAPH REQUIREMENTS

A. During each inspection the following series of photographs shall be taken:

1. Area Photograph: During the inspection, a photograph shall be taken of the manhole cover showing location within the roadway, shoulder, or easement as appropriate. Photographs shall be taken of any indications of previous overflows such as watermarks and paper or other debris typical of sewer overflows. Surface photographs shall be oriented in the direction of the outgoing pipe to show the pipeline cover and easement condition. The area photographs should show the manhole visible in the foreground where possible. A minimum of 1 area photo is required.

2. Internal Photograph: Take a photograph of the manhole interior in plan view showing the general arrangement of the incoming and outgoing sewers, manhole walls, and other appurtenances. The internal condition photograph shall be oriented with the direction of the outgoing main line flow at the bottom of the photograph (6:00 position). A minimum of 1 internal photograph is required.

3. Manhole Defect Photographs: During manhole inspections digital photographs shall be taken of all defects. Photographs must clearly and accurately show each defect and correspond to defects and photo numbers logged on the manhole inspection form. A minimum of 1 photo for each observed defect is required.

4. Connecting Pipe Photographs: The camera should then be pointed into all incoming and outgoing pipes where possible to capture general conditions within the pipes. Any obvious blockages or defects should be noted using PACP defect codes. A minimum of 1 photo of each incoming or outgoing pipe is required.

B. During inspections manholes shall be free of steam, fog, water vapor, or other conditions that will impact the quality of photographs.

C. All photographs shall adequately capture the manhole conditions and details of defects. Lighting and camera quality shall provide a clear, in-focus picture of the manhole interior, manhole defects, and manhole. The lighting shall provide uniform light free from shadows or hot spots.

D. If larger than 640 x 480 resolution, then photo will be converted to 640 x 480. Photos less than 640 x 480 are not acceptable and converting upward to 640 x 480 is not acceptable. All photographs shall be resized to 640 x 480 resolution to minimize file size.

E. The images shall be kept electronically, copied to a CD, DVD, or external hard drive, and submitted with the inspection forms per paragraph 3.06. Photographs shall be named according to the photograph naming conventions included herein.

F. All digital photographs shall be referenced on the manhole inspection form and electronic spreadsheet/database.

G. All digital photographs shall be renamed in accordance with the following photo file naming convention:

1. Area Photo = Manhole ID, A, Photo Number, jpg

   Example: 3965002A0001.jpg
   Manhole: 39650002
   A=Area Photo
   Photo No.0001

2. Internal Photo = Manhole ID, I, Photo Number, jpg

   Example: 3965002I0001.jpg
   Manhole: 3965002
   I=Internal Photo
   Photo No.0001

(Note: Photo oriented with the outgoing pipe on the bottom)

3. Manhole Defect Photo = Manhole ID, M, Photo Number, jpg

   Example: 3965002M0015
   Manhole: 3965002
   M=Manhole Defect Photo
   Photo No. 0015

4. Pipe Photo = Manhole ID, P, Photo Number, jpg

   Example: 3965002P0002.jpg
   Manhole: 3965002
   P=Pipe Photo
   Photo No. 0002

3.10 MANHOLE NUMBERING, INSPECTION FORMS AND DEFECT CODES

The Contractor shall use the Owner's manhole numbering system when performing the inspections for this Project. Manhole numbers will be provided by the Owner if not already provided on the plans. Defect codes shall conform to those specified in the NASSCO MACP specification. Standard manhole defect codes (a subset of MACP) are included along with a standard manhole inspection form at the end of this specification.

3.11 SITE RESTORATION

After inspecting manholes in an area, the work site shall be cleaned and restored to pre-Work conditions. If any existing manholes are buried and subsequently exposed, then restore the site to equal or better condition.

3.12 DELIVERABLES

The Contractor will be required to submit the following deliverables at the completion of inspection.

A. Scanned Field Inspection Reports to include:

1. Inspection session header information (see required fields above)
2. Component observations
3. Manhole inspection details including defects observed and photo image references
4. Connecting pipe details
5. Manhole plan view sketch
6. Format:
   Adobe Acrobat PDF files: 1 report PDF per manhole
   File name: <MH ID> <Date (year_mo_day format)>.PDF
   Example: 30060002_2010_02_16.pdf

B. Inspection digital photograph in Owner approved format and resolution, and assigned file names in accordance with the Owner standard.

C. Electronic Inspection Data stored and exported in Owner approved NASSCO Manhole Assessment and Certification Program (MACP) compliant Microsoft Access database (.MDB) version 4.4, or Excel file delivered on DVD or portable hard drive.

D. Marked up field maps detailing map corrections and/or discrepancies noted during inspection.

E. All digital files shall be submitted on DVD or portable hard drive, labeled as follows:

1. DVD/Hard drive Labels: Typed labels shall be attached to the face of each DVD. The typed index labels shall include the following information:

   a. Content (Manhole Inspections)
   b. Contractor name
   c. Date and Purpose of Survey (CIP R/R)
   d. Tributary Pump station number
   e. Manholes included (listing of manholes using standard Asset Numbers)
   f. Contract Number / Delivery Order Number (if applicable)
   g. QA/QC report including listing of manhole inspections reviewed and results.

END OF SECTION

SECTION 02771

CURE-IN-PLACE FOR SANITARY SEWER RENEWAL

PART 1 - GENERAL

1.01 REQUIREMENTS

A. The Work within this Section consists of the installation and testing of cured-in-place pipe (CIPP). The CIPP shall provide a structurally sound, joint-less and water-tight new pipe within a pipe. The Contractor is responsible for proper, accurate and complete installation of the CIPP.

B. The finished liner shall extend over the installation length in a continuous, tight fitting, watertight pipe-within-a-pipe and shall be fabricated from materials which, when installed, will be chemically resistant to withstand internal exposure to domestic sewage.

C. Neither the CIPP system, nor its installation, shall cause adverse effects to any of the Owner's facilities or processes. The use of the product shall not result in the formation or production of any detrimental compounds or by-products at the treatment facilities. The Contractor shall test and monitor the levels of by-products produced as a result of the installation operations. The Contractor shall conduct installation operations and schedule cleanup in a manner to cause the least possible obstruction and inconvenience to traffic, pedestrians, businesses, and property owners or tenants.

1.02 INSTALLER EXPERIENCE AND QUALIFICATIONS

A. The Contractor's staff experience shall meet as a minimum the following requirements. The inability to document such experience may be grounds for rejecting the proposed installer's staff.

1. The proposed Superintendent(s) must have a minimum of three (3) years of CIPP lining supervisory field experience on projects totaling a minimum of 150,000 LF of 8-inch or greater CIPP liner installation using the methods and materials proposed for this Work, as documented by verifiable references.

Superintendent(s) resume of projects: Each reference project shall include the pipe dimensions, length of installation, size/type of flow control required to perform the Work, description of the actual work performed including installation method, owner's name, telephone number and contact person, and date of installation. It is required that the Superintendent(s) named are the Superintendent(s) assigned to this project and on site during the entire project construction. All referenced experience shall be for projects completed within the United States or Canada and shall have used the same installation method, CIPP liner and resin combination proposed for this project. References will be

checked. The Contractor is required to have at least 1 qualified Superintendent on site at all times during the construction activities.

2. Installation Crew: At least 1 person other than the Superintendent from each of the CIPP installation crews shall have a minimum of 1-year of CIPP experience totaling at least 20,000 lineal feet of 8-inch or greater installed liner. The crewmember with listed qualifications must be on the project site during all installation activities and for the entire project construction.

3. Boiler Technician: Contractor shall provide the name and information for the boiler technician who will perform the actual Work. The boiler technician must have a minimum of 2 projects totaling at least 10,000 lineal feet of CIPP lining in which a similar position was held.

4. Lateral Cutter Technician: Contractor shall provide the name and information for the technicians who will perform the actual Work. The lateral cutter technician must have a minimum of 5 projects totaling at least 20,000 lineal feet of CIPP lining in which a similar position was held.

5. CCTV Inspection Crew: Lead CCTV inspectors shall be NASSCO PACP certified to report gravity main liner defects.

6. The final decision to accept or reject the product, manufacturer, and/or installer lies solely with the Owner. The named Manufacturer, Field Superintendent, CIPP Lead Installer, Boiler Technician, Lateral Cutter and CCTV Inspector must be employed to perform the Work for the entire duration of the contract, unless changes are specifically authorized by the Owner.

1.03 PERFORMANCE WORK STATEMENT

A. The Contractor shall submit, before any lining WORK is performed, to the Owner a Performance Work Statement (PWS) which clearly defines the CIPP product delivery in conformance with the requirements of these contract documents. The PWS shall contain at a minimum the following:

1. Contractor's certificate of compliance that clearly indicates that the CIPP will conform to the project requirements as outlined in Specification Section 01010 Summary of Work and as delineated in these specifications.

2. A detailed installation plan describing:

   a. All preparation work (cleaning operations, pre-CCTV inspections, by-pass pumping, and traffic control)
   b. Installation procedure and method of curing
   c. Service reconnection
   d. Quality control and testing to be performed
   e. Post-CCTV inspection
   f. Warrantees

g. Description of the proposed CIPP lining technology.

3. A detailed plan for identifying all active service connections prior to, and in advance of, mainline installation. The Contractor will assume all costs associated with improper or inadequate verifications of active service or lateral connections. No compensation will be paid for remedying reinstatement of inactive laterals or for time delays due to improper or inadequate active service verifications.

4. The qualifications of the Contractor.

   a. Name, business address and telephone number

   b. Personnel names, experience, and certifications for Field Superintendent, CIPP lead Installer, Lateral Cutter, Boiler Technician, and Lead CCTV NASSCO PACP Certificated Inspector to be directly involved with this project. The Contractor shall sign and date the information provided and "certify that to the extent of his knowledge, the information is true and accurate, and that the supervisory personnel will be directly involved with and used on this project". Substitutions of personnel and/or methods will not be allowed without written authorization of the Owner.

   c. Specialty technicians shall be certified by the equipment manufacturer and/or its authorized representative. Certifications shall be submitted to the Owner/Professional.

5. Proposed manufacturer's technology data shall be submitted for all CIPP products and all associated technologies to be furnished.

6. All tools and equipment required for a complete installation of the CIPP.

   a. Clearly describe all equipment including proposed back-up equipment to be furnished for this project.

   b. Identify redundant tools and equipment to be kept on the job site in the event of equipment breakdown.

   c. The Contractor shall outline the mitigation procedure to be implemented in the event of key equipment failure during the installation process for the CIPP.

7. A detailed description of the Contractor's proposed procedures for the removal of any existing blockages in the pipeline that may be encountered during the cleaning process.

8. Detailed public notification plan for stage notification to residences affected by the CIPP installation.

9. An odor control plan that will ensure that project specific odors will be minimized at the project site and surrounding area.

10. Outline specific repair or replacement procedures for potential defects that may occur in the installed CIPP. Repair or replacement procedures shall be as recommended by the CIPP system manufacturer and shall be submitted prior to any Work.

    a. Repairable defects that may occur in the installed CIPP shall be specifically defined by the Contractor based on the manufacturer's recommendations, including a detailed step-by-step repair procedure, resulting in a finished product meeting the requirements of the specifications.

    b. Un-repairable defects that may occur to the CIPP shall be clearly defined by the Contractor based on the manufacturer's recommendations, including a recommended procedure for the removal and replacement of the CIPP.

1.04 REFERENCES

A. Codes, Specifications, and Standards

1. Codes, specifications, and standards referred to by number or title shall form a part of this specification to the extent required by the references thereto. Latest revisions shall apply, unless otherwise shown or specified.

2. All American Society for Testing and Materials (ASTM) Standards noted below shall be to the latest revised version.

   D543 – Standard and Practice for Evaluating the Resistance of Plastics to Chemical Reagents

   D638 – Standard Test Method for Tensile Properties of Plastics

   D790 – Standard Test Methods for Flexural Properties of Un-reinforced and Reinforced Plastics and Electrical Insulating Materials

   D792 – Standard Test Methods for Density and Specific Gravity of Plastics by Displacement

   D2122 – Standard Test Method for Determining Dimensions of Thermoplastic Pipe and Fittings

   D2837 – Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials

   D2990 – Standard Test Methods for Tensile, Compressive, and Flexural Creep and Creep-Rupture of Plastics

D3567 – Standard Practice for Determining Dimensions of Fiberglass (Glass-Fiber-Reinforced Thermosetting Resin) Pipe and Fittings

D3681 – Standard Test Method for Chemical Resistance of "Fiberglass (Glass Fiber Reinforced Thermosetting Resin) Pipe and Fittings

D5813 – Standard Specification for Cured-in Place Thermosetting Resin Sewer Pipe

F1216 – Standard Practice for Rehabilitation of Existing Pipelines and Conduits by Inversion and Curing of a Resin-impregnated Tube

F1743 – Standard Practice for Rehabilitation of existing pipelines and conduits by pulled-in-place installation of cured-in-place thermo setting resin pipe

F2019 - Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Pulled in Place Installation of Glass Reinforced Plastic (GRP) Cured-in-Place Thermosetting Resin Pipe (CIPP)

F2561 - Standard Practice for Rehabilitation of a Sewer Service lateral and Its Connection to the Main Using a One Piece Main and Lateral Cured-in-Place Liner

F2599 – The Sectional Repair of Damaged Pipe By Means of An Inverted Cured-In-Place Liner.

1.05 PRE-TREATMENT OF REGULATED CHEMICALS TO DISCHARGE INTO SEWER

A. CIPP liner systems using resins containing styrene or other regulated chemicals that will be discharged into the wastewater system shall be required to reduce the concentration of Styrene in the cure water prior to discharge to the sanitary sewer. The discharge limits are as follows for a maximum total discharge including water added for cool down of 100,000 gallons:

	Styrene Limits for < 100,000 Total Gallons of Discharge Including Water Added for cool down	
Treatment Plant	**Maximum Styrene Concentration Limit for Discharge (PPM)**	**Maximum Total Pounds per Day of Styrene to be Discharged (ppd)**
South Bermuda	10.60	8.84
Cypress West	2.83	2.36
Walnut	0.71	0.59
Lake Marion	1.28	1.07

1. A single day's or line segment water discharge in excess of 100,000 gallons per day shall require approval by the Owner's Environmental Compliance Section for separate concentration limit evaluation and approval.

B. CIPP liner systems using resins containing styrene or other regulated chemicals that will be discharged into the wastewater system shall require a pre-treatment plan to remove the regulated chemicals to acceptable levels prior to discharge. The Contractor shall submit the pre-treatment plan to the Owner for approval prior to discharge. The information required shall include:

1. MSDS for all chemicals used in the process and that will be discharged into the wastewater system.

2. Representative analytical data that was performed in the past for the proposed process, as collected from the wastewater stream.

3. The addresses and mapped locations of the discharge.

4. The total duration of discharge request.

5. The anticipated discharge temperature. Discharges in excess of 140°F are not permitted.

6. The Contractor shall submit for approval a summary table of pre-treatment design calculations in Excel containing the following information:

   a. Dates of discharge of each section

   b. Lining section numbers using the OCUD numbering system

   c. Length and diameter of each section

   d. Volume (in gallons) of inversion water of each section

   e. Volume (in gallons) of cool down water of each section

   f. Total volume (in gallons) of inversion and cooling water of each section

   g. Regulated chemical (in pounds) in discharge volume of each section

   h. Reduction chemical (in pounds) to meet post-treatment concentration limit

   i. Reaction time period (in hours) to achieve post-treatment concentration limit

   j. Cool down time period (in hours)

   k. Regulated chemical post-treatment concentration limit (in PPM)

7. The Contractor shall provide pre-treatment and post-treatment sampling and laboratory analysis of the process wastewater and submit the results to the Owner for verification.

C. After curing, the Contractor shall obtain a post-treatment cure water sample at each site and submit for laboratory analysis.

1. The following laboratory analysis is required:

a. One (1) sample to be collected from the treated water line segment and analyzed for “Styrene” using EPA Method 8260.

b. One (1) “Trip Blank” sample, analyzed for “Styrene” using EPA Method 8260.

2. The Contractor shall submit the analytical report to the Owner for approval.

3. The Contractor shall be responsible for all costs related to laboratory analytical testing of the water samples collected.

4. Sampling shall continue for each successive lining segment until the laboratory results verify the Contractor’s competency in determining the amount of styrene reduction tablets/material required for a given water volume. Competency will be determined by meeting the stated discharge limits.

5. Once the sample results demonstrate that the discharge limits have been met the Contractor shall follow similar styrene reduction procedures for subsequent lining segments, but sampling will not be required.

6. Should samples from three locations not meet the discharge limits, the Owner may require the Contractor to hold cure water in place until laboratory results confirm the water is below the discharge limits.

7. The Owner reserves the right to obtain samples at any site on any line segment to ensure compliance with the discharge limits.”

1.06 RESPONSIBILITY FOR OVERFLOWS AND SPILLS

A. It shall be the responsibility of the Contractor to schedule and perform his work so as to result in no overflows or spills of sewage or combined sewage from the system. If sewage flows are such that they interfere with the Contractor's ability to perform work, the Contractor shall be responsible for scheduling his work during low flow periods or provide bypass pumping.

B. In the event of overflows caused by the Contractor's work activities, the Contractor shall immediately take appropriate action to contain and stop the overflow, clean up the spillage, disinfect the area affected by the spill, and notify the Owner and all necessary regulatory agencies in a timely manner.

C. Contractor will indemnify and hold harmless the Owner for any fines or third-party claims for personal or property damage arising out of a spill or overflow that is fully or partially the responsibility of the Contractor. Should fines subsequently be imposed as a result of any overflow for which the Contractor is fully or partially responsible, the Contractor shall

pay all such regulatory and other fines and all of the Owner's legal, engineering, and administrative costs in defending such fines and claims associated with the overflow.

D. If the Contractor is required to hold cure water due to unacceptable styrene testing results, the Contractor shall be required to provide bypass pumping or other means to insure wastewater service is not disrupted during the hold period.

1.07 SHOP DRAWINGS AND SUBMITTALS

A. Submittals shall be submitted to the Owner for review and acceptance prior to construction in accordance with the General Conditions and specifications Section 01340. Submittals shall include the following:

1. Performance Work Statement shall be provided with a table of contents and tabbed sections.

2. Product:

a. A list of projects from the Manufacturer that total a minimum of 500,000 linear feet of liner installed in the United States. An Excel spread sheet shall be included listing as a minimum the name of projects, diameters of mains, linear footage of mains, completion date, contract amount, name of owner, address, contact person, and phone number.

b. Fabric tube – manufacturer and description of product components.

c. Flexible membrane (coating) material and recommended repair (patching) procedure if applicable.

d. Raw resin data – manufacturer and description of product components for all resin types.

e. Manufacturer’s shipping, storage and handling recommendations for all components of the CIPP system.

f. All MSDS sheets for all materials to be furnished.

g. Tube wet-out and cure method including:

1) A complete description of the proposed wet-out procedure for the proposed technology

2) The manufacturer’s recommended cure method for each diameter and thickness of CIPP liner to be installed including the curing medium and the method of application

3. Quality Control Plan

   a. Defined responsibilities of the Contractor's personnel for assuring that all quality requirements are met. These will be assigned by the Contractor to specific personnel.

      Proposed procedures for quality control, product sampling and testing shall be defined and submitted as part of the Plan.

   b. Proposed methods for product performance controls, including the method of and frequency of product sampling and testing both in raw material form and cured product form.

   c. Inspection forms and guidelines for quality control inspections shall be prepared in accordance with the standards specified within this specification.

   d. The manufacturer shall furnish a check list containing key elements of the CIPP installation criteria that is important for the Owner to ensure that quality control and testing requirements are performed in accordance with these specifications.

4. Engineering design calculations shall be submitted in a timely fashion prior to construction, in accordance with the Appendix of ASTM F-1216, for each length of liner to be installed including the thickness of each proposed CIPP. It will not be acceptable for the Contractor to submit a design for the most severe line condition and apply that design to all of the line sections.

   All calculations shall include data that conforms to the requirements of these specifications.

   a. These calculations shall be performed and certified by a Professional Engineer registered in the State of Florida.

   b. The manufacturer shall certify as to the compliance of its materials to the values used in the calculations.

5. The liner manufacturer shall submit a tabulation of time versus temperature. This tabulation shall show the lengths of time that exposed portions of the liner will endure without self-initiated cure or other deterioration beginning. This tabulation shall be at 5°F (degrees Fahrenheit) increments ranging from 70°F to 100°F.

   The manufacturer shall also submit his analysis of the progressive effects of such "pre-cure" on the insertion and cured properties of the liner.

6. Certified copies of test reports of factory tests required by the applicable standards and this Section.

7. Manufacturer's installation instructions and procedures.

8. CIPP Installation Record (Shot Record) to include shot number and corresponding manhole to manhole pipe reaches for each scheduled installation, design thickness, actual thickness delivered to the site, pipe diameter, reach length, total length of shot, and number of laterals.

9. Wastewater pre-treatment plan including data, measurements, assumptions, calculations and procedures for the pre-treatment of CIPP process wastewater containing regulated chemicals.

10. Manufacturer's detailed procedures for repairing liners that have been installed incorrectly or that have failed during installation.

11. Contractor's procedures and materials for service renewal including time and duration of sewer service unavailability and a complete description of the methods he intends to use to reconnect the existing laterals.

12. Sampling procedures and locations for obtaining representative samples of the finished liner.

13. Sampling tests for compliance by an independent laboratory shall be made according to the applicable ASTM specification and the manufacturer's quality control program.

B. A final certificate of compliance with this specification shall be provided by the manufacturer for all lining material furnished.

1.08 WARRANTY

A. The materials used for the project shall be certified by the manufacturer for the specified purpose. The Contractor shall warrant the liner material and installation for a period of one (1) year. During the Contractor warranty period, any defect which may materially affect the integrity, strength, function and/or operation of the pipe, shall be repaired at the Contractor’s expense in accordance with procedures in these specifications and as recommended by the manufacturer.

B. The Contractor shall conduct a warranty television inspection via use of CCTV within 11 months following completion of the project. If it is found that any of the CIPP has developed abnormalities since the completion of the project, the abnormalities shall be repaired and/or replaced by the Contractor promptly as per these specifications and as recommended by the manufacturer.

C. On any work completed by the Contractor that is defective and/or has been repaired, the Contractor shall warrant this work for an additional one (1) year.

1.09 DELIVERY, STORAGE, AND HANDLING

A. The Contractor shall be responsible for the delivery, storage, and handling of products. No products shall be shipped to the job site without the approval of the Owner.

B. Keep products safe from damage. Promptly remove damaged products from the job site. Replace damaged products with undamaged products.

C. The wet-out facility shall write the Shot number, total wet-out length, thickness, pipe width, and resin type on each bag delivered to the project.

1.10 CONNECTING PIPE DETAILS

A. Each pipe entering and exiting the manhole shall be photographed where possible and inspected to determine diameter, pipe material, debris levels, and rim to invert distance (to 0.1-feet).

PART 2 - PRODUCTS

2.01 GENERAL

A. The materials used shall be designed, manufactured, and intended for sanitary sewer pipe relining and the specific application in which they are used. The materials shall have a proven history of performance in sewer relining and rehabilitation.

B. Pipe lining products pre-approved by the Owner include: Insituform Technologies (CIPP Liner), National Liner (CIPP Liner), LMK Enterprises (Performance Liner), Stevens Technologies (CIPP Liner 2 part 100% epoxy), Inner Cure Technologies (Reichold/Dion CIPP Liner), Lanzo Lining Services (Lanzo CIPP Lining System), and Premier Pipe (Premier Pipe CIPP Lining System), Layne Inliner (CIPP Liner), and Miller Pipeline (CIPP Liner). All products must meet the specification herein and will require approval prior to installation.

C. All materials, shipped to the project site, shall be accompanied by test reports certifying that the material conforms to the ASTM listed herein. Materials shall be shipped, stored, and handled in a manner consistent with written recommendations of the CIPP system manufacturer to avoid damage. Damage includes, but is not limited to, gouging, abrasion, flattening, cutting, puncturing, or ultra-violet (UV) degradation. On site storage locations, shall be approved by the Owner. All damaged materials shall be promptly removed from the project site at the Contractor's expense and disposed of in accordance with all current applicable agency regulations.

D. The finished pipe liner in place shall be fabricated from materials which when complete are chemically resistant to and will withstand internal exposure to domestic sewage having a pH range of 5 to 11 and temperatures up to 150ºF.

E. Take all necessary field measurements of the existing pipe (including diameter, ovality and length) prior to manufacturing liners.

F. The minimum length shall be that deemed necessary by the Contractor to effectively span the distance from the inlet to the outlet of the respective manholes unless otherwise specified. The Contractor shall verify the lengths in the field before manufacturing.

2.02 STRUCTURAL REQUIREMENTS

A. Each CIPP shall be designed to withstand internal and/or external loads as dictated by the site and pipe conditions. The CIPP design shall assume no bonding to the original pipe wall.

B. The Contractor must have performed long-term testing for flexural creep of the CIPP pipe material installed by his company. Such testing results are to be used to determine the long-term, time dependent flexural modulus to be utilized in the product design. The long-term modulus shall not exceed 50 percent of the short-term value for the resin system and shall be verifiable through testing. The materials utilized for the contracted project shall be of a quality equal to or better than the materials used in the long-term test with respect to the initial flexural modulus used in the CIPP design.

C. The Contractor shall submit, prior to installation of the lining materials, certification of the compliance with these specifications and/or the requirements of the CIPP system. Certified material test results shall be included that confirm that all materials conform to these specifications. Materials not complying with these requirements will be rejected.

D. The design thickness of the CIPP shall be arrived at using standard engineering methodology as found in ASTM F1216 and the physical properties. In no case shall the finished thickness of the cured liner be less than 4.5 millimeters. The required cured structural CIPP wall thickness shall be based, as a minimum, on the physical properties described in TABLE 02771 - 1 Minimum Physical Properties and per the design of the Professional Engineer and in accordance with the design equations in ASTM F 1216 Appendix X1 and the following design parameters:

Design Considerations	**Criteria**
Tube Design	ASTM F 1216 Appendix X1
Hydrostatic Buckling	ASTM F 2561 Section 6.1 and 6.1.1
Design Safety Factor	2.0
Retention Factor for Long Term Flexural Modulus to be used in Design	50 % of the short-term value of the resin system
Quality	2 %

Design Considerations	Criteria
Groundwater Depth*	100% depth from pipe invert to surface
Soil Depth*	As indicated on the plans
Lining enhancement factor (K)	7
Soil Modulus**	1,000 psi
Soil Density**	120 pcf
Live Load**	One (1) H20 passing truck
Design Condition	Fully deteriorated
Minimum Long-Term Life	50 years

*Denotes multiple line segments may require a table of values
**Denotes information required for fully deteriorated design conditions

TABLE 02771-1

Minimum Physical Properties

Property	Standard	Cured Composite per ASTM F1216 (PSI)
Flexural Strength (short term)	ASTM D790	4,500
Flexural Modulus of Elasticity (short term)	ASTM D790	250,000

E. When multiple layers are present, the layers of the finished CIPP shall be uniformly bonded. It shall not be possible to separate any two layers with a probe or point of a knife blade so that the layers separate cleanly or such that the knife blade moves freely between the layers. If separation of the layers occurs during testing of the field samples, new samples will be cut from the work. The composite of the materials will, upon installation inside the host pipe, exceed the minimum test standards specified by the American Society for Testing Methods. Any reoccurrence may be cause for rejection of the work.

2.03 CURED-IN-PLACE LINER

A. Fabric

1. The Contractor shall determine the minimum tube length necessary to effectively span the designated run between manholes. The Contractor shall verify the lengths in the field prior to ordering and prior to impregnation of the tube with resin, to ensure that the tube will have sufficient length to extend the entire length of the run. The Contractor shall also measure the inside diameter of the existing pipelines in the field prior to ordering liner so that the liner can be installed in a tight-fitted condition.

2. The sewn tube shall consist of one or more layers of absorbent non-woven felt fabric and meet the requirements of ASTM F-1216, ASTM F1743, or ASTM D5813. The tube shall be constructed to withstand installation pressures, have sufficient strength to bridge missing pipe, and stretch to fit irregular pipe sections.

3. The wet out tube shall have a relatively uniform thickness that when compressed at installation pressures will equal or exceed the calculated minimum design CIPP wall thickness.

4. The flexible tube shall be fabricated to a size that when installed will neatly fit (minimum 99.75%) the internal circumference of the existing sanitary sewer lines (including services). Allowance shall be made for circumferential stretching during insertion so that the final cured product is snug against the wall of the host pipe.

5. The outside layer of the tube shall be coated with an impermeable, flexible membrane that will contain the resin and allow the resin impregnation (wet out) procedure to be monitored.

6. The tube shall contain no intermediate or encapsulated elastomeric layers. No material shall be included in the tube that may cause delamination in the cured CIPP. No dry or unsaturated layers shall be evident.

7. The wall color of the interior pipe surface of CIPP after installation shall be a relatively light reflective color so that a clear detailed examination with closed circuit television inspection equipment may be made.

8. Seams in the tube shall be stronger than the non-seamed felt material.

9. The tube shall be marked for a distance at regular intervals along its entire length, not to exceed five feet. Such markings shall include the Manufacturers name or identifying symbol.

10. Unless otherwise specified, the Contractor will use a polyester filter felt tube and a resin and catalyst system compatible with the inversion process and having the minimum physical properties for the cured pipe identified in Table 02771 - 1 Minimum Physical Properties.

B. Resin

1. The Contractor shall provide a submittal per Section 01340 of the specifications for the type of resin to be used for each pipe material prior to commencement of construction.

2. The resin system shall be a corrosion resistant polyester or vinyl ester resin and catalyst system or epoxy and hardener system that when properly cured within the tube composite, meets the minimum requirements of ASTM F1216, ASTM F1743 or F2019, the physical properties given herein these specifications Section 02771 and those, which are to be utilized in the design of the CIPP for this project.

3. The resin used shall not contain non-strength enhancing fillers.

4. The Contractor shall submit the resin characteristics, including filler identification, to the Owner for approval prior to lining activities.

5. The resin shall produce a CIPP that will comply with the structural and chemical resistance requirements of the specification.

6. The Contractor is responsible for ensuring that the appropriate resin is used for optimal adherence to the existing pipe materials and note what CIP materials will be used for lining through each type of material in their submittals and how this will be tracked prior to installation. If a section of gravity main piping to be lined consists of multiple pipe materials, the contractor is responsible for ensuring a type of resin is used which will provide optimal adherence to all pipe materials at no additional cost to the Owner. It should be assumed that the full length of each section of liner (from manhole to manhole) must meet the advanced resin requirements if one section or segment of the piping requires an upgraded resin to ensure optimal adherence to the piping material.

PART 3 - EXECUTION

3.01 PREPARATION

A. Prior to any lining of a pipe so designated:

1. It shall be the responsibility of the Contractor to remove all internal debris and all obstructions and clean the existing sewer line and/or lateral in accordance with the recommendations of the liner manufacturer prior to installation of the liner and in accordance with Section 02761 "Cleaning Sanitary Sewer Systems." Both mainline and lateral line shall be cleaned.

   a. Preparation of the interior surface shall be accomplished by a thorough high-pressure water-jet cleaning. The pipe shall be left free of all dirt, grease, sand, rocks, roots, concrete, all debris and obstructions, including any other deleterious materials. Any roots in the pipe shall be either removed or cut off flush with the interior.

   b. If conditions such as broken pipe and major blockages are found that will prevent proper cleaning or where additional damage would result if cleaning is attempted or continued, the Contractor shall notify the Owner immediately. The Owner will determine what course of action will be taken to complete the project.

   c. Precautions shall be taken by the Contractor to ensure that no damage or flooding of public or private property is caused by the cleaning operation.

   d. The Owner shall inspect the prepared pipe for cleanliness and smoothness before the Contractor is authorized to proceed with pipe lining operations.

2. Certified PACP personnel trained in locating breaks, obstacles and service connections by closed circuit television shall perform inspection of existing sewer lines. The interior of the line shall be carefully inspected in accordance with Section 02762 "Televising Sanitary Sewer Systems" to determine the location of laterals in any condition that may prevent proper installation of the liner pipe into the lines. Such conditions shall be noted so they can be corrected. A digital data video and a suitable log shall be prepared by the Contractor during the Work and provided to the Owner a minimum of two weeks prior to liner installation.

3. The Contractor shall provide for the flow of sewage around the section or sections of pipe designated for lining as specified in Section 02516 "Collection System Bypass."

   a. Flow control shall be exercised as required to ensure that no flowing sewage comes into contact with sections of the sewer under repair.

   b. A sewer line plug shall be inserted into the sewer upstream from the section to be repaired. The plug shall be so designed that all or any portion of the sewage flows can be released.

      During the review, testing and installation portion of the operation, flows shall be shut off in order to properly install the cured-in-place pipe lining. The upstream manholes shall be constantly monitored for degree of surcharging. After the installation is complete, flows shall be restored to normal level.

   c. Wherever lines are blocked off and the possibility of backing up the sewage and causing harm to public and private property is foreseen, it shall be the Contractor's responsibility to bypass flow from manhole to manhole.

   d. Bypassing shall be accomplished using sewer plugs with pump connections, by pumping down surcharged manholes, or by other methods acceptable to the Owner. All bypassed flow must be discharged to a sanitary sewer. Bypassed flow shall not be allowed to enter any storm line, drainage ditch or street gutter.

   e. During a bypass operation, the pump shall be manned continuously; the Contractor shall maintain the pump and bypass equipment; and shall be responsible for any damages to public or private property due to the malfunction of same.

4. The Contractor shall clear the line of obstructions such as solids, dropped joints, protruding service connections or collapsed pipe that will prevent the insertion of the liner pipe. If inspection reveals an obstruction that cannot be removed by conventional sewer cleaning equipment, then the Owner shall be notified immediately.

5. Do not install liner if ground water temperatures and/or ambient temperatures are excessive or do not meet the manufacturer's recommendations for the product installation procedures.

6. Notification of Public or Customers: Customers shall be notified by the Contractor with door hangers at least 3 days prior to the shutdown of any lateral services. The door hanger shall be approved by the Owner and advise the customers of when the Work will begin, expected date of completion, the type of work, and contact person for any questions on the door hanger.

   When it is necessary to shut down a private sewer lateral while work is in progress and before the laterals are reconnected, the customers shall be notified by the Contractor. No sewer or water service is to remain shut down for more than a period of 8-hours unless the Contractor provides substitute services for the residents. **The Contractor will assume all costs associated with improper or inadequate verifications of active service or lateral connections. No compensation will be paid for remedying reinstatement of inactive laterals or for time delays due to improper or inadequate active service verifications.**

   Commercial sewer services shall be maintained at all times that the business is open. No sewage from the services or main line shall be discharged on the ground or in waterways.

7. Contractor shall coordinate pump stations, force main and sanitary sewer operation, bypass and shutdown control with the Owner.

8. Traffic Control: The Contractor shall provide all traffic control measures required for the safety of the public, workers and equipment during the Work and in accordance with FDOT, the City or County, and the Owner.

9. The Contractor shall provide critical backup equipment to insure that the lining operation progresses without interruption. Required backup equipment shall include at a minimum 1 additional lateral cutter system and 1 additional CCTV camera system.

3.02 INSTALLATION OF LINER

A. The CIPP liner shall be installed and cured in the host pipe per the manufacturer's specifications as described and submitted in the Performance Work Statement. CIPP installation shall be in accordance with the applicable ASTM Standards with the following modification:

   1. Prior to installation and as recommended by the manufacturer remote temperature gauges or sensors shall be placed inside the host pipe to monitor the temperatures during the cure cycle. Liner and/or host pipe interface temperature shall be monitored and logged during curing of the liner.

   2. The heat source shall be fitted with suitable monitors to gauge the temperature of the incoming and outgoing heat source. Another such gauge shall be placed between the impregnated reconstruction tube and the pipe invert at the remote manhole to determine the temperatures during cure. The resin manufacturer shall recommend temperature in the line during the cure period.

3. The wet-out tube shall be positioned in the pipeline using the method specified by the manufacturer. Care should be exercised not to damage the tube as a result of installation. The tube shall be inverted through an existing manhole or approved access point and fully extend to the next designated manhole or termination point. Sufficient excess resin will be provided to insure excretion into cracked pipe and/or joints of the host pipe after curing.

4. After inversion is completed, the Contractor shall supply suitable heat source and recirculation equipment. The equipment shall be capable of delivering the heat source throughout the section uniformly to raise the temperature above the temperature required to affect a cure of the resin. This temperature shall be determined by the resin/catalyst system employed.

   Temperatures shall be monitored and recorded throughout the installation process to ensure that each phase of the process is achieved at the manufacturer's recommended temperature levels. Copies of these records shall be given to the Owner at the completion of each installation.

5. Curing shall be accomplished by utilizing the appropriate medium in accordance with the manufacturer’s recommended cure schedule. The curing source input and output temperatures shall be monitored and logged during the cure cycles if applicable. The manufacturer’s recommended cure method and schedule shall be used for each line segment installed, and the liner wall thickness and the existing ground conditions with regard to temperature, moisture level, and thermal conductivity of soil, per ASTM Standards as applicable, shall be taken into account by the Contractor.

6. For heat cured liners, if any temperature sensor or multiple sensors do not reach the temperature as specified by the manufacturer to achieve proper curing or cooling, the installer can make necessary adjustments to comply with the manufacturer’s recommendations. The system computer should have an output report that specifically identifies each installed sensor station in the length of pipe, indicates the maximum temperature achieved and the sustained temperature time. Each sensor should record both the maximum temperature and the minimum cool down temperature and comply with manufacturer’s recommendations.

7. For UV cured liners, all light train sensor readings, recorded by the tamper proof computer, shall provide output documenting the cure along the entire length of the installed liner. The cure procedure shall be in accordance with the manufacturer’s recommendation as included in the performance work statement.

8. Temperatures and curing data shall be monitored and recorded by the Contractor throughout the installation process to ensure that each phase of the process is achieved as approved in accordance with the CIPP system manufacturer’s recommendations.

9. The Contractor shall immediately notify the Owner of any delays taking place during the insertion operation. Such delays shall possibly require sampling and testing by an independent laboratory of portions of the cured liner at the Owner's discretion. The cost of such test shall be borne by the Contractor and no extra compensation will be allowed. Any failure of sample tests or a lack of immediate

notification of delay shall be automatic cause for rejection of that part of the Work at the Owner's discretion.

10. Initial cure shall be deemed to be completed when inspection of the exposed portions of cured pipe appear to be hard and sound and the remote temperature sensor indicates that the temperature is of a magnitude to realize an exotherm.

    The cure period shall be of a duration recommended by the resin manufacturer, as modified for the cured-in-place inversion process, during which time the recirculation of the heat source and cycling of the heat exchanger to maintain the temperature continues. Contractor shall retain a resin-impregnated sample (wick) to provide verification of the curing process taking place in the host pipe.

11. The Contractor shall cool the hardened pipe to a temperature below 100°F before relieving the static head in the inversion standpipe. Cool-down may be accomplished by the introduction of cool water into the inversion standpipe to replace water being drained and disposed per the approved pre-treatment plan. Care shall be taken in the release of the static head so that a vacuum will not be developed that could damage the newly installed pipe.

12. The Contractor shall seal the liner at all manhole reconnections with an approved hydrophilic gasket, compatible with the liner, to completely seal any annular space present. The use of caulk or similar materials will not be permitted to make this seal. Finish the inside of the manhole with a quick set cement grout to raise the invert to the grade of the liner pipe. Also use this grout to dress up around the end of the liner.

13. If the pipe liner fails to make a tight seal due to broken or misaligned pipe at the manhole wall or other reason, the Contractor shall apply a seal at that point.

14. The temperature of water discharged to the sewer system from processing liners shall not exceed 100°F maximum or the level allowed by State or Local standards. When draining water, care shall be exercised not to create a vacuum in the line.

15. After the liner has been installed, all active, existing services shall be temporarily reinstated. This shall be done without excavation in pavement areas, and in the case of non-man-entry pipes, from the interior of the pipeline by means of a 360° (degree) television camera and a cutting device that re-establishes the service connection. When a remote cutting device is used and a cleanout is available, then a mini-camera down the service may also be used to assist the operator in cutting or trimming. All coupons shall be recovered at the downstream manhole and removed.

16. The cost for maintaining sanitary sewer service for the property owners shall be included in the prices bid and no additional compensation will be allowed.

B. The segmental CIPP liner shall be installed and cured in the host pipe per the manufacturer’s specifications as described and submitted in the Performance Work Statement. CIPP installation shall be in accordance with the applicable ASTM Standards with the following modification:

1. The length and number of liners shown in the work tables on the drawings reflect the lengths of the liners the OWNER has identified as being satisfactory to

complete the repair. The CONTRACTOR shall verify the lengths in the field before cutting liner to length. The liner must extend a minimum of 6 inches past the nearest pipe joint nearest the defect being repaired.

2. The segmental liner shall be sealed on each end using an approved hydrophilic gasket, compatible with the liner material. The use of caulk or similar materials will not be permitted to make this seal.

3.03 POST INSTALLATION

A. Service Lateral Renewal

1. The number of service connections on some sewer segments may exceed the number of buildings actually served.

   It is the Contractor's responsibility to determine through dye testing, or other acceptable methods, the services that are active/live and thus require reinstatement. The Contractor will be required to coordinate the timing of the installation of the main line liner and the lateral liners based on the active/live services being confirmed prior to commencing lining of the sewer main, and prior to any taps within the main liner.

2. The Owner shall be notified of any inactive services to vacant parcels. These should not be renewed unless otherwise directed by the Owner.

3. The Contractor shall reconnect all active/live service connections or side sewers. The exact location and number of service connections or side sewers shall be verified during the initial television inspection. It shall be the Contractor's responsibility to accurately field locate all existing service connections or side sewers and establish means for access for flow control. The Contractor shall reconnect all service connections or side sewers to the liner pipe as indicated in accordance with the Contract Documents.

4. The Contractor shall be responsible for restoring/correcting, without any delay, all missed or faulty reconnections, as well as any damage caused to property owners for not reconnecting the services soon enough or for not giving notice to the property owners.

5. Any lateral not initially reinstated by the Contractor that proves to be active shall be reinstated by the Contractor at no additional cost to the Owner and the Contractor shall be responsible for any resulting property damage of floods or any other associated impacts.

6. Any inactive laterals that are incorrectly re-instated must be re-lined with a segmental liner by the Contractor at no additional cost to the Owner. Vinyl ester resin is required for segmental liners to ensure adherence. Segmental liners must be installed 3 feet past the incorrectly re-instated lateral on each side of the lateral.

7. All existing service connections shall be reconnected by a remote controlled cutting device directed internally by a television camera or by internal manual cutting. Cuts shall be made by experienced operators so that no blind attempts or holes are made in the liner pipe. Locations shall be verified carefully to match earlier tapes for accurate lateral location, especially where dimples are not well

defined. The Owner reserves the right to require service connection by excavation at the Contractor's expense at any location if the quality or workmanship of the cut is not satisfactory.

8. A 2-pass process of utilizing a cutter to open the lateral followed by wire brush (or similar) attachment to complete the cutting flush with the lateral walls should be utilized, or approved alternate. It shall be properly aligned, invert to invert, to the existing connection with no obstructions to the flow. Resin slugs shall be removed as necessary from reinstated service connections. Any mis-cuts shall be repaired at no cost to the Owner and shall be performed utilizing an additional thinner liner to prevent water from entering behind the liner to the full satisfaction of the Owner. All coupons cut from the liner for reopening of lateral connections shall be retrieved from the sewer, accounted for by the Contractor, and turned over to the Owner.

9. Service connections shall be reinstated to at least 95% of the original area as it enters the host pipe.

10. All service connections and side sewers to be reconnected to the main sewer, shall be cleaned up to a length of 1-foot from the inside face of the existing wall of the main pipe.

    All deposits within the first foot of the service connection or side sewer in the service connections shall be removed and laterals reinstated.

11. Contractor shall provide a sound, smooth transition from laterals/side sewers to the main sewer. Contractor shall submit for approval a detailed repair plan for the permanent repair of any gaps between the installed liner and the face of the lateral/side sewer connections. This shall include, but is not limited to, installing segmented liners, lateral liners or grouting of the leak. The repair plan options shall be submitted to the Owner for repair method selection. No additional payment will be made for the cost to complete the approved repair.

12. For PVC laterals or laterals that have been previously lined with cured-in-place pipe the Contractor shall take care during the reinstatement to avoid damage to the lateral pipe.

B. Each pipe lined shall be post-CCTV inspected in accordance with Section 02762 "Televising Sanitary Sewer Systems" as soon as practical after processing to assure complete curing.

1. The Contractor shall not reactivate any section of lined sewer pipe until authorized to do so by the Owner. Segments not fully conforming to these Specifications must be immediately brought to the Owner's attention with a proposed method of correction.

2. Immediately prior to conducting the post-lining CCTV, the Contractor shall thoroughly clean the newly installed liner removing all debris and build-up that may have accumulated, at no additional cost to the Owner.

3. The post-CCTV inspection documentation shall be submitted within 5 working days of the liner installation. The Owner may at its discretion suspend any further installation of CIPP until the post-installation documentation is submitted.

a. As a result of this suspension, no additional working days will be added to the contract, nor will any adjustment be made for increase in cost.

C. Defects

1. The liner shall be continuous and free of all visual and material defects except those resulting from pre-lined conditions (such conditions shall be brought to the attention of the Owner prior to lining).

2. There shall be no damage, deflection, holes, delaminating, uncured resin or other visual defects in the liner.

3. The liner surface shall be smooth and free of waviness throughout the pipe.

4. No visible leakage through the liner or at manhole or service lateral connections will be allowed.

5. Any defects located during the inspection shall be corrected by the Contractor to conform to the requirements of the specifications and to the satisfaction of the Owner.

6. Any lateral not initially reinstated by the Contractor that proves to be active shall be considered a defect and reinstated by the Contractor at no additional cost to the Owner and the Contractor shall be responsible for any resulting property damage of floods or any other associated impacts.

7. Any inactive laterals that are incorrectly re-instated shall be considered a defect and must be re-lined with a segmental liner by the Contractor at no additional cost to the Owner. Vinyl ester resin is required for segmental liners to ensure adherence. Segmental liners must be installed 3 feet past the incorrectly re-instated lateral on each side of the lateral.

8. Defects in the installed CIPP shall be identified and defined as specified in Section 02762 Televising Sanitary Sewer Systems.

9. Repairable defects that may occur in the installed CIPP shall be specifically defined by the Contractor based on manufacturer's recommendations, including a detailed step-by-step repair procedure, resulting in a finished product meeting the requirements of these contract specifications.

10. Un-repairable defects that may occur to the CIPP shall be clearly defined by the Contractor based on the manufacturer's recommendations, including a recommended procedure for the removal and replacement of the CIPP.

D. Manhole Connections

1. Where liners of any type are installed in 2 or more continuous manhole segments, the liner invert through the intermediate manholes shall be left intact. Final finishing of the installation in those intermediate manholes shall require removal of the top of the exposed liner and neat trimming of the liner edge where it touches the lip of the manhole bench.

2. Reinstate openings for all manhole drop assemblies after relining mainline sewer. Inside drop assemblies are not required to be relined.

3. A seal consisting of a resin mixture or hydrophilic seal compatible with the installed CIPP shall be applied at manhole/wall interface in accordance with the CIPP system manufacturer's recommendations.

E. Portions of any piece of liner material removed during installation shall be available for inspection and retention by the Owner.

3.04 TESTING

A. The physical properties of the installed CIPP shall be verified through field sampling and laboratory testing. All testing shall be furnished by the Contractor. All materials testing shall be performed at the Contractor's expense, by an independent third party laboratory selected by the Owner as recommended by the CIPP manufacturer.

All tests shall be in accordance with applicable ASTM test methods to confirm compliance with the requirements in these documents.

B. The Contractor shall pay for all testing included in this section

C. The Contractor shall provide samples for testing from the actual installed CIPP liner. The Contractor shall determine sampling location and procedures to ensure representative samples are obtained from the finished liner, subject to the approval by the Owner. The contractor shall provide removable sizing sleeves, when possible, to collect liner samples, which accurately replicate the host pipe diameter.

1. A minimum of 1 sample shall be taken of the first segment installed or as directed by the Owner.

2. A minimum of 2 samples shall be taken for each 2,500 lineal feet of liner material installed or for each manufacturing lot, if less, or as directed by the Owner.

3. A minimum of 6 samples per project shall be taken for each type of liner furnished or as directed by the Owner.

4. A sample shall be cut from a section of cured liner that has been inverted or pulled through a like diameter pipe which has been held in place by a suitable heat sink such as sand bags.

5. All curing, cutting, and identification of samples shall be witnessed by the Owner's representative.

D. Tests of the samples shall be conducted in accordance with ASTM standards.

1. Short term flexural properties: The initial tangent flexural modulus of elasticity and flexural strength shall be measured in accordance with test methods in ASTM D790.

2. Fiber reinforced flexural properties: specimens should be sampled in accordance with ASTM F1743, section 8.1.2 and flexural properties shall be determined in accordance with ASTM F1743, section 8.1.3 along the longitudinal and circumferential axis of the install CIPP.

3. Fiber reinforced tensile properties: Where the CIPP is reinforced with oriented continuous or discontinuous fibers to enhance the physical properties of the CIPP, specimens shall be sampled in accordance with ASTM F1743, section 8.1.2 and tensile properties shall be determined in accordance with ASTM D3039 and tested along the longitudinal axis and circumferential axis of the installed CIPP.

4. CIPP wall thickness shall be determined in a manner consistent with ASTM D5813, section 8.1.2. Thickness measurements shall be made in accordance with the practice in ASTM D3567 for ASTM D5813, section 8.1. Deduct from the measured values the thickness of any plastic coating or CIPP layer not included in the structural design of the CIPP. The average thickness shall be calculated using all measured values and shall meet or exceed the minimum design thickness. The minimum wall thickness at any point shall not be less than 87.5% of the approved specified thickness.

E. The installed CIPP thickness shall be measured for each liner shipment to the job site. If the CIPP thickness does not meet that specified in the contract and submitted as the approved design by the Contractor, then the liner shall be repaired or removed.

F. The samples shall be made by core drilling 2-inch diameter test plugs at random locations selected by the Owner. As an alternative the Contractor may use industry proven, non-destructive methods for confirming the thickness of the installed CIPP if it can be shown the calibrated thickness is the same as core test plugs.

3.05 ACCEPTANCE

A. Liner

1. It is the intent of these specifications that the completed liner with all appurtenances shall be essentially equivalent in final quality and appearance to new sewer installation.

2. The finished liner shall be continuous over the entire segment between manholes and homogenous throughout.

3. The finished liner shall be fully rounded and as free as commercially practicable from visible defects, including but not limited to damage, deflection, holes, delamination, ridges, cracks, uncured resin, foreign inclusions or other objectionable defects.

4. Where a defect in the liner requires removal of a section of the liner in the Owner's opinion, the Contractor shall make all repairs as required by the Owner and shall install a segmental liner, compatible with the liner, to accomplish a continuous finished liner. The minimum required length of the liner will be to remedy the defective area as well as overlapping the area for at least 3 feet on each side of the defect, unless termination at a manhole.

5. The pipe shall be neatly and smoothly cut off at each manhole. The manhole trough shall be raised to the invert of the liner to preclude snagging and shoaling of debris.

B. Defects: Any defect which will or could affect the structural integrity, strength of the lining, flow impairment, or leaks shall be repaired as outlined below or in accordance with the approved repair or replacement procedures as recommended by the CIPP system manufacturer. The repair or replacement of the defects will be at the Contractor's expense. Repair or replacement of defects shall include an extended warranty at no cost to the Owner for an additional year after the defect was repaired or replaced.

1. Leaks

a. There shall be no visible infiltration through the liner, around the liner at manhole connections, at lined service connections or in lined services. Contractor shall repair any visible leaks and the repair method shall be approved by the Owner.

2. Wrinkles/Fins

a. Wrinkles outside the flow line of the pipeline:

(1) Wrinkles/fins in height up to a maximum of 5% of the inside diameter of the host pipe are acceptable

(2) Wrinkles/fins over 5%, particularly those of a longitudinal configuration, may be acceptable and should be evaluated, by the project engineer for acceptance, on a case-by-case basis.

b. Wrinkles in the flow line:

(1) Wrinkles/fins projecting more than 5% into the flow that are generally longitudinal in their orientation may be deemed acceptable by the Owner on a case-by-case basis by considering any potential operation and maintenance issues that would result from their being left in place.

(2) Wrinkles/fins in the lower third or flow line of the finished CIPP (based upon the depth of flow) that are generally circumferential in their orientation should not exceed 0.5-inches, whichever is smaller.

(3) Acceptability of larger wrinkles/fins meeting this characterization shall be, on a case-by-case basis by the Owner with consideration given to potential operations and maintenance issues that would result from their being left in place.

c. Repair when wrinkles/fins are removed:

(1) Wrinkles should be fully cured, tight and the resin should be homogeneous across the full width of the wrinkle.

(2) In most cases, when wrinkles/fins are removed from the installed CIPP, the resin in the liner pipe is fully cured and homogeneous and no further repair is required. If a repair is required the manufacturer should be contacted for the correct repair procedure.

3. Blisters should be probed and punctured to determine the existence of water behind the blister.

a. No action required unless the pipe is leaking at the blisters.

4. Lifts in Liner

a. Soft lifts should be re-processed by the Contractor to fully cure the CIPP.

b. Hard lift shall be removed and a new short liner as required being equivalent to the original installed CIPP.

5. A bulge in the invert caused by residual debris left in the pipe that impedes the flow characteristics of the pipeline should be cut out.

a. Cut out the section of the bulge and replace with a new short liner equivalent to the original product or as recommended by the manufacturer.

6. Pinholes: the area where the liner has pinholes should be patched with a short-liner repair or the liner removed and replaced as recommended by the manufacturer.

7. Soft spot in liner needs to be reheated and hardened or cut out and replaced or as recommended by the manufacturer.

8. Dry tube or white spots are not acceptable and shall be removed and a patch repair shall be performed or as recommended by the manufacturer.

9. Liner surface peeled off.

a. Cut out a representative sample of the CIPP.

b. Test physical properties and remaining CIPP thickness to verify that the contract design requirements are met.

c. Replace liner or as recommended by the manufacturer.

10. Hole in the liner is not acceptable.

    a. Small holes can be repaired with epoxy.

    b. Short liner installed over larger holes or as recommended by the manufacturer.

11. Cracks in liner are unacceptable and shall be repaired.

12. Loose liner seam tape shall be removed to prevent potential hang-up of debris.

13. Annular space between host pipe and liner at manhole.

    a. If leaking between the host pipe and the CIPP, inject a hydrophilic type grout to stop the leakage.

    b. If the pipe is located in groundwater, inject a hydrophilic type grout to stop possible future leakage.

    c. If the pipe in not in groundwater, a cementitious grout can be used to fill the space.

14. Liner Delamination

    a. Cut out the section of delaminated liner and replace with a new short liner equivalent to the original product or as recommended by the manufacturer.

15. CIPP Discoloration

    a. Obtain a sample for testing the CIPP physical properties. Follow manufacturer's recommendations for repair.

    b. Remove and replace the CIPP physical if the physical properties do not meet the contract minimum requirements.

    c. No action required if the tested samples meet the physical properties.

16. Improper repair of CIPP: duct tape is not an acceptable repair for any situation.

17. The CIPP should fit tight inside the host pipe.

    a. If the CIPP does not fit tightly against the original pipe at its termination point(s), the full circumference of the CIPP exiting the existing host pipe should be sealed by filling with a resin mixture compatible with the CIPP.

18. Overcut connection not allowed.

a. Opening cut to match bottom of service pipe to eliminate debris build-up.

b. If an overcut is made, provide a full-circle lateral liner at the overcut lateral location. Grouting will not be acceptable for overcuts.

c. Install a full-circle connection hat.

d. Install a short liner, then re-cut the service connection opening. Vinyl ester resin is required for segmental liners to ensure adherence. Segmental liners must be installed 3 feet past the incorrectly re-instated lateral on each side of the lateral.

19. Leakage between CIPP and host pipe at service connection.

a. Leakage shall be stopped.

b. Contractor shall submit to the Owner repair methods, including but not limited to, segmental liners, lateral liners or grouting, for Owner's approval. The method selected by the owner should be used to complete the repair at no additional cost to the owner.

20. Connection hat issue.

a. Coating from mainliner not removed before installing the hat.

b. Loose material shall be removed.

c. Remove and replace the connection hat as recommended by the manufacturer.

21. Undercut service connection.

a. Finish cut with brush to create a smooth opening

22. Resin slug in service connection.

a. If not blocking the flow from the service connection and slug does not impede more than 20% of the connection opening, no action required

b. If blocking the flow, remove slug or dig up and replace the connection

B. Service Connections

1. The CIPP lateral lining shall not inhibit the CCTV post video inspection of the mainline or service lateral pipes.

2. Reinstatement of all lateral connections shall be done neatly and smoothly.

3. Any inactive laterals that are incorrectly re-instated must be re-lined with a segmental liner by the Contractor at no additional cost to the Owner. Vinyl ester resin is required for segmental liners to ensure adherence. Segmental liners must be installed 3 feet past the incorrectly re-instated lateral on each side of the lateral.

3.06 CLEAN-UP AND RESTORATION

A. The Contractor shall not allow the site of the Work to become littered with trash and waste material, but shall maintain the site in a neat and orderly condition throughout the construction period.

B. On or before completion, the Contractor shall clean and remove from the site of the Work all surplus and discarded materials, temporary structures, stumps and portions of trees, and debris of any kind. He shall leave the site of work in a neat and orderly condition, similar or equal to that prior to construction.

C. All private and public property along or adjacent to the Work disturbed by construction operations shall be restored to a condition similar or equal to that existing prior to construction.

D. Before final acceptance by the Owner, the Contractor shall replace and/or restore any water, sewer, drain, and gas lines and appurtenances; electrical, telephone, telegraph conduits and wires, both underground and aboveground, and appurtenances; traffic signals, fire and police alarm systems and appurtenances; sidewalks, curbs, gutter, drainage ditches and pavements and all other public utility facilities and appurtenances along or adjacent to the Work that may have been disturbed by construction operations.

E. Conditions permitting, property cleanup and restoration shall begin and be prosecuted to completion on a timely basis as set forth herein.

3.07 PROGRESSIVE CIPP INSTALLATION RECORD (SHOT RECORD)

A. The Contractor shall provide a progressive CIPP Installation Record (Shot Record) with monthly application for partial payments. The progressive shot record shall indicate quantities actually installed and deviations to the parameters included in the shot record (i.e. shot number and corresponding manhole to manhole pipe reaches for each scheduled installation, design thickness, actual thickness delivered to the site, pipe diameter, reach length, total length of shot, and number of laterals).

B. Monthly partial payments will not be approved without prior approval of the progressive CIPP Installation record (Shot Record) including verification and acceptance of all quantities by the Owner.

3.08 WARRANTY INSPECTION

A. The Contractor shall conduct a warranty television inspection via use of CCTV within 11 months following completion of the project. If it is found that any of the CIPP has developed abnormalities since the completion of the project, the abnormalities shall be

repaired and/or replaced by the Contractor promptly as per these specifications and as recommended by the manufacturer.

END OF SECTION

SECTION 02773

SERVICE LATERAL CLEAN-OUTS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work: The Contractor shall install service lateral cleanouts on laterals as indicated in the Drawings and Specifications and as directed by the Owner. All costs of material, equipment, labor and other costs due to the unspecified field conditions shall be borne by the Contractor.

B. Record Information: The Contractor shall submit to the Owner the locations and elevations of the clean-out tops as per the Owner's asset requirements in Appendices B and C.

PART 2 - PRODUCTS

2.01 GENERAL

A. All material supplied shall be one of the products specified in Appendix A as appended to these technical specifications.

2.02 MATERIALS

A. Polyvinyl Chloride Pipe and Fittings: Polyvinyl Chloride (PVC) Pipe shall meet the requirements of Section 15064 "Polyvinyl Chloride Pipe and Fittings."

B. Concrete and Reinforcing Steel: Concrete and reinforcing steel shall conform to the requirements of Division 3 - Concrete. Concrete classes for the various purposes shall be as follows:

1. Manhole bottoms, Class A

2. Precast manholes, Class A (4,000-psi)

3. Pipe and riser encasement, Class C

4. Protective slabs, Class C

5. Cleanout pads, Class C

C. Cement Mortar: Cement mortar for manhole construction shall comply with ASTM Designation C 270, Type M, except that the cement shall be Portland Type II only. No mortars that have stood for more than 1-hour shall be used.

PART 3 – EXECUTION

3.01 PREPARATION

A. The interior of all pipe shall be thoroughly cleaned of all foreign material before being installed and shall be kept clean.

3.02 INSTALLATION

A. Sewer Pipe

1. PVC Pipe

a. Handling PVC pipe: The handling of PVC pipe shall be in such a manner that the pipe is not damaged by dragging it over sharp and cutting objects. Sections of pipe with deep cuts and gouges shall be removed and discarded at no expense to the Owner.

2. Laterals/Service Connections

a. Service lateral connections shall be constructed in accordance with the details as indicated on the Drawings.

b. All connections and changes of direction shall be made using standard fittings designed for that purpose.

c. Locator balls shall be placed near the top of all sanitary sewer service cleanouts as indicated on the Drawings.

d. On curbed streets, the exact location for each service connection shall be marked by etching or cutting an "S" in the concrete curb. Where no curb exists or is planned, locations shall be marked by a method approved by the Owner.

e. H20 loaded cleanouts will be required to be provided in all traffic areas. PVC cleanouts will not be acceptable in traffic areas or areas subject to traffic loads.

3.03 FIELD QUALITY CONTROL

A. Workmanship: Clean-outs shall be built watertight.

B. Closed Circuit Television Inspection

1. Internal gravity sewer video inspection shall be performed by the Contractor to check for alignment and deflection. The television inspection shall also be used to check for cracked, broken, or otherwise defective pipe and overall pipe integrity.

END OF SECTION

SECTION 02774

WASTEWATER GRAVITY COLLECTION SYSTEM

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work: Construction of sanitary sewers, sewer connections and appurtenances as shown on the Drawings or specified herein.

1.02 QUALITY ASSURANCE

A. Scope of Work: Construction of sanitary sewers, sewer connections and appurtenances as shown on the Drawings or specified herein.

B. Storage: PVC pipe shall be stored on level ground, preferably turf or sand, free of sharp objects which could damage the pipe. Stacking of the PVC pipe shall be limited to a height that will not cause excessive deformation of the bottom layers of pipes. Where necessary, due to ground conditions, the pipe shall be stored on wooden sleepers, spaced suitably and of such width as not to allow deformation of the pipe at the point of contact with the sleeper or between supports.

C. Tests: Certified records of tests made by the manufacturer or by a reliable commercial laboratory shall be submitted with each shipment of pipe. All pipe shall be inspected upon delivery and that which does not conform to the requirements of these specifications shall be rejected and must be immediately removed by the Contractor. The Contractor shall furnish and provide samples of pipe for the performance of such additional tests as the Owner may deem necessary.

1.03 SHOP DRAWINGS AND SUBMITTALS

A. Submittals shall be submitted to the Owner for review and acceptance prior to construction in accordance with the General Conditions and specifications Section 01340.

1. Precast manholes
2. Manhole frames, covers, and other castings
3. Manufacturer's certified test report on castings
4. Certification of admix installation from pre-caster
5. Certified test records for polyvinyl chloride pipe
6. Mill Test Certificates on ductile iron pipe
7. Manhole pipe connections
8. Coal tar epoxy
9. Special interior linings

B. Record Information: The Contractor shall submit to the Owner the elevations of the center of the manhole covers and inverts of all pipes in the manholes and all cleanout elevations. All rigid couplings or fitting locations shall also be provided.

PART 2 - PRODUCTS

2.01 GENERAL

A. All material supplied shall be one of the products specified in Appendix A as appended to these technical specifications.

2.02 MATERIALS

A. Ductile Iron Pipe and Fittings: Ductile iron pipe shall meet the requirements of Section 15050 "Utility Piping, Fittings, Valves, and Accessories."

B. Polyvinyl Chloride Pipe and Fittings: Polyvinyl Chloride (PVC) Pipe shall meet the requirements of Section 15064 "Polyvinyl Chloride Pipe and Fittings."

C. Precast Concrete Manholes

1. Precast manholes shall conform to the requirements of ASTM Designation C 478.

a. The minimum shell thickness shall be 5-inches.

b. Lifting holes through the structures are not permitted.

c. The design of the structure shall include a precast base of not less than 8-inches in thickness poured monolithically with the bottom section of the manhole walls.

d. Where drop structures are required, the design of the structure shall include a precast base, for the drop structure, of not less than 8-inches in thickness poured monolithically with the bottom section of the manhole walls.

e. New manholes shall contain a crystalline waterproofing concrete admix. Crystalline waterproofing concrete admix shall be added to the concrete during the batching operation. Admix concentration shall be added based upon manufacturer design percent concentration of admixture to the required weight of cement. The amount of cement shall remain the same and not be reduced. A colorant shall be added to verify the admix was added to the concrete for all precast manholes. Colorant shall be added and provided at the admix manufacturing facility, not at the concrete batch plant. Contractor shall provide certification from the pre-caster that the admix was installed in accordance with the manufacturers recommendations.

2. Top sections shall be eccentric, except that concrete top slab shall be used where shallow cover requires a top section less than 3-feet deep.

3. New manholes shall be lined with Interior Linings where shown on the Drawings.

D. Concrete and Reinforcing Steel: Concrete and reinforcing steel shall conform to the requirements of Division 3 - Concrete. Concrete classes for the various purposes shall be as follows:

1. Manhole bottoms, Class A
2. Precast manholes, Class A (4,000-psi)
3. Pipe and riser encasement, Class C
4. Protective slabs, Class C

E. Castings: Gray iron castings for manhole frames, covers, adjustment rings, and other items shall conform to the ASTM Designation A 48, Class 30. Castings shall be true to pattern in form and dimensions and free of pouring faults and other defects in positions which would impair their strength, or otherwise make them unfit for the service intended. No plugging or filling will be allowed. Lifting or "pick" holes shall be provided, but shall not penetrate the cover. Casting patterns shall conform to those shown or indicated on the Drawings. The words shall be cast in all manhole covers as shown on the Drawings and standard details. All manhole frames and covers shall be traffic bearing to meet AASHTO H-20 loadings unless otherwise specified.

F. Brick: Brick for manhole construction shall be dense, hard burned, shale, or clay brick conforming to ASTM Designation C 32, Grade MM or C 62, Grade MW, except that brick absorption shall be between 5 and 25-grams of water absorbed in 1-minute by dried brick, set flat face down, in 1/8-inch of water.

G. Cement Mortar: Cement mortar for manhole construction shall comply with ASTM Designation C 270, Type M, except that the cement shall be Portland Type II only. No mortars that have stood for more than 1-hour shall be used.

H. Pipe Adapter: Connection of PVC gravity sewer lines to precast manholes and wetwells shall be made by using a flexible boot type manhole coupling adapter. Materials for fastening boots to manhole openings shall contain no plastic parts, nor require special tools for installation.

I. Interior Linings (proposed structures): Interior surfaces of new wetwells shall be lined. Interior surfaces of new manholes shall be lined where shown on the Drawings. Coatings and linings shall meet the requirements of Appendix A.

J. Joint Sealer: Joint sealer material for precast manhole structures shall be pre-formed flexible plastic conforming to Federal Specification SS-S-00210 (GSA-FSS). Seal all exterior joints with Portland Type II cement after setting of joint sealer and placement of manhole section to form a watertight joint.

K. Non-Shrink Mortar: Non-shrink mortar shall be used for filling annular spaces and holes in precast manholes and wetwells.

L. Manhole Encapsulation: Manhole cones, riser rings, iron frame, cover, and all joints shall be encapsulated with a heat shrink-wrap with a minimum thickness of 98-mils (2.5-mm).

1. Wrap shall have a cross-linked polyolefin backing coated with a protective heat activated adhesive. The wrap shall effectively bond to the substrate via primer provided by the manufacturer. The wrap shall be applied with a high intensity propane torch.

2. Heat shrink-wrap for all barrel section joints of manholes shall be a minimum 9-inch width. Corbel section, riser rings, and ring and cover shall have a minimum 12-inch width wrap.

3. Adhesive type materials shall not be allowed.

PART 3 - EXECUTION

3.01 PREPARATION

A. Upon satisfactory excavation of the pipe trench, as specified in Section 02220 "Excavating, Backfilling and Compacting" a continuous trough for the pipe barrel and recesses for the pipe bells shall be excavated by hand digging so that, when the pipe is laid in the trench, true to line and grade, the pipe barrel will receive continuous uniform support and the bell will receive no pressure from the trench bottom.

B. The interior of all pipe shall be thoroughly cleaned of all foreign material before being lowered in the trench and shall be kept clean during laying operations by means of plugs or other approved methods.

3.02 INSTALLATION

A. Sewer Pipe

1. General

a. Laying of pipe shall proceed upgrade with spigot ends pointing in the direction of flow. Before pipe is joined, gaskets shall be cleaned of all dirt, stones, and other foreign material. The spigot ends of the pipe and/or pipe gaskets shall be lubricated lightly with a lubricant as specified by the pipe manufacturer and approved by the Owner. Sufficient pressure shall be applied to the pipe so as to properly seat the socket into the bell of the pipe. Any damage to the pipe due to over-exertion shall be replaced at the Contractor's expense. All pipe shall be laid straight, true to the lines and grades shown on the Drawings.

b. Variance from established line and grade, at any point along the length of the pipe, shall not be greater than 1/32-inch per inch of pipe diameter and not to exceed 1/2-inch, provided that any such variation does not result in a level or reverse sloping invert.

c. Any pipe, which is disturbed or found to be defective after installation, shall be taken up and relayed or replaced at the Contractor's expense.

d. Approved utility crossing signs shall be placed on the pipe alignment at each side of any waterway crossing.

2. PVC Pipe

a. Handling PVC pipe: The handling of PVC pipe shall be in such a manner that the pipe is not damaged by dragging it over sharp and cutting objects. Sections of pipe with deep cuts and gouges shall be removed and discarded at no expense to the Owner.

b. Lowering pipe into trench: Care shall be exercised when lowering pipe into the trench to prevent damage to or twisting of the pipe.

3. Building Laterals/Service Connections

a. Service connections shall be constructed in accordance with the details as indicated on the Drawings.

b. Sewer lateral pipe shall be extended to the right-of-way and plugged at the right-of-way line to avoid leakage (unless otherwise indicated on the Drawings). All connections and changes of direction shall be made using standard fittings designed for that purpose.

c. Locator balls shall be placed under all sanitary sewer service cleanouts.

d. On curbed streets, the exact location for each service connection shall be marked by etching or cutting an "S" in the concrete curb. Where no curb exists or is planned, locations shall be marked by a method approved by the Owner.

4. PVC C-900 DR 14 Pipe Section: PVC C-900 DR 14 pipe shall be substituted for the specified PVC pipe where:

a. The sewer or service pipe is to be constructed with less than 30-inches of cover between the top of the pipe and the final top of pavement or ground line.

b. The PVC sewer main crosses over a water main, or is at a depth which results in less than 18-inches clear distance between pipes when crossing under a water main. The DR 14 pipe shall extend a minimum of 10-feet on each side of the point of crossing.

c. The lateral separation of the sewer pipe and potable water piping is less than 10-feet.

B. Manholes:

1. Manhole excavation and bedding at manhole junctions shall be performed in accordance with the provisions of Section 02220 "Excavating, Backfilling and Compacting" of these specifications.

2. The invert channels shall be smooth and accurately shaped to a semicircular bottom conforming to the inside of the adjacent sewer section using 2,500-psi concrete. Steep slopes outside the invert channels shall be avoided. Changes in size and grade shall be made gradually and evenly. Changes in the direction of the sewer or entering branch shall be a smooth curve with radius as long as practicable. Invert channels shall also be formed for pipe stubouts.

3. The first pipe joint outside the manhole shall be located a minimum distance of 24-inches from the outside surface of the manhole.

4. Precast manhole tops shall terminate at such elevations to permit laying brick courses under the manhole frame to make allowance for future street grade adjustments.

5. Frames and covers shall be set accurately to conform to the finished grade.

6. Outside drop connections shall be made in accordance with the details shown on the Drawings.

7. Drop connection base slab extensions on precast manholes shall be manufactured monolithically with the manhole elements at the casting yard. The manufacturer shall submit for approval the method of drop manhole construction.

8. Where additional pipe connections or modifications of existing factory made openings are required on new or existing precast concrete manholes or wetwells, all cutting relative thereto shall be performed only by a power driven abrasive wheel or saw. It is specifically noted that such connections to existing manholes or wetwells shall be installed in accordance with the details for new units shown on the Drawings, and shall be caulked watertight with non-shrink grout.

9. Connection of the pipe entering the manhole shall be made by using a flexible boot type manhole coupling adapter. At the entry into the manhole, no part of the horizontal pipe shall rest against the concrete. All piping replacements into manholes and/or manhole replacements require new boot type manhole coupling adapters. Core openings must be repaired and concrete restored as necessary.

10. Manholes shall be completed as the work progresses so that testing may be conducted as prescribed in paragraph 3.03 Field Quality Control.

C. Concrete encasement: Class C concrete encasement shall be constructed in accordance with details shown on the Drawings.

1. The Owner may order the line encased when:

a. The sewer main crosses over a water main, or is at a depth which results in less than 18-inches clear distance between pipes when crossing under a water main. Encasement shall extend a minimum of 10-feet on each side of the point of crossing. In lieu of encasement, the sewer line may be constructed of PVC DR 14 pipe and shall be laid such that both joints will be a distance of 10-feet from the crossing.

b. The maximum width for trench excavations is exceeded. The Contractor shall construct concrete encasement around the pipe for the length of the excessive excavation. No payment will be made for the concrete encasement required due to excessive trench widths.

2. The points of beginning and ending of pipe encasement shall be not more than 6-inches from a pipe joint to protect the pipe from cracking due to uneven settlement of its foundation or the effects of superimposed live loads.

D. Concrete protective slabs: Concrete protective slabs as shown on the Drawings shall be constructed over gravity sewers that have less than 3-feet of cover from finished grade.

E. Connections to existing structures: Proposed sewer lines shall be connected to the existing manholes by core drilling the proper size opening and installing a flexible boot type manhole adapter as specified in paragraph 2.01.H of this Section.

F. Invert channels (benching) shall be provided for all new manholes and existing manholes which are connected into. No brick shall be allowed in construction of the manhole invert. Inverts shall be poured using 2,500-psi concrete. Concrete benching or re-benching is required for all new and rehabilitation projects.

3.03 FIELD QUALITY CONTROL

A. Workmanship: Sewers and appurtenances shall be built watertight. The sewage must be pumped for disposal and special care and attention must be paid to securing watertight construction. Upon completion, the sewers, or sections thereof, will be tested and gauged and if leakage is above the allowable limits specified, the sewer will be rejected.

B. Inspection: On completion of each block or section of sewer, or such other times as the Owner may direct, the block or section of sewer shall be cleaned, tested, and inspected.

1. Each section of the sewer shall show, on examination from either end, a full circle of light between manholes.

2. Each manhole or other appurtenance to the system shall be of the specified size and form, be watertight (no leakage allowed by visual inspection), and be

constructed with the top set permanently to specified position and grade. All repairs shown necessary by the inspection shall be made; broken or cracked pipe replaced; all deposits removed and the sewer left true to line and grade, entirely clean and ready for use.

3. No pipe shall exceed a deflection of 5%. After the final backfill has been in place at least 30-days, the Contractor shall perform deflection testing using a rigid ball or mandrel with a diameter of not less than 95% of the base inside diameter or average inside diameter of the pipe, depending which is specified in the ASTM standard to which the pipe is manufactured. If the mandrel does not pass the completed section of sewer, the entire section of sewer will be rejected.

C. Closed Circuit Television Inspection:

1. Internal gravity sewer video inspection shall be performed by the Contractor to check for alignment and deflection. The television inspection shall also be used to check for cracked, broken, or otherwise defective pipe and overall pipe integrity.

2. The video internal inspection will be performed in 2 stages. The first inspection shall be within 30-days after the installation of the gravity sewer pipe provided the road base is in place and the manhole rings and covers are to grade. The second inspection of the gravity sewer pipe shall be before the end of the 1-year warranty period.

3. If the first or second video inspection reveals cracked, broken, or defective pipe, or pipe misalignment resulting in vertical sags in excess of 1-1/2-inch or a ring defection in excess of 5%, the Contractor shall be required to repair or replace the pipeline. Successful passage of both the low-pressure air exfiltration test and video inspection is required before acceptance by the Owner.

4. Prior to repair or replacement of failed sewer pipe, the method of repair or replacement shall be submitted to the Owner for approval. Pressure grouting of pipe or manholes shall not be considered as an acceptable method of repair.

D. Low Pressure Air Exfiltration Testing:

1. The Contractor shall provide all labor, equipment, and materials and shall conduct all testing required under the direction of the Owner for all full length lateral replacements.

2. Low pressure air testing shall conform to the requirements of UNI-B6-79 "Recommend Practice for Low-Pressure Air Testing of Installed Sewer Pipe", as published by UNI-Bell Plastic Pipe Association.

3. During sewer Construction, all service laterals, stubs, and fittings into the sewer test section shall be properly capped or plugged so as not to allow for air loss that could cause an erroneous air test result. Where necessary, the Contractor shall restrain caps, plugs, or short pipe lengths such that blowouts are prevented.

4. Each test section shall not exceed 400-feet in length and shall be tested between adjacent manholes.

5. Before testing, Contractor shall install monitoring wells at each manhole to determine groundwater level and adjust test pressure accordingly. In no case shall the test pressure exceed 9.0-psig. All pressurizing equipment shall include a regulator or relief valve set no higher than 9.0-psig to avoid over-pressurizing.

6. Low-pressure air shall be slowly introduced into the sealed line until the internal air pressure reaches 4.0-psig greater than the average backpressure of any groundwater above the invert of the pipe, but not greater than 9.0-psig.

7. When temperatures have been equalized and pressure stabilized at 4.0-psig greater than the average groundwater backpressure, the air hose from the control panel to the air supply shall be shut off or disconnected. The continuous monitoring pressure gauge shall then be observed while the pressure is decreased to no less than 3.5-psig greater than the average groundwater backpressure. At a reading of 3.5-psig greater than the average groundwater backpressure, timing shall commence with a stopwatch or other timing device that is at least 99.8% accurate.

8. If the time shown in the table, for the designated pipe size and length, elapses before the air pressure drops 1-psig; the section under-going test shall have passed. The test may be discontinued once the prescribed time has elapsed.

9. If the pressure drops 1-psig before the appropriate time shown in the table has elapsed, the air loss rate shall be considered excessive and the section of pipe has failed the test.

10. Should the section fail to meet test requirements, the Contractor shall determine the source or sources of leakage, and make all necessary repairs and shall repeat the test until the test section is within established limits. All corrective work shall be at the Contractor's expense.

E. Correction of Non-Conforming Work:

1. All non-conforming work shall be repaired or replaced by the Contractor at no additional expense to the Owner. Non-conforming work shall be defined as failure to adhere to any specified or implied directive of these technical special provisions and/or the Drawings, including but not limited to pipe not laid straight, true to the lines and grades as shown on the Drawings, damaged or unacceptable materials, misalignment or diameter ring deflection in pipe due to bedding or backfilling, water standing in any pipe segment or structure, visible or detectable leakage, and failure to pass any specified test or inspection.

Table 02774-1
Test Time Table

TEST TIME: For sewer diameter between 8 inches and 36 inches inclusive, the pipe shall be tested between adjacent manholes. The test time for the air pressure to drop the specified one pound shall be as listed below:											
SPECIFICATION TIME REQUIRED FOR A 1.0 PSIG PRESSURE DROP											
1 Pipe Dia. (in.)	2 Minimum Time (min:sec)	3 Length for Minimum Time (ft)	4 Time for Longer Length (sec)	Feet							
				100	150	200	250	300	350	400	450
6	5:40	398	0.854 L	5:40	5:40	5:40	5:40	5:40	5:40	5:42	6:24
8	7:34	298	1.520 L	7:34	7:34	7:34	7:34	7:36	8:52	10:08	11:24
10	9:26	239	2.374 L	9:26	9:26	9:26	9:53	11:52	13:51	15:49	17:48
12	11:20	199	3.148 L	11:20	11:20	11:24	14:15	17:05	19:56	22:47	25:38
15	14:10	159	5.342 L	14:10	14:10	17:48	22:15	26:42	31:09	35:36	40:04
18	17:00	133	7.692 L	17:00	19:13	25:38	32:03	38:27	44:52	51:16	57:41
21	19:50	114	10.470 L	19:50	26:10	34:54	43:37	52:21	61:00	69:48	78:31
24	22:40	99	13.674 L	22:47	34:11	45:34	56:58	68:22	79:46	91:10	102:33
27	25:30	88	17.306 L	28:51	43:16	57:41	72:07	86:32	100:57	115:22	129:48
30	28:20	80	21.366 L	35:37	53:26	71:13	89:02	106:50	124:38	142:26	160:15
36	34:00	66	30.768 L	51:17	76:55	102:34	128:12	153:50	179:29	205:07	230:46

TABLE 02774-2
LATERAL AIR TEST FORM

[ ]	OWNER: TWA	No. Copies _____	LATERAL
[ ]	ENGINEER: Tetra Tech	No. Copies _____	PRESSURE TEST
[ ]	CONTRACTOR: _____	No. Copies _____	NO. _____

PROJECT DATA:

Name: Owner: _____

Location: Kissimmee, FL Engineer: _____

Number: 200-08466-16XXX Contractor: _____

Date: Subcontractor: _____

Street Name: _____

Upstream Manhole No. _____ Downstream Manhole No. _____

Host Pipe Material Lateral Pipe Material _____

Lateral Location: _____feet from MH No._____.

Lateral Position: _____o'clock

Time-Start of Test: _____ Pressure - start of test (psi): _____

Time-End of Test: Pressure - End of test (psi): _____

Total Time of Test: _____ Total pressure drop

(psi): REMARKS:

_____

_____

THE ABOVE TEST (DOES) (DOES NOT) MEET THE SPECIFICATIONS TEST

WITNESS

_____	_____	_____
by CONTRACTOR	by TWA	by ENGINEER

END OF SECTION

SECTION 02775

WASTEWATER MANHOLE REHABILITATION

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work: Sanitary sewer manhole rehabilitation including:

1. Rehabilitation and leak proofing of manholes by lining with spray applied or centrifugally cast light-weight structural reinforced concrete, spray applied epoxy resin systems, or equal as determined by Owner.

2. The repair and sealing of the manhole base, bench, invert, walls, corbel/cone, and chimney of brick, block, or precast manholes, including the removal of any unsound material.

3. The inspection and testing of the various types of work to insure compliance.

1.02 DESCRIPTION

A. Codes, Specifications, and Standards (Not Used)

B. Testing and Materials Standards

1. American Society of Testing and Materials (ASTM)

C. Related Sections

1. Division 2 and Division 15.

1.03 DEFINITIONS (Not Used)

1.04 RESPONSIBILITY FOR OVERFLOWS AND SPILLS

A. It shall be the responsibility of the Contractor to schedule and perform his work so as to result in no overflows or spills of sewage from the system. If sewage flows are such that they interfere with the Contractor's ability to perform work, the Contractor shall be responsible for scheduling his work during low flow periods or provide bypass pumping per Section 02516.

B. In the event of overflows caused by the Contractor's work activities, the Contractor shall immediately take appropriate action to contain and stop the overflow, clean up the spillage, disinfect the area affected by the spill, and notify the Owner and all necessary regulatory agencies in a timely manner.

C. Contractor will indemnify and hold harmless the Owner for any fines or third-party claims for personal or property damage arising out of a spill or overflow that is fully or partially the responsibility of the Contractor. Should fines subsequently be imposed as a result of any overflow for which the Contractor is fully or partially responsible, the Contractor shall pay all such regulatory and other fines and all of the Owner's legal, engineering, and administrative costs in defending such fines and claims associated with the overflow.

1.05 SHOP DRAWINGS AND SUBMITTALS

A. Shop Drawings shall be submitted to the Owner per Section 01340 for review and acceptance prior to starting construction in accordance with the General Conditions Contract Documents.

B. Submittals shall be submitted to the Owner for review and acceptance at least 14-days prior to starting manhole rehabilitation in accordance with the General Conditions and Division 1 for the following:

1. Manufacturers' Certificate of Compliance certifying compliance with the applicable Specifications and Standards. The certifications shall list all materials furnished under this Section.

2. Certified copies of factory tests required by the applicable Standards, the Manufacturer, and this Section.

3. Manufacturer's handling, storage, and installation instructions and procedures.

4. Recommended lining thickness design to withstand groundwater pressure as specified in Part 3 of this Section.

PART 2 - PRODUCTS

2.01 GENERAL

A. Materials

1. All materials furnished for this work shall be in accordance with Appendix A as appended to these specifications.

2. The materials used shall be designed, manufactured, and intended for sewer manhole rehabilitation and the specific application in which they are used. The materials shall have a proven history of performance in sewer manhole rehabilitation. The materials shall be delivered to the job site in original unopened packages clearly labeled with the manufacturer's identification and printed instructions. All materials shall be stored and handled in accordance with recommendations of the manufacturer. All materials shall be mixed and applied in accordance with the manufacturer's written instructions.

3. The Contractor shall warrant and hold harmless the Owner against all claims for patent infringement and any loss thereof.

4. Handle and store all materials and dispose of all wastes in accordance with applicable regulations.

5. Each lining system shall be designed for application over wet surfaces (but not active running water) without degradation of the final product and/or the bond between the product and the manhole surfaces.

B. The following shall be used for stopping active leaks in concrete and masonry manholes:

1. A premixed fast-setting, volume-stable waterproof cement plug consisting of hydraulic cement, graded silica aggregates, special plasticizing, and accelerating agents. It shall not contain chlorides, gypsum's, plasters, iron particles, aluminum powder, or gas-forming agents, or promote the corrosion of steel it may come in contact with. Set time shall be approximately 1-minute. Ten (10) minute compressive strength shall be approximately 500-psi.

2. A siliconate-based liquid accelerator field mixed with neat Portland cement. The set time shall be approximately 1-minute.

3. The elastomeric polyurethane resin-soaked method, using dry twisted jute oakum, or resin-rod with polyurethane resin (water activated).

C. The following shall be used for patching, repointing, filling, and repairing non-leaking holes, cracks, and spalls in concrete and masonry manholes:

1. A premixed non-shrink cement-based patching material consisting of hydraulic cement, graded silica aggregates, special plasticizing and accelerating agents, which has been formulated for vertical or overhead use. It shall not contain chlorides, gypsums, plasters, iron particles, aluminum powder, or gas-forming agents or promote the corrosion of steel with which it may come into contact. Set time (ASTM C-191) shall be less than 30-minutes. One-hour compressive strength (ASTM C-109) shall be a minimum of 200-psi and the ultimate compressive strengths (ASTM C-882-Modified) shall be a minimum of 1,700-psi.

D. Spray applied or centrifugally cast structural reinforced cement manhole lining

1. The material applied to the surface of the manhole shall be a cementitious blend of calcium aluminate cement and manufactured calcium aluminate aggregates for constructing a liner that is impervious to the flow of water, is resistant to sulfide attack, and restores structural integrity to existing manhole walls.

2. A monolithic liner shall be formed which covers all interior manhole surfaces and shall have the following minimum requirements at 28-days:

Compressive Strength (ASTM C-579B)	3,000-psi
Tensile Strength (ASTM C-496)	300-psi
Flexural Strength (ASTM C-293) (Modified)	600-psi
Shrinkage (ASTM C-596)	0% at 90% R.H.
Bond (ASTM C-321)	130-psi
Density, when applied	105± pcf

E. Spray applied epoxy resin system manhole lining.

1. The material sprayed onto the surface of the manhole shall be an epoxy resin system formulated for application within a sanitary sewer environment. The resin will exhibit suitable corrosion resistance and enhance the structural integrity of the existing manhole.

F. Multi-component stress skin panel liner system.

1. The material applied onto the surface of the manhole shall be a multi-component stress skin panel liner system designed to withstand the effects of hydrogen sulfide without any deterioration to the liner. The liner shall be a solvent free, two-component polymeric, moisture/chemical barrier specifically developed for the wastewater environment.

2. The cured epoxy resin system shall conform to the following minimum Structural Standards:

Table 02775-1
Minimum Structural Standards

Cured Product	Test Method	Results
Tensile Stress	ASTM D-638	7,000-psi
Flexural Stress	ASTM D-790	13,000-psi
Flexural Modulus	ASTM D-790	500,000-psi
Compressive Strength	ASTM D-695	13,000-psi

PART 3 - EXECUTION

3.01 MANHOLE REHABILITATION SELECTION

A. Where Contract Drawings refer to 'Seal and Coat' manhole, the work shall include completely sealing all infiltration and applying manhole coating as approved in Appendix A under *Painting & Liners* for *Wet Well & Manhole* and denoted 'Existing Structures with minimal concrete deterioration'.

B. Where Contract Drawings refer to 'Lining' manhole, the work shall include completely lining entire manhole as approved in Appendix A under *Painting & Liners* for *Wet Well & Manhole* and denoted 'Existing Structures with significant concrete deterioration'.

3.02 REHABILITATION OF MANHOLE STRUCTURE

A. General Procedures

1. All materials furnished for this work shall be in accordance with Appendix A as appended to these specifications.

2. Safety: The Contractor shall perform all work in strict accordance with all applicable OSHA, state, local, and manufacturer's safety standards. Each method of manhole rehabilitation in this Section requires some degree of manhole entry by workers. Particular attention is drawn to those safety requirements regarding confined space entry and respiratory protection from airborne particulate materials during cleaning, product mixing, and application.

3. Cleaning: All concrete and masonry surfaces to be rehabilitated shall be clean. All grease, oil, laitance, coatings, loose bricks, mortar, unsound brick or concrete, and other foreign materials shall be completely removed. Water blasting utilizing a 210°F steam unit and proper nozzles shall be the primary method of cleaning; however, other methods such as wet or dry sandblasting, acid wash, concrete cleaners, degreasers, or mechanical means may be required to properly clean the surface. All surfaces on which these methods are used shall be thoroughly rinsed, scrubbed, and neutralized to remove cleaning agents and their reactant products. Debris resulting from cleaning shall be removed from the manhole and not discharged downstream.

4. Stopping Infiltration: After surface preparation and prior to the application of mortars and coatings, infiltration shall be stopped either by plugging with a waterstop compound or chemical grout sealing.

5. Patching: All large holes or voids around joints, or pipes and all spalled areas and all holes caused by missing or cracked brick shall be patched. All missing mortar shall be repointed using a non-shrink patching mortar. All cracked or disintegrated material shall be removed from the area to be patched or repointed, exposing a sound sub base. All cracks not subject to movement and greater than 1/16-inch in width shall be routed out to a minimum width and depth of 1/2-inch and patched with non-shrink patching mortar.

6. Flow Control: The Contractor shall be responsible for plugging or diverting the flow of sewage as needed for repair and lining of manhole inverts and benches.

7. Remove all loose grout and rubble from existing channel. Rebuild channel if required by reshaping and repairing slope of shelves or benches. Work shall include aligning inflow and outflow ports in such a manner as to prevent the deposition of solids at the transition point. All inverts shall follow the grades of the pipe entering the manhole. Changes in direction of the sewer and entering branch or branches shall have a true curve with the largest possible radius and shall be shaped to allow easy entrance of maintenance equipment including buckets or T.V. camera.

8. Each lining system shall be installed in accordance with the manufacturer's recommendation to withstand groundwater pressures. For manholes greater than 12-feet in depth, the lining shall withstand the pressures associated with a groundwater depth equal to the manhole depth. Linings for all other manholes shall withstand the pressures associated with groundwater depth of 12-feet. Measure groundwater depth from manhole bench to top of ground surface.

9. Application of products shall be by factory certified applicators.

3.03 SPRAY APPLIED LIGHT-WEIGHT STRUCTURAL REINFORCED CEMENT

A. The surface prior to spraying shall be damp without noticeable free water droplets or running water. Materials shall be spray-applied to a minimum uniform thickness to insure that all cracks, crevices, and voids are filled and a somewhat smooth surface remains after light troweling. The light troweling is performed to compact the material into voids and to set the bond.

B. The first application shall have begun to take an initial set (disappearance of surface sheen, which could be 15-minutes to 1-hour depending upon ambient conditions) before the second application to assure a minimum total finished thickness of 1/2-inch. The final finished thickness may need to be greater than 1/2-inch as recommended by the manufacturer to withstand groundwater pressures. A depth gauge shall be used during application, at various locations, to verify the required thickness. The surface then shall be trowelled to smooth finish with care taken not to over trowel so as to bring additional water to the surface and weaken it. Manufacturer's recommendations shall be followed whenever more than 24-hours have elapsed between applications.

C. The bench covers used to catch debris shall be removed and the bench and invert sprayed such that a gradual slope is produced from the walls to the invert with the thickness at the edge of the invert being no less than 1/2-inch. The wall-bench intersection shall be rounded to a uniform radius the full circumference of the intersection.

D. No application shall be made to frozen surfaces or if freezing is expected to occur within the manhole for 24-hours after application. If ambient temperatures are in excess of 95°F, precautions shall be taken to keep the mix temperature at time of application below 90°F, using ice if necessary.

E. The final application shall have a minimum of 4-hours cure time before being subjected to active flow.

3.04 CENTRIFUGALLY CAST STRUCTURAL REINFORCED CEMENT

A. Application procedures shall conform to the recommendations of the manufacturer.

B. The rotating casting applicator shall be positioned to evenly apply the material and be withdrawn at a rate to assure a final minimum thickness of 1-inch. The final finished thickness may need to be greater than 1-inch as recommended by the manufacturer to

withstand groundwater pressures. A depth gauge shall be used during application, at various locations to verify the required thickness.

C. The bench covers used to catch debris shall be removed and the bench and invert sprayed or hand applied so that a gradual slope is produced from the walls to the invert with the thickness at the edge of the invert being no less than 1/2-inch. The wall-bench intersection shall be rounded to a uniform radius the full circumference of the intersection.

D. No application shall be made to frozen surfaces or if freezing is expected to occur within the manhole for 24-hours after application. If ambient temperatures are in excess of 95°F, precautions shall be taken to keep the mix temperature at time of application below 90°F.

E. The final application shall have a minimum of 1-hour cure time as recommended by the manufacturer before being subjected to active flow.

3.05 SPRAYED APPLIED EPOXY RESIN SYSTEM

A. Application procedures shall conform to the recommendations of the manufacturer.

B. The epoxy resin shall be sprayed onto the surfaces of the manhole walls, benches, and inverts to produce a smooth coating and yield the required structural integrity and corrosion resistance. A depth gauge shall be used during application at various locations to verify the required thickness.

C. The epoxy resin shall be applied to a minimum thickness of 0.125-inches (125-mils) at the top of the manhole and gradually thickened in accordance with manufacturer's recommendations to withstand groundwater pressures. The application shall have a minimum cure time as recommended by the manufacturer before being subjected to active flow.

D. The sloped surface of the manhole bench shall be made non-skid by broadcasting aluminum oxide or sand into the surface prior to gelatin/set.

3.06 MULTI-COMPONENT LINER SYSTEM

A. Application procedures shall conform to the recommendations of the manufacturer.

B. The liner system shall be sprayed onto the surfaces of the manhole walls, benches, and inverts to produce a smooth surface. The spray equipment shall be specifically designed to accurately ratio and apply the liner system.

C. Final installation shall be a minimum of 500-mils.

D. The application shall have a minimum cure time as recommended by the manufacturer before being subjected to active flow.

3.07 SANITARY SEWER LATERAL CONNECTIONS TO MANHOLES

A. Sanitary sewer lateral connections to rehabilitated manholes shall be reinstated to provide a seamless, leak free, and unobstructed flow connection between the new manhole lining or coating system and the lateral connection per 3.01A.

B. Sanitary sewer laterals requiring rehabilitation shall be renewed per Section 02772 "Cured-In-Place Pipe (CIPP) For Lateral Renewal."

3.08 MANHOLE REHABILITATION ACCEPTANCE

A. Test all rehabilitated manholes using the vacuum test method as per ASTM C 1244 "Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test", following the manufacturer's recommendations for proper and safe procedures. Vacuum testing of manholes and structures shall be performed after curing of linings. Any visible leakage in the manhole or structure before, during, or after the test shall be repaired regardless of the test results.

B. All pipes for vacuum testing entering the manhole shall be installed at the top access point of the manhole. A vacuum of 10-inches of mercury (5.0-psi) shall be drawn on the manhole, and the time shall be measured for the vacuum to drop to 9-inches of mercury (4.5-psi). Manholes will be considered to have failed the air test if the time to drop 1-inch of mercury is less than what is shown in the following table:

Table 02775-2
Vacuum Test Timetable

Vacuum Test Timetable Manhole Diameter – Inches				
Depth – feet	48-inches	60-inches	72-inches	96-inches
4	30 sec.	30 sec.	30 sec.	30 sec.
8	30 sec.	30 sec.	32 sec.	38 sec.
12	30 sec.	39 sec.	48 sec.	57 sec.
16	40 sec.	52 sec.	64 sec.	76 sec.
20	50 sec.	65 sec.	80 sec.	95 sec.
24	60 sec.	78 sec.	96 sec.	114 sec.
+ Each 2'	+5 sec.	+6.5 sec.	+8.0 sec.	+9.5 sec.

C. Manhole depths shall be rounded to the nearest foot. Intermediate values shall be interpolated. For depths above 24-feet, add the values listed in the last line of the table for each 2-feet of additional depth.

D. If the manhole or structure fails the vacuum test, the Contractor shall perform additional repairs and repeat the test procedures until satisfactory results are obtained.

E. After the manhole rehabilitation work has been completed, the manhole shall be inspected by the Contractor in the presence of the Owner and the work shall be accepted

if found satisfactory to the Owner. No evidence of visible leaks shall be allowed. Non-uniformity, sagging, lamination, holidays or other defects will be cause for rejection of the coating. All surfaces shall be tested for the presence of holidays and pinholes via spark testing at 100-volts per millimeter. The Contractor shall provide the testing equipment and perform the testing in the presence of the Owner. Any holidays or pinholes found during the testing shall be repaired and the surface re-tested until the surfaces are completely free of holidays and pinholes.

3.09 APRON AND FLOW CHANNEL RECONSTRUCTION

A. Manholes shown on the Drawings to require apron and flow channel reconstruction shall have aprons built up and sloped toward the flow channel. Flow channels shall be smooth and deep enough to prevent buildup of debris. This work requires entry of the structure for demolition and removal of the existing apron and flow channel and reconstruction of the flow channel to TWA standards. Bypass pump sewage as necessary to keep the work area dry until properly cured. Upon completion, all excess materials shall be removed from the manhole and sewer line and disposed of properly.

3.10 CLEANUP

A. After the installation work has been completed and the testing is acceptable, the Contractor shall clean up the entire project area. The Contractor shall dispose of all excess material and debris. The work area shall be left in a condition equal to or better than the prior condition.

3.11 WARRANTY

A. The Contractor shall guarantee his work for a warranty period of 1-year from the date of acceptance.

B. If at any time during the warranty period any leakage, cracking, loss of bond, or other discontinuity is identified, the Contractor shall remove and replace the manhole liner with new material at no cost to the Owner. No field repair shall be approved.

C. The Contractor shall conduct a warranty television inspection via use of CCTV within 11 months following completion of the project. If it is found that any of the manholes have developed abnormalities since the completion of the project, the abnormalities shall be repaired and/or replaced by the Contractor promptly as per these specifications and as recommended by the manufacturer.

D. Furnish an extended warranty for manhole rehabilitation materials from the Contractor and liner manufacturer for a total of 5-years from date of final completion. Warranty must be a full warranty for the entire 5 year period and not a prorated warranty.

END OF SECTION

SECTION 02822

LOAMING AND SODDING

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required to prepare lawn bed and install sodding as specified.

B. Areas to receive sodded grass lawns shall be as follows:

1. All grassed areas disturbed by the Contractor's operation.

1.02 SUBMITTALS

A. Provide technical data as provided in Section 01340 for shop drawings on all materials or installation procedures required under this Section.

B. Submit representative topsoil samples for analysis by a private laboratory to determine nutrient deficiencies and outline a proper fertilization program.

C. Submit as provided in Section 01720 certifications required for all sodding supplied.

PART 2 - PRODUCTS

2.01 LOAM

A. Loam (topsoil) shall be fertile, natural soil, typical of the locality, free from large stones, roots, sticks, peat, weeds and sod and obtained from naturally well drained areas. It shall not be excessively acidic or alkaline nor contain toxic material harmful to plant growth. Topsoil stockpiled under other Sections of this Division may be used, but the Contractor shall furnish additional loam at his own expense, if required.

2.02 SOIL CONDITIONERS

A. Fertilizer:

1. Fertilizer shall be a complete fertilizer, the elements of which are derived from organic sources. Fertilizer shall be a standard product complying with State and Federal fertilizer laws.

2. Percentages of nitrogen, phosphorus and potash shall be based on laboratory tests on soils and approved by the Engineer. For the purpose of bidding,

assume 6% nitrogen, 6% phosphorus and 6% potash by weight. At least 50% of the total nitrogen shall contain no less than 3% water-insoluble nitrogen.

3. Fertilizer shall be delivered to the site, mixed as specified, in the original unopened standard size bags showing weight, analysis and name of manufacturer. Containers shall bear the manufacturer's guaranteed statement of analysis, or a manufacturer's certificate of compliance covering analysis shall be furnished to the Engineer. Store fertilizer in a weatherproof place and in such a manner that it will be kept dry and its effectiveness will not be impaired.

B. Superphosphate shall be composed of finely ground phosphate rock as commonly used for agricultural purposes containing not less than 20 available phosphoric acid.

C. Lime shall be ground limestone.

2.03 SOD

A. Sod shall be Argentine Bahia, Floratam or of like kind where existing sod is removed or disturbed and replaced by Contractor's operation. Sod shall have firm texture, a compacted growth and good root development, as approved.

B. Sod shall be certified to meet Florida State Plant Board specifications, absolutely true to varietal type, and free from weeds or other objectionable vegetation, fungus, insects and disease of any kind.

C. Before being cut and lifted the sod shall have been mowed 3 times with the final mowing not more than a week before cutting into uniform dimensions.

PART 3 - EXECUTION

3.01 LAWN BED PREPARATION

A. Areas to be sodded shall be cleared of all rough grass, weeds, and debris, and ground brought to an even grade as approved.

B. The soil shall then be thoroughly tilled to a minimum 8 inch depth.

C. Loam shall be placed to a minimum depth of 4 inches and shall be lightly compacted. No loam shall be spread in water.

D. Lime shall be applied at a rate necessary to achieve a pH of 6 to 7.

E. Superphosphate at a rate for bidding purposes of 5 pounds per 1,000 square foot and complete fertilizer at a rate for bidding purposes of 16 pounds per 1,000 square foot shall be evenly distributed over entire area and cross-disced into a depth of 4-6 inches.

F. The areas shall then be brought to proper grade, free of sticks, stones, or other foreign matter over l-inch in diameter or dimension. The surface shall conform to finish grade, less the thickness of sod, free of water-retaining depressions, the soil friable and of uniformly firm texture.

3.02 SOD HANDLING AND INSTALLATION

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

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

C. Bring the sod edge in a neat, clean manner to the edge of all paving and shrub areas. Top dressing with approved, clean weed free sand may be required at no additional cost to the Owner if deemed necessary by the Engineer.

D. All areas disturbed by Contractor's operations within the utility easements, temporary construction easements, and Osceola County Rights-of-Way shall be sodded in accordance with Osceola County Standards.

3.03 MAINTENANCE

A. The Contractor shall produce a dense, well established lawn. The Contractor shall be responsible for the repair and resodding of all eroded or bare spots until project acceptance. Repair sodding shall be accomplished as in the original work except that fertilizing may be omitted. Sufficient watering shall be done by the Contractor to maintain adequate moisture for optimum development of the lawn areas. Sodded areas shall receive no less than 1.5 inches of water per week.

3.04 REPAIRS TO LAWN AREAS DISTURBED BY CONTRACTOR'S OPERATIONS

A. Lawn areas planted under this Contract and lawn areas outside the designated areas damaged by Contractor's operations shall be repaired at once by proper sod bed preparation, fertilizing and resodding, in accordance with these Specifications.

3.05 TIMING

A. Restoration activities shall begin as soon as possible following trench backfill and compaction but no later than three (3) days after completion of backfill and compaction.

END OF SECTION

DIVISION III
CONCRETE

SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor and materials required and install cast-in-place concrete complete as shown on the Drawings and as specified herein.

1.02 SUBMITTALS

A. Submit to the Engineer, in accordance with submittal requirements, shop drawings and product data including the following:

1. Sources of cement, pozzolan and aggregates.

2. Material Safety Data Sheets (MSDS) for all concrete components and admixtures.

3. Air-entraining admixture. Product data including catalogue cut, technical data, storage requirements, product life, recommended dosage, temperature considerations and conformity to ASTM standards.

4. Water-reducing admixture. Product data including catalogue cut, technical data, storage requirements, product life, recommended dosage, temperature considerations and conformity to ASTM standards.

5. High-range water-reducing admixture (plasticizer). Product data including catalogue cut, technical data, storage requirements, product life, recommended dosage, temperature considerations, retarding effect, slump range and conformity to ASTM standards. Identify proposed locations of use.

6. Concrete mix for each formulation of concrete proposed for use including constituent quantities per cubic yard, water-cementitious materials ratio, concrete slump, type and manufacturer of cement. Provide either a. or b. below for each mix proposed.

a. Standard deviation data for each proposed concrete mix based on statistical records.

b. The curve of water-cementitious materials ratio versus concrete cylinder strength for each formulation of concrete proposed based on laboratory tests. The cylinder strength shall be the average of the 28 day cylinder strength test results for each mix. Provide results of 7 and 14 day tests if available.

7. Sheet curing material. Product data including catalogue cut, technical data and conformity to ASTM standard.

8. Liquid curing compound. Product data including catalogue cut, technical data, storage requirements, product life, application rate and conformity to ASTM standards. Identify proposed locations of use.

B. Samples

1. Fine and coarse aggregates if requested by the Engineer.

C. Test Reports

1. Fine aggregates - sieve analysis, physical properties, and deleterious substance.

2. Coarse aggregates - sieve analysis, physical properties, and deleterious substances.

3. Cements - chemical analysis and physical properties for each type.

4. Pozzolans - chemical analysis and physical properties.

5. Proposed concrete mixes - compressive strength, slump and air content.

D. Certifications

1. Certify admixtures used in the same concrete mix are compatible with each other and the aggregates.

2. Certify admixtures are suitable for use in contact with potable water after 30 days of concrete curing.

3. Certify curing compound is suitable for use in contact with potable water after 30 days (non-toxic and free of taste or odor).

1.03 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)

1. ASTM C31 - Standard Practice for Making and Curing Concrete Test Specimens in the Field.

2. ASTM C33 - Standard Specification for Concrete Aggregates.

3. ASTM C39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.

4. ASTM C42 - Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.

5. ASTM C94 - Standard Specification for Ready-Mixed Concrete.

6. ASTM C143 - Standard Test Method for Slump of Hydraulic Cement Concrete

7. ASTM C150 - Standard Specification for Portland Cement

8. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete

9. ASTM C173 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.

10. ASTM C231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.

11. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete.

12. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.

13. ASTM C494 - Standard Specification for Chemical Admixtures for Concrete.

14. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete.

15. ASTM C1017 - Standard Specification for Chemical Admixtures for use in Producing Flowing Concrete.

B. American Concrete Institute (ACI).

1. ACI 304 - Guide for Measuring, Mixing, Transporting and Placing Concrete.

2. ACI 305 - Hot Weather Concreting.

3. ACI 306.1 - Standard Specification for Cold Weather Concreting.

4. ACI 318 - Building Code Requirements for Structural Concrete.

5. ACI 350 - Environmental Engineering Concrete Structures.

C. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.04 QUALITY ASSURANCE

A. Reinforced concrete shall comply with ACI 318, the recommendations of ACI 350R and other stated requirements, codes and standards. The most stringent requirement of the codes, standards and this Section shall apply when conflicts exist.

B. Only one source of cement and aggregates shall be used on any one structure. Concrete shall be uniform in color and appearance.

C. Well in advance of placing concrete, discuss with the Engineer the sources of individual materials and batched concrete proposed for use. Discuss placement methods, waterstops and curing. Propose methods of hot and cold weather concreting as required. Prior to the placement of any concrete containing a high-range water- reducing admixture (plasticizer), the Contractor, accompanied by the plasticizer manufacturer, shall discuss the properties and techniques of batching and placing plasticized concrete.

D. If, during the progress of the work, it is impossible to secure concrete of the required workability and strength with the materials being furnished, the Engineer may order such changes in proportions or materials, or both, as may be necessary to secure the desired properties. All changes so ordered shall be made at the Contractor's expense.

E. If, during the progress of the work, the materials from the sources originally accepted change in characteristics, the Contractor shall, at his/her expense, make new acceptance tests of aggregates and establish new design mixes.

F. Testing of the following materials shall be furnished by Contractor to verify conformity with this Specification Section and the stated ASTM Standards.

1. Fine aggregates for conformity with ASTM C33 - sieve analysis, physical properties, and deleterious substances.

2. Coarse aggregates for conformity with ASTM C33 - sieve analysis, physical properties, and deleterious substances.

3. Cements for conformity with ASTM C150 - chemical analysis and physical properties.

4. Pozzolans for conformity with ASTM C618 - chemical analysis and physical properties.

5. Proposed concrete mix designs - compressive strength, slump and air content.

G. Field testing and inspection services will be provided by the Owner. The cost of such work, except as specifically stated otherwise, shall be paid by the Owner. Testing of the following items shall be by the Owner to verify conformity with this Specification Section.

1. Concrete placements - compressive strength (cylinders), compressive strength (cores), slump, and air content.

2. Other materials or products that may come under question.

H. All materials incorporated in the work shall conform to accepted samples.

1.05 DELIVERY, STORAGE AND HANDLING

A. Cement: Store in weather-tight buildings, bins or silos to provide protection from dampness and contamination and to minimize warehouse set.

B. Aggregate: Arrange and use stockpiles to avoid excessive segregation or contamination with other materials or with other sizes of like aggregates. Build stockpiles in successive horizontal layers not exceeding 3-ft in thickness. Complete each layer before the next is started. Do not use frozen or partially frozen aggregate.

C. Sand: Arrange and use stockpiles to avoid contamination. Allow sand to drain to uniform moisture content before using. Do not use frozen or partially frozen aggregates.

D. Admixtures: Store in closed containers to avoid contamination, evaporation or damage. Provide suitable agitating equipment to assure uniform dispersion of ingredients in admixture solutions which tend to separate. Protect liquid admixtures from freezing and other temperature changes which could adversely affect their characteristics.

E. Pozzolan: Store in weather-tight buildings, bins or silos to provide protection from dampness and contamination.

F. Sheet Curing Materials: Store in weather-tight buildings or off the ground and under cover.

G. Liquid Curing Compounds: Store in closed containers.

PART 2 - PRODUCTS

2.01 GENERAL

A. The use of manufacturer's name and model or catalog number is for the purpose of establishing the standard of quality and general configuration desired.

B. Cement: U.S. made Portland cement complying with ASTM C150. Air entraining cements shall not be used. Cement brand shall be subject to approval by the Engineer and one brand shall be used throughout the Work. The following cement type(s) shall be used:

2.02 MATERIALS

A. Materials shall comply with this Section and any applicable State or local requirements.

B. Cement: Domestic Portland cement complying with ASTM C150. Air entraining cements shall not be used. Cement brand shall be subject to approval by the Engineer and one brand shall be used throughout the Work. The following cement type(s) shall be used:

1. Class A,B,C,D Concrete - Type II with the addition of fly ash resulting in C_3A being below 5 percent of total cementitious content, Type III limited to 5 percent C_3A or Type V.

C. Fine Aggregate: Washed inert natural sand conforming to the requirements of ASTM C33.

D. Coarse Aggregate: Well-graded crushed stone or washed gravel conforming to the requirements of ASTM C33. Grading requirements shall be as listed in ASTM C33 Table 2 for the specified coarse aggregate size number. Limits of Deleterious Substances and Physical Property Requirements shall be as listed in ASTM C33 Table 3 for severe weathering regions. Size numbers for the concrete mixes shall be as shown in Table 1 herein.

E. Water: Potable water free from injurious amounts of oils, acids, alkalis, salts, organic matter, or other deleterious substances.

F. Admixtures: Admixtures shall be free of chlorides and alkalis (except for those attributable to water). When it is required to use more than one admixture in a concrete mix, the admixtures shall be from the same manufacturer. Admixtures shall be compatible with the concrete mix including other admixtures and shall be suitable for use in contact with potable water after 30 days of concrete curing.

1. Air-Entraining Admixture: The admixture shall comply with ASTM C260. Proportioning and mixing shall be in accordance with manufacturer's recommendations.

2. Water-Reducing Agent: The admixture shall comply with ASTM C494, Type Proportioning and mixing shall be in accordance with manufacturer's recommendations.

3. High-Range Water-Reducer (Plasticizer): The admixture shall comply with ASTM C494, Type F and shall result in non-segregating plasticized concrete with little bleeding and with the physical properties of low water/cement ratio concrete. The treated concrete shall be capable of maintaining its plastic state in excess of 2 hours. Proportioning and mixing shall be in accordance with manufacturer's recommendations. Where walls are 14-inch thick or less and the wall height exceeds 12 feet, a mix including a plasticizer must be used.

4. Admixtures causing retarded or accelerated setting of concrete shall not be used without written approval from the Engineer. When allowed, the admixtures shall be retarding or accelerating water reducing or high range water reducing admixtures.

G. Pozzolan (Fly Ash): Pozzolan shall be Class C or Class F fly ash complying with ASTM C618 except the Loss on Ignition (LOI) shall be limited to 3 percent maximum.

H. Sheet Curing Materials. Waterproof paper, polyethylene film or white burlap-polyethylene sheeting all complying with ASTM C171.

I. Liquid Curing Compound. Liquid membrane-forming curing compound shall comply with the requirements of ASTM C309, Type 1-D (clear or translucent with fugitive dye) and shall contain no wax, paraffin, or oil. Curing compound shall be approved for use in contact with potable water after 30 days (non-toxic and free of taste or odor).

2.03 MIXES

A. Development of mix designs and testing shall be by an independent testing laboratory acceptable to the Engineer engaged by and at the expense of the Contractor.

B. Select proportions of ingredients to meet the design strength and materials limits specified in Table 1 and to produce concrete having proper placability, durability, strength, appearance and other required properties. Proportion ingredients to produce a homogenous mixture which will readily work into corners and angles of forms and around reinforcement without permitting materials to segregate or allowing excessive free water to collect on the surface.

C. The design mix shall be based on standard deviation data of prior mixes with essentially the same proportions of the same constituents or, if such data is not available, be developed by a testing laboratory, acceptable to the Engineer, engaged by and at the expense of the Contractor. Acceptance of mixes based on standard deviation shall be based on the modification factors for standard deviation tests contained in ACI 318. The water content of the concrete mix, determined by laboratory testing, shall be based on a curve showing the relation between water cementitious ratio and 7 and 28 day compressive strengths of concrete made using the proposed materials. The curves shall be determined by four or more points, each representing an average value of at least three test specimens at each age. The curves shall have a range of values sufficient to yield the desired data, including the specified design strengths as modified below, without extrapolation. The water content of the concrete mixes to be used, as determined from the curve, shall correspond to strengths 16 percent greater than the specified design strengths. The resulting mix shall not conflict with the limiting values for maximum water cementitious ratio and net minimum cementitious content as specified in Table 1.

D. Compression Tests: Provide testing of the proposed concrete mix or mixes to demonstrate compliance with the specified design strength requirements in conformity with the above paragraph.

E. Entrained air, as measured by ASTM C231, shall be as shown in Table 1.

1. If the air-entraining agent proposed for use in the mix requires testing methods other than ASTM C231 to accurately determine air content, make special note of this requirement in the admixture submittal.

F. Slump of the concrete as measured by ASTM C143, shall be as shown in Table 1. If a high-range water-reducer (plasticizer) is used, the slump indicated shall be that

measured before plasticizer is added. Plasticized concrete shall have a slump ranging from 7 to 10-in.

G. Proportion admixtures according to the manufacturer's recommendations. Two or more admixtures specified may be used in the same mix provided that the admixtures in combination retain full efficiency and have no deleterious effect on the concrete or on the properties of each other.

TABLE 1
CONCRETE MIX REQUIREMENTS

Class	Design Strength (1)	Cement (2)	Fine Aggregate (2)	Coarse Aggregate (3)	Cementitious Content(4)
A	2500	C150 Type II	C33	57	440 min.
B	3000	C150 Type II	C33	57	480 min.
C	4000	C150 Type II	C33	57	560 min.
D	5000	C150 Type II	C33	57	600 min.

Class	W/Cm Ratio (5)	Fly Ash	AE Range (6)	WR (7)	HRWR (8)	Slump Range Inches
A	0.62 max.	--	3.5 to 5	Yes	*	1-4
B	0.54 max.	--	3.5 to 5	Yes	*	1-3
C	0.44 max.	25% max	3.5 to 5	Yes	*	3-5
D	0.40 max.	--	3.5 to 5	Yes	*	3-5

NOTES:

(1) Minimum compressive strength in psi at 28 days
(2) ASTM designation
(3) Size Number in ASTM C33
(4) Cementitious content in lbs/cu yd
(5) W/Cm is Water-Cementitious ratio by weight
(6) AE is percent air-entrainment
(7) WR is water-reducer admixture
(8) HRWR is high-range water-reducer admixture
* HRWR used at contractor's option except where walls are 14-inch thick or less and the wall height exceeds 12 feet a mix including a plasticizer must be used.

PART 3 - EXECUTION

3.01 MEASURING MATERIALS

A. Concrete shall be composed of Portland cement, fine aggregate, coarse aggregate, water and admixtures as specified and shall be produced by a plant acceptable to the Engineer. All constituents, including admixtures, shall be batched at the plant except a high-range water-reducer may also be added in the field.

B. Measure materials for batching concrete by weighing in conformity with and within the tolerances given in ASTM C94 except as otherwise specified. Scales shall have been certified by the local Sealer of Weights and Measures within 1 year of use.

C. Measure the amount of free water in fine aggregates within 0.3 percent with a moisture meter. Compensate for varying moisture contents of fine aggregates. Record the number of gallons of water as-batched on printed batching tickets.

D. Admixtures shall be dispensed either manually using calibrated containers or measuring tanks, or by means of an automatic dispenser approved by the manufacturer of the specific admixture.

1. Charge air-entraining and chemical admixtures into the mixer as a solution using an automatic dispenser or similar metering device.

2. Inject multiple admixtures separately during the batching sequence.

3.02 MIXING AND TRANSPORTING

A. Batch plants shall have a current NRMCA Certification or equal.

B. Concrete shall be ready-mixed concrete produced by equipment acceptable to the Engineer. No hand-mixing will be permitted. Clean each transit mix truck drum and reverse drum rotation before the truck proceeds under the batching plant. Equip each transit-mix truck with a continuous, nonreversible, revolution counter showing the number of revolutions at mixing speeds.

C. Ready-mix concrete shall be transported to the site in watertight agitator or mixer trucks loaded not in excess of their rated capacities as stated on the name plate.

D. Keep the water tank valve on each transit truck locked at all times. Any addition of water above the appropriate W/Cm ratio must be directed by the Engineer. Added water shall be incorporated by additional mixing of at least 35 revolutions. All added water shall be metered and the amount of water added shall be shown on each delivery ticket.

E. All central plant and rolling stock equipment and methods shall comply with ACI 318 and ASTM C94.

F. Select equipment of size and design to ensure continuous flow of concrete at the delivery end. Metal or metal-lined non-aluminum discharge chutes shall be used and shall have slopes not exceeding 1 vertical to 2 horizontal and not less than 1 vertical to 3 horizontal. Chutes more than 20-ft long and chutes not meeting slope requirements may be used if concrete is discharged into a hopper before distribution.

G. Retempering (mixing with or without additional cement, aggregate, or water) of concrete or mortar which has reached initial set will not be permitted.

H. Handle concrete from mixer to placement as quickly as practicable while providing concrete of required quality in the placement area. Dispatch trucks from the batching plant so they arrive at the work site just before the concrete is required, thus avoiding excessive mixing of concrete while waiting or delays in placing successive layers of concrete in the forms.

I. Furnish a delivery ticket for ready mixed concrete to the Engineer as each truck arrives. Each ticket shall provide a printed record of the weight of cement and each aggregate as batched individually. Use the type of indicator that returns for zero punch or returns to zero after a batch is discharged. Clearly indicate the weight of fine and coarse aggregate, cement and water in each batch, the quantity delivered, the time any water is added, and the numerical sequence of the delivery. Show the time of day batched and time of discharge from the truck. Indicate the number of revolutions of the truck mixer.

J. Temperature and Mixing Time Control

1. In cold weather, do not allow the as-mixed temperature of the concrete and concrete temperatures at the time of placement in the forms to drop below 40 degrees F.

2. If water or aggregate has been heated, combine water with aggregate in the mixer before cement is added. Do not add cement to mixtures of water and aggregate when the temperature of the mixture is greater than 90 degrees F.

3. In hot weather, cool ingredients before mixing to maintain temperature of the concrete below the maximum placing temperature of 90 degrees F. If necessary, substitute well-crushed ice for all or part of the mixing water.

4. The maximum time interval between the addition of mixing water and/or cement to the batch and the placing of concrete in the forms shall not exceed the values shown in Table 2.

TABLE 2

MAXIMUM TIME TO DISCHARGE OF CONCRETE

Air or Concrete Temperature (whichever is higher)	Maximum Time
80 to 90 Degree F (27 to 32 Degree C)	45 minutes
70 to 79 Degree F (21 to 26 Degree C)	60 minutes
40 to 69 Degree F (5 to 20 Degree C)	90 minutes

If an approved high-range water-reducer (plasticizer) is used to produce plasticized concrete, the maximum time interval shall not exceed 90 minutes.

3.03 CONCRETE APPEARANCE

A. Concrete mix showing either poor cohesion or poor coating of the coarse aggregate with paste shall be remixed. If this does not correct the condition, the concrete shall be rejected. If the slump is within the allowable limit, but excessive bleeding, poor workability, or poor finishability are observed, changes in the concrete mix shall be obtained only by adjusting one or more of the following:

1. The gradation of aggregate.

2. The proportion of fine and coarse aggregate.

3. The percentage of entrained air, within the allowable limits.

B. Concrete for the work shall provide a homogeneous structure which, when hardened, will have the required strength, durability and appearance. Mixtures and workmanship shall be such that concrete surfaces, when exposed, will require no finishing. When concrete surfaces are stripped, the concrete, when viewed in good lighting from 10-ft away, shall be pleasing in appearance, and at 20-ft shall show no visible defects.

3.04 PLACING AND COMPACTING

A. Placing

1. Verify that all formwork completely encloses concrete to be placed and is securely braced prior to concrete placement. Remove ice, excess water, dirt and other foreign materials from forms. Confirm that reinforcement and other embedded items are securely in place. Have a competent workman at the location of the placement who can assure that reinforcing steel and embedded items remain in designated locations while concrete is being placed. Sprinkle semi-porous subgrades or forms to eliminate suction of water from the mix. Seal extremely porous subgrades in an approved manner.

2. Deposit concrete as near its final position as possible to avoid segregation due to rehandling or flowing. Place concrete continuously at a rate which ensures the concrete is being integrated with fresh plastic concrete. Do not deposit concrete which has partially hardened or has been contaminated by foreign materials or on concrete which has hardened sufficiently to cause formation of seams or planes of weakness within the section. If the section cannot be placed continuously, place construction joints as specified or as approved.

3. Pumping of concrete will be permitted. Use a mix design and aggregate sizes suitable for pumping and submit for approval.

4. Remove temporary spreaders from forms when the spreader is no longer useful. Temporary spreaders may remain embedded in concrete only when made of galvanized metal or concrete and if prior approval has been obtained.

5. Do not place concrete for supported elements until concrete previously placed in the supporting element (columns, slabs and/or walls) has reached adequate strength.

6. Where surface mortar is to form the base of a finish, especially surfaces designated to be painted, work coarse aggregate back from forms with a suitable tool to bring the full surface of the mortar against the form. Prevent the formation of excessive surface voids.

7. Slabs

    a. After suitable bulkheads, screeds and jointing materials have been positioned, the concrete shall be placed continuously between construction joints beginning at a bulkhead, edge form, or corner. Each batch shall be placed into the edge of the previously placed concrete to avoid stone pockets and segregation.

    b. Avoid delays in casting. If there is a delay in casting, the concrete placed after the delay shall be thoroughly spaded and consolidated at the edge of that previously placed to avoid cold joints. Concrete shall then be brought to correct level and struck off with a straightedge. Bullfloats or darbies shall be used to smooth the surface, leaving it free of humps or hollows.

    c. Where slabs are to be placed integrally with the walls below them, place the walls and compact as specified. Allow 1 hour to pass between placement of the wall and the overlying slab to permit consolidation of the wall concrete. Keep the top surface of the wall moist so as to prevent cold joints.

8. Formed Concrete

a. Place concrete in forms using tremie tubes and taking care to prevent segregation. Bottom of tremie tubes shall preferably be in contact with the concrete already placed. Do not permit concrete to drop freely more than 4-ft. Place concrete for walls in 12 to 24-in lifts, keeping the surface horizontal. If plasticized concrete is used, the maximum lift thickness may be increased to 7-ft and the maximum free fall of concrete shall not exceed 15-ft.

B. Compacting

1. Consolidate concrete by vibration, puddling, spading, rodding or forking so that concrete is thoroughly worked around reinforcement, embedded items and openings and into corners of forms. Puddling, spading, etc., shall be continuously performed along with vibration of the placement to eliminate air or stone pockets which may cause honeycombing, pitting or planes of weakness.

2. All concrete shall be placed and compacted with mechanical vibrators. The number, type and size of the units shall be approved by the Engineer in advance of placing operations. No concrete shall be ordered until sufficient approved vibrators (including standby units in working order) are on the job.

3. A minimum frequency of 7000 rpm is required for mechanical vibrators. Insert vibrators and withdraw at points from 18 to 30-in apart. At each insertion, vibrate sufficiently to consolidate concrete, generally from 5 to 15 seconds. Do not over vibrate so as to segregate. Keep a spare vibrator on the site during concrete placing operations.

4. Concrete Slabs: Concrete for slabs less than 8-in thick shall be consolidated with vibrating screeds; slabs 8 to 12-in thick shall be compacted with internal vibrators and (optionally) with vibrating screeds. Vibrators shall always be placed into concrete vertically and shall not be laid horizontally or laid over.

5. Walls and Columns: Internal vibrators (rather than form vibrators) shall be used unless otherwise approved by the Engineer. In general, for each vibrator needed to melt down the batch at the point of discharge, one or more additional vibrators must be used to densify, homogenize and perfect the surface. The vibrators shall be inserted vertically at regular intervals, through the fresh concrete and slightly into the previous lift, if any.

6. Amount of Vibration: Vibrators are to be used to consolidate properly placed concrete but shall not be used to move or transport concrete in the forms. Vibration shall continue until:

a. Frequency returns to normal.

b. Surface appears liquefied, flattened and glistening.

c. Trapped air ceases to rise.

d. Coarse aggregate has blended into surface, but has not disappeared.

3.05 CURING AND PROTECTION

A. Protect all concrete work against injury from the elements and defacements of any nature during construction operations.

B. Curing Methods

1. Curing Methods for Concrete Surfaces: Cure concrete to retain moisture and maintain specified temperature at the surface for a minimum of 7 days after placement. Curing methods to be used are as follows:

a. Water Curing: Keep entire concrete surface wet by ponding, continuous sprinkling or covered with saturated burlap. Begin wet cure as soon as concrete attains an initial set and maintain wet cure 24 hours a day.

b. Sheet Material Curing: Cover entire surface with sheet material. Securely anchor sheeting to prevent wind and air from lifting the sheeting or entrapping air under the sheet. Place and secure sheet as soon as initial concrete set occurs.

c. Liquid Membrane Curing: Apply over the entire concrete surface except for surfaces to receive additional concrete. Curing compound shall NOT be placed on any concrete surface where additional concrete is to be placed, where concrete sealers or surface coatings are to be used, or where the concrete finish requires an integral floor product. Curing compound shall be applied as soon as the free water on the surface has disappeared and no water sheen is visible, but not after the concrete is dry or when the curing compound can be absorbed into the concrete. Application shall be in compliance with the manufacturer's recommendations.

2. Specified applications of curing methods.

a. Slabs for Water Containment Structures: Water curing only.

b. Slabs on Grade and Footings (not used to contain water): Water curing, sheet material curing or liquid membrane curing.

c. Structural Slabs (other than water containment): Water curing or liquid membrane curing.

d. Horizontal Surfaces which will Receive Additional Concrete, Coatings, Grout or Other Material that Requires Bond to the substrate: Water curing.

e. Formed Surfaces: None if nonabsorbent forms are left in place 7 days. Water cure if absorbent forms are used. Sheet cured or liquid membrane cured if forms are removed prior to 7 days. Exposed horizontal surfaces of formed walls or columns shall be water cured for 7 days or until next placement of concrete is made.

f. Concrete Joints: Water cured or sheet material cured.

C. Finished surfaces and slabs shall be protected from the direct rays of the sun to prevent checking and crazing.

D. Cold Weather Concreting:

1. "Cold weather" is defined as a period when for more than 3 successive days, the average daily outdoor temperature drops below 40 degrees F. The average daily temperature shall be calculated as the average of the highest and the lowest temperature during the period from midnight to midnight.

2. Cold weather concreting shall conform to ACI 306.1 and the additional requirements specified herein. Temperatures at the concrete placement shall be recorded at 12 hour intervals (minimum).

3. Discuss a cold weather work plan with the Engineer. The discussion shall encompass the methods and procedures proposed for use during cold weather including the production, transportation, placement, protection, curing and temperature monitoring of the concrete. The procedures to be implemented upon abrupt changes in weather conditions or equipment failures shall also be discussed. Cold weather concreting shall not begin until the work plan is acceptable to the Engineer.

4. During periods of cold weather, concrete shall be protected to provide continuous warm, moist curing (with supplementary heat when required) for a total of at least 350 degree-days of curing.

a. Degree-days are defined as the total number of 24 hour periods multiplied by the weighted average daily air temperature at the surface of the concrete (e.g: 5 days at an average 70 degrees F = 350 degree-days).

b. To calculate the weighted average daily air temperature, sum hourly measurements of the air temperature in the shade at the surface of the concrete taking any measurement less than 50 degrees F as 0 degrees.

c. Divide the sum thus calculated by 24 to obtain the weighted average temperature for that day.

5. Salt, manure or other chemicals shall not be used for protection.

6. The protection period for concrete being water cured shall not be terminated

during cold weather until at least 24 hours after water curing has been terminated.

E. Hot Weather Concreting

1. "Hot weather" is defined as any combination of high air temperatures, low relative humidity and wind velocity which produces a rate of evaporation estimated in accordance with ACI 305R, approaching or exceeding 0.2 lbs/sq ft/hr).

2. Concrete placed during hot weather, shall be batched, delivered, placed, cured and protected in compliance with the recommendations of ACI 305R and the additional requirements specified herein.

   a. Temperature of concrete being placed shall not exceed 90 degrees F and every effort shall be made to maintain a uniform concrete mix temperature below this level. The temperature of the concrete shall be such that it will cause no difficulties from loss of slump, flash set or cold joints.

   b. All necessary precautions shall be taken to promptly deliver, to promptly place the concrete upon its arrival at the job and to provide vibration immediately after placement.

   c. The Engineer may direct the Contractor to immediately cover plastic concrete with sheet material.

3. Discuss with the Engineer a work plan describing the methods and procedures proposed to use for concrete placement and curing during hot weather periods. Hot weather concreting shall not begin until the work plan is acceptable to the Engineer.

3.06 REMOVAL OF FORMS

A. Except as otherwise specifically authorized by the Engineer, forms shall not be removed before the concrete has attained a strength of at least 30 percent of its specified design strength, nor before reaching the following number of day-degrees of curing (whichever is the longer):

TABLE 3

MINIMUM TIME TO FORM REMOVAL

Forms for	Degree Days
Beams and slabs	500
Walls and vertical surfaces	100

(See definition of degree-days in Paragraph 3.05D above).

B. Shores shall not be removed until the concrete has attained at least 70 percent of its specified design strength and also sufficient strength to support safely its own weight and construction live loads.

3.07 INSPECTION AND FIELD TESTING

A. The batching, mixing, transporting, placing and curing of concrete shall be subject to the inspection of the Engineer at all times. The Contractor shall advise the Engineer of his/her readiness to proceed at least 24 hours prior to each concrete placement. The Engineer will inspect the preparations for concreting including the preparation of previously placed concrete, the reinforcing steel and the alignment, cleanliness and tightness of formwork. No placement shall be made without the inspection and acceptance of the Engineer.

B. Sets of field control cylinder specimens will be taken by the Engineer (or inspector) during the progress of the work, in compliance with ASTM C31. The number of sets of concrete test cylinders taken of each class of concrete placed each day shall not be less than one set per day, nor less than one set for each 150 cu yds of concrete nor less than one set for each 5,000 sq ft of surface area for slabs or walls.

1. A "set" of test cylinders consists of four cylinders: one to be tested at 7 days and two to be tested and their strengths averaged at 28 days. The fourth may be used for a special test at 3 days or to verify strength after 28 days if 28 day test results are low.

2. When the average 28 day compressive strength of the cylinders in any set falls below the specified design strength or below proportional minimum 7 day strengths (where proper relation between seven and 28 day strengths have been established by tests), proportions, water content, or temperature conditions shall be changed to achieve the required strengths.

C. Cooperate in the making of tests by allowing free access to the work for the selection of samples, providing an insulated closed curing box for specimens, affording protection to the specimens against injury or loss through the operations and furnish material and labor required for the purpose of taking concrete cylinder samples. All shipping of specimens will be paid for by the Owner. Curing boxes shall be acceptable to the Engineer.

D. Slump tests will be made in the field immediately prior to placing the concrete. Such tests shall be made in accordance with ASTM C143. If the slump is greater the specified range, the concrete shall be rejected.

E. Air Content: Test for air content shall be made on fresh concrete samples. Air content for concrete made of ordinary aggregates having low absorption shall be made in compliance with either the pressure method complying with ASTM C231 or by the volumetric method complying with ASTM C173.

F. The Engineer may have cores taken from any questionable area in the concrete work such as construction joints and other locations as required for determination of concrete quality. The results of tests on such cores shall be the basis for acceptance, rejection or determining the continuation of concrete work.

G. Cooperate in obtaining cores by allowing free access to the work and permitting the use of ladders, scaffolding and such incidental equipment as may be required. Repair all core holes. The work of cutting and testing the cores will be at the expense of the Owner.

3.08 FAILURE TO MEET REQUIREMENTS

A. Should the strengths shown by the test specimens made and tested in compliance with the previous provisions fall below the values given in Table 1, the Engineer shall have the right to require changes in proportions outlined to apply to the remainder of the work. Furthermore, the Engineer shall have the right to require additional curing on those portions of the structure represented by the test specimens which failed. The cost of such additional curing shall be at the Contractor's expense. In the event that such additional curing does not give the strength required, as evidenced by core and/or load tests, the Engineer shall have the right to require strengthening or replacement of those portions of the structure which fail to develop the required strength. The cost of all such core borings and/or load tests and any strengthening or concrete replacement required because strengths of test specimens are below that specified, shall be entirely at the expense of the Contractor. In such cases of failure to meet strength requirements the Contractor and Engineer shall confer to determine what adjustment, if any, can be made in compliance with Sections titled "Strength" and "Failure to Meet Strength Requirements" of ASTM C94. The "purchaser" referred to in ASTM C94 is the Contractor in this Section.

B. When the tests on control specimens of concrete fall below the specified strength, the Engineer will permit check tests for strengths to be made by means of typical cores drilled from the structure in compliance with ASTM C42 and C39. In the case of cores not indicating adequate strength, the Engineer, in addition to other recourses, may require, at the Contractor's expense, load tests on any one of the slabs, beams, piles, caps, and columns in which such concrete was used. Tests need not be made until concrete has aged 60 days.

C. Should the strength of test cylinders fall below 60 percent of the required minimum 28 day strength, the concrete shall be rejected and shall be removed and replaced.

3.09 PATCHING AND REPAIRS

A. It is the intent of this Section to require quality work including adequate forming, proper mixture and placement of concrete and curing so completed concrete surfaces will require no patching.

B. Defective concrete and honeycombed areas as determined by the Engineer shall be repaired as specified by the Engineer.

C. As soon as the forms have been stripped and the concrete surfaces exposed, fins and other projections shall be removed; recesses left by the removal of form ties shall be filled; and surface defects which do not impair structural strength shall be repaired. Clean all exposed concrete surfaces and adjoining work stained by leakage of concrete, to approval of the Engineer.

D. Immediately after removal of forms remove plugs and break off metal ties. Promptly fill holes upon stripping as follows: Moisten the hole with water, followed by a 1/16-in brush coat of neat cement slurry mixed to the consistency of a heavy paste. Immediately plug the hole with a 1 to 1.5 mixture of cement and concrete sand mixed slightly damp to the touch (just short of "balling"). Hammer the grout into the hole until dense, and an excess of paste appears on the surface in the form of a spiderweb. Trowel smooth with heavy pressure. Avoid burnishing.

E. When patching exposed surfaces the same source of cement and sand as used in the parent concrete shall be employed. Adjust color if necessary by addition of proper amounts of white cement. Rub lightly with a fine Carborundum stone at an age of 1 to 5 days if necessary to bring the surface down with the parent concrete. Exercise care to avoid damaging or staining the virgin skin of the surrounding parent concrete. Wash thoroughly to remove all rubbed matter.

3.10 SCHEDULE

A. The following (Table 4) are the general applications for the various concrete classes and design strengths:

TABLE 4 CONCRETE SCHEDULE

Class	Design Strength (psi)	Description
A	2,500	Concrete fill and duct encasement
B	3,000	Concrete overlay slabs and pavements
C	4,000	Walls, slabs on grade, suspended slab and beam systems, columns, grade beams and all other structural concrete
D	5,000	Prestressed concrete

END OF SECTION

SECTION 03410

PRECAST CONCRETE STRUCTURES

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work: The work under this Section includes the design, casting, delivery and erection of precast concrete structures as indicated on the Drawings.

1.02 QUALITY ASSURANCE

A. Standards: Unless otherwise indicated, all materials, workmanship and practices shall be in accordance with the current editions of the following standards:

1. Standard Building Code.

2. ACI 318, Building Code Requirements for Reinforced Concrete.

3. PCI MNL 116, Manual for Quality Control for Plants and Production of Precast Concrete Products.

1.03 SUBMITTALS

A. The following information shall be submitted to the Engineer for approval in accordance with Section 01340. Fabrication shall not begin until submission has been approved.

1. Quality Control: Satisfactory evidence shall be submitted that plant and production methods meet the requirements of PCI MNL 116.

2. Design: Complete calculations including shear, moment, buoyancy, and camber calculations shall be submitted. All computation sheets shall bear the seal of a Professional Engineer registered in the State of Florida. Design water table shall be assumed to be at finished grade.

3. Shop Drawings: Complete fabrication and erection drawings shall be submitted. All drawings shall bear the seal of a Professional Engineer registered in the State of Florida.

B. Manufacturer's data sheets shall be submitted on the following:

1. Joint mastic and gaskets.

2. Pipe connections.

3. Grout material.

4. Hatches and manhole covers.

1.04 DELIVERY, STORAGE AND HANDLING

A. Transportation and erection shall be done by qualified personnel using proper equipment. Lifting and supporting shall be done only at points indicated on the shop drawings.

1.05 MANUFACTURERS

A. Mack Precast Corporation.

B. Taylor Precast.

C. Volusia Precast

D. Or approved equal

PART 2 - PRODUCTS

2.01 MATERIALS AND FABRICATION

A. Precast Concrete Structures:

1. Design loads shall consist of dead load, live load, impact, soil loads and loads due to water table, as well as other loads which may be imposed upon the structure. Wetwells and manholes shall be designed in accordance with ASTM C-478. The wall thicknesses for wetwells, vaults and manholes shall be as shown on the Drawings.

2. Forms used for precast concrete shall be of metal and sufficiently designed and braced to maintain their alignment under pressures of the concrete during placing. Base and first section of precast structures shall be an integral cast.

3. Aggregates. All aggregates, fine and coarse, other than lightweight aggregate shall conform to ASTM C 33. Lightweight aggregates, fine and coarse, shall conform to ASTM C 330. Aggregates shall be free of deleterious substances causing reactivity with oxidized hydrogen sulfide. Both types of aggregate shall be graded in a manner so as to produce a homogenous concrete mix. All materials are to be accurately weighed at a central batching facility for mixing.

4. Cement shall be Portland cement Type II.

5. Minimum compressive strength of concrete used for precast concrete structures shall be 4,000 psi at 28 days.

6. Placing. All concrete shall be handled from the mixer or transport vehicle to the place of final deposit in a continuous manner, as rapidly as practicable, and without segregation or loss of ingredients, until the approved unit is completed. Maximum elapsed time from batching to placement shall be 2 hours. Concrete shall be placed in layers not over 2 feet deep. Each layer shall be compacted by mechanical internal or external vibrating equipment. Duration of the vibration cycle shall be limited to the time necessary to produce satisfactory consolidation without causing objectionable segregation.

7. Curing:

   a) For purposes of early reuse of forms, precast concrete may be steam cured after an initial set has taken place. The steam temperature shall not exceed 160°F, and the temperature shall be raised from normal ambient temperatures at a rate not to exceed 40°F per hour.

   b) The steam cured unit shall not be removed from the forms until sufficient strength is obtained for the unit to withstand any structural strain to which it may be subjected during the form stripping operation. After the stripping of forms, further curing by means of water spraying or a membrane curing compound may be used, and shall be of a clear or white type, conforming to ASTM C 309.

8. Reinforcing steel shall be sufficiently tied to withstand any displacement during the pouring operation. All bars shall be Grade 60.

9. Joints shall be tongue and groove pipe ends sealed with round or other flexible type natural rubber joint ring gaskets in conformance with ASTM C 433 or by a flexible preformed bitumastic sealing material equal to Ram-Nek as manufactured by R.K. Snyder and Co., Houston, Texas. If rubber joint ring gaskets are used, interior and exterior voids in the pipe joints shall be sealed with flexible sealing material specified above, installed in strict accordance with the manufacturer's printed instructions. If manhole sections are sealed with a flexible preformed bitumastic sealing material, adequate material shall be applied so that "squeeze out" occurs at the interior and exterior of the joint. Rubber joint ring gaskets and flexible preformed bitumastic sealing material shall be provided by the manhole manufacturer.

10. Sealing Compound and Grout: Plastic sealing compound shall comply with Federal Specification SS-S-00210. Mortar shall comply with ASTM C 387, Type S, or use grout complying with Section 3600.

11. Eccentric precast concrete cone sections shall be manufactured of precast concrete with reinforcing and joints as specified above for straight riser sections.

12. Lifting holes through the structures are not permitted. Equally spaced lifting lugs, rings or non-penetrating lift inserts shall be provided.

13. Top slabs for shallow manholes and pumping station wet wells may be precast or cast-in-place. Steel reinforcing shall be as indicated on the Drawings. Concrete for top slabs shall have a compressive strength of 4,000 psi at 28 days. Thickness of concrete for top slabs for manholes, wetwells and vaults shall be as shown on the Drawings.

14. Manholes inverts for new manholes shall be precast into the manhole base section by the manhole manufacturer unless prior approval is obtained from the Engineer to construct inverts in the field. Invert elevations for existing manholes shall be maintained as shown on the Drawings. The drop from inlet to outlet shall be a minimum of one inch unless approved by the Engineer. The channel height of the manhole invert shall match the crown of the exit sewer. Manhole benches shall be sloped a minimum of one inch per foot from the outside periphery of the manhole to the edge of the invert channel.

B. Pipe Connections:

1. Pipe connections for new and existing manholes shall be resilient, waterproof connections designed in accordance with ASTM C 923 "Resilient Connectors Between Reinforced Concrete Manhole Structures and Pipes". Resilient pipe connectors shall either be cast into the manhole wall or installed following casting or for existing manholes in a cored section of the manhole wall. Resilient connectors shall either be a gasket type connector equal to the A-Lok pipe to manhole seal as manufactured by Atlantic Concrete Products, Inc., or a flexible neoprene boot with stainless steel clamps equal to the KOR-N-SEAL System as manufactured by the Dukor Corporation or as per approved manufacturer's listing in Appendix A. A-Lok type connectors are to be used only with new structures and must be integrally cast into the structure. When the pipe is installed in the resilient manhole connector, the pipe shall be capable of 200 minimum deflection in any direction.

C. Frames and Covers: Cast iron manhole frames and covers shall be provided for manholes and aluminum access hatches shall be provided for wetwells and vaults as specified below:

1. Standard Manhole Frames and Covers: Shall be gray iron castings conforming to ASTM A 48, Class 30B for Gray Iron Castings; and shall be smooth, true to pattern, free from blow holes, sand holes, projections and other harmful defects. The seating surfaces of both the frame and cover shall be machined so that the cover will not rock after it has been seated. The cover shall be provided with a precisely

machined dovetail groove with a neoprene 0-ring gasket to provide a self-sealing cover. The gasket shall be glued in place at the foundry. The manhole cover shall be solid with two non-penetrating pick holes. Manhole frames and covers shall be U.S. Foundry and Manufacturing Corp. No. 663-AB-MB or equal for manholes inside the City of Kissimmee limits, and Model No. 663-ABM or equal for manholes outside the City of Kissimmee limits.

a) Anchor Bolts: Anchor bolts for bolting manhole frame to precast manholes shall be 3/4-inch diameter galvanized all thread steel rods with a 5 inch hook for embedment in the precast manhole top. The bolts shall be of sufficient length to provide a minimum 2 inch thread projection through the flange of the manhole frame. Two anchor bolts shall be cast into the precast manhole top section or slab, positioned at 180 degrees, at the time of manufacture. Manhole frames shall be drilled to match the bolt settings prior to coating.

D. Coatings:

1. Interior surfaces of precast structures shall be coated with two (2) coats of water based epoxy (red, then grey in color) 3-5 mils DFT each, as manufactured by Tnemec or approved equal.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Earthwork: The Contractor shall prepare an excavation large enough to accommodate the structure and permit sealing of openings, waterproofing, and backfilling operations. Earthwork shall conform to the applicable sections of Division 2.

B. Installation of Precast Concrete Structures: Precast concrete structures shall be constructed in a workmanlike manner at the locations and dimensions indicated on the Drawings. Precast structures shall be set on a foundation of crushed stone, 12 inches thick. Crushed stone material shall be a well-graded crushed stone or crushed gravel meeting the requirements of ASTM C33, Gradation No. 67 (3/4 inch to No. 4 sieve). The precast structures shall be constructed such that the structure will not transmit dead or live loads to the piping. Care shall be taken to prevent earth and other material from entering precast structures.

C. Sealing and Grouting: Fill all interior and exterior joints between precast sections with a joint sealant, as recommended by the structure manufacturer.

D. Installing Precast Sections:

1. Set each precast concrete unit plumb on a bed of sealant to make a watertight joint at least 1/2-inch thick with the concrete base or with the preceding unit. Point the inside joint and wipe off the excess sealant.

2. Assemble units so that the cover conforms to the elevations shown on the Drawings.

3. Pipe connections at precast structures shall be provided at the locations shown on the Drawings. Connections shall be resilient and waterproof

4. All voids in interior and exterior manhole section joints and lift holes for manhole sections shall be filled with a non-shrinking, non-metallic grout. Grout shall be applied and cured in strict accordance with the manufacturer's recommendations. The grout shall be finished smooth and flush with the wall surface of the manhole.

E. Manhole Flow Channels and Bench Walls:

1. Unless prior approval is obtained from the Engineer, manhole flow channels (inverts) and bench walls shall be precast into the manhole base section as specified above in Paragraph 2.0l.A.14.

2. Upon prior approval from the Engineer, manhole inverts may be constructed in the field. Invert channel bottoms shall be smooth and semicircular in shape conforming to inside of adjacent sewer sections. Changes in direction of flow shall be made with a smooth curve of as large radius as the size of manhole will permit. Changes in size and grade of channels shall be made gradually and evenly to give a smooth uninterrupted flow pattern through the manhole. Channel height shall match the crown of the connection sewer pipe exiting the manhole. Manhole bench walls shall be smooth and shall slope one inch per foot from the edge of the invert channel to the precast manhole wall. Invert channels may be constructed by forming in concrete or by building up brick and mortar to form the manhole bench walls on each side of the channel, and plastering over bricks with cement mortar with a minimum thickness of 1/2-inch. Manhole invert construction shall only be performed by experienced and qualified workmen.

3. Bricks used to construct manhole invert channels and bench walls shall be standard size (2 1/2-in. H X 4 in. W X 8-in. L) brick in conformance with ASTM C 32 "Sewer and Manhole Brick (Made From Clay and Shale)", mixing: One (1) volume of Type II Portland Cement with three (3) volumes of sand and sufficient clean water to produce a rich mass of approved consistency. Mixing mortar on the ground or any paved surface shall not be permitted. Sand to be used in making mortar shall be clean, well-graded, and shall pass a standard No. 4 sieve.

F. Setting Frames and Covers:

1. Unless otherwise indicated on the Drawings, in unpaved areas the tops of manholes shall be set 0.2-feet above finished grade and the tops of wetwells and vaults shall be set 0.5-feet above finished grade, unless otherwise indicated on the Drawings.

2. The top of all precast manholes may be brought to proper grade for receiving manhole frame by using not more than three courses of brick or precast concrete grade rings. Bricks and mortar used for manhole top grade adjustment shall be as specified above in Paragraph 3.0l.E.3. Precast concrete grade rings shall be precast with steel reinforcement in conformance with ASTM C 478 and concrete with a compressive strength of 4000 psi in 28 days. Precast concrete grade rings shall be manufactured in half annular shapes for easy of handling. The grade ring dimensions shall be 2 inches thick with an annular width of 8 inches and an inside diameter of 24 inches.

3. Masonry construction shall be performed by experienced and qualified workmen only. All work shall be laid plumb, straight, level, square and true. Brick shall be laid in full beds of mortar and shoved into place. All joints shall be full and not more than 1/2-inch in thickness. The Contractor shall set in place and bond in the masonry all necessary anchor bolts and miscellaneous items specified elsewhere. The masonry walls shall be plastered on the inside and outside with a one-half inch coat of Portland Cement mortar.

4. Following curing of any masonry construction required for manhole top adjustment, set manhole frame in a bed of 1/4- to 1/2-inch thick flexible bitumastic sealing material (Ram-Nek) and anchor in place with two 3/4-inch diameter anchor bolts, which shall be securely embedded in the top of the manhole. Seal the flange of the manhole ring to the top of the manhole with cement mortar.

G. Interior Coating: The interior coating system shall be applied following installation of the precast structures and any piping or equipment which will penetrate or attach to the walls. Surface preparation and application of the coating system shall be in strict accordance with the manufacturer's recommendations.

H. Backfill: After the structure and all appurtenances are in place and approved, backfill shall be placed to the original ground line or to the limits designated on the Drawings. Backfill material shall consist of sand or loose earth, free from stones, clods, or other deleterious material. It shall be placed in horizontal layers not exceeding 12 inches in depth, and shall be moistened and thoroughly compacted to a minimum relative density conforming to the requirements of Division 2.

END OF SECTION

DIVISION IV
MASONRY

SECTION 04230

REINFORCED UNIT MASONRY

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Provide all materials, equipment and labor required to complete the reinforced unit masonry construction in accordance with the Drawings and Specified herein. Coordinate all work with that of other trades.

B. The work under this section includes, but is not necessarily limited to, the following:

1. Split-face concrete masonry units (CMU)

2. Reinforced CMU block and lintels

3. Masonry reinforcing, ties, and anchors

4. Grouting for masonry work

1.02 QUALITY ASSURANCE

A. Prior to construction of any masonry buildings, sample wall sections shall be constructed in location(s) approved by the County, to establish a standard of quality for masonry construction for the entire Project. A sample wall section shall be constructed for each type of concrete masonry units (standard, split-face, etc.) to be used on the Project. Include 1 complete exterior and interior control joint to be caulked. Each sample wall section shall have a minimum of 50-square feet of wall face and shall be at least 6 block courses high and 12.67-feet long. For multi-colored, split-face CMU sample walls, at least 3-courses shall be constructed for each color of split-face CMU to be used on the Project. The sample wall(s) will be inspected and approved by the County and shall be maintained by the Contractor throughout the length of the project for use as the "standard of quality" for comparative purposes with masonry walls constructed on the Project. Sample wall section(s) shall be removed by the Contractor upon substantial completion of the Project.

1.03 SUBMITTALS

A. Submit shop drawings, product data, mixes, etc., in accordance with Section 01300.

B. Submit complete shop drawings, including bar lists and placement drawings Comply with ACI 315 “Details and Detailing Concrete Reinforcement”. Include elevations of all reinforced walls showing reinforcement.

C. Submit manufacturer’s certifications that all masonry units meet or exceed all specified standards.

D. Product data for split-face CMU types indicating composition, shape, surfaces, and dimensions.

E. Submit 3 color samples for integral colored split-faced concrete masonry units and colored mortar mixers.

F. Submit catalog data for metal ties and anchors, joint reinforcement, and control joint material.

G. Samples of split-face CMU illustrating face profile, color range, surface, and texture.

H. Installation instructions.

PART 2 PRODUCTS

2.01 MASONRY UNITS

A. Split-Face concrete masonry units

1. Standard and lightweight CMU shall conform to ASTM C90, Grade N, Type I, as shown on the Drawings.

2. CMU shall be free from substances that will cause staining or pop-outs and shall be fine, even textured with straight and true edges. All units shall have been wet steam cured for at least 18-hours and then air cured in covered storage for not less than 28-days before delivery. Units shall have a maximum linear drying shrinkage of 0.25% (percent) (ASTM C426) and have a moisture content at time of delivery not exceeding 30% (percent) of total absorption.

3. Split-face CMU's for interior and exterior walls where indicated on the Drawings, shall be as manufactured by DeMaco Corporation, Rockblock, Inc., or approved equal. Units shall have 8-inch by 16-inch nominal face size. Matching end and corner units shall be selected from samples provided by the block manufacturer. Split-face units shall be high strength units having a minimum compressive strength of 1,900-psi for any 1-unit. Minimum acceptable water absorption rate shall be 6% of the oven dry weight of the masonry unit in pounds per cubic feet. Split-face CMU's shall be factory prefinished with an integral coloring agent that is added during the mixing process. The coloring agent used for this project shall be from the same lot and batch numbers. The color for the split-face CMU's shall be selected by the County from the CMU manufacturer's standard color samples.

4. CMU noted as fire rated on the Drawings shall conform to Underwriters Laboratories, Inc. Standard for Concrete Masonry Units UL618, and shall have a 2-hour fire resistant rating.

5. All split rib CMU shall have a height minimum of 7-1/2-inch equally spaced 3/4-inch deep by 3/4-inch wide bevels. The projected face shall have a rough texture.

6. Units shall be obtained from 1 manufacturer to ensure even color and texture.

7. Provide special units required by the Drawings including solid, corner, pilaster, lintels, and jamb units.

8. Split-face CMU units shall be Dillon Company, Swords Creek Virginia or DeMaco Concrete Products, Sarasota Florida.

B. Concrete Masonry Units

1. CMU's for structures shall conform to ASTM C90, Grade N, Type II normal weight units with minimum compressive strength of 1,900-psi.

2. Vertical Reinforcing: Provide as shown on the Drawings.

C. Integral Water Repellent

1. Provide units made with integral water repellant for exposed units. Integral water repellant to be a liquid polymeric admixture that does not reduce flexural bond strength. Integral water repellant shall be ACM Chemistries; Rainbloc, Grace Construction Products; Dry-Block or equal.

2.02 REINFORCEMENT

A. Reinforcing Steel: ASTM Designation A615, Grade 60, unless otherwise specified. Single width reinforcement shall be ladder or truss type, fabricated with a single pair of galvanized 9-gauge side rods and continuous 9-gauge cross-rods spaced not more than 16-inches on center.

B. Galvanized dovetailed anchor slots shall be Heavy Filled, Catalog Number 8334 by Vulcan Metal Products, Inc. or equal, and shall be 5-inches long, 16-gauge galvanized.

C. Dovetail anchors shall be placed at 16-inches on center for anchorage to concrete framework or walls.

D. Corrugated non-ferrous 16-gauge metal ties manufactured for use with the anchor slots provided shall be spaced at a maximum of 8-inches on center vertically and 16-inches on center horizontally.

E. The Contractor shall provide and install miscellaneous anchors and attachment members required both for the anchorage of his own work and that of other trades requiring attachment to masonry, which are not specifically provided under separate sections.

F. Control joints shall be factory extruded preformed styrene-butadiene-rubber compound, conforming to ASTM D2000 2AA805 and shall be as manufactured by Dur-O-Wal, Hohmann and Bernard, Inc., AA Wire Products or equal. Control joints shall be installed as shown on the Drawings.

G. Weep holes shall be 1/4-inch outside diameter by 4-inches long, clear plastic tubing that will not strain brickwork, by Hohmann and Bernard, Inc., or equal.

H. Cleaning compound shall be mild, non-caustic detergent solution such as 801 Super Real Clean by Superior Manufacturing Co., or 600 Sureclean by Process Solvent Co., Inc., or equal.

2.03 MASONRY LINTELS

A. General: Provide precast or built-in-place masonry lintels in compliance with the requirements below.

B. Built-in-place masonry lintels:

1. Built-in-place lintel to be made from lintel and bond beam concrete masonry units with reinforcing bars places ad indicated and filled with grout.

2. Lintels shall be of length sufficient to bear 8” on either side of opening.

3. Temporarily support all built-in-place lintels until cured.

C. Pre-cast concrete lintels:

1. U-Lintel units, minimum compressive strength: 3500 psi at 28 days.

2. All units shall have sand block finish

3. Manufacture and tolerances shall be in compliance with PCI MNL-116, “Manual for Quality Control for Precast and Prestressed Concrete.”

4. Manufacturer shall rate U-lintel units for gravity, uplift, and lateral loads in units of pounds per linear foot, and provide load vs. deflection data.

5. Lintels shall be of length sufficient to bear 8” on either side of opening.

2.04 MORTAR AND GROUT MATERIALS

A. Portland Cement shall conform to ASTM C150 Type II requiring only sand and water for mixing. Masonry cements may be used for colored mortar when specifically accepted.

B. Lime for masonry mortar shall be hydrated, conforming to ASTM C207, Type S.

C. Sand shall be clean, durable particles, free from detrimental amounts of organic matter. The sand shall conform to the limits of ASTM C14. Sand for grout shall conform to ASTM C144 or C33 as required.

D. Water shall be potable, free from detrimental amounts of oils, acids, alkalis, or organic matter, and shall be clean and fresh.

E. Masonry cements used for integral colored CMU's shall be specifically approved for colored mortar. Colored mortar mixers shall be factory premixed with color pigments and Portland cement, requiring only sand and water for mixing. Colored mortar for the project shall be from the same factory lot and batch numbers. Color of the mortar mix shall be selected by the Owner from the mortar manufacturer's standard color samples.

F. Water repellent admixture added to mortar shall match water repellent used in manufacture of split-face CMU.

G. Strength of mortars shall exceed 1,800-pounds per square inch, when tested with 2-inch cubes at the end of a 28-day aging period.

H. Grout

1. Portland cement shall conform to ASTM C150, Type I.

2. Aggregates shall conform to ASTM C144.

3. Grout for constructing CMU lintel blocks and for grouting cores to receive embedded anchors or reinforcing shall conform to ASTM C476, fine or coarse grout. Strength shall be 2,500-psi minimum at 28-days. Grout will have a slump of 10-inches, plus or minus 1-inch, at time of placement.

4. Concrete grout for filling structural CMU cells shall use 3/8-inch pea rock mix with a minimum compressive strength of 3,000-psi.

PART 3 EXECUTION

3.01 INSTALLATION

A. Provide formwork and shores as required for temporary support of reinforced masonry elements. Design, erection, support, bracing, and maintenance of formwork are the Contractor's responsibility.

B. Construct formwork to conform to shape, line, and dimensions shown and sufficiently tight to prevent leakage of mortar grout or concrete.

C. Do not remove forms and shoring until reinforced masonry member has hardened sufficiently to carry its own weight and all other reasonable temporary loads that may be placed on it during construction. Do not remove forms and shoring supporting the weight of concrete in beams, slabs, and other members until concrete has attained its specified 28-day compressive strength.

3.02 MORTAR

A. Mortar shall be machine mixed in an approved type of mixer in which the quantity of water can be accurately and uniformly controlled. The mixing time shall not be less than 5-minutes, approximately 2-minutes of which shall be for mixing the dry materials and not less than 3-minutes for continuing the mixing after the water has been added. Where hydrated lime is used for mortar requiring lime content, the Contractor will have the option of using the dry-mix method or first converting the hydrated lime into putty.

B. Where the dry-mix method is employed, the materials for each batch shall be well turned over together until the even color of the mixed, dry materials indicates that the cementitious material has been distributed throughout the mass, after which the water shall be gradually added until a thoroughly mixed mortar of the required plasticity is obtained.

C. Mortar that has begun to set shall not be used.

D. Mortar shall be used and placed in final position within 1-1/2 hours after mixing.

E. Mortar boards and boxes shall be cleaned at the end of each days work, and all tools shall be kept clean.

3.03 LAYING CONCRETE BLOCK

A. Do not wet concrete masonry units (CMU).

B. Masonry shall not be laid at temperatures below 40°F, without the approval of the Owner, and all work shall be done in such a manner as to insure the proper and normal hardening of

all mortar. All masonry work shall be so protected and heated that the temperature at the surface will not fall below 50°F for a period of 72-hours after placing. Any completed work found to be affected by cold weather shall be taken down and rebuilt by the Contractor at his expense.

C. All CMU shall be laid in a full bed of mortar, applied to shells only. Butter the vertical joint of unit already set in the wall and all contact faces of the unit to be set. Each unit shall be placed and shoved against the unit previously laid so as to produce a well compacted vertical mortar joint for the full shell thickness. Units shall be set with all cells in a vertical position. The moisture content of the units when laid shall not exceed 35% (percent) of the total absorption as determined by laboratory test. Split-face CMU's shall be laid with the horizontal stringline control to the inside face of block in a full bed of mortar on all 4 sides.

D. Masonry units shall be laid in a running bond unless otherwise shown.

E. Sizes shall be as specified and called for on the Drawings and where "Soaps" and "Splits" are used, the space between these members and the backup material shall be slushed full of mortar.

F. Masonry joints which are exposed to view shall be tooled in accordance with the following:

1. Wait until unit mortar is thumbprint hard before tooling joint.

2. Both vertical and horizontal joint spacing shall be uniform.

3. Joints for CMU shall be 3/8-inch.

4. Joints for structural block shall be 1/4-inch.

5. Joints shall be tooled slightly concave.

6. Joints for standard CMU shall be rubbed with a sponge to provide a flush, neat, rubbed joint.

7. Exterior joints for split-face CMU shall be rubbed with a sponge, paddle, or Styrofoam tool to cause the joint to blend with the masonry unit's exterior split-face. Interior face joints of split-face CMU shall match standard CMU joints.

G. Install all frames required to be set in masonry. Set masonry tightly against frames, build in and mortar in all frame anchors and fill frames solid with mortar.

H. Control joints shall be installed at the intersection of masonry walls with structural concrete members and elsewhere as detailed on the Drawings. Joints shall be raked out to a depth of 3/4-inch for the full height or full width of the wall suitable for caulking. The maximum

length, horizontally, between vertical control joints shall be 40-feet, but joints shall be located only as directed or shown. Joints shall be equal in width to the standard mortar joint.

I. All masonry slots, chases, or openings required for the proper installation of the work of other sections shall be constructed as indicated on the Drawings or in accordance with information furnished before the work is started at the points affected. No chase shall be cut into any wall constructed of hollow units after it is built, except as directed by the County.

J. Field cut split-face CMU with power tools to provide straight true edge and avoid damage to split-face. Do not install chipped or broken units.

K. Exercise care that wet mortar is not splashed onto split-face during installation. Excess or splashed mortar shall be cleaned from face with a burlap wipe.

L. During grouting, placement of foamed-in-place insulation, and application of sealants, ensures that materials are not smeared onto split-faces of CMU. Remove smeared materials as recommended by manufacturer.

M. Surfaces shall be brushed as work progresses and maintained as clean as practical. Unfinished work shall be raked back where possible, and toothed only where absolutely necessary. Before leaving fresh or unfinished work, walls shall be fully covered and protected against rain and wind, and before continuing work, previously laid surfaces shall be swept clean. The tops of walls or other unfinished work shall be protected against all damage by frost or the elements by means of waterproof paper, tarpaulins, boards, or other means reviewed by the County.

N. The Contractor shall build in all miscellaneous items to be set in masonry for which placement is not specifically provided under separate Divisions, including reglets, lintels, ties, electrical panel boxes, sleeves, vents, grilles, anchors, grounds and exterior electrical conduits, and fixtures, and shall cooperate with other trades whose work is to be coordinated with the work under this Section.

O. All anchorage, attachment, and bonding devices shall be set so as to prevent slippage and shall be completely covered with mortar or grout.

P. All ties and reinforcing for masonry shall be furnished and installed by the Contractor.

Q. Loose lintels shall be set in a full bed of mortar and supported by solid or mortar filled hollow concrete blocks as detailed on the Drawings.

R. Bed and grout all items coming in contact with masonry where grouting is required, including door bucks and frames set in masonry. The Contractor shall install all anchor bolts,

base plates, and seats in masonry walls, and build in all items required for the completion of the building as they apply to masonry.

S. Block work shall be laid plumb, level, and true to line and grade. Lay block within the following tolerances from specified dimensions:

1. Mortar joint thickness: Bed-1/8 inch; Head- ¼ inch, +3/8 inch

2. Variation from plumb, level, and line: ¼ inch in 10 feet, 3/8 inch total

T. Where solid CMU units are shown, lay units with full mortar head and bed joints.

U. Walls

1. Pattern Bond: Lay CMU wall units as specified in Section 04050 "Masonry." Bond and interlock each course at corners and intersections and use special-shaped units where shown, and as required for corners, jambs, sash, control joints, lintels, bond beams, and other special conditions.

2. Maintain vertical continuity of core or cell cavities, which are to be reinforced and grouted, to provide minimum clearance and grout coverage for vertical reinforcement bars. Keep cavities free of mortar. Solidly bed webs in mortar where adjacent to reinforced cores or cells.

3. Where horizontal reinforced beams (bond beams) are shown, use special units or modify regular units to allow for placement of continuous horizontal reinforcement bars. Place small mesh expanded metal lath or wire screening in mortar joints under bond beam courses over cores or cells of non-reinforced vertical cells, or provide units with solid bottoms.

4. Option: Where all vertical cores are not shown to be grouted, Contractor may elect to fill all vertical cores with grout, in which case, requirements for mortar bedding of cross-webs and closing of core spaces below bond beams will not apply.

V. Columns, Piers, and Pilasters

1. Use CMU of the size, shape, and number of vertical core spaces shown. If not shown, provide units which provide minimum clearances and grout coverage for number and size of vertical reinforcement bars shown.

2. Provide pattern bond as shown, or if not shown, provide alternate head joints in vertical alignment.

3. Where bonded pilaster construction is shown, construct wall and pilaster units together to the maximum pour height specified.

3.04 PLACING REINFORCEMENT

A. Clean reinforcement of loose rust, mill scale, earth or other materials which will reduce bond to mortar or grout. Do not use reinforcement bars with kinks or bends not shown on Drawings or final shop drawings, or bars with reduced cross-section due to excessive rusting or other causes.

B. Place reinforcement straight, centered in cells, and tied at laps and intersection of bars. Horizontal reinforcement may be placed as the masonry work progresses. Where vertical bars are shown in close proximity, provide a clear distance between bars of not less than the nominal bar diameter or 1 inch, whichever is greater.

C. For columns, piers, and pilasters, provide a clear distance between vertical bars as shown, but not less than 1-1/2-times the nominal bar diameter or 1-1/2-inches, whichever is greater. Provide lateral ties as shown.

D. Splice reinforcement bars only as shown. Do not splice at other points unless approved by the Engineer. Provide lapped splices, unless otherwise shown. In splicing vertical bars or attaching to dowels, tie splices with wire.

E. Provide not less than the minimum lap shown, or if not shown, as required by governing code.

F. Embed metal ties in mortar joints as work progresses, with a minimum mortar cover of 5/8 inch on exterior face of walls and 1/2 inch at other locations.

G. Anchor reinforces masonry work to supporting structure as indicated.

3.05 GROUTING

A. Use fine grout for filling spaces less than 4 inches in both horizontal directions.

B. Use course grout for filling 4-inch spaces or larger in both horizontal directions.

C. Place grout within 1.5 hours from introducing water in the mixture and prior to initial set.

D. Grouting Technique: At the Contractor's option, use either low-lift or high-lift grouting techniques subject to the requirements which follow.

E. Consolidate grout by mechanical vibration and reconsolidate by mechanical vibration after initial water loss and settlement has occurred.

F. Low-Lift Grouting:

1. Provide a minimum clear dimension of 2 inches and clear area of 8 sq. in. in vertical cores to be grouted.

2. Place vertical reinforcement prior to laying of CMU. Extend vertical reinforcement above elevation of maximum pour height as required to allow for splicing and support it in position at vertical intervals not exceeding 192 bar diameters nor 10 feet.

3. Lay CMU to maximum pour height. Limit pour height to 5 feet. If bond beam occurs below the 5 feet height stop, pour at course below bond beam.

4. Preparation of Grout Spaces: Prior to grouting, inspect and clean out the grout spaces. Remove dust, dirt, mortar droppings, loose pieces of masonry and other foreign materials from grout spaces. Clean reinforcement and adjust to proper position. Clean top surface of structural members supporting masonry to ensure bond.

5. Pour grout using container with spout or by chute and rod or vibrate during placing. Place grout continuously. Do not interrupt pouring of grout for more than one hour. Terminate grout pours 1 1/2-inches below top course of pour.

6. Bond Beams: Terminate grout in vertical cells 1 1/2-inches below bond beam course. Place horizontal reinforcement in bond beams with corners and intersections lapped as shown. Place grout in bond beam course before filling vertical cores above bond beam.

G. High-Lift Grouting:

1. Do not use high-lift grouting technique for grouting of CMU unless minimum cavity dimension and area is 3 inches and 10 sq. in., respectively.

2. Provide cleanout holes in first course at all vertical cells which are to be filled with grout. Use units with one face shell removed and provide temporary supports for units above, or use header units with concrete brick supports, or cut openings in one face shell. Openings shall have a minimum area of 12 square inches and a minimum opening dimension of 3 inches.

3. Construct masonry to full height of maximum grout pour specified, prior to placing grout.

4. Limit grout lifts to a maximum height of 5 feet and grout pour to a maximum height of 24 feet.

5. Place vertical reinforcement before grouting. Tie vertical reinforcement to dowels at base of masonry where shown and thread CMU over or around reinforcement. Support vertical reinforcement at intervals not exceeding 192 bar diameters nor 10 feet.

6. Where reinforcement is prefabricated into cage units before placing, fabricate the units with vertical reinforcement bars and lateral ties of the size and spacing shown.

7. Place horizontal beam reinforcement as the masonry units are laid.

8. Embed lateral tie reinforcement in mortar joints where shown as masonry units are laid.

9. Where lateral ties are shown in contact with vertical reinforcement bars, embed additional lateral tie reinforcement in mortar joints. Place as shown, or if not shown, provide as required to prevent grout blowout or rupture of CMU face shells, but provide not less than No. 2 bars or 8-gauge wire ties spaced 16-inches on center for members with 20-inches or less side dimensions, and 8-inches on center for members with side dimensions exceeding 20-inches.

10. Preparation of Grout Spaces: Prior to grouting, inspect and clean out the grout spaces. Remove dust, dirt, mortar droppings, loose pieces of masonry and other foreign materials from grout spaces. Clean reinforcement and adjust to proper position. Clean top surface of structural members supporting masonry to ensure bond. After final cleaning and inspection, close cleanout holes and brace closures to resist grout pressures.

11. Do not place grout until entire height of masonry to be grouted has attained sufficient strength to resist displacement of masonry units and breaking of mortar bond. Install shores and bracing, if required, before starting grouting operations.

12. Place grout by pumping into grout spaces unless alternate methods are acceptable to the Engineer.

13. Limit grout pours to sections which can be completed in one working day with not more than one hour interruption of pouring operation. Place grout in lifts which do not exceed 5 feet. Allow not less than 30 minutes, nor more than one hour between lifts of a given pour. Vibrate each grout lift during pouring operation.

14. Place grout in lintels or beams over openings in one continuous pour.

15. Where bond beam occurs more than 1 course below top of pour, fill bond beam course to within 1-inch of vertically reinforced cavities during construction of masonry.

16. When more than one pour is required to complete a given section of masonry, extend reinforcement beyond masonry as required for splicing. Pour grout to within 1 1/2 inches of top course of first pour. After grouted masonry is cured, lay masonry units and place reinforcement for second pour section before grouting. Repeat sequence if more pours are required.

17. Grout for filled cells shall be tested.

3.06 PROTECTION

A. During erection: Cover top of walls with waterproof sheeting at end of day. Cover partially completed walls when work is not in progress. Extend 24-inches minimum down both sides and hold securely in place.

B. Protect face of walls, sills, and other projections from roof run-off, water, mud, grout, and mortar.

C. Spread sand or straw at base of walls to minimize dirt and clay splashed.

D. Without damaging completed work, provide protective boards at exposed external corners, which may be damaged by construction activities.

E. Clean installed block at the end of each work day.

3.07 CLEANING

A. All holes in exposed masonry shall be pointed, and defective joints shall be cut out and re-pointed with mortar of same color as that of the original and adjoining work.

B. Exposed masonry shall be protected against staining by wall coverings, and excess mortar shall be wiped off the surface as the work progresses.

C. All masonry shall be cleaned with approved detergent solution in accordance with manufacturer's printed directions. No acid or metal scrapers shall be used on masonry.

D. Before applying any cleaning agent to the entire wall, it shall be applied to a sample wall area of approximately 20-square feet in a location reviewed by the County. No further cleaning work may proceed until the sample area has been reviewed by the County, after which time the same cleaning materials and method shall be used on the remaining wall area.

E. After cleaning, treat exposed split-face CMU surfaces and mortar joint sealer applied in accordance with manufacturer's instructions. Verify surfaces are clean and thoroughly dry prior to application.

END OF SECTION.

DIVISION IX
FINISHES

SECTION 09220

CEMENT PLASTER (STUCCO)

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section includes materials and installation of the exterior stucco finish with integral color.

1.2 SUBMITTALS

A. Submit product data including manufacturer's literature demonstrating compliance with these specifications.

B. Submit color chart showing integral coloring options for Owner's selection.

1.3 QUALITY ASSURANCE

A. Codes and Standards: Comply with provisions of following codes, specifications, and standards, except where more stringent requirements are shown or specified:
   1. FBC, Florida Building Code.

   2. Portland Cement Plastering Standards

B. Use skilled workmen who are trained and experienced and who are familiar with the installation of the products specified herein.

C. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution. Mockup shall include decorative reveal panels as shown on wall section in the Drawings.

PART 2 - MATERIALS

2.1 PLASTER MATERIALS

A. Portland cement shall conform to ASTM C150, Type I or IA.

B. Lime shall be special finishing hydrated lime conforming to ASTM C206, Type S.

C. Sand shall be clean, natural and free from soluble salts and organic matter, and shall comply with ASTM C35 and when dry shall pass No. 4 sieve.

D. Fiber shall be pure manilla, glass or synthetic fiber, good quality ½ inch to 2 inches in length, free from grease, oil, dirt and other impurities. No asbestos shall be used.

E. Water shall be clean, fresh potable water.

F. Bonding agent shall be Acryl 60 by Harris Specialty Chemicals, Inc.

2.2 STUCCO ACCESSORIES

A. Stucco accessories shall be produced from weather proof PVC as manufactured by Vinyl Tech Accessories Plastic Components, Inc.

B. Corner beads shall be No. 1.

C. Casing beads shall be No. 10.

D. Stucco reveal shall be 708-75.

E. Stucco reveal cross intersection shall be PRC-75.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas where the cement plaster (stucco) will be installed and bring any unsatisfactory conditions to the attention of the Contractor. Do not proceed with installation until the unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Cement plaster (stucco) shall be 3 coat work on CMU or concrete with a minimum thickness of ¾ inch. The three coats shall be scratch coat, brown coat and finish coat.

B. Apply scratch coat in a 3/8 inch minimum thickness with sufficient pressure to force it through and completely imbed metal lath or to form a good bond on masonry, and then scratch to roughen surface.

C. Apply brown coat over scratch coat in a ¼ inch minimum thickness with sufficient pressure to form a good bond, rodded level and left rough.

D. Apply finish coat over brown coat in a 1/8 inch minimum thickness. Float finish to a true, even surface and as required to produce a fine texture. Finish shall be sand finish.

E. Moisture protection and curing. Dampen previous coats that have dried out prior to time for applications of next coat. Dampen with water as required for uniform suction.

3.3 CLEANUP

A. Clean up any loose material upon completion of installation and dispose of in designated containers or off site.

END OF SECTION

DIVISION XV
MECHANICAL

SECTION 15050

UTILITY PIPING, FITTINGS, VALVES, AND ACCESSORIES

PART 1-GENERAL

1.01 DESCRIPTION

A. Scope of Work:

1. The Work included in this Section consists of furnishing all labor, equipment, and materials and in performing all operations necessary for the construction, installation or restoration of all utility piping, valves, and appurtenances complete and ready for operation as shown on the Drawings or callouts and specified herein.

2. All products in contact with potable water shall be in accordance with ANSI/NSF Standard 61 for potable water contact.

3. Water service replacements are assumed and the exact location of the services are not known, therefore only callouts are shown on the Drawings. Contractor is to field verify and remove and replace existing single, double or triple water services up to 150 feet in length and up to 2-inches in diameter within open cut/excavation limits for the rehabilitation work. Existing water services are to be removed and properly abandoned/placed out of service and new water services installed to meet Owner requirements.

B. Related Work Described Elsewhere:

1. Section 02774: Wastewater Gravity Collection System.
2. Section 15064: Polyvinyl Chloride (PVC) Pipe and Fittings.

1.02 QUALITY ASSURANCE

A. Construction Requirements:

1. All the lines shall be installed with at least 36-inches of cover within utility easements and 42-inches of cover within Osceola County Right-of-Way.

2. For underground utilities, changes in horizontal alignment of less than 11-1/4 degrees may be achieved through the use of allowable pipe deflection in lieu of fittings shown on the Drawings at the Contractor's option, but subject to approval of the Engineer as to layout. Said deflection shall not exceed 75 percent of the maximum allowable deflection as stated in the pipe manufacturer's installation instructions.

3. Install proposed pipe so as not to scratch, dent, or damage any existing pipes. Pipe shall be installed in a way that prevents damaging existing pipe. If existing pipes are damaged due to construction, the Contractor shall be required to repair the pipe according to the Owner's requirements.

B. Pipe Inspection: The Contractor shall obtain from the pipe manufacturers a certificate of inspection to the effect that the pipe and fittings supplied for this Contract have been inspected at the plant and that they meet the requirements of these Specifications. All pipe and fittings shall be subject to visual inspection at time of delivery by rail or truck and also just before they are lowered into the trench to be laid. Joints or fittings that do not conform to these Specifications will be rejected and must be removed immediately by the Contractor.

The entire product of any plant may be rejected when, in the opinion of the Engineer, the methods of manufacture fail to secure uniform results, or where the materials used are such as to produce inferior pipe or fittings.

1.03 SUBMITTALS

A. Shop Drawings:

1. In general, the following Shop Drawings shall be submitted to the Engineer for approval prior to construction:

a) Mill test certificates or certified test reports on pipe and fittings.

b) Details of restrained and flexible joints.

c) Valve boxes.

d) All valves.

e) Couplings.

f) Wet taps.

g) Service saddles.

h) Pressure gauges.

i) Flexible expansion joints, tie rods, and flanged coupling adapters.

j) Joint lubricant.

k) Temporary plug and anchorage system for hydrostatic pressure test.

l) Detailed piping layout drawings and pipe laying schedule (see below).

2. Tabulated layout schedule for each pipe system including:

a) Pipe invert station and elevation at each change of grade and alignment.

b) The limits of each reach of pipe thickness class and of restrained joints.

c) The limits of each reach of concrete encasement.

d) Locations of valves and other mechanical equipment.

e) Methods and locations of supports.

f) Details of special elbows and fittings.

3. A separate Shop Drawing submittal will be required for each major item listed above and for each different type of an item within a major item. For example, separate submittals will be required for each valve type. All submittals shall be in accordance with the General and Special Conditions and Section 01340: Shop Drawings and Submittals.

B. Acceptance of Material:

1. The Contractor shall furnish an Affidavit of Compliance certified by the pipe manufacturer that the pipe, fittings, and specials furnished under this Contract comply with all applicable provisions of current AWWA and ASTM standards and these Specifications. No pipe or fittings will be accepted for use in the Work on this project until the Affidavit has been submitted and approved by the Engineer.

2. The Owner reserves the right to sample and test any pipe or fitting after delivery and to reject all pipe and fittings represented by any sample which fails to comply with the specified requirements.

1.04 DELIVERY, STORAGE AND HANDLING

A. Pipe, fittings, valves, and accessories shall be handled in such manner as to ensure a sound undamaged condition during shipping, delivering, and installing.

B. Particular care shall be taken not to injure the pipe coating and linings.

C. Insides of valves and piping shall be kept free of dirt and debris.

1.05 JOB CONDITIONS

A. Water in Excavation: Water shall not be allowed in the trenches while underground pipes are being laid and/or tested. The Contractor shall not open more trench than the available pumping facilities are able to dewater to the satisfaction of the Engineer. The Contractor shall assume responsibility for disposing of all water so as not to injure or interfere with the normal drainage of the territory in which he is working. In no case shall the pipelines being installed be used as drains for such water, and the ends of the

pipe shall be kept properly and adequately plugged during construction by the use of approved stoppers and not by improvised equipment. All necessary precautions shall be taken to prevent the entrance of mud, sand, or other obstructing matter into the pipelines. If on completion of the work any such materials has entered the pipelines, it must be cleaned as directed by the Engineer so that the entire system will be left clean and unobstructed.

PART 2 - PRODUCTS

2.01 DUCTILE IRON PIPE AND FITTINGS

A. Ductile Iron Pipe: Ductile iron pipe shall conform to the requirements of ANSI, A21.51 and AWWA C151, latest revision. The minimum pressure class for underground pipes shall be Class 150. Pipe shall be furnished in laying lengths of 20 feet or less, unless specifically shown otherwise on the Drawings. Flanged pipe shall have a minimum thickness class of Class 53. All pipe and fittings shall be new and unused, no refurbished piping or fittings will be accepted.

B. Coating and Lining:

1. Interior Lining for Wastewater Piping: Ductile iron pipe, fittings, and specials shall be lined with Protecto 401 Ceramic Epoxy, a high build multi-component amine cured Novalac epoxy lining, containing at least 20 percent by volume of ceramic quartz pigment, manufactured by Indurall Coatings, Inc., Birmingham, Alabama, or approved equal. The interiors of the ductile iron pipe, fittings, and specials shall receive 40 mils dry film thickness (DFT) of the ceramic epoxy protective lining. Storage, surface preparation, application, and safety precautions shall strictly follow manufacturer's instructions.

2. Where ductile iron pipe and fittings are to be installed above ground, pipe, fittings, and valves shall be thoroughly cleaned and coated with the following:

a. Prime Coat for Ferrous Metals: Two-part epoxy polyamide primer.
Carboguard 888 Primer: One (1) coat, 4 mils DFT.

b. Intermediate Coat: Two component cross-linked epoxy.
Carboguard 890: One (1) coat, 6 mils DFT.

c. Finish Coats: Single component, water-borne acrylic topcoat.
Carbocrylic 3359: Two (2) coats, 2 mils DFT per coat.

C. Fittings: Fittings for ductile iron pipe shall be either mechanical joint, restrained joint, or flanged joint as indicated on the Drawings and shall have a minimum working pressure of 250 psi. Fittings shall be ductile iron and shall conform to ANSI/AWWA C110/A21.10, ANSI/AWWA C111/A21.11 and ANSI/AWWA C153/A21.53, latest revisions for flanged and mechanical joint pipe. Fittings shall be coated and lined in the manner specified above for ductile iron pipe. The rubber gaskets for flanged, mechanical, and push-on joints shall be as described below.

D. Flanged Joints: Flanges shall be Class 125 per ANSI B16.1 with any special drilling and tapping as required to insure correct alignment and bolting.

1. Gaskets:

   a. Liquid Service: Fullface, 1/8-inch thick, cloth-inserted rubber: Johns-Manville No. 109, John Crane Co., Style 777, or equal. Gaskets shall be suitable for a water pressure of 350 psi at a temperature of 180°F.

2. Bolts, nuts, and washers for flanges shall be 316 stainless steel conforming to ASTM A 103, Grade B8M for bolts, and ASTM A 194, Grade 8M for nuts.

3. Flanges shall be long-hub type screwed tightly on pipe by machine at the foundry prior to facing and drilling. Flange machine surfaces shall be coated with rust inhibitor immediately after facing and drilling. Field assembled screwed on flanges are prohibited.

2.02 POLYVINYL CHLORIDE (PVC) PIPE AND FITTINGS

A. Small Gravity Drainage Piping: PVC pipe smaller than 4 inches nominal diameter used for gravity drainage piping shall be Schedule 40 pipe in accordance with ASTM D1785. Schedule 40 PVC pipe shall have solvent welded joints as specified for PVC pressure pipe.

B. Gravity Sewer Piping

1. Polyvinyl Chloride (PVC) gravity sewer pipe and fittings 4 inches through 15-inches in size shall conform to ASTM D-3034, "Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings," SDR 35. Uniform minimum "pipe stiffness" at five (5) percent deflection shall be 46 psi.

2. The supplier shall be responsible for the performance of all inspection and testing requirements specified in ASTM D-3034. Complete records of inspections, examinations and tests shall be kept and submitted to the Engineer. The Owner reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure that materials and services conform to the prescribed requirements.

3. Pipe shall be joined with integral bell and spigot type rubber gasketed joints in accordance with ASTM D-3212. Each integral bell joint shall consist of a formed bell with a rubber gasket. Gaskets shall conform to ASTM F-477. Joints shall permit contraction, expansion and settlement, and yet maintain a watertight connection.

4. Pipe shall be furnished in standard laying lengths not exceeding twenty (20) feet. Minimum standard length of pipe shall be thirteen (13) feet.

5. All fittings and accessories shall be furnished by the pipe supplier and shall have bell and/or spigot configurations compatible with the pipe.

6. All gaskets shall be factory installed.

7. All PVC pipe for gravity sewers shall be green in color.

C. Small PVC Pressure Piping: Unless otherwise specified, PVC pressure pipe smaller than 4 inches nominal diameter shall be Schedule 80 PVC in accordance with ASTM D1785. Schedule 80 pipe shall have either solvent welded or threaded joints. PVC pressure pipe shall bear the approved seal of the National Sanitation Foundation (NSF). PVC pipe that is exposed to sunlight shall be manufactured with additives to provide resistance to ultraviolet deterioration.

1. Fittings: Socket type, solvent welded fittings for Schedule 80 PVC pipe shall be in conformance with ASTM D2467. Threaded type fittings for Schedule 80 PVC pipe shall be in conformance with ASTM D2464. All solvent welded or threaded joints shall be watertight.

2. Flanges: Flanges for Schedule 80 PVC pipe shall be rated for a 150 psi working pressure with ANSI B 16.1 dimensions and bolting pattern. Flanges shall be connected to PVC piping with either solvent welded or threaded joints in accordance with ASTM D2467 or ASTM 2464, respectively. Gaskets shall be neoprene, full faced type with a minimum thickness of 1/8-inch. Nuts and bolts shall be hexagonal with machine threads, manufactured of Type 316 stainless steel in accordance with ASTM A320, Class 2. Type 316 stainless steel flat washers, with lock washers, shall be used against PVC flanges. The nuts shall have a hardness that is lower than that of the bolts and washers by a difference of 50 Brinnell hardness to prevent galling during installation.

3. Solvent Cement: PVC solvent cement shall be in compliance with ASTM D2564 and in accordance with the pipe manufacturer's recommendations.

4. Thread Lubricant: Lubricant for Schedule 80 threaded joints shall be Teflon tape only.

D. Large PVC Pressure Piping

1. PVC pipe 4 through 12 inches in size shall conform to AWWA C900. Such pipe shall have a Dimension Ratio (DR) of either 18 or 25 depending upon the application in the Pipe Schedule in the Drawings. The pressure rating for DR18 pipe shall be 150 psi and the pressure rating of DR25 pipe shall be 100 psi. PVC pipe shall have the same outside diameter as ductile iron pipe for each pipe size.

2. PVC pipe larger than 12 inches in size shall conform to AWWA C905. Such pipe shall have a Dimension Ratio (DR) of either 18 or 25 depending upon the application in the Pipe Schedule in the Drawings. The pressure rating for DR18 pipe shall be 235 psi and the pressure for the DR25 pipe shall be 165 psi. PVC

pipe shall have the same outside diameter as ductile iron pipe for each pipe size.

3. Fittings shall be ductile iron fittings with mechanical joint ends as specified herein.

4. Bell and Spigot: Pipe joints shall be made with integral bell and spigot pipe ends. The bell shall consist of an integral thickened wall section designed to be at least as strong as the pipe wall. The bell shall be supplied with a factory glued rubber ring gasket which conforms to the manufacturer's standard dimensions and tolerances. The gasket shall meet the requirements of ASTM F477 "Elastomeric Seals (Gaskets) for Joining Plastic Pipe". PVC joints shall be "Ring-Tite" as manufactured by J-M Manufacturing Company, Inc. or an equal approved by the Engineer.

5. Restrained Joints: Where indicated on the Drawings, to prevent pipe joints and fittings from separating under pressure, pipe joints and fittings shall be restrained as follows:

   a. PVC pipe bell and spigot joints shall be restrained with the EBBA Iron MEGALUG® Series 1500 Restrainer or an equal approved by the Engineer. The restraining device and tee head bolts shall be manufactured of high strength ductile iron meeting ASTM A536, Grade 6542-10. Clamping bolts and nuts shall be manufactured of high strength, low alloy steel meeting the requirements of ANSI/AWWA C111/A21.11. The following systems are acceptable alternatives to the devices specified above:

      1) Romac Industries, Inc. Style 470SJ and Style 611.

      2) Star Pipe Products Series 1100C and Series 1200C.

      3) Sigma Corporation PV-LOK Series PVP.

   b. Mechanical joint fittings used with PVC pipe shall be restrained with the EBBA Iron MEGALUG® Series 2000 PV Restrainer or an equal approved by the Engineer. The restraining device and tee head bolts shall be manufactured of high strength ductile iron meeting ASTM A536, Grade 65-42-10. Clamping bolts and nuts shall be manufactured of high strength, low alloy steel meeting the requirements of ANSI/AWWA C111/A21.11. The following systems are acceptable alternatives to the devices specified above:

      1) Romac Industries, Inc. Style 470MJ and Style 612.

      2) Star Pipe Products PVC StarGrip and PVC Ring Lock.

      3) Sigma Corporation PV-LOK Series PVM.

2.03 PIPE COUPLINGS

A. Pipe couplings used to join two pieces of plain end pipe shall be sized to suit the outside diameter of the pipe ends to be jointed. Transition couplings shall be used to join pipes of different outside diameters. All pipe couplings shall be rigid connections.

B. Connections from new gravity sewer pipes to existing pipes shall be made with flexible coupling with stainless steel shear ring and clamps as manufactured by Fernco Series 5000 RC or approved equal.

C. Connections from new force mains to existing force mains shall meet the following requirements:

1. Coating: All carbon steel parts of the coupling shall be coated on the interior and exterior with a fusion bonded thermosetting epoxy coating with a 12-mil nominal coating thickness. The coating shall be equal to AL-CLAD as manufactured by Dresser Industries, Inc.

2. Gaskets: Gaskets for the coupling shall be wedge type manufactured of Buna-N resilient rubber.

3. Bolts: Bolts shall be manufactured of high strength Type 316 stainless steel with Type 316 stainless steel hexagonal nuts. Bolts and nuts shall conform dimensionally to ANSI/AWWA C111, latest revision.

4. Manufacturer: Couplings shall be Style 38 as manufactured by Dresser Industries, Inc. or an equal approved by the ENGINEER.

2.04 PIPE AND VALVE IDENTIFICATION SYSTEMS

A. Materials selected for identification systems for each type surface shall be the product of a single manufacturer.

B. Buried piping shall be identified by identification tape installed over the centerline of the pipelines.

1. Identification Tape for Steel or Iron Pipe: Identification tape shall be manufactured of inert polyethylene film so as to be highly resistant to alkalies, acids, or other destructive agents found in soil, and shall have a minimum thickness of 4 mils. Tape width shall be 6 inches and shall have background color specified below, imprinted with black letters. Imprint shall be as specified below and shall repeat itself a minimum of once every 2 feet for entire length of tape. Tape shall be Terra Tape Standard 250, or approved equal.

2. Identification Tape for Plastic or Non-Magnetic Pipe: Identification tape shall be manufactured of reinforced polyethylene film with a minimum overall thickness

of 4 mils and shall have a 0.35 mil thick magnetic metallic foil core. The tape shall be highly resistant to alkalies, acids, and other destructive agents found in soil. Tape width shall be 3 inches and shall have background color specified below, imprinted with black letters. Imprint shall be as specified below and shall repeat itself a minimum of once every 2 feet for entire length of tape. Tape shall be TerraTape Sentry Line 1350, or approved equal.

3. Warning tape shall be placed 12” to 18” above all pipe.

4. Tape background colors and imprints shall be as follows:

Imprint	Background Color
“Caution Water Line Buried Below”	Blue
"Caution Gravity Sewer Line Buried Below"	Green

5. Identification tape shall be "Terra Tape" as manufactured by Reef Industries, Inc., Houston, TX; Allen Systems, Inc., Wheaton, IL; or approved equal.

C. Buried piping shall be identified by a continuous longitudinal painted "green" stripe of oil-based enamel paint located within the top 90 degrees of the pipe. Said stripe shall be a minimum 2-inch in width for pipe sizes less than 24-inch in diameter and three stripes (3) 2-inch in width within the top 90 degrees for pipe sizes 24-inch and larger.

D. General Notes and Guidelines:

1. Pipelines, equipment, or other items which are not listed here shall be assigned a color by the Owner and shall be treated as an integral part of the Contract.

2. All inline equipment and appurtenances not assigned another color shall be painted the same base color as the piping. The pipe system shall be painted with the pipe color up to, but not including, the flanges attached to pumps and mechanical equipment assigned another color.

E. All insulated surfaces, unless otherwise specified, shall be given one (1) coat of sizing, one (1) prime coat, and one (1) finish coat.

2.05 WATER SERVICES

A. Water service piping shall be 1-inch, 1½-inch or 2-inch blue, PC-200, DR-9 polyethylene tubing conforming to AWWA C-901 and PE3408, as manufactured by Endot or approved equal.

B. Corporation stops shall be 1-inch, 1½-inch or 2-inch brass ball type, equipped with connections compatible with the polyethylene tubing and threaded (CC-tapered) in accordance with AWWA C-800, latest edition. Insert stiffeners for PE pipe is not

acceptable. Corporation stops shall be manufactured by Ford FB-1000 (CC threaded 1"), or approved equal.

C. Curb stops shall be 1-inch, 1½-inch or 2-inch lockable brass type, equipped with connections compatible with polyethylene tubing and conform to AWWA C-800 and C-901, latest edition. Insert stiffeners are not allowed. Curb stops shall be manufactured by Ford B43-342W (1" single service), or approved equal.

D. Service saddles shall be double strapped iron service saddle with fusion bonded epoxy coating and double stainless steel straps flattened U-bolts as manufactured by Ford, or approved equal.

2.06 MISCELLANEOUS ITEMS

A. Other items necessary for the complete installation and not specified herein shall conform to the details and notes shown on the Drawings. All minor items implied, usually included, or required for the construction of a complete operating system shall be installed whether shown on the Drawings or not.

PART 3 - EXECUTION

3.01 INSPECTION

A. All pipe, fittings, valves, and other material shall be subject to inspection and approval by the Engineer after delivery, and no broken, cracked, imperfectly coated, or otherwise damaged or unsatisfactory material shall be used. When a defect or crack is discovered, the injured portion shall not be installed. Cracked pipe shall have the defect cut off at least 12 inches from the break in the sound section of the barrel.

3.02 GENERAL INSTALLATION REQUIREMENTS

A. Excavation, backfill, and compaction shall conform to the provisions of Section 02220. Upon satisfactory installation of the pipe bedding material as specified in Section 02220, a continuous trough for the pipe barrel and recesses for the pipe bells or couplings shall be excavated by hand digging. When the pipe is laid in the prepared trench, true to line and grade, the pipe barrel shall receive continuous, uniform support and no pressure will be exerted on the pipe joints from the trench bottom.

B. Cover for underground piping shall not be less than that indicated on the Drawings. The minimum cover for pipe shall be 36 inches. In areas where other piping conflicts preclude the maximum cover desired, the piping shall be laid to provide the maximum cover obtainable.

C. Pipe, fittings, valves, and accessories shall be installed as shown or indicated on the Drawings.

D. All connections to existing piping systems shall be made as shown or indicated on the Drawings after consultation and cooperation with authorities of the Owner. Some such connections may have to be made during off-peak hours (late night or early morning).

E. Pipe Joint Deflection: Whenever it is desirable to deflect pipe joints to avoid obstructions or to maintain required alignment, the amount of the joint deflection shall not exceed 80 percent of the maximum limits allowed by the pipe manufacturer.

F. In preparation for pipe installation, placement (stringing) of pipe should be as close to the trench as practical on the opposite side of the trench from the excavated material. The bell ends of the pipe should point in the direction of the work progress.

G. Pipe and fittings shall be laid accurately to the lines and grades indicated on Drawings or required. Where grades for the pipeline are not indicated on the Drawings, maintain a uniform depth of cover with respect to finish grade. Care shall be taken to insure a good alignment both horizontally and vertically and to give the pipe a firm bearing along its entire length. Any pipe which has its grade or joint disturbed after laying shall be taken up and relayed.

H. All pipe and fittings shall be cleared of sand, dirt, and debris before laying. All precautions shall be taken to prevent sand, dirt, or other foreign material from entering the pipe during installation. If necessary, a heavy, tightly woven canvas bag of suitable size shall be placed over each end of the pipe before lowering into the trench and left there until the connection is made to the adjacent pipe. Any sand, dirt, or other foreign material that enters the pipe shall be removed from the pipe immediately. Interior of all pipe and fittings shall be kept clean after installation until accepted in the complete Work.

I. Any time that pipe installation is not in progress, the open ends of pipe shall be closed by a watertight plug or other method approved by the Engineer. Plugs shall remain in pipe ends until all water is removed from the trench. No pipe shall be installed when trench conditions are unsuitable for such work, including standing water, excess mud, or rain.

J. Pipe shall be low air pressure tested per Section 15064.

K. Sewer Bypass and Dewatering

1. Contractor shall provide temporary sewer bypassing and dewatering as required to successfully complete the work.

2. Contractor shall provide sewer bypassing by pumping or diverting upstream flow around the working area.

a. Contractor shall furnish pumps, conduits, plugs, and other equipment to successfully bypass the sewer flow. Engines shall be equipped with

mufflers and/or enclosures to keep the noise level within local ordinance requirements.

b. All bypass flow shall be discharged to the nearest downstream manhole.

3. Contractor shall dewater all sagged submerged portions of the sewer during television inspection and whenever necessary to successfully complete lining or grouting work.

a. Sewer flow shall be reduced so that no portion of the television camera's lens is submerged during inspection. The flow may be temporarily forced away from the area under inspection by water jetting or plugging. Where these methods cannot adequately reduce the flow, the Contractor shall pump the flow form the sewer.

b. All dewatered flow shall be discharged to the nearest downstream manhole.

L. Potable water services shall be disinfected prior to being placed in service. Disinfection procedures shall be approved by the Engineer and shall be in conformance with ANSI/AWWA C651, latest revision.

END OF SECTION

SECTION 15064

POLYVINYL CHLORIDE (PVC) PIPE AND FITTINGS

PART 1 – GENERAL

1.01 DESCRIPTION

A. Scope of Work: Furnish all labor, materials, equipment and incidentals required and install and test all polyvinyl chloride (PVC) piping, fittings and appurtenances as shown on the Drawings and specified herein.

B. General Design: The equipment and materials specified herein are intended to be standard types of PVC pipe and ductile iron fittings for use in transporting wastewater, reclaimed water, and water.

1.02 QUALITY ASSURANCE

A. Qualifications: All of the PVC pipe and ductile iron fittings shall be furnished by manufacturers who are fully experienced, reputable, and qualified in the manufacture of the materials to be furnished. The pipe and fittings shall be designed, constructed, installed in accordance with the best practices and methods and shall comply with these specifications as applicable.

B. Standards:

1. AWWA C900/C905

2. ASTM D1784 / D1785 / D2241 / D2466 / D2564 / D2729 / D2774 / D3034 / D3139 / D3212

3. NSF 14

4. UNI-B-1 through 5

C. Factory Tests: The manufacturer shall perform the factory tests described in Section 3 - AWWA C900/C905.

D. Quality Control:

1. The manufacturer shall establish the necessary quality control and inspection practice to ensure compliance with the referenced standards.

2. In addition to the manufacturer's quality control procedures, the Owner may select an independent testing laboratory to inspect the material at the production

facility for compliance with these specifications. The Owner will pay for the cost of facility inspection requested by the Owner.

1.03 SHOP DRAWINGS AND SUBMITTALS

A. Submittals shall be submitted to the Owner/Professional for review and acceptance prior to construction in accordance with the General Conditions and specifications Section 01340.

B. Materials and Shop Drawings

C. Manufacturer's Certification

1. Submit sworn certification of factory tests and their results.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Delivery and Storage: Delivery and storage of the materials shall be in accordance with the manufacturer's recommendations. PVC pipe shall be covered with black plastic with a minimum thickness of 15-mil. Joint gaskets shall be stored in a clean, dark and dry location until use.

B. Handling: Care shall be taken in loading, transporting and unloading to prevent damage to the pipe or fittings and their respective coatings. Pipe or fittings shall not be rolled off the carrier or dropped. Pipe shall be unloaded by lifting with a forklift or crane. All pipe or fittings shall be examined before installation and no piece shall be installed which is found to be defective. Pipe shall be handled to prevent damage to the pipe or coating. Accidental damage to pipe or coating shall be repaired to the satisfaction of Owner or it shall be removed from the job. When not being handled, the pipe shall be supported on timber cradles or on level ground, graded to eliminate all rock points and to provide uniform support along the full pipe length. When being transported, the pipe shall be supported at all times in a manner to prevent distortion or damage to the lining or coating. Any unit of pipe that, in the opinion of the Owner, is damaged beyond repair by the Contractor shall be removed from the site.

C. The Contractor shall be responsible for all materials furnished and stored until the date of project completion. The Contractor shall replace, at his expense, all materials found to be defective or damaged in handling or storage. The Contractor shall, if requested by the Owner, furnish certificates, affidavits of compliance, test reports, samples or check analysis for any of the materials specified herein. All pipe delivered to project site for installation is subject to random testing for compliance with the designated specifications.

PART 2 – PRODUCTS

2.01 GENERAL

A. All material supplied shall be one of the products specified in Appendix A as appended to these technical specifications.

2.02 MATERIALS

A. Polyvinyl Chloride (PVC) Pipe

1. Standards: AWWA C900/C905 and ASTM D1784/D3034/F679 (Gravity Sewer)

2. Compounds: Class 12454-A or Class 12454-B

3. PVC Gravity Pipe and Fittings: PVC gravity pipe (8-inch to 15-inch), shall conform to ASTM D3034, maximum SDR 35. PVC gravity pipe (18-inch to 36-inch), shall conform to ASTM F679 and uniform minimum "pipe stiffness" at 5% (percent) deflection shall be 46-psi. The joints shall be integral bell elastomeric gasket joints manufactured in accordance with ASTM D3212 and ASTM F477. Applicable UNI Bell Plastic Pipe Association standard is UNI B.

4. Sanitary Laterals: Pipe, fittings, and joints shall be SDR 26 up to the point of connection to the main, where the fitting shall be adapted to the same SDR as that of the main.

   Service laterals shall be connected to the wye, provided in the gravity sewer where such is available, utilizing approved fittings or adapters.

5. PVC Pressure Pipe and Fittings: All PVC pipe of nominal diameter 4 to 12-inches shall be manufactured in accordance with AWWA Standard C900 and greater than 12-inches shall be manufactured in accordance with AWWA Standard C905. The PVC pipe shall have a minimum working pressure rating of 100-psi and shall have a maximum dimension ratio of 18. Pipe shall be the same outside diameter as ductile iron pipe.

6. Dimension Ratio/Thickness: (unless otherwise shown on the Drawings)

   a. Raw Wastewater:

      (1) Pressure Systems: DR 18

      (2) Gravity Systems: DR 35 (ASTM D3034) or PS 46 (ASTM F679)

   b. Treated Wastewater: DR 18

   c. Reclaimed Water: DR 18

d. Raw Water: DR 18

e. Potable Water: DR 18

f. Irrigation Piping: Schedule 40 or SDR 21

7. Joints:

a. Push-on integral bell elastomeric gasket joints:

(1) Standards: ASTM D3212/D3139/F477 and UNI-B-1

(2) Gaskets:

(a) Potable and Reclaimed Water Service: Styrene Butadiene Rubber (SBR) rieber type.

(b) Wastewater Service: Styrene Butadiene Rubber (SBR) rieber type for C900 / C905 pipe. Styrene Butadiene Rubber (SBR) ring type for gravity systems.

(3) Pipe Markings: Pipes shall have a manufacturer's home-mark on the spigot. On field cut pipe, the Contractor shall provide home-mark on the spigot in accordance with manufacturer's recommendations.

b. Solvent weld (nominal diameter less than 4-inches):

(1) Standards: ASTM D2466/D2564

(2) Type: Slip Fitting Socket (tapered)

(3) Exclusions: Plastic saddle and flange joints will not be used.

c. Restrained Joints:

(1) Restrained joint devices shall be made specifically for PVC pipe and meet or exceed the requirements in ASTM F-1674.

(2) Manufacturers: Uni-flange mechanical joint restraints and bell restraints (for all sizes); Meg-a-lug system as manufactured by EBBA Iron (sizes 12-inches or less), or acceptable equal.

(3) Design pressure rating equal to or above test pressure as specified herein.

d. Pipe Length:

(1) Pressure systems: 20-feet maximum nominal length.

(2) Gravity systems: 13-feet minimum nominal length.

B. Fittings - Pressure Systems (nominal diameter 4-inches and greater):

1. Materials: Ductile iron.

2. Joints: Mechanical Joint, Minimum 350-psi pressure rating.

3. Gaskets:

a. Water and Reclaimed Water Service: Styrene Butadiene Rubber (SBR) ring type.

b. Wastewater Service: Neoprene rubber ring type.

4. Exclusions: Standard double bell couplings will not be acceptable where the pipe will slip completely through the coupling.

5. All fittings shall conform to either ANSI/AWWA C110/A21.10 and/or C153/A21.53, latest revision, and shall be ductile iron.

6. All fittings shall have a date code cast (not printed or labeled), with identification of the date, factory and unit at which it was cast and machined. Fittings shall have distinctly cast on them the pressure rating, nominal diameter of openings, manufacturer's name, the country where cast, and deflection angle. Ductile iron fittings shall have the letters "DI" or "Ductile" cast on them.

7. All potable water main fittings shall have NSF certification and ISO 9001 certification for both the foundry and manufacturer. The NSF 61 certification shall be issued on all coatings and linings, from the said manufacturers that are used for potable water applications.

8. All ductile iron fittings shall have exterior coatings, including markings and colors, and interior linings in conformance with Section 15062 "Ductile Iron Pipe and Fittings."

C. Fittings - Pressure Systems (nominal diameter less than 4-inches)

1. Material: Polyvinyl Chloride (PVC).

2. Joints: Slip fitting tapered socket with solvent weld.

3. Solvent: Sure Guard 12 or acceptable equal.

4. Exclusions: Plastic saddle and flange joint fittings shall not be used.

2.03 LOCATION MARKERS, LOCATION WIRE AND IDENTIFICATION MARKINGS

A. Electronic Markers and Locator System (for reclaimed water and wastewater ONLY)

1. Markers: Markers shall consist of a passive device capable of reflecting a specifically designated repulse frequency tuned to the utility (service) being installed. Markers shall be color coded in accordance with the American Public Works Association's "Utility Locating and Coordinating Council Standards." Colors shall be: Wastewater and Reclaimed Water - #1404 Green.

   Markers shall be full range. Markers shall be installed directly above the centerline of the respective pipeline at intervals not to exceed 100-feet, at each fitting (tees, wyes, crosses, reducers, plugs, caps and bends) or change in horizontal direction and at each valve along the pipeline. Markers shall be hand backfilled to 1-foot above the pad and have a finished depth of burial of not less than 2-feet or more than 6-feet. No separate payment shall be made for furnishing and installing the respective frequency and color-coded electronic pad type marker.

2. Locator System: Marker locator set shall be the 3M Dynatel 1420 or 3M Dynatel 1420E Electronic Marker System Marker Locator, or acceptable equal. The Contractor shall furnish 1 locator set for each type of service piping installed on the Project (i.e.: reclaimed water, wastewater.) to the Owner. Each unit shall incorporate the following features and accessories:

   a. Unit(s) shall be tuned to the proper frequency for each type (service) of piping.

   b. Field strength meter that provides visual indication of the return signal.

   c. Function switch for selection of operation mode.

   d. Sensitivity control to adjust the receiver gain.

   e. Audio speaker for signal response.

   f. Battery access panel containing condensed operating instructions.

   g. Auxiliary headset and heads set jack.

   h. Permanently attached shoulder straps.

   i. Rugged shockproof and weatherproof storage/carrying case.

3. Manufacturer: System shall be Scotch Mark Locator System, or acceptable equal.

B. Location Detection Wire

1. Materials: Continuous, insulated 10-gauge copper wire (color to match pipe identification).

2. Installation: Directly above (1-inch maximum) centerline of pipe terminating at top of each valve box collar and be capable of extending 18-inches above top of box (stored inside the 2-inch brass pipe through the valve box collar) in a manner so as not to interfere with valve operation. For direction drilling installations, a minimum of 2 (two) 10-gauge wires shall be pulled along with the pipe.

C. Identification Markings:

1. Pipe furnished in solid color or white with color lettering as indicated below.

a. Lettering along top 90° (degrees) of pipe, minimum 3/4-inch in height with appropriate wording appearing 1 or more times every 21-inches along the entire length of the pipeline.

(1) Raw Wastewater: Safety Green

(2) Reclaimed Water: Purple (Pantone 522C)

(3) Potable Water: Safety Blue

PART 3 – EXECUTION

3.01 INSTALLATION

A. Standards: AWWA C900/C905/UNI-B 3 and 4

B. Underground Polyvinyl Chloride (PVC) Pipe and Fittings

1. Bedding: Firm, dry and even bearing of suitable material. Blocking under the pipe will not be permitted.

2. Placement/Alignment:

a. Installation shall be in accordance with lines and grades shown on the Drawings. For pressure systems, deflection of joints shall not exceed 75% of that recommended by the manufacturer.

b. All pipe and fittings shall be inspected prior to lowering into trench to insure no cracked, broken or otherwise defective materials are being used. All homing marks shall be checked for the proper length so as to not allow a separation or over homing of connected pipe. Homing marks incorrectly marked on pipe shall result in rejection of pipe and removal

from site. The Contractor shall clean ends of pipe thoroughly and remove foreign matter and dirt from inside of pipe and keep clean during and after installation.

c. Proper implements, tools and facilities shall be used for the safe and proper protection of the Work. Pipe shall be lowered into the trench in such a manner as to avoid any physical damage to the pipe. Pipe shall not be dropped or dumped into trenches under any circumstances.

d. Trench Dewatering and Drainage Control: Contractor shall prevent water from entering trench during excavation and pipe laying operations to the extent required to properly grade the bottom of the trench and allow for proper compaction of the backfill. Pipe shall not be laid in water.

e. Pipe Laying in Trench: Dirt or other foreign material shall be prevented from entering the pipe or pipe joint during handling or laying operations and any pipe or fitting that has been installed with dirt or foreign material in it shall be removed, cleaned and re-laid. Pigging of pipe may be used to remove foreign materials in lieu of flushing. At times when pipe installation is not in progress, the open ends of the pipe shall be closed by a watertight plug or by other means approved by the Owner to ensure absolute cleanliness inside the pipe. The color stripe and pipe text shall be viewed from the top of pipe when installed. When installing PVC pipe, no additional joints will be installed until the preceding pipe joint has been completed and the pipe carefully embedded and secured in place.

f. Locating Wire: Locating wire, for electronically locating pipe after it is buried, or installed by trenchless technology shall be attached along the length of and installed with the pipe. This is applicable to all sizes and types of pressure mains. At a minimum, the tracing wire is to be attached to the pipe with nylon wire ties. The wire itself shall be 10-gauge single strand solid core copper wire with non-metallic insulation. The insulation shall be color coded for the type of pipe being installed. Continuous continuity must be maintained in the wire along the entire length of the pipe run. Permanent splices must be made in the length of the wire using wire connectors approved for underground applications as listed in the uniform electric code handbook. The coiled wire shall extend to a minimum of 12-inches above the surface and be connected to a test station box at valve locations.

g. PVC Pressure Pipe Installation and Training: PVC pipe shall be installed in accordance with standards set forth in the UNI-BELL "Handbook of PVC Pipe", AWWA C605, and AWWA Manual M-23. The pipe shall be laid by inserting the spigot end into the bell flush with the insertion line or as recommended by the manufacturer. At no time shall the bell spigot end be allowed to go past the "insertion line" or "homing mark" for pressure pipe applications and homing mark shall be visible.

h. Field Cutting: PVC pipe can be cut with a handsaw or power driven abrasive disc making a square cut. The end shall be beveled with a beveling tool, wood rasp or power sander to the same angle as provided on the factory-finished pipe. The insertion line on the spigot shall be remarked to the same dimensions as the factory-marked spigot.

i. All Contractor pipe crews utilizing PVC pressure pipe shall be trained on an annual basis by Uni-Bell in coordination with the Owner and attended by the manufacturer's representative of the respective approved Manufacturers in Appendix A. The Uni-Bell PVC training session will consist of proper handling, storage, installation, and compaction as well as Owner requirements regarding PVC pipe and deflection. Every person handling, installing or backfilling PVC pipe shall not be permitted to install Owner owned and / or maintained pipe without training.

j. Approved manufacturer’s representatives (Appendix A), not present at the hosted Uni-Bell training session or individuals of pipe crews not in attendance shall be trained on every project site. On-site project training shall be for each manufacturer of pipe utilized on-site, per crew and per project. Specifically each crewmember shall be trained on every project by every pipe manufactures representative regardless of previous on-site training. Every person handling, installing or backfilling PVC pipe shall not be permitted to install Owner owned and / or maintained pipe without training.

k. PVC Gravity Pipe Installation: Gravity sewer pipe shall be installed to the homing mark, no tolerance. Any noticeable separation shall be removed and reinstalled. The homing mark may be disregarded to meet the maximum of 1-inch separation between bell and spigot requirement. Joints:

l. Joint Placement:

(1) Push on joints: Pipe shall be laid with the bell ends facing upstream. The gasket shall be inserted and the joint surfaces cleaned and lubricated prior to placement of the pipe. After joining the pipe, a metal feeler shall be used to verify that the gasket is correctly located.

(2) Mechanical Joints: Pipe and fittings shall be installed in accordance with the "Notes on Method of Installation" under ANSI A21.11/AWWA C111. The gasket shall be inserted and the joint surfaces cleaned and lubricated with soapy water before tightening the bolts to the specified torque.

C. Thrust Restraint

1. Thrust restraint shall be accomplished by the use of mechanical restraining devices unless specifically identified otherwise on the Drawings or herein.

2. Length of restrained joints shall be in accordance with the lengths listed in the table as shown on the Drawings.

D. Installation of Pipes on Curves

1. No joint deflection or pipe bending is allowed in PVC pipe. The maximum allowable tolerance in the joint due to variances in installation is 0.75° (degrees) (3-inches per joint per 20-foot stick of pipe).

No bending tolerance in the pipe barrel shall be acceptable. Alignment change shall be made only with sleeves and fittings.

3.02 CLEANING AND FIELD TESTING

A. At the conclusion of the Work, the Contractor shall provide all associated cleaning and field testing as specified in associated sections of these specifications.

END OF SECTION

APPENDICES

Appendix A

Approved Manufacturers and Materials

	ITEM	MANUFACTURER	PART / DESCRIPTION
	SEWER MAIN MATERIALS		
Valves	Air Release Valve	ARI Flow Controls	D-020 - Stainless Steel
			D-025 - Stainless Steel
			D-025L - S.S., Lift Station
		H-Tech	986 - Stainless Steel
	Check Valves	Kennedy – McWane	1106AW
		M&H – McWane	159-02A
		Mueller	A-2600-6-01B1
		Clow – McWane	1106AW
		GA Industries	220
	Gate Valves	Clow – McWane	AWWA C509 Resilient Wedge Fusion Bond Epoxy Coated
		Mueller	
		American	
	Valve Box Lids		Cast Iron Round
	Valve Box Risers		DI
			C900 PVC
	Debris Cap	SW Services	DC457 (screw type)
			DC456 (slip type)
Manholes	Manhole Frame and Cover	U.S. Foundry	USF 663-AB-MK 'SANITARY' tag for Manholes 'ARV' tag for Vaults
	Manhole Inflow Barrier	USSI	Inflow Defender w/Stiffening Ribs
	Manhole Jointing Material	Henry	RN-101
			RN-103
		ConSeal	CS-102B
		Martin Asphalt Co.	Evergrip 990
	Manhole External Joint Sealer	ConSeal	CS-212 (8" minimum)
		Canusa-CPS	Wrapid Seal (8" minimum)
		GPT	Boa-Tape
			Riser Wrap
	Pipe - Manhole Seal	Trelleborg	Kor-N-Seal
	Manhole Drop Connection		SDR35 to SCH-80 PVCP
Pipe & Fittings	Fittings, M.J.	Tyler Union	Protecto 401 Liner
		U.S. Pipe – Mueller	
		American	
		Star Pipe	
		Clow - McWane	
		Sigma	
		SIP	
	Fittings, PVC		SDR 26 Minimum
	Pipe, Ductile Iron, Gravity	American	Pressure Class 150 Protecto 401 Liner or Permox PC3-9043 Liner
		U.S. Pipe	
		McWane	
	Pipe, PVC Force Main		C900 / C905 DR 25 Minimum, DR 18 Minimum, Restrained
	Pipe, PVC Gravity		SDR 35 Minimum

Pipe & Fittings *(Continued)*	Pipe, HDPE		C906 DR17
	Restrained Joints	Tyler Union	TufGrip, Field Lok
		Romac	GripRing
		EBAA Iron	Megalug
		Ford	Uni-Flange
		Star Pipe Products	Star Grip
			Series 1000
		American	Lok-Ring – 12” or less (Fast-Tite)
		Sigma	One-Lok
		SIP	Easy Grip
	Casing Spacers	Cascade Waterworks	Fusion Bond Coating 12” Band minimum 2" Runners
		GPT	
		BWM Company	
		Advance Products	
		CCI Pipeline	
	Expansion Joints	Mercer Rubber	Rubber Flex
		Metraflex	RubbeFlex
		EBAA Iron	Sliding Seal
	Marker Tape		Metallic
	Locator Wire		Direct Bury – 14 Ga Directional Bore – 8 Ga Insulated Copper
Tapping Sleeves & Saddles	Service Saddles	JCM	406
		Ford	FC202
		Romac	202NS
		Mueller	DR2S
		Smith-Blair	317
		Robar	2408
	Tapping Sleeves, Fabricated Steel	JCM	412
		Romac	FTS420 w/ Stainless Hardware
		Total Piping Solutions	Triple Tap
		Ford	FTSC
	Tapping Sleeves, Full Body Ductile Iron MJ	American	2800
		Mueller	
	Tapping Sleeves, Full Body SS MJ	JCM	432
		Cascade	CST-EX
WASTEWATER LIFT STATION MATERIALS			
Lift Station Materials	Conduit (Wet Well - Panel)		Ridgid Aluminum
	Generator Circuit Breaker	Square D	
	Generator Systems	Caterpillar	
		Onan - Cummins	
	Automatic Switch Gear	Onan	
		Zenith – General Electric	
	Pressure Gauges	Ashcroft	
		H.O. Trerice Co.	
	Submersible Pumps	Xylem - Flygt	
		ABS	
		Wilo EMU	

Lift Station Materials *(Continued)*	Pump-out Discharge	Coupling Co., Inc.	Aluminum fittings w/male Cam
	Wetwell Access Frames	Halliday	W2S
	Control Panels (CP)	Multitrode	
		DCR	
		Stacon, Inc.	
	Alarm Horn (AH)	Edwards	ALA43T-GA-115S
		Wheelock	31T-115-R
	Alarm Light (AL)	Red Dot	ALVLRX-40
	Area Light	Atlas Lighting	DD175M
	Control Circuit Breaker	Square D – Schneider Electric	QOU120
	Control Circuit Transformer	Square D – Schneider Electric	EO-18
	Duplex Receptacle/GFI	Square D – Schneider Electric	GFSR-115-IC
		Hubbel	GF-52621
		Pass & Seymour	2095BKCC10
	Elapse Time Meter	Cramer	635G
		Hecon - Daneher	TO621134
	Emergency Circuit Breaker	Square D – Schneider Electric	QOU, FAL, KAL, LAL
	Enclosure	Hoffman - Pentair	
		Tanco – Thomas & Betts	
	Flasher	MPE	025-120-13SP
		SSAC	FS-126
	Transducer	JDA	2000S
	High Level Float	Roto-Float	
	Fuses	Cooper Bussmann	
		Gould-Ferraz-Shawmut	
	Generator Receptacle	Crouse-Hinds	AR2042: (230V,200A, 3P,4W)
			AR2042S22: (460V,200A,3P,4W)
	Ground Test Enclosure	Quazite - Hubbell	AC111817KEO
	Hand-off-auto Selector	Square D – Schneider Electric	9001-SKS
	Horn Silence Button	Square D – Schneider Electric	9001-SKR-1U
	Interior Panel Light	American Lighting	LXC1H-WH
	Magnetic Flow Meter	Endress-Hauser	
		Rosemont	
	Main Circuit Breaker	Square D – Schneider Electric	QOU, FAL, KAL, LAL
	Main Circuit Transformer	Square D – Schneider Electric	500SV43F
	Moisture and Temperature Light	Dialight	803-1710
		General Electric	LMP1819, LMP120MB
	Motor Circuit Breaker	Square D – Schneider Electric	QOU, FAL, KAL, LAL
	Motor Starter	Square D – Schneider Electric	D-8536, NEMA Size 1, 2, 3
	Overload Heater	Square D – Schneider Electric	
	Phase Monitor	Diversified	LSU-100-ASA
	Pilot Light	Square D – Schneider Electric	9001
		Dialight	803-1710
		General Electric	LMP1819, LMP120MB
	Pump Automatic Alternator	Diversified – Marsh Bellofram	BRA-120-ACA (Duplex)
	Relay	Potter Brumfield - Tyco	KRPA-11AN
		Eagle Signal - Danaher	22 Series
	Resistor		5 watt, 2500 ohm

Lift Station Materials *(Continued)*	Run Indicator Light	Square D – Schneider Electric	9001
		Dialight	803-1710
		General Electric	LMP1819, LMP120MB
	Safety Mat	NoTrax	Safety Stance 549 - 36”x64”
	Surge Protector	General Electric	
		Edco - Emerson	
	Terminal Strips	Square D – Schneider Electric	9070-GR6
		Marathon – Regal Beloit	Series 200
		Phoenix	UKK B3
	Odor Control System	Biorem	
		BioAir Solutions	
		Evoqua - Siemens	ZABOCS
	Geotextile Fabric	U.S. Fabrics	US 315
Painting & Liners			
Wet Well & Manhole	Manhole Exterior Surface Coating		Per Joint Sealer Manufacturer, Bituminous Coating Minimum
	Manhole Interior Surface Coating	Xypex	Xypex - Additive Acceptable
		Devoe	Tru-Glaze-WB 4418Grey/4030Red
		Pro-Tech Coatings, Inc.	EW-1 Red & Grey
			Bituminous Coating
	Wet Well and Manhole	Sun Coast Environmental	Poly-Triplex
	Wet Well and Manhole Integrally Cast Liner	Agru America, Inc.	SureGrip Liner
		GSE Environmental	GSE StudLiner
	Manhole Interior Surface Liner (Existing Structures with minimal concrete deterioration)	Sauereisen	SewerGard 210RS/T/X
		Raven Lining Systems	Raven 405
		CCI Spectrum, Inc	SpectraShield
		Kerneous, Inc.	SewperCoat
		Quadex, Inc.	Aluminaliner
		GML Coatings, LLC	Green Monster Liner
		Sprayroq, Inc.	Spraywall
	Wet Well and Manhole Rehabilitation Coating (Existing Structures with significant concrete deterioration)	Sauereisen	F120/121 Underlayment +
			210RS/T/X Epoxy Coating
		Raven Lining Systems, Inc.	Raven 405
		Quadex, Inc	Aluminaliner
		Kerneos, Inc.	SewperCoat
		GML Coatings, LLC	GML30/60 Underlayment +
			Green Monster Primer +
			Green Monster Liner
Pipe & Fittings	Wet Well Fittings		
	Field primer	Sauereisen	Conoweld 501
		Tnemec	Zinc 90-97
	Topcoat	Sauereisen	SewerGard 210G
		Tnemec	Typoxy 27WB
	Aerial Pipe & Fittings (Water, Reuse, & Sewer)		
	Field primer		Alkyd metal primer
	Topcoat		Alkyd gloss enamel
	Fire Hydrants		Per Applicable Fire Code(s)

Water and Reuse Main Materials			
Valves	Air Release Valve	ARI Flow Controls	D-020 - Stainless Steel
			D-025 - Stainless Steel
		H-Tech	986 - Stainless Steel
		Dezurik	440
		Ventomat	RBX DN50
	Check Valves	Kennedy – McWane	1106AW
		M&H – McWane	159-02A
		Mueller	A-2600-6-01B1
		Clow – McWane	1106AW
		GA Industries	220
	Gate Valves	Clow – McWane	AWWA C509
		Mueller	Resilient Wedge
		American	Fusion Bond Epoxy Coating
	Valve Box Lids		Cast Iron Water – Round Reuse - Square
	Valve Box Risers		DI
			C900 PVC
	Debris Cap	SW Services	DC457 (screw type)
			DC456 (slip type)
Tapping Sleeves	Tapping Sleeves, Fabricated Steel	JCM	412
		Romac	FTS420 w/ Stainless Hardware
		Total Piping Solutions	Triple Tap
		Ford	FTSC
		Robar	6908
	Tapping Sleeves, Full Body Ductile Iron MJ	American	2800
		Mueller	
	Tapping Sleeves, Full Body SS MJ	JCM	432
		Cascade	CST-EX
		Robar	6606BB
Pipe & Fittings	Fittings, M.J.	Tyler Union	Cement Lined
		U.S. Pipe – Mueller	
		American	
		Star Pipe	
		Clow - McWane	
		Sigma	
		SIP	
	Pipe, Ductile Iron	American	Cement Lined
		U.S. Pipe	
		McWane	
	Pipe, PVC	Diamond	C900/905 DR18
		Certa-Lok	
		U.S. Pipe – Mueller	
		JM Eagle	
		Centennial Plastics	
	Pipe, HDPE		C906 SDR11

Pipe & Fittings *(Continued)*	Restrained Joints	Tyler Union	TufGrip, Field Lok
		Romac	GripRing
		EBAA Iron	Megalug
		Ford	Uni-Flange
		Star Pipe Products	Star Grip
			Series 1000
		American	Lok-Ring – 12” or less (Fast-Tite)
		Sigma	One-Lok
		SIP	Easy Grip
	Casing Spacers	Cascade Waterworks	Fusion Bond Coating 12" Band 2" Runners
		GPT	
		BWM Company	
		Advance Products	
		CCI Pipeline	
	Marker Tape		Metallic
	Locator Wire		Direct Bury – 14 Gauge Directional Bore – 8 Gauge Insulated Copper
Service Lines	Polyethylene Tubing	Endot	EndoPur – Water
			EndoCore – Reuse
		Charter Plastics	Blue Ice – Water
			Lavender Ice – Reuse
		Vanguard Pipe & Fittings	Bruiser – Water
			Purple – Reuse
		ADS	PolyFlex CTS
	Corporation Stops	Mueller	MIP to Pack Joint Ball Valve No Lead Brass
		Ford	
		A.Y. McDonald	
	Curb Stops	Mueller	Pack Joint to Swivel Meter Ball Valve w/ Padlock Wing No Lead Brass
		Ford	
		A.Y. McDonald	
	Meter Branch	Mueller	Pack Joint to Swivel Meter No Lead Brass
		Ford	
		A.Y. McDonald	
	Service Tee	Mueller	Pack Joint No Lead Brass
		Ford	
		A.Y. McDonald	
	Meter Box	NDS	D1500-OLSB – Water
			D1200-OLSB – Water
			D1500-DVOLSP – Reuse
			D1200-OLSP – Reuse
	Service Saddles	Ford	FC202
		Romac	202NS
		Mueller	DR2S
		Smith-Blair	317
		Robar	2408
	Service Saddles for HDPE (Fusion Taps)	Smith-Blair	317, 4”- 16” Pipe
		Ford	FCP202, 4”- 12” Pipe
		JCM	406, 4”- 24” Pipe
		Romac	202N-H, 4”- 12” Pipe

Miscellaneous	Fire hydrants	Mueller	Super Centurion
		Kennedy	Guardian K-81A
			Guardian K-81D
		Waterous	Pacer 250
		Clow	Medallion
		U.S. Pipe	M94
		American	B84B
	Automatic Flushing Device	Environmental Enhancement	HydroGuard

Appendix B

Record Drawing Accuracy Table

Record Drawing Accuracy Table

Asset	Horizontal Accuracy (feet)	Elevation Accuracy (feet)	Location: horizontal center and vertical top, unless otherwise specified
Bench Marks / Control	N/A	0.01	Point
Horizontal Control	0.01	N/A	Point
Easement and Tracts	*	N/A	Survey Monuments
Hydrants	1.0	N/A	Operating Nut
Hydro Guard	1.0	N/A	Top Center of Cover
Blow Off Valves	1.0	N/A	Valve Enclosure
Air Release Valves	1.0	N/A	Valve Enclosure
System Valves	1.0	0.1	Operating Nut and Valve Body / (Give Elev. Of Valve Box / "Give distance between")
Master Meter	1.0	N/A	Register / (Give Finish Grade / "Give distance between")
Master Backflow	1.0	N/A	Top of Main Body / (Give Finish Grade / "Give distance between")
Meter Box	1.0	0.1	Top of Meter Box
Clean-out	1.0	0.1	Top of Clean-out
Pump Stations	1.0	0.01	Top Center of Wet Well, Bottom of Wet Well, All Pipe Inverts and Discharge Pipe
Manholes Cover	1.0	0.1	Top Center of Cover
Manholes Inverts	N/A	0.01	All Pipe Inverts
Grease Taps	1.0	0.1	Top Center of Waste Tank
Vault	1.0	0.1	Top Center of Cover
Monitoring Wells	1.0	0.1	Top of Monitoring Well
Wells	1.0	N/A	Top of Main Body

Fittings	1.0	0.1	Top of Fitting / (Give Finish Grade / "Give depth to Fitting")
Piping at 100' Max Intervals	1.0	0.1	Top of Pipe / (Give Finish Grade / "Give depth to Piping")
Restrained Pipe	1.0	0.1	Top of Pipe, Joint and Limits
Connection to Existing Utilities	1.0	0.1	Top of Pipe
Directional Drill or Bore & Jack Casing	1.0	0.1	Top of Casing, Carrier Pipe and Limits of Crossing
Existing Utilities (See Note)	1.0	As Required	As Required

(*) Shall conform to the requirements of the "Chapter 61G17-6, "Minimum Technical Standards"

Note: Construction shall provide X, Y, and Z coordinates for ALL existing utilities including but not limited to Water, Wastewater, and Reclaimed Water.

Appendix C

Coordinate Asset Table Template

Coordinate Asset Table

Asset Type[1]	ID Number[2]	UTILITIES Asset Coordinates		
		X	Y	Elevation

1.Asset type shall correspond to those listed in Appendix ‘J’

2. ID Number shall be as shown on the RECORD DRAWING provided by the DEVELOPER’s ENGINEER

Appendix D

Warranty for Coatings and Liners Template

Toho Water Authority Warranty for Coatings and Liners

Project Data (to be completed by TWA):

Project Name: _____

TWA Project Number: _____

Date Executed: _____

Effective Date of Warranty: _____

Expiration Date of Warranty: _____

Description of Items Covered by Warranty: _____

_____

_____

_____

Project Data (to be completed by Contractor):

Material System: _____

Material Manufacturer: _____

Manufacturer Contact Info Address: _____

_____

Name: _____

Phone: _____

Email: _____

Material Applicator: _____

Applicator Contact Info Address: _____

_____

Name: _____

Phone: _____

Email: _____

Warranty

_____(“Manufacturer”) in conjunction with the Manufacturer approved applicator

_____(“Applicator”) warrant the material and application of the

_____(“Material System”) for a period of ten years of service under environments associated with exposure to domestic wastewater and wastewater gases.

This warranty shall not extend to defects or deterioration of the Material System caused by faults in the host structure, vandalism, acts of God, or any installation made through the material after project completion.

If the material or application is found to be defective within the ten year warranty period, Manufacturer and Applicator shall, within 60 calendar days of notification, cause the coating and/or liner to be repaired, removed, and/or reapplied as deemed necessary by the Toho Water Authority. All costs including, but not limited to, materials, equipment, labor, dewatering, repair or replacement of substrate, bypass pumping of wastewater, Maintenance of Traffic, coordination, permitting, inspections, and the removal, restoration or replacement of pavement, landscaping, and all other ground cover shall be borne by the Manufacturer and Applicator. All repair work performed under this warranty shall be warrantied for a period of no less than five years and until the Expiration Date of Warranty (above). Removal and reinstallation of the Material System under this warranty due to a Material System failure shall be warranted for a period of ten years.

If the Applicator and/or Manufacturer fail to perform under this warranty, Toho Water Authority reserves the right to perform the necessary repairs or cause the necessary repairs to be performed at the Manufacturer’s and Applicator’s expense.

Additionally, failure to perform under this warranty shall result in removal of the Manufacturer and Applicator from consideration in future Toho Water Authority projects.

_____	_____
Manufacturer	Applicator
_____	_____
Signature	Signature
_____	_____
Print Name	Print Name
_____	_____
Title	Title

Corporate Seal

Corporate Seal

Appendix E

Geotechnical Report

Appendix F

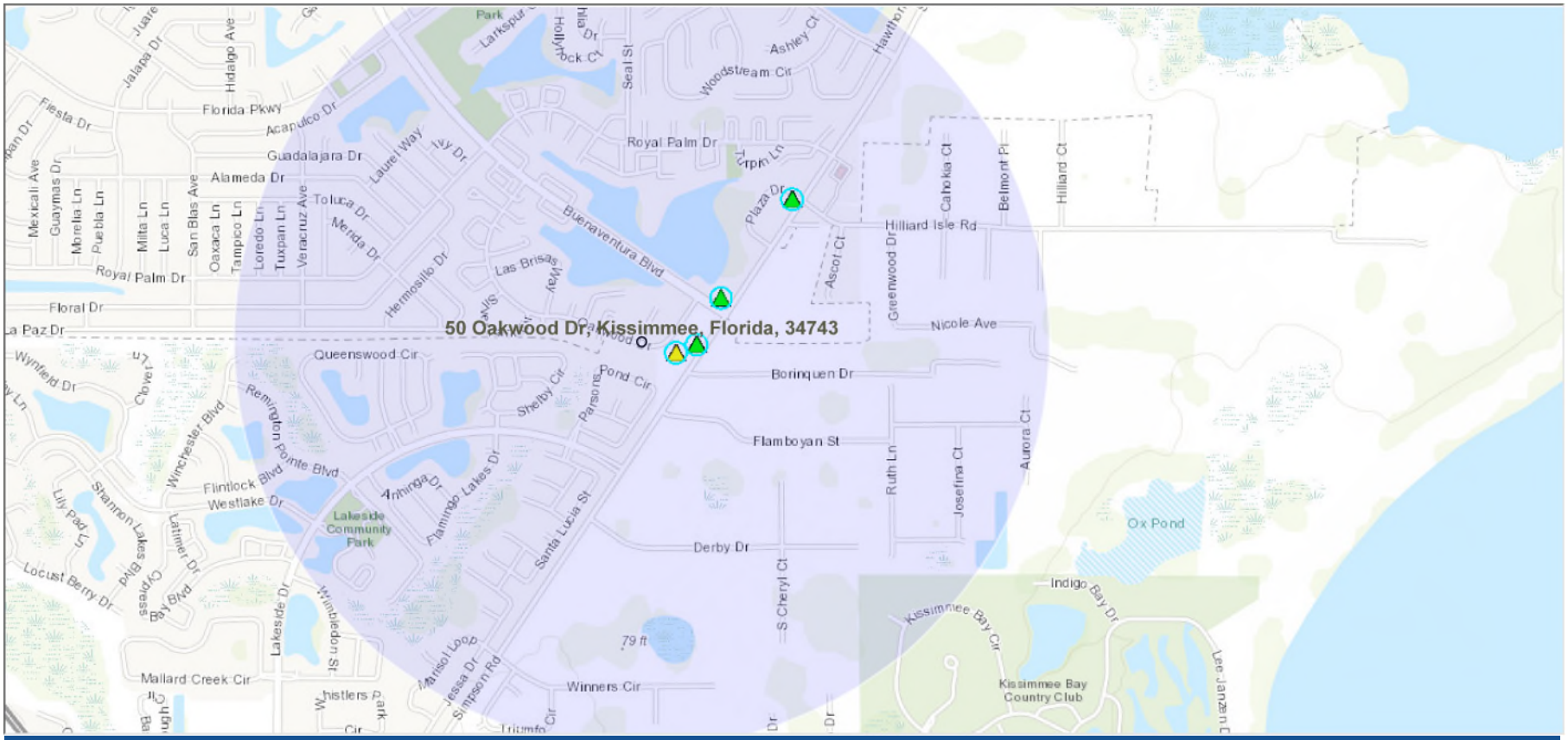
Contaminated Sites Summary

Florida DEP

CONTAMINATION LOCATOR MAP

Search Criteria: Sites within 1 mile of 50 Oakwood Dr., Kissimmee, FL 34741. Cleanup types: Brownfields Petroleum Superfund Other Waste Cleanup

For further information, please call the Waste Cleanup Hotline at (866)282-0787. **If you wish to search again, please** click here



DEP Cleanup Sites: 4 found.

B V L Drycleaner
2523 Boggy Creek Rd
Kissimmee, FL 34741
Facility Id: ERIC_5078
PENDING Other Cleanup
Watch This Site
Documents

GLOBAL MARKET #1145
2571 BOGGY CREEK RD
KISSIMMEE, FL 34743
Facility Id: 8513670
ACTIVE Petroleum Cleanup
Watch This Site
Documents

CIRCLE K #2721205
101 BUENAVENTURA BLVD
KISSIMMEE, FL 34743
Facility Id: 8521967
ACTIVE Petroleum Cleanup
Watch This Site
Documents

SUNSHINE FOOD MART #355
2688 SIMPSON RD
KISSIMMEE, FL 34744
Facility Id: 9802083
ACTIVE Petroleum Cleanup
Watch This Site
Documents