INVITATION TO BID (ITB)
BID # FY 2019-2020-004

EXHIBIT A
TECHNICAL SPECIFICATIONS

12” WATER MAIN ALONG FOSTER ROAD

PREPARED FOR:
CITY OF HALLANDALE
DEPARTMENT OF PUBLIC WORKS
AND PROCUREMENT DEPARTMENT

Prepared by:
Dave E. Clarke, P.E.
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DIVISION 00 – BIDDING AND CONTRACTING REQUIREMENTS

DIVISION 01 – GENERAL REQUIREMENTS

01 10 00 SUMMARY OF WORK

PART 1 -- GENERAL

1.1 THE REQUIREMENT

A. The WORK to be performed under this Contract includes, but is not limited to, furnishing and installing new potable water piping, valves, and fire hydrants; connecting to existing potable water piping; abandoning existing potable water piping; and all ancillaries associated with completion of this work. The CONTRACTOR is responsible for the proper handling and disposal of any existing Asbestos Cement Piping (ACP) being demolished and/or connected to. The WORK shall be complete, and all work, materials, and services not expressly indicated or called for in the Contract Documents which may be necessary for the complete and proper construction of the WORK in good faith shall be provided by the CONTRACTOR as though originally so indicated, at no increase in cost to the City of Hallandale Beach (OWNER).

1.2 WORK COVERED BY CONTRACT DOCUMENTS

A. The WORK of this Contract comprises furnishing, installation and construction of the following:

1. Approximately 2,970 Linear feet of 12-inch PVC potable water piping
2. Approximately 25 Linear feet of 10-inch PVC potable water piping
3. Approximately 1,420 Linear feet of 8-inch PVC potable water piping
4. Approximately 210 Linear feet of 6-inch PVC potable water piping
5. Approximately 280 Linear feet of 12-inch DIP potable water piping
6. Approximately 140 Linear feet of 8-inch DIP potable water piping
7. New fire hydrants and replacing existing fire hydrants on existing mains.
8. Service connections including saddle taps, steel casings, polyethylene tubing, meter boxes, meters, backflow preventers, valves and appurtenances for all homes and businesses within the work area.
9. Leveling course and overlay on existing asphalt roadways on Foster Road, NW 9th St, NW 9th Ave, NW 8th Ter, NW 7th Ter, NW 7th Ave and NW 6th Ave.

10. Replacement of damaged concrete sidewalks, curb and gutter, concrete pavers and sod.

B. The WORK shall include furnishing and installing all piping, services, fire hydrants, and appurtenances complete in place, including all hot taps and cut-in connections to existing piping; surveying for both horizontal and vertical control for construction of the pipeline and appurtenances, all earthwork, trench excavation, transporting excess material to the OWNER’s onsite storage area, removal and disposal of unsuitable material, dewatering, furnishing and installing pipe bedding material, all backfill, and compaction; furnishing and installing pipe restraint; including the temporary and permanent restoration of pavement and pavement markings; construction of supports for existing utilities, repair of damaged existing utilities indicated on the drawings; temporary and final restoration of all improvements incidental to the pipeline construction including restoration of sodding, landscaping, fences, driveways, and other existing features removed or damaged during pipeline construction; flushing, pressure testing, water quality sampling and bacteriological testing of pipelines; disposal of existing asbestos concrete pipe in conformance with regulatory requirements; training, monitoring, and safety gear for handling asbestos concrete pipe; restoration and cleanup; providing maintenance of traffic; coordination with the OWNER, permitting agencies, and private lot owners; including required surveying for the preparation of record drawings and completion of record drawings, and all other work required a complete installation, all in accordance with the requirements of the Contract Documents.

C. The WORK is located on Foster Road located in City of Hallandale Beach between NW 10th Ave and NW 4th Ave., and on NW 9th St from NW 9th Ave to NW 8th Ave.

D. The CONTRACTOR’s attention is directed to the project milestones as follows:

1. Milestone 1 – Apply for all required permits and submit all required information for permits within 45 days of Notice to Proceed (NTP) as required by Specification 01 77 40 Permits.

2. Milestone 2 – Obtain all required permits within 120 days of NTP as required by Specification 01 77 40 Permits.

3. Milestone 3 – Substantial Completion within 365 days of Notice of Commencement (NOC). Substantial completion shall consist of completion and acceptance of the following:

   a. All potable water mains, FHs, and services installed, pressure tested, disinfected, cleared by the Florida Department of Environmental Protection (FDEP), and placed into service.

4. Milestone 4 – Final Completion within 395 days of Notice to Proceed.
1.3 CONTRACT METHOD

A. The WORK hereunder will be constructed under a lump sum contract.

1.4 WORK BY OTHERS

A. Where two (2) or more contracts are being performed at one time on the same Site or adjacent land in such manner that work under one contract may interfere with work under another, the OWNER will determine the sequence and order of the Work in either or both contracts. When the Site of one contract is the necessary or convenient means of access for performance of work under another, the OWNER may grant privilege of access or other reasonable privilege to the contractor so desiring, to the extent, amount, and in manner and at time that the OWNER may determine. No OWNER determination of method or time or sequence or order of the work or access privilege shall be the basis for a claim for delay or damage except under provisions of the General Conditions for temporary suspensions of the work. The CONTRACTOR shall conduct its operations so as to cause a minimum of interference with the work of such other contractors, and shall cooperate fully with such contractors to allow continued safe access to their respective portions of the Site, as required to perform work under their respective contracts.

B. Interference With Work On Utilities: The CONTRACTOR shall cooperate fully with all utility forces of the OWNER or forces of other public or private agencies engaged in the relocation, altering, or otherwise rearranging of any facilities which interfere with the progress of the WORK, and shall schedule the WORK so as to minimize interference with said relocation, altering, or other rearranging of facilities.

1.5 CONTRACTOR USE OF SITE AND OR PUBLIC RIGHT OF WAY

A. The CONTRACTOR shall be responsible obtaining the necessary storage/staging areas for materials and equipment within the public Right of Way or any available vacant/empty lot adjacent to the Right of Way. Excavated materials and/or backfill materials shall not be stored in the roadway Right of Way for more than 48 hours. If suitable for backfill elsewhere, excavated material must be stockpiled within the staging area. Materials unsuitable for backfill must be removed and disposed of immediately.

1. Wherever possible, open trenches must be backfilled/plated, and barricades removed while maintaining adequate safety measures.

2. Streets must be graded/leveled to provide reasonable assurance against personal injury, vehicle damage, etc.

3. Streets temporarily restored, as described above, must be regularly maintained. For example, streets must be watered, new potholes filled and disturbed, and adjacent paved streets swept.

B. The CONTRACTOR's use of the Site shall be limited to its construction operations, including on-Site storage of materials, on-Site fabrication facilities, and field offices.
C. The CONTRACTOR shall not store or leave any equipment or materials within the Right-of-Way or on private property during non-construction hours, other than equipment that cannot be reasonably moved daily.

D. The CONTRACTOR shall regularly remove construction debris, unsuitable excavated material/rocks, and refuse from the Staging Area and shall remove it within 48 hours when directed to do so by the OWNER. All removed corrugated metal pipe, storm drain structures, and other demolished items shall be removed from the site or placed in dumpster within 24 hours of removal.

E. The CONTRACTOR shall obtain all required municipal or other governmental permits for any offsite storage yards, processing areas, or other operations. Refer to Specification 01 77 40 Permits.

1.6 OUTAGE PLANS

A. The CONTRACTOR shall not remove from service any existing operating potable water pipeline, fire hydrant, or close any valves without permission from the OWNER. The CONTRACTOR shall coordinate with the OWNER and ENGINEER for when the WORK requires removing any potable water, from service to conduct tie-ins.

B. The CONTRACTOR shall develop an Outage Plan detailing the identifying the existing pipelines to be isolated and removed from service, the valves to be closed, lots that will be effected by the outage, the tasks to be performed, the anticipated duration of each task, and the total anticipated time to complete the work and return the pipelines back into service. The CONTRACTOR shall submit the Outage Plan to the OWNER and ENGINEER for review and approval a minimum of two weeks before the outage.

1. The OWNER shall operate all existing valves as required by the Outage Plan. Under no circumstances shall the contractor operate any existing valves.

2. The CONTRACTOR shall be responsible for providing written notification to the lot owners indicating the date, time, and duration of the outage at no additional cost to the OWNER. The notification shall be provided to the lot owner a minimum of one week in advance.

3. The CONTRACTOR shall provide written confirmation of the shutdown date and time two working days prior to the actual shutdown.

1.7 PROJECT MEETINGS

A. A Project Kickoff and a Pre-Construction Meeting shall be held in accordance with Specification 01 32 20 – Project Meetings

B. Permitting Meetings with permitting agencies shall be held in accordance with Specification 01 32 20 – Project Meetings
C. Progress Meetings shall be held in accordance with Specification 01 32 20 – Project Meetings

1.8 ADMINISTRATIVE AND SUPERVISORY PERSONNEL

A. General: In addition to Project Superintendent, provide a dedicated Project Manager specific to this project as a supervisor to oversee proper performance of the WORK. Project Manager shall attend all meetings and have the authority to make decisions on behalf of the CONTRACTOR. Project Manager shall attend the site at a minimum once a day to evaluate the construction and to prepare a daily job report. Project Manager shall be responsible for all coordination, document handling, submittals review and processing, quality control, and project scheduling. The Project Manager, once approved, shall not be replaced without prior consent of the Owner and Engineer.

B. Project Superintendent shall be a direct employee of the CONTRACTOR.

C. Project Superintendent shall fluently speak, read and write in English.

PART 2 -- PRODUCTS (NOT USED)

PART 3 -- EXECUTION (NOT USED)

END OF SECTION
ABBREVIATIONS OF INSTITUTIONS

PART 1 -- GENERAL

1.1 GENERAL

A. Wherever in these Specifications references are made to the standards, specifications, or other published data of the various international, national, regional, or local organizations, such organizations may be referred to by their acronym or abbreviation only. As a guide to the user of the Specifications, the following acronyms or abbreviations which may appear shall have the meanings indicated herein.

1.2 ABBREVIATIONS

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<tr>
<td>AA</td>
<td>Aluminum Association</td>
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<tr>
<td>AAMA</td>
<td>American Architectural Manufacturers Association</td>
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<tr>
<td>AASHTO</td>
<td>American Association of State Highway and Transportation Officials</td>
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<tr>
<td>AATCC</td>
<td>American Association of Textile Chemists and Colorists</td>
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<tr>
<td>ABMA</td>
<td>American Bearing Manufacturer’s Association – ABMA</td>
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<td>ACGIH</td>
<td>American Conference of Governmental Industrial Hygienists</td>
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<tr>
<td>ACI</td>
<td>American Concrete Institute</td>
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<tr>
<td>ACOE</td>
<td>Army Corps of Engineers</td>
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<td>ACPA</td>
<td>American Concrete Pipe Association</td>
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<td>AF&amp;PA</td>
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<td>AFBMA</td>
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<td>American Gas Association</td>
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<td>American Hardboard Association</td>
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<td>AHAM</td>
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<td>American Hot Dip Galvanizers Association</td>
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<td>AI</td>
<td>The Asphalt Institute</td>
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<td>American Industrial Hygiene Association</td>
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<td>AMCA</td>
<td>Air Movement and Control Association International, Inc</td>
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<td>American National Standards Institute, Inc.</td>
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<td>Air-Conditioning and Refrigeration Institute</td>
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<td>Acoustical Society of America</td>
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ICEA  Insulated Cable Engineers Association
ICCEC  Electrical Code
ICC-ES  International Code Council Evaluation Service
IEEE  Institute of Electrical and Electronics Engineers
IES  Illuminating Engineering Society
IESNA  Illuminating Engineering Society of North America
IFC  International Fire Code
IFGC  International Fuel Gas Code
IMC  International Mechanical Code
IME  Institute of Makers of Explosives
IPC  International Plumbing Code, Association Connecting Electronic Industries
IPCEA  Insulated Power Cable Engineers Association
IRC  International Residential Code
ISA  Instrument Society of America
ISDI  Insulated Steel Door Institute
ISEA  Industrial Safety Equipment Association
ISO  International Organization for Standardization
ITE  Institute of Traffic Engineers
ITU-T  Telecommunications Standardization Sector of the International Telecommunications Union
LPI  Lightning Protection Institute
LRQA  Lloyd’s Register Quality Assurance
MBMA  Metal Building Manufacturer’s Association
MIL  Military Standards (DoD)
MFTA  Mechanical Power Transmission Association
MSS  Manufacturers Standardization Society
MTI  Marine Testing Institute
NAAMM  National Association of Architectural Metal Manufacturer’s
NACE  National Association of Corrosion Engineers
DASMA  Door and Access Systems Manufacturers Association International
NAPF  National Association of Pipe Fabricators
NBBPVI  National Board of Boiler and Pressure Vessel Inspectors
NBS  National Bureau of Standards
NCCLS  National Committee for Clinical Laboratory Standards
NCMA  National Concrete Masonry Association
NEC  National Electrical Code
NEMA  National Electrical Manufacturer’s Association
NETA  International Electrical Testing Association
NFPA  National Fire Protection Association or National Fluid Power Association
NISO  National Information Standards Organization
NIST  National Institute of Standards and Technology
NLGI  National Lubricating Grease Institute
NRCA  National Roofing Contractors Association
NSF  National Sanitation Foundation
NWWDA  National Wood Window and Door Association
OSHA  Occupational Safety and Health Administration
PCA  Portland Cement Association
PCI  Precast/Prestressed Concrete Institute
PPI  Plastic Pipe Institute
RCRA  Resource Conservation and Recovery Act
RIS  Redwood Inspection Service, a division of the California Redwood Association, CRA
RMA  Rubber Manufacturers Association
RVIA  Recreational Vehicle Industry Association
RWMA  Resistance Welder Manufacturer's Association
SAE  Society of Automotive Engineers
SDI  Steel Door Institute, Steel Deck Institute
SFWMD  South Florida Water Management District
SMA  Screen Manufacturers Association
SMACNA  Sheet Metal and Air Conditioning Contractors National Association
SPFA  Steel Plate Fabricator’s Association
SPIB  Southern Pine Inspection Bureau
SSBC  Southern Standard Building Code, Southern Building Code Congress
SSPC  Society for Protective Coating
SSPWC  Standard Specifications for Public Works Construction
STLE  Society of Tribologists and Lubricating Engineers
TAPPI  Technical Association of the Worldwide Pulp, Paper, and Converting Industry
TFI  The Fertilizer Institute
TIA  Telecommunications Industries Association
TOD  Town of Davie
TPI  Truss Plate Institute
UBC  Uniform Building Code
UL  Underwriters Laboratories, Inc.
WCLIB  West Coast Lumber Inspection Bureau
WDMA  National Window and Door Manufacturers Association
WEF  Water Environment Federation
WI  Woodwork Institute
WRI  Wire Reinforcement Institute, Inc.
WWPA  Western Wood Products Association

PART 2 -- PRODUCTS (NOT USED)

PART 3 -- EXECUTION (NOT USED)

END SECTION
01 10 15 INDEX OF DRAWINGS

PART 1 -- GENERAL

1.1 CONTRACT DRAWINGS

A. Plans labeled **ISSUED FOR BID DATED XXXXXX** and any subsequent revision thereto introduced by Addenda prior to Bid, showing the work of the Contract are hereby made a part of the Contract Documents and are listed as follows:

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<td>C-14 PLAN &amp; PROFILE (STA 100+00 TO STA 102+00)</td>
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<td>C-15 WATER CONNECTION SECTIONS</td>
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<td>C-16 FIRE HYDRANT SECTIONS</td>
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<td>C-17 FIRE HYDRANT SECTIONS</td>
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Due to the possibility of typing errors or omissions, the above list shall not be considered as necessarily complete, nor shall the Standard Details which may be included elsewhere herein be considered as forming a complete listing of all Standard Details which may apply to this Project. Perform all work shown on all sheets of the Plans, as specified herein or necessary for a complete functional installation and no extra compensation will be made due to the omission or incorrect listing of a Drawing in this Section. The CONTRACTOR shall field investigate and verify as necessary for this work prior to the construction.

C. **APPENDICES**

1. Geotechnical Investigation Report
2. FDEP Water Main Construction Permit Application

**PART 2 -- PRODUCTS (NOT USED)**

**PART 3 -- EXECUTION (NOT USED)**

END OF SECTION
01 14 00  CONSTRUCTION CONSTRAINTS

PART 1 -- GENERAL

1.1 THE SUMMARY

A. WORK shall be scheduled, sequenced, and performed in a manner which minimizes disruption to the public and to the operation and maintenance of existing facilities along the pipeline alignment.

B. The CONTRACTOR shall incorporate the construction and schedule constraints of this Section in preparing the construction schedules required under Specifications 01 32 16 – CPM Construction Schedule.

1.2 TEMPORARY CONNECTIONS

A. Making connections to existing facilities or other operations that interfere with the operation of the existing equipment shall be thoroughly planned in advance, and required equipment, materials, and labor shall be on hand at the time of undertaking the connections. WORK shall be completed as quickly as possible and with as little delay as possible and shall proceed continuously (24 hours a day and seven days a week) if necessary, to complete modifications and/or connections in the minimum time.

B. The cost of any temporary facilities and night, weekend, or holiday activity and overtime payments required during process interruptions shall be included in the WORK.

C. Temporary facilities and piping shall be located to minimize interference with CONTRACTOR's construction facilities and OWNER's operation and maintenance of the distribution water system. Piping materials shall be suitable for the material being conveyed and be as required in the Contract Specifications.

1.3 CONSTRUCTION SEQUENCING

A. Construction activities shall be scheduled and sequenced to ensure continuous operation of the existing distribution water system. The CONTRACTOR shall be responsible for development of the construction sequencing. In implementing the construction sequencing, the CONTRACTOR shall maintain the existing facilities in service until new facilities are constructed and are operational to supplement the existing capacity. When new facilities are operational, the existing facilities may be taken out of service. The following general guidelines shall be used by the CONTRACTOR in planning the sequence of construction.

1. Safe working conditions for personnel shall be maintained during installation, modification, and demolition WORK. The foregoing includes at least proper trench excavation, the provision of temporary equipment guards, supports, warning signs, sidewalk, and covers over openings.

2. Valves to be temporarily shut off during the WORK shall be operated by the owner.
1.4 SCHEDULE CONSTRAINTS

A. General: It is the CONTRACTOR’s responsibility to coordinate and plan the construction activities to integrate each schedule constraint into performance of the overall WORK.

B. The listing of schedule constraints below does not mean that every constraint or special condition has been identified. The list does not substitute for the CONTRACTOR’s coordination and planning for completion of the WORK within the Contract Times.

C. The work will be performed in residential neighborhood. The CONTRACTOR shall reasonable minimize the inconvenience to the residents and property owners, and reasonably maximize the safety of residents.

1. Approximately one week prior to the start of work in a particular (section of a street) the Contractor shall distribute flyers to all addresses in that location explaining the work that will be done, explaining the measures to be taken to protect the safety and the property of the residents, explaining how the Contractor will minimize inconvenience and to inform the residents of the contact information (cellphone number and emails) of key personnel: Contractor’s Public Relations’ Officer, Contractor’s on-site Superintendent, OWNER’s Project Manager, City’s on-site Representative. Contractor must also distribute flyers to all residents affected by water main shutdown to facilitate the connection to existing water mains.

2. Prior to start of work in a particular (section of) street, the Contractor must field verify the actual size and type of existing mains and fittings prior to ordering fittings and tapping sleeves and valves required for connecting into existing water mains.

3. At any given time, the length of the continuous, open trench shall no exceed 2,000 LF.

4. Open trench, outside the direct area that workers and equipment require, shall barricaded on both sides.

5. H-20 traffic rated steel plates shall cover open trenches across driveways.

6. At the end of each workday, backfill of trenches, compaction, placement of temporary pavement, removal of barricades and other temporary construction and clean up shall not lag more than 200 LF behind pipe installation.

7. Restoration to original or better condition of landscaping, private driveways, private fences, and all other types of private or public property, even if it is placed in the public right of way, and that has been affected by the construction activities, shall not lag more than 500 LF behind pipe installation.

8. Full lane width pavement overlay shall not commence until installed water distribution piping in that location has been accepted by the OWNER.

D. No construction activities shall take place between the hours of 5:00 PM to 7:00 AM. No deliveries shall be allowed between the hours of 5:00 PM and 7:00 AM.
01 29 00 MEASUREMENT AND PAYMENT

PART 1 -- GENERAL

1.1 THE SUMMARY

A. Payment for the various items of the Bid Schedule, as further specified herein, shall include all compensation to be received by the CONTRACTOR for furnishing all tools, equipment, supplies, and manufactured articles, and for all labor, operations, and incidentals appurtenant to the items of work being described, as necessary to complete the various items of the WORK all in accordance with the requirements of the Contract Documents, including all appurtenances thereto, and including all costs of permits and cost of compliance with the regulations of public agencies having jurisdiction, including Safety and Health Requirements of the Occupational Safety and Health Administration of the U.S. Department of Labor (OSHA). No separate payment will be made for any item that is not specifically set forth in the Bid Schedule, and all costs therefor shall be included in the prices named in the Bid Schedule for the various appurtenant items of work.

B. The following explanation of the Measurement and Payment for the Bid Schedule items is provided; however, the omission of reference to any item shall not alter the intent of the Bid Schedule or relieve the CONTRACTOR of the necessity of constructing a complete project under this Contract.

C. The quantities set forth in the Bid Schedule are approximate and are given to establish a uniform basis for the comparison of bids. The OWNER reserves the right to increase or decrease the quantity of any item or portion of the work during the progress of construction in accordance with the terms of the Contract.

D. Unit prices are used as a means for computing bid, for Contract purposed, for periodic payments, and for determining the value of additions or deletions.

E. Payments shall be made for the items listed on the Bid Forms on the basis of the work actually performed and completed. No payment to be made for materials stored on site or elsewhere. Payment for completed work is including but not limited to, the furnishing of all necessary labor, materials, equipment, tools, transportation, delivery, disposal of waste and surplus material, backfilling and site restoration as shown in the plans, and all other appurtenances to complete the construction and installation of the work as shown on the drawings and described in the specifications. If any time of work, process, equipment or material is not specifically listed in the unit price bid item schedule of values, the CONTRACTOR shall include as provide said work, process, equipment or material of the best quality workmanship appropriate for the intended use at no additional cost.

1.2 ESTIMATED QUANTITIES

A. Where quantities are shown, they are approximate and are given only as a basis of calculation upon which the award of the contract is to be made. OWNER or ENGINEER do not assume any responsibility for the final quantities, nor shall CONTRACTOR claim
misunderstanding because of such estimate of quantities. Final payment will be made only for the satisfactorily completed quantity of each item.

B. The ENGINEER’S estimated quantities for unit bid prices, as listed in the Bid Form, are approximate only and are included solely for the purpose of comparison of Bids. OWNER does not expressly or by implication agree that the nature of the materials encountered below the surface-of the ground or the actual quantities of material encountered or required will correspond therewith and reserves the right to increase or decrease any quantity or to eliminate any quantity as OWNER may deem necessary. The CONTRACTOR will not be entitled to any adjustment in a unit bid price as a result of any change in an estimated quantity and agrees to accept the aforesaid unit bid prices as complete and total compensation for any additions or deductions caused by a variation in quantities as a result of more accurate measurement, or by any changes or alterations in the Work ordered by the OWNER, and for use in computation of the value of the Work performed for progress payments.

1.3 MEASUREMENT STANDARDS

A. All work completed under the Contract shall be measured according to the United States Standards Methods.

1.4 METHOD OF MEASUREMENT AND PAYMENT

A. **Lump Sum Items:** Where the payment is to be made on a lump sum basis, no separate payment will be made for any item of work required to complete the lump sum item.

B. **Unit Price Items:** Where payment is to be made on a unit price basis, separate payment will be made for the items of work described herein and listed on the Bid Schedule. Any related work not specifically listed, but required for satisfactory completion of the Work, shall be considered to be included in the scope of the appropriate listed work items.

C. **Measurement of Length:** Unless otherwise specified for the particular items involved, all measurements of distance for items to be paid for on the basis of length shall be taken horizontally or vertically.

D. **Measurement of Area:** In the measurement of items paid for on the basis of area of finished work, the lengths and/or widths to be used in the calculations shall be the actual dimensions measured along the surface of the completed work within the neat lines shown or designated. At intersections, the measurement used for length of side area will be measured from the outside edge of the width allowed along the main trench.

E. **Failed Testing:** No additional payment will be allowed due to failed tests, generation additional work from the Contractor. Contractor shall correct the substandard condition and restore area to final condition at his own expense. The OWNER may back charge the contractor, via change order, for re-inspection expenses due to failed tests due to the negligence of the contractor.
1.5 BASIS OF PAYMENTS

A. The various items of Work will be paid for in the unit-amounts per work item times units completed and accepted by Owner of work items listed in the Bid Form. The sum of all separate payments shall not exceed the contract price.

A. Utility Pipe Placed Out of Service 6″/8″/10″/12″ Piping / LF: For placing out of service (grout fill) existing water main pipes and fittings, or removing pipe if in conflict with proposed construction, which will be paid for at the unit price bid times the number of linear feet of water main placed out of service or removed if in conflict with proposed construction, which payment shall be full compensation for materials necessary and labor required to place out of service existing pipes; project record document and all other appurtenant and miscellaneous items and work including final cleanup for the complete and satisfactory placing out of service of the pipe.

B. Furnish and Install 6″/8″/10″/12″ Piping / LF: This item shall be measured as LF of the horizontal projection along the center line of the pipe of pipe installed, and shall include the cost of providing the pipe and fittings on site, proper storage and protection on site, installation; disposal of debris, waste and refuse; preparing, obtaining approval and providing maintenance of traffic (MOT) and traffic control; furnishing, installation and removal of fill and flush connections for filling mains; hydrostatic testing, pressure testing, cleaning, flushing, disinfection, water quality sampling, and chlorine supply identification tape; the cost of trenching (including 1): sheeting, shoring, bracing, dewatering, and any measures associated with dewatering, such as turbidity barrier and sediment control; 2): additional excavation necessary for crossing under existing utilities; backfill (including flowable fill if so directed by the OWNER), Type B Bedding per Trenching restoration Detail, removal hauling or additional suitable backfill material if required, compaction and density testing; the cost of temporary pavement over the trench, including removal of existing asphalt and temporary asphalt; the cost of placing, maintain and removing the necessary barricades and fencing for public safety. As-buils, soft digs, test pits, exploratory digging and restoration for existing utilities, repairs to damaged existing utilities, repaints to irrigation systems, and driveway and sidewalk restoration shall be included in these pay items. Silt fence, erosion control measures, fittings, pipe lubricant, connection couplings, adaptors, reducers, gaskets, joint restraints (also those additional fittings, gaskets, joint restraints necessary for crossing of existing utilities); temporary plugs and caps and all other consumables, appurtenances and incidenitals as shown on the plans and specifications and/or necessary for a complete and operational water distribution system shall be included in the unit price for this pay item. This item also includes the cost for site clean-up during the execution of the work and final clean-up after completion of pipe installation and/or other construction activities as called for in the plans and specifications. This payment item includes the cost of labor, sweeping, consumables, equipment and all other necessary items and components to maintain a condition commensurate with a residential neighborhood: free of dust, waste and debris, no stock piles of construction materials other than in the designated locations; street sweeping and clean-up immediately following installation of temporary pavement; general clean-up at the end of each work day; watering site or other measures of dust control to minimize dust impact in the neighborhood. The Contractor shall apply good ‘housekeeping’ practices.
during the execution of the work. If the OWNER is dissatisfied with the cleanliness of the site, it may issue to the Contractor a written notice to improve cleanliness with specific instructions for improvement. If the Contractor does not improve cleanliness to the satisfaction of the OWNER, the payment for this pay item may be denied and a separate contractor may be hired to complete Dust Control and Clean-up operations. Denied payments and cost of independent contractor will be subtracted from the lump-sum amount for this pay item through a change order and from the retainage amount if necessary.

1. **Furnish and Install 6”/8”/12” DIP Piping / LF:** Measurement for payment shall be based on the completion of the horizontal projection of LF measured along the centerline, including fittings for 6”/8”/12” DIP Pressure Class 350.

2. **Furnish and Install 6”/8”/10”/12” PVC Piping / LF:** Measurement for payment shall be based on the completion of the horizontal projection of LF measured along the centerline, including fittings for 6”/8”/10”/12” PVC Pipe.

C. **Furnish and Install 6”/8”/10”/12” Gate Valves with Valve Boxes / EA:** The unit price for this item shall include the cost of labor, equipment, the valve, transportation to the site, storage and protection on-site, bi-directional testing prior to installation, installation on new or existing water mains, mechanical restraints (Megalugs), riser, operator, valve box and cover, excavation (including sheeting, shoring, bracing, dewatering, and any measures associated with dewatering); backfill (including flowable fill if so directed by the OWNER) compaction and testing; the cost of temporary pavement (permanent pavement if the valve is located outside the limits of repaving); concrete collar, sodding and/or landscaping, if valve is located outside the roadway; the cost of placing, maintaining and removing the necessary barricades and fencing for public safety, the cost of providing the measures called for in the MOT. White Reflective Pavement Markers, as directed by the OWNER; painting of box cover as described in these specifications and as directed by the OWNER; disposal of debris, waste and refuse, and all other necessary items for a complete, installed and operable valve, and all items shown in the Broward County Standard Details.

D. **8” Concrete Slab for Ground <2.5’ / SY:** This item shall include all cost of the mixture, in place and accepted, for furnishing and constructing 8-inch reinforced concrete protective slab in areas of low ground cover per Broward County Standard Detail and will be paid for at the unit price bid times the number of square yards of concrete placed completed and accepted. Price and payment will be full compensation for each work related to the volume of concrete, steel reinforcement and shall include all forms, falsework, joints, weep holes, drains, pipes, conduits, bearing pads, setting anchors bolts and dowels, reinforcement, surface finish, and cleaning up, as shown in Plans. The price will also include excavation, backfilling, clearing and grubbing as indicated/required in Plans.

E. **Furnish and Install Fire Hydrant Assemblies / EA:** The unit price for this item shall include the cost of the fire hydrant and appurtenant piping, fitting, mechanical restraints, valves, painting (including color coating per flow test results), transportation to the site, storage and protection on-site, disposal of debris, waste and refuse, and installation complete with all joints mechanically restrained, bollards, 6” gate valve, excavation
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(including sheeting, shoring, bracing, dewatering), backfill and compaction, removal and hauling of suitable backfill material if required, compaction and testing; sidewalk, driveway and pavement restoration, landscaping restoration/sodding, riser, valve box and cover, collar, concrete pad, coordination and assistance of flow testing. The bollards shall be made of schedule 40 steel pipe filled with concrete. Measurement for payment shall be based on the completion of the number of bollards, including proper color and minimum embedment in 3000 PSI concrete

F. **Fire Hydrant Assemblies (Remove) / EA:** For removal of existing Fire Hydrant assemblies complete. The price will be paid for at the unit price bid times the number of fire hydrants assemblies removed. The price shall be full compensation for removing, cleaning, loading, delivering and unloading to the M-D WASD storage yard existing fire hydrants and shall include, but not be limited to; plugging and placing out of service existing fire water line; transportation and handling costs; saw cutting existing pavement, special sheeting and shoring; including cutting and threading as required; excavation and backfilling; furnishing and installing reinforced concrete slab, permanent pavement and base restoration, if necessary; repairing and bringing existing sidewalk and curb and gutter to equal or better than original conditions; any necessary pavement, asphalt or concrete, or landscape harmonization to connect to private property; other details within Plans and this specifications and all other appurtenant and miscellaneous items and work.

G. **Furnish and Install Tapping Sleeves with Tapping Valves / EA:** The unit price for this item shall include the cost of the tapping sleeve and tapping valve, transportation to the site, maintenance of traffic, storage and protection on-site, disposal of debris, waste and refuse. Installation including all labor, equipment, cranes, tapping rigs and consumables, complete with valve, riser, valve box and cover, collar, mechanical restraints, reducers and all other appurtenances and incidentals necessary for a complete and operational installation; soft signs, exploratory excavation and restoration to determine location, type, size and condition of existing mains to be connected to; excavation (including sheeting, shoring, bracing, dewatering); backfill driveway and surface restoration, whether it will be temporary pavement, permanent pavement, sodding / landscaping, etc. All cleaning, disinfecting and pressure testing required for these connections shall be included in this item.

1. **Furnish and Install 6”x6” Tapping Sleeve and Tapping Valve / EA:** Measurement for payment shall be based on the completion of the number of 6”x6” taps.

2. **Furnish and Install 20”x12” Tapping Sleeve and Tapping Valve / EA:** Measurement for payment shall be based on the completion of the number of 20”x12” taps.

H. **Decommissioning and Capping Existing Water Mains / EA:** The unit price for this item includes all labor, equipment, coordination, materials and all other appurtenances and incidentals necessary to locate, cut, cap and decommission existing water mains as indicated on the Plans. The existing main that will be abandoned shall be cut at or very close to the cross or Tee where it emanates from the existing main that remains in service. Excavation (including sheeting, shoring, bracing, dewatering); location of existing water mains to be abandoned; backfill (including flowable fill if so directed by the OWNER),
removal and hauling of additional suitable backfill material if required, compaction and testing, sidewalk, driveway and pavement surface restoration, disposal of debris, waste and refuse, shall be included for this item. Maintenance of traffic and coordination with the City of Hallandale Beach and notification to the public of all necessary temporary water main shutdowns shall be included in this item. Measurement for payment shall be based on the completion of the number of decommissioned and capped water mains.

I. Stand-alone Bacteriological Sample Point / EA: The unit price for this item shall include furnishing and installing the corporation stop, saddle, tubing, 1” gate valve, fittings and all other appurtenances and incidentals as shown on the plans, details and specifications and necessary for a complete and operational water sampling point. The unit price shall also include the cost for removing the sampling point after the water system has been approved and the Contractor receives direction from the OWNER to remove the sampling point. The cost for trenching, backfill, temporary pavement installation for installation and removal shall be included in the unit price. Measurement for payment shall be based on the completion of the number of “stand-alone” sampling points.

J. Water Service Connections / EA: The unit price for this item shall include all labor, equipment and materials for furnishing and installing the corporation stop, saddle, service line, steel casings, angle valve, yoke and U-branch, replacement of galvanized pipes and fittings inside existing meter boxed and all other appurtenances and incidentals, disposal of debris, waste and refuse. Installation of the service line can be done either by trenching, or by trenchless methods unless additional pavement resurfacing is required by trenching methods; if trenchless methods are preferred, the cost of the trenchless installation and the sleeves shall be included in this pay item. If trenching is preferred, the cost of trenching, backfill, compaction, testing and temporary pavement, permanent pavement, driveway or full sidewalk section removal and restoration shall be included in this pay item. Sidewalk restoration shall be provided up the existing expansion joints at each side of trench, but it shall not exceed 15 feet of total restored length of sidewalk per service line. Sideway damaged beyond these limits, shall be restored by the contractor at his own expense and shall not be paid through this pay item.

1. The width of the U-branch for dual meter installations may be different from the distance between the existing water service lines in the private properties. In these situations, the Contractor shall enter the private property to the minimum extent necessary to establish the connection from the meters to the private service lines. The cost for the additional labor, materials, restoration, equipment and all other necessary items to establish the connection shall be included in the pay item for double services.

2. Where two single meter boxes are located directly next to each other, but are supplied by one corporation stop and a single, 1 ½” service line, the installation of the single service line with two meters and two boxes shall be measured and paid for as the installation of one double water service connection.

3. At locations in the drawings where trenching services lines will generate additional pavement restoration not shown in the plans, the contractor must perform these installations by trenchless methods, or resurface pavement at his own expense to the extents approved by the OWNER.
K. **8”x6” Reducer / EA:** Measurement for payment shall be based on the completion of the number of reducers fully installed.

L. **Connection to existing WM with Fittings, Solid Sleeves / EA:** All direct connections to existing water mains either with fittings, couplings, pipe segments, tees or crosses shall be included in this pay item. Contractor shall include the cost of furnishing and installing all pipe, fittings, reducers and couplings required to make connections to existing water mains. The unit cost for this item shall also include excavation (including sheeting, shoring, bracing, dewatering), removal of existing concrete anchors, caps and plugs; furnishing and installing all necessary piping installation materials, such as spool pieces, connection couplings, driveway and full flag sidewalk restoration, gaskets, joint restraints, and all other appurtenances and incidentals for the complete installation of a water system. Cleaning, disinfection and where feasible, flushing shall be included in this payment item. Backfill (including flowable fill if so, directed by the OWNER), removal and hauling of additional suitable backfill material if required, compacting and testing and temporary pavement installation is included in this item. Proper disposal of waste and debris shall be part of this item. The Contractor shall only make the connection between the newly installed system and the existing water system after receiving direction from the OWNER, and under the direct supervision of the OWNER or its representative. Failure to adhere to this may result in contamination of the water supply in the existing system, and the Contractor will, at his cost, test the existing system for the extents of the contamination, and will, at his cost, clean, flush, disinfect and test the existing system. Measurement for payment shall be based on the completion of the number of connections.

M. **As-Built Drawings / LS:** This pay item shall include all costs associated with the production of final As-built drawings including all survey work and necessary requested revisions. As-built drawings shall be provided by the Contractor to the Engineer three weeks prior to final inspection. All As-built data shall be provided by a Florida licensed surveyor, signed and sealed and dated by the responsible party. At the completion of the work, deliver the drawings documenting As-built information, measured by a licensed surveyor, to the engineer, in good condition and free from any extraneous notation. Contractor shall provide three (3) hard copies 11”x17” of as-builts, one (1) AutoCAD file and one (1) PDF file. The As-built information on the water system is to include, but not be limited to locations of all valves, fittings, fire hydrants and water service and top-of-pipe elevation on 100-foot intervals at a minimum. Measurement for payment shall be based on the completion of this pay item.

N. **Water Valve, Sewer Valve, Lateral Reconnections and Manhole Re-adjustment / EA:** It shall be the Contractor's responsibility to coordinate and have all adjustments made to the existing water meters, valves, and manholes encountered during construction, in order to meet all final grades, unless otherwise indicated by the City of Hallandale Beach or the respective utility owner. Contractor shall also repair any damaged sewer lateral hit during construction under this pay item. Omission of such structures and laterals from the Contract Plans does not relieve the Contractor from making such adjustments as may be deemed necessary. The Contractor shall take this provision into account when personally investigating the site prior to bidding. Measurement for payment shall be based on the completion of this pay item.
O. **Furnish and Install Plugs / EA:** This pay item shall include all costs associated with removing the existing cross or fitting and properly capping the existing water main as directed by the City of Hallandale Beach. The cost for this item shall include soft digs to confirm size and fitting types, the preparation of a shop drawing for the work and for the MOT (to be approved by the Engineer and the OWNER) the cost of the MOT, excavation (including sheeting, shoring, bracing, and dewatering), cutting, capping, plugging, the cost of all materials, pipe and fittings, consumables, appurtenances and incidentals to complete the work under this pay item, the cost of backfilling (including flowable fill if so directed by the OWNER), removal and hauling of additional suitable backfill material if required, compaction, testing, and asphalt pavement restoration to the extents required. Measurement for payment shall be based on the completion of this pay item.

P. **Installation of New Meter Boxes (1” meter) / EA:** The unit price for this item includes the disconnection, removal, installation, materials and setting of the meter box (flushed with the existing ground) and meter. Measurement for payment shall be based on the number of fully installed meter boxes.

Q. **Restoration of 4” Concrete Sidewalk / SF:** Measurement for payment for furnishing and constructing concrete sidewalks will be based upon the actual number of square feet of such sidewalks constructed as shown in the drawings, all in accordance with the requirements of the Contract Documents. Payment for furnishing and constructing concrete sidewalks will be made at the unit price per square foot named in the Bid Schedule which price shall constitute full compensation for completing said work, including all earthwork, excavation, clearing, grading, compaction of subgrade, importing and placement of clean fill material to meet proposed sidewalk grades, backfilling of sidewalk, furnishing and construction of the concrete sidewalk, ADA accessible ramps, driveway turnouts, adjustment of existing water meters and sewer cleanouts to finished grade, furnishing and setting for expansion joint material, reinforcement, disposal of excess material, and the appurtenant items for which separate payment is not specifically included in the Bid Schedule. Measurement for payment shall be based on the Square Feet (SF) installed as approved by the Engineer.

R. **Sod / SY:** This pay item includes all labor, equipment and materials for sodding, grading, topsoil, the preparation of the surface prior to placement of sod, close placement of sod, fertilizing, watering and other maintenance as specified herein and not included under other pay items. The total pay requests for this pay item shall not exceed the contractual amount for this pay item without prior written approval from the OWNER. Sod restoration included in this pay item is necessary to restore original conditions damaged due to construction operations. Sod damaged by the contractor due to failure to exercise care at the construction site, shall be responsible for watering the shrub/sod daily, for a minimum of four (4) weeks after installation. Measurement for payment shall be based on the Square Yard (SY) installed as approved by the Engineer.

S. **Erosion and Sedimentation Control / LS:** This pay item includes all necessary operations to prevent contamination or disturbing of the environment of the properties adjacent to the work. This includes, but is not limited to; confining all runoff from disturbed surfaces and contaminated waters and utilizing barriers to prevent erosion and contamination and all de equipment and materials for sodding, grading, topsoil, the
preparation of the surface prior to placement of sod, close placement of sod, fertilizing, watering and other maintenance as specified herein and not included under other pay items. The total pay requests for this pay item shall not exceed the contractual amount for this pay item without prior written approval from the OWNER. Sod restoration included in this pay item is necessary to restore original conditions damaged due to construction operations. Sod damaged by the contractor due to failure to exercise care at the construction site, shall be responsible for watering the shrub/ sod daily, for a minimum of four (4) weeks after installation. Measurement for payment shall be based on the Square Yard (SY) installed as approved by the Engineer.

T. **1" Asphalt Pavement / SY:** The cost for this pay item shall include all labor, equipment and materials necessary to provide a 1 ½" thick (after compaction) asphaltic concrete overlay of full pavement width at all work areas and as shown in the plans. Also included are disposal of debris, tack and prime coats, compaction, asphaltic concrete, paving of asphalt driveways damaged by constrictions activities; protection of newly laid asphalt, and any other related activities required for providing a new asphalt pavement surface for all affected areas in this contract. This activity shall only take place after all work has been completed, after approval of the OWNER, and after clearance from the department of health has been obtained. Measurement for payment shall be based on the Square Yard (SY) installed as approved by the Engineer.

U. **Installation of New Crosswalk Pavers / SF:** The cost for this pay item shall include all labor, equipment and materials necessary to remove and install new pavers at existing crosswalks. This shall include the removal and installation of the existing concrete header curb, as per plan details. Measurement for payment shall be based on the Square Feet (SF) installed as approved by the Engineer.

V. **Curbing Installation / LF:** Measurement for payment to remove and re-place curb and gutter / valley gutter / drop curb will be based upon the number of square feet of such curb and gutter / valley gutter actually removed and re-placed as determined by measurement along the centerline of the curb in place by the width of the curb and gutter, all in accordance with the requirements of the Contract Documents. Payment to remove and re-place curb and gutter / valley gutter / drop gutter will be made at the unit price per square foot of curb named in the bid schedule, which shall constitute full compensation for complete installation including excavation, grading, forming, saw cutting of pavement, 4" limerock pad, drop curb, removal and disposal of existing curbing/ curb and gutter, and cleanup of all areas disturbed by this construction. Measurement for payment shall be based on the Linear Feet (LF) installed as approved by the Engineer.

W. **Striping and Pavement Markings / LS:** This pay item shall include all the necessary pavement markings needed to be restored after pavement overlay, including any initial stripping of paint to provide a proper finished product. Stripping shall be with thermoplastic paint and as required to restore original conditions, to meet requirements of the Manual on Uniform Traffic Control Devices, FDOT and as shown in the drawing notes and specifications. Also included is maintenance of traffic and paint protection and reflective pavement markers (RPM’s – yellow, white, blue and green), disposal of debris, and any other related activities required to provide thermoplastic striping at all resurfaced streets in this contract.

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Transmission and Distribution
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X. Mobilization / Demobilization / Permits / Bonds / Insurance / LS: This item shall cover the costs for all necessary insurance, bonds and permits the Contractor must secure; the cost for obtaining the FDOH permit; the costs for making available on the work site the necessary temporary facilities and the necessary personnel, supplies, tools and equipment to perform the work (heavy construction equipment, hand tools, storage, laydown yards, temporary and/or portable power supply, barricades, fence and safety equipment, and all other items necessary to start the work); submittal of all required documentation, such as insurance certificates and bonds; posting OSHA required notices and establishment of safety programs; notifications to the affected public; Contractor’s superintendent on site full-time. Demobilization shall be included in this item and shall be part of 'substantial completion' and includes the removal of all tools and equipment from site, the removal of all temporary facilities, the restoration of those areas to original or better conditions that were used for temporary facilities. No additional payments will be made for mobilization and demobilization activities due to shutdowns, suspension of work, or other mobilization requirements. Measurement for payment shall be based on the completion of the mobilization items, as described, to the satisfaction of the OWNER and shall not be more than 5% of the Total Bid. The lump sum amount for this bid item shall be distributed as follows: 60% at the completion of the mobilization requirements and 40% at substantial completion of the work.

Y. Maintenance of Traffic / LS: Measurement of payment shall include the preparation and processing of Maintenance of Traffic Plans to respective divisions and installation, thereafter, including a Florida Licensed Professional Traffic Engineer preparing the MOT plans to the satisfaction of the OWNER and shall not be more than 5% of the Total Bid. No lane closures during Holiday periods. Any additional costs including but not limited to barricades, lights, off duty police officers and other duties associated with nighttime work shall be incorporated into the cost for this item. The lump sum amount for this bid item shall be distributed as follows: equal monthly amounts during the duration of the contract time.

Z. Cost for Compliance with Trench Safety Act – F.S. 553.60 through 533.64 if any / LS: The Contractor must be in compliance with Florida Statutes Part III Trench Safety Act Chapter 553.60 through 553.64, if applicable for this project. Bid submission must reference the Trench Safety Standards that will be in effect during the period of construction of the project. Measurement for payment shall be based on the percentage of completion of the lump sum price in the bid form as determined by the Engineer.

AA. Cost for Compliance with Special Shoring Requirements – F.S. 553.60 through 533.64 if any / LS: The Contractor must be in compliance with Florida Statutes Part III Trench Safety Act Chapter 553.60 through 553.64, if applicable for this project. Bid submission must reference the Trench Safety Standards that will be in effect during the periods of construction of the project. Measurement of payment shall be based on the percentage of completion of the lump sum price in the bid form as determined by the Engineer.
1.6 PAYMENTS

A. Shall be accordance with the provisions of the GENERAL CONDITIONS. Invoices for the work completed for each payment period shall include construction photographs per Specification 01 32 00.

PART 2 -- PRODUCTS (NOT USED)

PART 3 -- EXECUTION (NOT USED)

END OF SECTION
01 29 73 SCHEDULE OF VALUES

PART 1 -- GENERAL

1.1 THE SUMMARY

A. This Section defines the process whereby the Schedule of Values (unit price breakdown) shall be developed and incorporated into the cost loading function of the CPM Schedule in accordance with the requirements of Specification 01 32 16 – CPM Construction Schedule.

B. Monthly progress payment amounts will be determined from the monthly progress updates of the CPM Schedule activities.

C. Develop the Schedule of Values independent of but simultaneous with the development of the CPM Schedule activities and logic.

1.2 DETAILED SCHEDULE OF VALUES

A. Prepare and submit a detailed Schedule of Values to the ENGINEER within ten (10) Days from the date of the Notice To Proceed (NTP).

B. The Schedule of Values shall begin with the Bid Summary Form included in the Bid Package and further break down work activities in sufficient detail such that the ENGINEER is able to determine monthly progress payment amounts through cost loading of the CPM Schedule activities.

C. Because the ultimate requirement is to develop a detailed Schedule of Values sufficient to determine appropriate monthly progress payment amounts through cost loading of the CPM Schedule activities, furnish a sufficiently detailed breakdown in order to meet this requirement.

D. The ENGINEER will be the sole judge of acceptable numbers, details and description of values established.

E. If, in the opinion of the ENGINEER, a greater number of Schedule of Values items than proposed are necessary, add the additional items so identified by the ENGINEER.

F. Adjustments and Acceptance

1. The CONTRACTOR and ENGINEER shall meet and jointly review the detailed Schedule of Values within 30 Days the date of the ENGINEER receiving the Schedule of Values from the CONTRACTOR, at which time the value allocations and extent of detail shall be reviewed in order to determine if necessary adjustments to the values are required, and to determine if sufficient detail has been proposed in order to allow acceptable cost loading of the CPM Schedule activities.
2. Make necessary adjustments to the value allocation or level of detail and submit a revised detailed Schedule of Values within ten (10) Days from the review meeting.

3. Following acceptance of the detailed Schedule of Values, incorporate the values into the cost loading portion of the CPM Schedule.

4. Concurrently develop the CPM activities and logic with the development of the detailed Schedule of Values; however, it shall be necessary to adjust the detailed Schedule of Values to correlate to individual Schedule activities.

5. It is anticipated that instances will occur, due to the independent but simultaneous development of the Schedule of Values and the CPM Schedule activities, where interfacing these 2 documents will require changes to each document.

6. Schedule activities may need to be added to accommodate the detail of the Schedule of Values, and Schedule of Value items may need to be added to accommodate the detail of the CPM Schedule activities.

7. Where such instances arise, propose changes to the Schedule of Values and to the CPM Schedule activities in order to satisfy the CPM Schedule cost loading requirements.

1.3 CROSS-REFERENCE LISTING

A. To assist in the correlation of the Schedule of Values and the CPM Schedule, provide a cross-reference listing to be furnished in 2 parts:

1. In the first part, list each scheduled activity with the breakdown of the respective valued items making up the total cost of the activity; and,

2. In the second part, list the valued item with the respective schedule activity or activities that make up the total indicated cost.

B. In the case where a number of schedule items make up the total cost for a valued item (shown in the Schedule of Values), indicate the total cost for each Schedule of Value item.

C. Incorporate approved Change Orders reflected in the CPM Schedule into the Schedule of Values as a single unit identified by the Change Order number.

1.4 CHANGES TO SCHEDULE OF VALUES

A. Changes to the CPM Schedule which additional activities not included in the original schedule but included in the original WORK (schedule omissions) shall have values assigned as approved by the ENGINEER.

B. Reduce other activity values in order to provide equal value adjustment increases for added activities, as approved by the ENGINEER.
C. In the event that the CONTRACTOR and ENGINEER agree to make adjustments to the original Schedule of Values because of inequities discovered in the original accepted detailed Schedule of Values, increases and equal decreases to values for activities may be made.

1.5 LIQUIDATED DAMAGES

A. The schedule of Values information is an integral part of the scheduling and reporting under the Construction Schedule and the progress payment information.

B. As such, it is critical information to evaluating progress and the proper planning of the OWNER's and ENGINEER's WORK-related effort as well as their financial obligations associated with the Project.

C. If a submittal required by this Section is found to be incomplete or is submitted later than required, the OWNER will suffer financial loss and, accordingly, liquidated damages will be assessed against the CONTRACTOR in accordance with the Contract Documents.

PART 2 -- PRODUCTS (NOT USED)

PART 3 -- EXECUTION (NOT USED)

END OF SECTION
01 32 00 CONSTRUCTION PHOTOGRAPHS

PART 1 -- GENERAL

1.1 THE SUMMARY

A. The CONTRACTOR shall conduct pre-construction, construction progress, and post construction photographs and videos of the construction project as specified herein.

B. The CONTRACTOR shall engage the services of a professional videographer for pre-construction video recording. The color audio-video DVD shall be prepared by a responsible commercial firm known to be skilled and regularly engaged in the business of pre-construction color audio-video documentation. Videographer shall furnish to ENGINEER the names and addresses of two (2) references that the videographer has performed color audio-video recording for projects of a similar nature within the last twelve (12) months. The videographer shall be approved by the ENGINEER prior to any video recording of the project site.

1.2 SUBMITTALS

A. Videos and photographs shall be submitted as specified herein and in accordance with Specification 01 33 00 - Contractor Submittals.

1.3 PRECONSTRUCTION PHOTOGRAPHS AND VIDEOS

A. Prior to commencing the WORK, the CONTRACTOR shall provide a continuous color digital audio-video recording (DVD) of the entire area of the project to serve as a record of the site pre-construction conditions. The CONTRACTOR will provide one copy of the pre-construction video to the OWNER, one copy to the ENGINEER, and maintain one copy free from damage or defect that shall become the property of the OWNER at Project Close Out. The CONTRACTOR shall review the video recordings for clarity and accuracy and shall make supplemental records of existing conditions if they are not clearly indicated.

B. No construction shall begin prior to review of the preconstruction video of the construction area by the OWNER, ENGINEER and the CONTRACTOR. The ENGINEER or OWNER shall have the authority to reject all or any portion of the video not conforming to specifications and order that it be redone at no additional charge to the OWNER. The CONTRACTOR shall reschedule unacceptable coverage within five (5) calendar days after being notified. The ENGINEER shall designate those areas, if any, to be omitted from or added to audio-video coverage.

C. Video recording shall be made not more than 60 days prior to commencement of construction.
D. The CONTRACTOR shall video the entire project area including the project site, and any other areas which may be affected or impacted by the WORK including staging and storage areas.

E. The CONTRACTOR shall supplement video recordings with photographs. A minimum of twenty (20) pre-construction photographs shall be provided.

F. The CONTRACTOR’S attention is directed to the deteriorating condition of the existing roadways, seawalls, and some of the private property. The CONTRACTOR shall take the necessary steps during preconstruction videotaping to ensure the existing conditions of roadway, seawalls, private property and all other areas within the area of WORK and areas that may be affected by the WORK are adequately documented to protect the CONTRACTOR and the OWNER from unsubstantiated claims.

1.4 CONSTRUCTION PROGRESS PHOTOGRAPHS

A. A minimum of six (6) photographs shall be taken each week until completion of the Work.

B. The number of photographs required shall be at the sole discretion of the ENGINEER whose decision shall be final. An increase in the number of photographs above the minimum shall not be cause for an increase in cost and no extra compensation will be allowed.

C. For all photograph the CONTRACTOR shall coordinate with the ENGINEER as to the actual number and location of views to be photographed and the day and time of photographing.

D. Progress photographs shall be submitted with monthly Applications for Payment in accordance with the Contract Documents.

1.5 POST-CONSTRUCTION PHOTOGRAPHS AND VIDEO

A. At project closeout, the CONTRACTOR shall provide a continuous color digital audio-video recording (DVD) of the entire area of the project to serve as a record of the post-construction conditions. The completed pump station project and adjacent properties shall be captured.

B. The post-construction video recording shall be supplemented with a minimum of forty (40) photographs documenting the completion of the project construction and adjacent properties.

PART 2 -- PRODUCTS

2.1 VIDEO MEDIA

A. The video portion of the recording shall produce bright, sharp, and clear pictures with accurate colors and shall be free from distortion, tearing, rolls, and any other form of picture imperfection.
B. All video recordings shall contain coverage of all surface features located within the construction zone of influence. Of particular concern shall be the existence of any faults, fractures, defects, etc. of existing features, particularly those located at private properties and homes immediately adjacent to and across the street from the project site. Panning, zoom-in and zoom-out rates shall be sufficiently controlled to maintain a clear view of the object.

C. All video recordings shall, by electronic means, display continuously and simultaneously, the date and time of recording. The video recording shall be generated with the actual taping date and time as transparent digital information. The date information shall contain the month, day and year.

D. Video media shall be standard Digital Video Disc (DVD) format.

E. Accompanying the video recording shall be a corresponding and simultaneously recorded audio recording. Each tape shall begin with the recorded date, project name and be followed by the general location, i.e., viewing side and direction of progress. The audio track shall consist of an original live recording. The recording shall contain exclusively the narrative commentary of the electrographer, recorded simultaneously with the fixed elevation video record of the zone of influence of construction. The recording shall assist in viewer orientation and in any needed identification, differentiation, clarification, or objective description of the features being shown in the video portion of the recording, including location relative to construction stations. The audio recording shall be free from any conversations between the camera operator and any other production technicians. The audio portion of the recording shall produce the commentary of the camera operator with proper volume, clarity, and be free from distortion and interruptions.

2.2 VIDEO MEDIA INDEXING

A. Video Identification: All video media shall be permanently labeled and shall be properly identified by number and project name and location.

B. Video Logs: Each video shall have a log of that video’s contents. The log shall describe the various segments of coverage contained on the video in terms of the names of the streets or easements, coverage beginning and end, directions of coverage, video unit counter numbers, and date.

C. Video Index: The electrographer shall provide an index listing, in order by video number, each video number and a brief description of coverage contained on that video, including engineering station numbers and/or street address at every building abutting roadway and canal.

2.3 PHOTOGRAPHS

A. Furnish one (1) color hard copy (3-½ by 5 inch) of each photograph and one (1) CD containing all pictures in electronic JPG format.

B. Photographs shall have a minimum clarity of 5 megapixels.
C. Hard copy prints: commercial quality prints, color, 3-½-inches by 5-inches, single weight on glossy paper. Enclose each print in a protector punched to fit a standard three ring binder.

D. Number photographs in sequence beginning with the numeral one. Each print shall be stamped with the following information stamped or typed on the back of the print:

<table>
<thead>
<tr>
<th>City of Hallandale Beach</th>
</tr>
</thead>
<tbody>
<tr>
<td>CONTRACT NO.</td>
</tr>
<tr>
<td>Contractor:</td>
</tr>
<tr>
<td>Photograph No.:</td>
</tr>
<tr>
<td>Date:</td>
</tr>
<tr>
<td>Time:</td>
</tr>
<tr>
<td>Description:</td>
</tr>
</tbody>
</table>

PART 3 -- EXECUTION

3.1 GENERAL

A. The ENGINEER and the OWNER may request to be present during the pre-construction video recording and photographing.

3.2 VISIBILITY

A. All video recordings and photographs shall be performed during times of good visibility: none shall be done during period of significant precipitation, mist, or fog. The video recordings and photographs shall only be done when sufficient sunlight is present to properly illuminate the subject, and to produce bright, sharp replications of those subjects.

B. No video recordings and photographs shall be performed when more than 10% of the area to be taped contains debris or obstructions unless otherwise authorized by the OWNER.

3.3 COVERAGE

A. The CONTRACTOR shall sufficiently capture the existing pre-construction conditions within the project site, but not limited to: staging areas, WORK areas, roadways, light poles, trees, landscaping, storm drainage structures, walls, and any other areas which may be affected or impacted by the WORK to protect the OWNER, the ENGINEER, and the CONTRACTOR from unsubstantiated claims. The CONTRACTOR shall capture existing deterioration of landscaping and other fixtures and features in or adjacent to the area of WORK, whether impacted or not.

3.4 CAMERA OPERATION

A. 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 playback.
addition, all other camera and recording system controls such as lens focus and aperture, video level, pedestal, chroma, white balance, and electrical focus shall be properly controlled or adjusted to maximize picture quality.

B. Viewer Orientation Techniques: The audio and video portions of the recording shall maintain viewer orientation. Visual displays of all visible building addresses shall be utilized. In easements where the proposed construction location will not be readily apparent to the video viewer, the OWNER shall indicate the proposed centerline of construction.

END OF SECTION
01 32 16    CPM CONSTRUCTION SCHEDULE

PART 1 -- GENERAL

1.1 GENERAL

A. The CONTRACTOR shall schedule the WORK in accordance with this Section.

B. Development of the schedule, the cost loading of the schedule, monthly payment requisitions and project status reporting requirements of the Contract shall employ computerized Critical Path Method (CPM) scheduling. The CPM Schedule shall be cost loaded based on the schedule of values as approved by the ENGINEER.

C. The CPM schedule and related reports should be prepared with the current version of Primavera Project Planner (P3) or SureTrak software.

1.2 DEFINITIONS

A. CPM Scheduling: The term shall be interpreted to be generally as outlined in the Association of General Contractors (AGC) publication, "The Use of CPM in Construction." except that either "i-j" arrow diagrams or precedence diagramming format may be utilized. In the case of conflicts between this Section and the AGC document, this Section shall govern.

B. Float: Unless otherwise indicated herein, float and total float are synonymous. Total float is the period of time measured by the number of Days each non-critical path activity may be delayed before it and its succeeding activities become part of the critical path. If a non-critical path activity is delayed beyond its float period, then that activity becomes part of the critical path and controls the end date of the WORK. Thus, delay of a noncritical path activity beyond its float period will cause delay to the project itself.

1.3 SCHEDULING QUALIFICATION SUBMITTALS

A. CONTRACTOR shall submit a statement of computerized CPM capability within fifteen (15) Days after Notice to Proceed to verify that either: (1) the CONTRACTOR has inhouse capability qualified to use CPM techniques and the Primavera P3 or SureTrak software or (2) that the CONTRACTOR will arrange for the services of a CPM consultant so qualified. In either event the statement shall identify the individual who will perform the CPM scheduling and shall describe the construction projects required below. The statement shall also identify the contact persons for the referenced projects with current telephone and address information.

B. Criteria: The individual performing scheduling shall have successfully applied computerized CPM technique to at least 2 projects of similar nature, scope, and value not less than one half the Total Bid Price of this project.
1.4 INITIAL SCHEDULE SUBMITTALS

A. Where submittals are required hereunder, the CONTRACTOR shall submit five (5) copies of each submittal item.

B. The CONTRACTOR shall submit a 60 Day Plan of Operation and a Project Overview Bar Chart at the Project Kickoff Meeting which will serve as the CONTRACTOR's plan of operation for the initial 60 Day period of the Contract Times and identify the manner in which the CONTRACTOR intends to complete the WORK within the Contract Times.

1. 60 Day Plan of Operation: During the initial 60 Days of the Contract Times, the CONTRACTOR shall conduct operations in accordance with a 60 Day bar chart type schedule. The chart so prepared shall show accomplishment of the CONTRACTOR's early activities (mobilization, permit acquisition, submittals necessary for early material and equipment procurement, submittals necessary for long lead equipment procurement, CPM submittals, initial sitework and other submittals and activities required in the first 60 Days).

2. Project Overview Bar Chart: The overview bar chart shall indicate the major components of the WORK and the sequence relations between major components and subdivisions of major components. The overview bar chart shall indicate the relationships and time frames in which the various components of the WORK will be made substantially complete and placed into service in order to meet the required milestones. Sufficient detail shall be included to subdivide major components in such activities as (1) excavation, (2) foundation subgrade preparation, (3) foundation concrete, (4) completion of structural concrete, (5) major mechanical WORK, (6) major electrical WORK, (7) instrumentation and control WORK, and (8) other important WORK for each major facility within the overall project scope. Planned durations and start dates shall be indicated for each WORK item subdivision. Each major component and subdivision component shall be accurately plotted on time scale sheets not to exceed 36-inches by 60-inches in size. No more than 4 sheets shall be employed to present this overview information.

C. The ENGINEER, OWNER, and the CONTRACTOR shall meet to review and discuss the 60 Day plan of operation and project overview bar chart within 5 Days after submittal. The ENGINEER's review and comment on the schedules will be limited to conformance with the sequencing and milestone requirements in the Contract Documents. The CONTRACTOR shall make corrections to the schedules necessary to comply with the requirements and shall adjust the schedules to incorporate any missing information requested by the ENGINEER.

1.5 CPM SCHEDULE SUBMITTALS

A. Original CPM Schedule Submittal: Within fifteen (15) Days after the commencement date stated in the Notice to Commencement, the CONTRACTOR shall submit for review by the ENGINEER a hard copy of the CPM schedule and the computerized schedule report tabulations. The CONTRACTOR shall also submit a CD that contains the schedule
The data shall be compatible with Primavera P3 or SureTrak to generate network diagrams and schedule reports identical to the hard copies submitted. This submittal shall have already been reviewed and approved by the CONTRACTOR's Project Manager, superintendent, and estimator prior to submission. The CPM schedule shall be a time-scaled network diagram of the "i-j" activity-on-arrow or precedence type. The network diagram shall describe the activities to be accomplished and their logical relationships and shall show the critical path. The CONTRACTOR's attention is directed to the requirement that the schedule shall contain sufficient detail and information to cost load the CPM schedule in accordance with the approved schedule of values. Each installation and sitework activity shall be cost loaded as indicated.

B. The computerized schedule report tabulations shall include the following:

1. Report of activities sorted by activity number: Activity numbers, where practical, shall correlate to the area numbers designated on the Contract Drawings.

2. Report of activities sorted by early start date.


4. Report of activities sorted by responsibility code. Responsibility codes shall be established for the CONTRACTOR, ENGINEER, OWNER, Subcontractors, Suppliers, etc. These codes shall be identified in the Network Diagram.

5. A successor-predecessor report which shall identify the successor and predecessor activities for each activity and ties between schedule activities.

C. Analysis

1. Early Completion

   a. The CONTRACTOR may show early completion on the original CPM submittal if that is its plan.

   b. An original CPM submittal showing early completion shall either be accompanied by:

      1) Request for change of Contract Times at zero change of Contract Price, accompanied by documentation demonstrating that the Bid was based on early completion, or

      2) Demonstration in the submittal that the time difference between early completion and the original Contract Time is total float.

   c. An early completion schedule unaccompanied by one of these will not be accepted.
d. The ENGINEER will analyze a request for Change Order in accordance with the General Conditions.

2. Float Ownership: Neither the OWNER nor the CONTRACTOR owns the float time. The project owns the float time. Liability for delay to the project completion date rests with the party causing the delay. For example, if Party A is responsible for consuming a portion of the float time and Party B later consumes the remainder of the float time plus additional time beyond the float time, Party B is responsible for the time that is a delay past the completion date. Party A would not be responsible for any delay since it did not consume all the float time, additional float time remained after its delay, and the completion date was unaffected by its tardiness.

D. Original CPM Schedule Review Meeting: The CONTRACTOR shall, within 25 Days from the commencement date stated in the Notice to Commencement, meet with the ENGINEER to review the original CPM schedule submittal. The CONTRACTOR shall have the Project Manager, superintendent, and the scheduler in attendance. The meeting will take place over a half day period. The ENGINEER's review will be limited to conformance with the Contract Documents. However, the review may also include:

1. Clarifications of the design intent.

2. Directions to include activities and information missing from the submittal.

3. Requests to the CONTRACTOR to clarify and revise the schedule.

E. Revisions to the Original CPM Schedule: Within 35 Days after the commencement date stated in the Notice to Commencement, the CONTRACTOR shall revise the original CPM schedule submittal to address review comments from the original CPM schedule review meeting and resubmit the network diagrams and reports for the ENGINEER's review. The ENGINEER, within 14 Days from the date that the CONTRACTOR submitted the revised schedule will either (1) accept the schedule and cost loaded activities as submitted, or (2) advise the CONTRACTOR in writing to review any part or parts of the schedule which either do not meet the requirements or are unsatisfactory for the ENGINEER to monitor the progress and status of WORK or evaluate monthly payment requests by the CONTRACTOR. The ENGINEER may accept the schedule conditional upon the first monthly CPM schedule update correcting deficiencies identified. When the schedule is accepted, it shall be considered as the "Original CPM Construction Schedule" until an updated schedule has been submitted. The ENGINEER reserves the right to require that the CONTRACTOR adjust, add to, or clarify any portion of the schedule which may later be discovered to be insufficient for the monitoring of WORK or approval of partial payment requests. No additional compensation will be provided for such adjustments, additions, or clarifications.

F. Acceptance

1. Acceptance of the CONTRACTOR's schedule by the ENGINEER and OWNER will be based solely upon compliance with the requirements. By way of the
CONTRACTOR assigning activity durations and proposing the sequence of the WORK, the CONTRACTOR agrees to utilize sufficient and necessary management and other resources to perform WORK in accordance with the schedule. Upon submittal of a schedule update, the updated schedule shall be considered the "current" project schedule.

2. Submission of the CONTRACTOR's progress schedule to the ENGINEER shall not relieve the CONTRACTOR of total responsibility for scheduling, sequencing, and pursuing the WORK to comply with the requirements of the Contract Documents, including adverse effects such as delays resulting from ill-timed WORK.

G. Monthly Updates and Periodic CPM Schedule Submittals

1. Following acceptance of the CONTRACTOR's original CPM schedule, the CONTRACTOR shall monitor the progress of the WORK and adjust the schedule each month to reflect actual progress and any changes in planned future activities. Each schedule update submittal shall be complete including information requested in the original schedule submittal and be in the schedule report format indicated below. Each update shall continue to show WORK activities including those already completed. Completed activities shall accurately depict "as built" information by indicating when the WORK was actually started and completed.

2. Neither the submission nor the updating of the CONTRACTOR's original schedule submittal nor the submission, updating, change, or revision of any other report, curve, schedule, or narrative submitted by the CONTRACTOR, nor the ENGINEER's review or acceptance of any such report, curve, schedule, or narrative shall have the effect of amending or modifying in any way the Contract Times or obligations under the Contract. Only a signed, fully executed Change Order can modify contractual obligations.

3. The monthly schedule update submittal will be reviewed with the CONTRACTOR during a monthly construction progress meeting held on the 20th Day of each month. The goal of these meetings is to enable the CONTRACTOR and the ENGINEER to initiate appropriate remedial action to minimize any known or foreseen delay in completion of the WORK and to determine the amount of WORK completed since the last schedule update. The status of the WORK will be determined by the percent complete of each activity in the updated CPM schedule. These meetings are considered a critical component of the overall monthly schedule update submittal, and the CONTRACTOR shall have appropriate personnel attend. As a minimum, the CONTRACTOR's Project Manager and superintendent shall attend these meetings. The CONTRACTOR shall plan on the meeting taking no less than 6 hours. Within 7 Days after the monthly progress meeting, the CONTRACTOR shall submit the revised CPM schedule, the revised CPM computerized tabulations, the revised successor/predecessor report, the project status reports as defined below and the CONTRACTOR's...
Application for Payment. Within 5 Days of receipt of the revised submittals, the ENGINEER will either accept or reject the monthly schedule update submittal. If accepted, the percent complete in the monthly update shall be the basis for the Application for Payment to be submitted by the CONTRACTOR. If rejected, the update shall be corrected and resubmitted by the CONTRACTOR before the Application for Payment for the update period will be processed.

1. Schedule Revisions: The CONTRACTOR shall highlight or otherwise identify changes to the schedule logic or activity durations made from the previous schedule. The CONTRACTOR shall modify any portions of the CPM schedule which become infeasible because activities are behind schedule or for any other valid reason.

1.6 CHANGE ORDERS

A. Upon approval of a Change Order, the change shall be reflected in the next submittal of the CPM Schedule. The CONTRACTOR shall utilize a sub-network in the schedule depicting the changed WORK and its effect on other activities. This sub-network shall be tied to the main network with appropriate logic so that a true analysis of the critical path can be made. Whenever the CONTRACTOR believes that a Change Order will extend the Contract Times, the sub-network analysis herein shall be submitted with the price proposal for the change. If the CONTRACTOR does not submit the sub-network demonstrating that the change affects the Contract Times, then no subsequent claim for additional time due to the change will be accepted.

1.7 CPM STANDARDS

A. Construction Schedule: Construction schedules shall include a graphic network diagram and computerized schedule reports as required below for status reporting.

B. Networks: The CPM network shall be in a form of a time scaled \( i-j \) activity-on-arrow or precedence type diagram and may be divided into a number of separate sheets with suitable match lines relating the interface points among the sheets. Individual sheets shall not exceed 36-inches by 60-inches.

C. Construction and procurement activities shall be presented in a time-scaled format with a calendar timeline along the entire sheet length. Each activity arrow or node shall be plotted so that the beginning and completion dates of each activity are accurately represented along the calendar timeline. Every activity shall use symbols that clearly distinguish between critical path activities, non-critical activities, and free float for each non-critical activity. Activity items shall be identified by their activity number, responsibility code, duration, and dollar value. Non-critical path activities shall show total float time in scale form by utilizing a dotted line or some other graphical means.

D. Duration Estimates: The duration estimate for each activity shall be computed in Days and shall represent the single best estimate considering the scope of the WORK and resources planned for the activity. Except for certain non-labor activities such as curing of concrete...
or delivery of materials, activity duration shall not exceed 10 Days nor be less than one Day, unless otherwise accepted by the ENGINEER.

1.8 SCHEDULE REPORT FORMAT

A. Schedule Reports: Schedule reports shall be prepared based on the CPM schedule, shall be submitted on paper and CD, depending on file size, and shall include the following minimum data for each activity:

1. Activity numbers and responsibility codes.
2. Work Order No.
3. CIP No.
4. Estimated activity duration.
5. Activity description.
6. Activity percent completion.
7. Early start date (calendar dated).
8. Early finish date (calendar dated).
9. Late start date (calendar dated).
10. Late finish date (calendar dated).
11. Status (whether critical).
12. Total float for each activity.
13. Free float for each activity.
14. Cost value for each activity.

B. Project Information: Each Schedule Report shall be prefaced with the following summary data:

1. Project name.
2. CONTRACTOR name.
3. Type of tabulation.
4. Project duration.
5. Contract Times (as revised by Change Orders).

6. The commencement date stated in the Notice to Proceed.

7. The data date and plot date of the CPM Schedule.

8. If an update, cite the new schedule completion date.

1.9 PROJECT STATUS REPORTING

A. The CONTRACTOR shall furnish monthly project status reports (overview bar chart and a written narrative report) in conjunction with the revised CPM schedules as indicated above. Status reporting shall be in the form below.

B. The CONTRACTOR shall prepare and submit monthly an overview bar chart schedule of the major project components. The overview bar chart schedule shall be a summary of the current CPM schedule (original and as updated and adjusted throughout the entire construction period). The major project components shall be represented as time bars which shall be subdivided into various types of WORK including demolition, excavation and earthwork, yard piping, concrete construction, and mechanical, electrical and instrumentation installations. Major components shall include each new structure by area designation, sitework, modifications to existing structures, tie-ins to existing facilities, and plant startups.

C. Each major component and subdivision shall be accurately plotted consistent with the project overview bar chart above. It shall represent the same status indicated by early start and finish activity information contained in the latest update of the CPM schedule. In addition, a percent completion shall be indicated for each major component and subdivision. The initial submittal of the overview bar chart schedule shall be made at the time that the revised original CPM schedule is submitted to the ENGINEER. The CONTRACTOR shall amend the overview schedule to include any additional detail required by the ENGINEER. The CONTRACTOR shall include any additional information requested by the ENGINEER at any time during the construction of the WORK.

D. The CONTRACTOR shall prepare monthly written narrative reports of the status of the project for submission to the ENGINEER. Status reports shall include:

1. The status of major project components (percent complete, amount of time ahead or behind schedule) and an explanation of how the project will be brought back on schedule if delays have occurred.

2. The progress made on critical activities indicated on the CPM schedule.

3. Explanations for any lack of WORK on critical path activities planned for the last month.

4. Explanations for any schedule changes, including changes to the logic and to activity durations.
5. A list of the critical activities scheduled to be performed in the next 2 months.

6. The status of major material and equipment procurement.

7. The value of materials and equipment properly stored at the Site but not yet incorporated into the WORK.

8. Any delays encountered during the reporting period.

9. An assessment of inclement weather delays and impacts to the progress of the WORK.

E. The CONTRACTOR may include any other information pertinent to the status of the WORK. The CONTRACTOR shall include additional status information requested by the ENGINEER.

1.10 INCLEMENT WEATHER PROVISIONS OF THE SCHEDULE

A. The Contractor’s schedule shall include at least the number of Days of delay due to unusually severe weather.

PART 2 -- PRODUCTS (NOT USED)

PART 3 -- EXECUTION (NOT USED)

END SECTION
PART 1 -- GENERAL

1.1 PROJECT KICKOFF MEETING

A. A Notice to Proceed (NTP) will be issued to the CONTRACTOR within ten (10) calendar days of the execution of the Construction Contract. The NTP shall authorize the CONTRACTOR to apply for all required permits and initiate the shop drawing and other CONTRACTOR submittals required by the Contract Documents.

B. A project kickoff meeting will be held within ten (10) calendar days of issuing the NTP.

C. The following entities shall attend the Project Kickoff Meeting:
   1. OWNER
   2. ENGINEER
   3. CONTRACTOR
   4. Others as requested by the OWNER, ENGINEER or CONTRACTOR

D. The minimum agenda for the Project Kickoff Meeting shall address the following items:
   1. Introductions
   2. Roles and Responsibilities – Designation of Responsible Personnel
   3. Communication Protocols
   4. Contractor Submittal Procedures and Forms
   5. Status of Insurance and Bonds
   6. Subcontractors and Suppliers
   7. Contract Milestones and Tentative Construction Schedule
   8. Permits
   9. Requests for Information and Proposals
   10. Field Decisions and Change Orders Procedures
   11. Payment Applications
   12. Use of Owner’s Allowance
E. The ENGINEER shall prepare and distribute the meeting agenda and shall preside at the meeting. The ENGINEER shall record and distribute minutes of the proceedings and decisions.

F. At the Project Kickoff Meeting, the CONTRACTOR shall furnish a list of all permits and licenses the CONTRACTOR shall obtain, indicating the agency to grant the permit, the expected date of submittal, and the expected date for receipt of the permit.

1. Within 30 calendar days of the date of the NTP, the CONTRACTOR shall apply for and submit required documentation including shop drawings and calculations, in full and complete, to obtain all permits required by Laws and Regulation from the agencies having jurisdiction.

G. Within 7 days of receipt of permits, copies shall be submitted to the ENGINEER.

1.2 PRE-CONSTRUCTION MEETING

A. A Notice of Commencement (NOC) shall be issued to a CONTRACTOR once all required permits have been obtained and required shop drawings have been approved. The NOC shall authorize the CONTRACTOR to begin construction. The NOC will initiate the start of the contract time as defined by the Contract Documents.

B. A Pre-construction Meeting will be held within ten (10) calendar days of issuing the NOC. The CONTRACTOR shall not initiate construction until after the Pre-Construction Meeting.

C. The following entities shall attend the Pre-Construction Meeting:

1. OWNER
2. ENGINEER
3. CONTRACTOR
4. Major SUBCONTRACTORS
5. Others as requested by the CITY, ENGINEER or CONTRACTOR

D. The minimum agenda for the Pre-Construction Meeting shall address the following items:

1. Introductions
2. Roles and Responsibilities – Designation of Responsible Personnel
3. Request for Information and Proposals
4. Procedures when Field Conditions differ from Design Drawings
5. Field Decisions and Change Orders Procedures
6. Permit Requirements
7. Community Relations
8. Deliveries and Storage
9. Security Procedures
10. Safety Procedures
11. Maintenance of Traffic
12. Construction Schedule and Sequencing
13. Inspections
14. Sampling and Testing Procedures
15. Shutdowns for Tie-Ins to Existing Mains
16. Hurricane Preparedness
17. Housekeeping Procedures
18. Project Meetings

E. The CONTRACTOR shall prepare and distribute the meeting agenda and shall preside at the meeting. The CONTRACTOR shall record and distribute minutes of the proceedings and decisions.

1.3 PROGRESS MEETINGS AND DAILY LOGS

A. The CONTRACTOR will conduct project meetings in accordance with Article 7.9.1 of the Contract for Construction.

B. The CONTRACTOR’S Project Meetings shall be conducted no less than biweekly and shall include the CONTRACTOR’S administrative, managerial, supervisory personnel, and representatives of each SUBCONTRACTOR working on the site. The ENGINEER and OWNER shall have the right, but not the obligation to attend such weekly Project Meetings.

C. The CONTRACTOR shall maintain detailed meeting notes from each such weekly Project Meeting. Meeting notes from each project meeting shall be submitted to the ENGINEER and OWNER within two (2) working days of each Project Meeting.
D. The CONTRACTOR’s Superintendent shall maintain a daily job diary which shall include for each work day the daily weather conditions at the Site, the identify of each SUBCONTRACTOR working on the Site, the manpower of each SUBCONTRACTOR working on the site, the identify of all visitors to the Site, and any and all other information reflecting any delays, hindrances, interferences, or other problems encountered or incurred at the Site.

E. The Superintendent shall be on the Project Site during all working hours; speak, read, and write in Fluent English; and be a direct employee of the CONTRACTOR (not a SUBCONTRACTOR).

F. Each week the CONTRACTOR shall furnish to the ENGINEER one (1) full and complete PDF copy of the daily job diary.

PART 2 -- PRODUCTS (NOT USED)

PART 3 -- EXECUTION (NOT USED)

END OF SECTION
01 33 00  CONTRACTOR SUBMITTAL

PART 1 -- GENERAL

1.1 DESCRIPTION OF WORK

A. Submit to the ENGINEER for review and approval, such shop drawings, test reports and data on materials, equipment, and material samples as are required for the proper control of work, and as specified in the Specification sections.

B. Submit to the ENGINEER a complete list of preliminary data on items for which shop drawings are to be submitted. Included in this list shall be the names of all proposed manufacturers furnishing specified items. Review of this list by the ENGINEER shall in no way expressed or implied relieve the CONTRACTOR from submitting complete shop drawings and providing materials, equipment, etc., fully in accordance with the Specifications. This procedure is required in order to expedite final review of shop drawings.

C. Maintain an accurate updated shop drawing submittal log which shall include the following items:

1. Submittal-Description and Number assigned.
2. Specification Section.
3. Drawings Sheet Number.
4. Date to Engineer.
5. Date returned to CONTRACTOR (from ENGINEER).
7. Date of Resubmittal and Return (as applicable).
8. Date material release (for fabrication).
9. Projected date of fabrication.
10. Projected date of delivery to site.

1.2 CONTRACTOR'S RESPONSIBILITY

A. The CONTRACTOR shall submit shop drawings to the ENGINEER for approval with the exception that no less than one (1) hard copy and one (1) electronic PDF copy shall be submitted. The ENGINEER will retain one (1) set and one (1) will be returned to the CONTRACTOR.
B. Shop drawings shall be submitted for all materials and equipment to be furnished, in addition, the submission shall include the motor efficiency, and motor torque speed curves from zero to full load speed for motors over 10 hp.

C. Shop drawings shall be submitted prior to any project construction activity. In a timely fashion, well before the contemplated ordering for fabrication of special order or long lead time items or construction use of any standard element of the work, the CONTRACTOR shall furnish shop drawings for the review and approval of the ENGINEER.

D. Furnish the ENGINEER with a schedule of shop drawings submittals fixing the respective dates for the submission of shop drawings, the beginning of manufacture, testing and installation of materials, supplies and equipment. This schedule shall indicate those that are critical to the progress schedule.

E. Submit to the ENGINEER all drawings and schedules sufficiently in advance of construction requirements to provide maximum time for checking and appropriate action from the time the ENGINEER receives them.

F. Prior to submission, the CONTRACTOR shall thoroughly check such drawings, satisfying himself that they meet the requirements of the Contract Documents and that they are coordinated with the arrangements set forth on other shop drawings, and shall place on them the project's name, ER number, address, the date and his stamp of approval. Where items for which shop drawings are submitted are to meet special conditions listed in the detailed Specifications, the conditions shall be so noted on the drawing. Where there is a deviation from the Specifications, the CONTRACTOR shall note it and state the reason why a deviation is required.

G. Each and every copy of the Drawings and data shall bear CONTRACTOR's stamp showing that they have been so checked and approved. Shop drawings shall indicate any deviations in the submittal from requirements of the Contract Documents and the CONTRACTOR shall state the reason why a deviation is required, and the deviation noted on the transmittal sheet. If the CONTRACTOR fails to notify the ENGINEER of a deviation and that deviation mistakenly gets approved by the ENGINEER, the CONTRACTOR shall be required to provide the contract specified material and/or equipment to the satisfaction of the ENGINEER.

H. Furnish a Certificate of Unit Responsibility, as specified in equipment specification section. Form is attached to this Section.

I. Shop drawings submitted without the required approval as specified above shall be returned without review and no extension of time will be granted for any delays caused by such improper submission.

J. All submittals shall be accompanied by a transmittal letter prepared in duplicate containing the following information:

1. Date.
2. Project Title and Number.

3. CONTRACTOR’s name and address.

4. The number of each shop drawings, data, and sample submitted.


6. Submittal Log Number conforming to and referring to Specification Section Numbers.

7. Certification the submittal conforms to the specifications or contains deviations to the specifications.

K. Any delays or costs caused, either directly or indirectly, by non-timely submissions; submission of items differing significantly from the intent of the Plans and/or Specifications; repeated submission of or argument over, rejected elements or changes required for acceptance; arguments with the criteria or requirements of the Plans or Specifications; or any other such similar activities shall be at the sole expense of the CONTRACTOR.

L. For major equipment submittals, as defined by the ENGINEER, the CONTRACTOR shall include in the submittal a copy of the specification with each and every paragraph initialed by the CONTRACTOR indication compliance, or indication a deviation is requested followed by a request for deviation listing/form.

M. Design calculations, drawings, and materials specifications shall be supplied as specified herein and by the individual specification sections.

N. Do not begin any of the work covered by a drawing, data, or a sample returned as “AMEND-RESUBMIT” or “REJECTED-RESUBMIT” until a revision or correction thereof has been reviewed and returned to him, by the ENGINEER, with approval as “NO EXCEPTIONS TAKEN” or “MAKE CORRECTIONS NOTED”. Be responsible for and bear all costs of damages which may result from the ordering of any material or from proceeding with any part of work prior to receiving ENGINEER’s approval or approval “As Noted” of the necessary shop drawings.

O. Shop drawings shall be of such character that they may be used as fabrication drawings. Prior to submission, the CONTRACTOR shall thoroughly check such drawings, satisfying himself that they meet the requirements of the Plans and Specifications and that they are coordinated with the arrangements set forth on other shop drawings, and shall place on them the Contract Number, the date and his stamp of approval. One (1) copy will be returned to the CONTRACTOR with the ENGINEER’s mark of approval thereon or will be marked to indicate changes necessary to effect compliance with the Specifications and the remaining copies will be retained by the OWNER. When drawings are approved by the ENGINEER, they shall be as binding as any of the Contract Documents. Any errors or omissions on the shop drawings shall not relieve the CONTRACTOR of his responsibility. He shall correct such errors, or omissions, including any necessary
additions or alterations to construction, at his expense upon notification by the ENGINEER.

P. Be fully responsible for observing the need for and for making any changes in the arrangement of piping, connections, wiring, manner of installation, etc., which may be required by the materials/equipment he proposes to supply, both as they pertain to his own work, work of others, or of other Divisions herein or Trades and clearly show such changes on the shop drawings. All changes shall be clearly called out.

Q. Determine and verify:

1. Field measurements.

2. Field construction criteria.

3. Catalog numbers and similar data.

4. Conformance with Specifications.

5. Installation and Maintenance clearances.

1.3 ENGINEER’S REVIEW OF SHOP DRAWINGS

A. Except as otherwise indicated, the ENGINEER will return prints of each submittal to the CONTRACTOR with comments noted thereon, within 20 Days following receipt by the ENGINEER.

B. It is considered reasonable that the CONTRACTOR shall make a complete and acceptable submittal to the ENGINEER by the first resubmittal on an item.

C. The OWNER reserves the right to withhold monies due to the CONTRACTOR to cover additional costs of the ENGINEER's review beyond the first resubmittal.

D. The ENGINEER'S maximum review period for each submittal or resubmittal will be 20 Days; thus, for a submittal that requires 2 resubmittals before it is complete, the maximum review period could be 60 Days.

E. If a submittal is returned to the CONTRACTOR marked "NO EXCEPTIONS TAKEN," formal revision and resubmission will not be required.

F. If a submittal is returned marked "MAKE CORRECTIONS NOTED," the CONTRACTOR shall make the corrections on the submittal, but formal revision and resubmission will not be required. If the CONTRACTOR does not agree to abide in full of the corrections, the CONTRACTOR must notify the ENGINEER within 5 days and the status will be revised to "AMEND-RESUBMIT".

G. Resubmittals
1. If a submittal is returned marked "AMEND-RESUBMIT," the CONTRACTOR shall revise the submittal and resubmit the required number of copies.

2. Resubmittal of portions of multi-page or multi-drawing submittals will not be accepted: For example, if a Shop Drawing submittal consisting of 10 drawings contains one drawing noted as "AMEND-RESUBMIT," the submittal as a whole is deemed "AMEND-RESUBMIT," and 10 drawings are required to be resubmitted.

3. Every change from a submittal to a resubmittal or from a resubmittal to a subsequent resubmittal shall be identified and flagged on the resubmittal. Submittal review comments shall be addressed as numbered in the review comments and all review comments addressed.

H. Rejected Submittals

1. If a submittal is returned marked "REJECTED-RESUBMIT," it shall mean either that the proposed material or product does not satisfy the specification, the submittal is so incomplete that it cannot be reviewed, or is a substitution request not submitted in accordance with the requirements of this section.

2. In the first 2 cases, the CONTRACTOR shall prepare a new submittal and shall submit the required number of copies.

3. In the latter case, the CONTRACTOR shall submit the substitution request according to the requirements of this section.

4. The resubmittal of rejected portions of a previous submittal will not be accepted.

I. The fabrication of an item may commence only after the ENGINEER has reviewed the pertinent submittals and returned copies to the CONTRACTOR marked either "NO EXCEPTIONS TAKEN" or "MAKE CORRECTIONS NOTED."

J. Corrections indicated on submittals shall be considered as changes necessary to meet the requirements of the Contract Documents and shall not be taken as changes to the contract requirements.

K. The CONTRACTOR shall be responsible for confirming and correlating quantities and dimensions, fabrication processes and techniques, coordinating WORK with the trades, and satisfactory and safe performance of the WORK.

L. Conformance:

1. Corrections or comments made on the CONTRACTOR's Shop Drawings during review shall not relieve the CONTRACTOR from compliance with Contract Drawings and Specifications.

2. Review is for conformance to the design concept and general compliance with the Contract Documents only.
3. The ENGINEER's review will not constitute an approval of dimensions, quantities, and
details of the material, equipment, device, or item shown. The review of drawings and
schedules will be general, and shall not be construed:

   a. As permitting any departure from the Contract requirements;

   b. As relieving the CONTRACTOR of responsibility for any errors,
      including details, dimensions, and materials;

   c. As approving departures from details furnished by the
      ENGINEER, except as otherwise provided herein.

4. The CONTRACTOR shall be responsible for confirming and correlating quantities and
dimensions, fabrication processes and techniques, coordinating WORK with the trades,
and satisfactory and safe performance of the WORK.

M. Variations:

   1. If the drawings or schedules as submitted describe variations and show a departure
      from the Contract requirements which ENGINEER finds to be in the interest of the
      OWNER and to be so minor as not to involve a change in Contract Price or time for
      performance, the ENGINEER may return the reviewed drawings without noting an
      exception.

   2. If the drawings or schedules, as submitted, describe variations and show a departure
      from the Contract requirements which the ENGINEER finds to be minor enough to be
      corrected by redlining the submittal, he shall do so and return the submittal marked
      "approved as noted." The redlined corrections shall be as binding on the
      CONTRACTOR as would be a resubmission embodying the same corrections.

N. Resubmittals will be handled in the same manner as first submittals. On resubmittals the
CONTRACTOR shall direct specific attention, in writing or on resubmitted shop drawings,
to revisions other than the corrections requested by the ENGINEER on previous
submissions. The CONTRACTOR shall make any corrections required by the ENGINEER.

O. If the CONTRACTOR considers any correction indicated on the shop drawings to
constitute a change to the Contract Drawings or Specifications, the CONTRACTOR shall
give written notice thereof to the ENGINEER.

P. When the shop drawings have been approved by the ENGINEER, the CONTRACTOR
shall carry out the construction in accordance therewith and shall make no further changes
therein except upon written instructions from the ENGINEER.

Q. No partial submittals will be reviewed. Submittals not complete will be returned to the
CONTRACTOR for resubmittal. Unless otherwise specifically permitted by the
ENGINEER, all submittals shall be made in groups containing all associated items for
systems, processes or as indicated in specific specifications sections. All drawings,
schematics, manufacturer's product data, certifications and other shop drawing submittals
required by a system specification shall be submitted at one time as a package to facilitate interface checking.

R. The approval of shop drawings and data will be general, and shall mean that upon examination of the drawings, no variations from the Contract requirements have been discovered, and approval will not relieve the CONTRACTOR of his responsibilities as defined under the Contract. The OWNER's review will not constitute an approval of dimensions, quantities and details of the material, equipment, device or item shown.

1.4 SHOP DRAWINGS

A. When used in the Contract Documents, the term "shop drawings" shall be considered to mean CONTRACTOR's plans for materials and equipment which become an integral part of the Project. These drawings shall be complete and detailed. Shop drawings shall consist of fabrication, erection and setting drawings and schedule drawings, manufacturer's scale drawings, and wiring and control diagrams. Cuts, catalogs, pamphlets, descriptive literature, and performance and test data shall be considered only as supportive to required shop drawings as defined above.

B. Manufacturer's catalog sheets, brochures, diagrams, illustrations and other standard descriptive data shall be clearly marked to identify pertinent materials, product or models. Delete information which is not applicable to the Work by striking or cross-hatching.

C. If drawings show variations from Contract requirements because of standard shop practice or for other reasons, describe such variations in the letter of transmittal. If the CONTRACTOR fails to describe such variations, he shall not be relieved of the responsibility for executing the work in accordance with the Contract, even though such drawings have been reviewed and approved.

D. For all mechanical and electrical equipment furnished, provide a list including the equipment name, address of and telephone number of the manufacturer's representative and service company so that service and/or spare parts can be readily obtained.

E. All manufacturers or equipment suppliers who propose to furnish equipment or products shall submit an installation list to the 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 operation for a period of at least five years, unless otherwise specified. Manufacturers and/or equipment which fails to meet the specified experience period will be considered if the manufacturer or supplier provides a bond or cash deposit which will guarantee replacement of the equipment or process in the event of failure or unsatisfactory service.

F. Only the ENGINEER will utilize the color "red" in marking shop drawing submittals.

1.5 REQUIRED INFORMATION

A. Transmittal Form
1. Shop Drawing submittals shall be accompanied by the ENGINEER's standard submittal transmittal form, a reproducible copy of which is available from the ENGINEER.

2. A submittal without the form, or where applicable items on the form have not been completed, will be returned for resubmittal.

B. Organization

1. Use a single submittal transmittal form for each technical specification Section or item or class of material or equipment for which a submittal is required.

2. A single submittal covering multiple Sections will not be accepted, unless the primary specification references other Sections for components: For example, if a pump Section references other Sections for the motor, shop-applied protective coating, anchor bolts, local control panel, and variable frequency drive, a single submittal would be accepted, whereas a single submittal covering vertical turbine pumps and horizontal split-case pumps would not be accepted.

3. On the transmittal form, index the components of the submittal and insert tabs in the submittal to match the components.

4. Relate the submittal components to specification paragraph and subparagraph, drawing number, detail number, schedule title, room number, or building name, as applicable.

5. Unless otherwise indicated, match terminology and equipment names and numbers used in the submittals with those used in the Contract Documents.

C. Format

1. Minimum sheet size shall be 8-1/2 inches by 11 inches, and maximum sheet size shall be 24 inches by 36 inches.

2. Where product data from a manufacturer is submitted, clearly mark which model is proposed, with complete pertinent data capacities, dimensions, clearances, diagrams, controls, connections, anchorage, and supports.

3. Present a sufficient level of detail for assessment of compliance with the Contract Documents.

4. Numbering

   a. Assign to each submittal a unique number.

   b. Number the submittals sequentially, with the submittal numbers clearly noted on the transmittal.
c. Assign original submittals a numeric submittal number followed by a decimal point and a numeric digit in order to distinguish between the original submittal and each resubmittal: For example, if submittal "25.1" requires a resubmittal, the first resubmittal will bear the designation "25.2" and the second resubmittal will bear the designation "25.3," and so on.

D. Disorganized submittals that do not meet the requirements of the Contract Documents will be returned without review.

E. Submit, as applicable, the following for all prefabricated or manufactured structural, mechanical, electrical, plumbing, process system, and equipment:

1. Shop drawings or equipment drawings, including dimensions, size and location of connections to other work, and weight of equipment.

2. Catalog information and cuts.

3. Installation or placing drawings for equipment, drives, and bases.

4. Supporting calculations, signed and sealed by a Florida Registered Engineer when required, for equipment and associated supports, or hangers required or specified to be designed by equipment manufacturers.

5. Signed and sealed calculations and drawings by in-house Florida Registered Professional Engineer for structural systems, indicating compliance to the structural design criteria specified in the Drawings.

6. Complete manufacturer's specifications, including materials description and paint system.

7. Performance data and pump curves.

8. Suggested spare parts with current price information.

9. List of special tools required for testing, checking, parts replacement, and maintenance. (Special tools are those which have been specially designed or adapted for use on parts of the equipment and are not customarily and routinely carried by maintenance mechanics).

10. List of special tools furnished with the equipment.

11. List of materials and supplies required for the equipment prior to, and during startup.

12. List of materials or supplies furnished with the equipment.

13. Special handling instructions.

14. Requirements for storage and protection prior to installation.
15. Requirements for routine maintenance required prior to equipment startup.

16. List of all requested exceptions to the Contract Documents.

1.6 SAMPLES

A. Furnish, for the approval of the ENGINEER, samples required by the Specifications or requested by the ENGINEER. Samples shall be delivered to the ENGINEER as specified or directed. The CONTRACTOR shall prepay all shipping charges on samples. Materials or equipment for which samples are required shall not be used in work until approved by the ENGINEER.

B. Quantity

1. The CONTRACTOR shall submit the number of samples indicated by the Specifications.

2. If the number is not indicated, submit not less than 3 samples.

3. Where the quantity of each sample is not indicated, submit such quantity as necessary for proper examination and testing by the methods indicated.

C. Identification and Distribution

1. Individually and indelibly label or tag each sample, indicating the salient physical characteristics and the manufacturer's name.

2. Each sample shall have a label indicating:
   a. Name of Project.
   b. Material or Equipment Represented.
   c. Name of Producer and Brand (if any).
   d. Location in Project

3. Upon acceptance by the ENGINEER, one set of the samples will be stamped and dated by the ENGINEER and returned to the CONTRACTOR, one set of samples will be retained by the ENGINEER, and one set shall remain at the Site in the ENGINEER's field office until completion of the WORK.

D. Samples shall be of sufficient size and quantity to clearly illustrate:

1. Functional characteristics of the product, with integrally related parts and attachment devices.

2. Full range of color, texture and pattern.
3. A minimum of two samples of each item shall be submitted.

E. The CONTRACTOR shall schedule sample submittals such that:

1. Sample submittals for color and texture selection are complete so the ENGINEER has 45 Days to assemble color panels and select color- and texture-dependent products and materials without delay to the construction schedule; and,

2. After the ENGINEER selects colors and textures, the CONTRACTOR has sufficient time to provide the products or materials without delay to the construction schedule.

3. The Contract Times will not be extended for the CONTRACTOR's failure to allow enough review and approval or selection time, failure to submit complete samples requiring color or texture selection, or failure to submit complete or approvable samples.

F. Selection

1. Unless otherwise indicated, the ENGINEER will select colors and textures from the manufacturer's standard colors and standard materials, products, or equipment lines.

2. If certain samples represent non-standard colors, materials, products, or equipment lines that will require an increase in Contract Times or Price, the CONTRACTOR shall clearly state so on the transmittal page of the submittal.

G. 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.

H. 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 work shall match the approved samples. Samples which failed testing or were not approved will be returned to the CONTRACTOR at his expense, if so, requested at time of submission

1.7 MANUFACTURER'S EXPERIENCE RECORD

A. When a manufacturer's experience record is required by these specifications, the following may be provided in lieu of the specified record:

1. Manufacturers and/or equipment which does not meet the specified experience period will be considered if the manufacturer or supplier provides a bond or cash deposit valid for five years less his years of experience, which will guarantee replacement of the equipment or process in the event of failure or unsatisfactory performance or service
1.8 PROPOSED SUBSTITUTIONS OR "OR APPROVED EQUAL" ITEMS

A. The CONTRACTOR’S bid price shall include materials or equipment meeting the specifications. Proposed substitutions will only be considered following award of the Contract as described herein.

B. Changes in products, materials, equipment, and methods of construction required by the Contract Documents which are proposed by the CONTRACTOR after award of the Contract are considered to be requests for substitutions. Where the Plans and/or Specifications designate the products of a particular manufacturer, the product specified has been found suitable for the intended use. Articles or products of similar characteristics may be offered for the approval of the ENGINEER if sufficient information is submitted by the CONTRACTOR to allow the ENGINEER to determine that the material or equipment proposed is equivalent or equal to that named, subject to the following requirements:

1. The burden of proof as to the type, function, and quality of any such substitution product, material or equipment shall be upon the CONTRACTOR.

2. The ENGINEER will be the sole judge as to the type, function, and quality of any such substitution and the ENGINEER’s decision shall be final.

3. The ENGINEER may require the CONTRACTOR to furnish additional data about the proposed substitution.

4. The OWNER may require the CONTRACTOR to furnish a special performance guarantee or other surety with respect to any substitution.

5. Acceptance by the ENGINEER of a substitution item proposed by the CONTRACTOR shall not relieve the CONTRACTOR of the responsibility for full compliance with the Contract Documents and for adequacy of the substitution.

6. The CONTRACTOR shall pay all costs of implementing accepted substitutions, including redesign and changes to WORK necessary to accommodate the substitution.

C. The procedure for review by the ENGINEER will include the following:

1. Prior to proposing any substitute item, CONTRACTOR shall satisfy itself that the item proposed is: equal or better to that specified; that such item will fit into the space allocated; that such item affords comparable ease of operation, maintenance and service; that the appearance, longevity and suitability for the climate are comparable; that by reason of costs savings, reduced construction time or similar demonstrable benefit, the substitution of such item will be in OWNER’s interest and will in no way detrimentally impact the project schedule. The burden of proof that such an item offered is equal in all respects to that specified shall be CONTRACTOR’S.

2. If the CONTRACTOR wishes to provide a substitution item, the CONTRACTOR shall make written application to the ENGINEER on the “Substitution Request Form.” A copy of this form is attached to the end of this Specification. Following award of
3. The CONTRACTOR shall certify by signing the form that the list of paragraphs on the form are correct for the proposed substitution.

4. The ENGINEER will evaluate each proposed substitution within a reasonable period of time, not to exceed 30 days.

5. As applicable, no shop drawing submittals shall be made for a substitution item nor shall any substitution item be ordered, installed, or utilized without the ENGINEER'S prior written acceptance of the CONTRACTOR'S "Substitution Request Form."

6. The ENGINEER will record the time required by the ENGINEER in evaluating substitutions proposed by the CONTRACTOR and in making changes by the CONTRACTOR in the Contract Documents occasioned thereby.

D. The CONTRACTOR's application shall address the following factors which will be considered by the ENGINEER in evaluating the proposed substitution:

1. Complete data substantiating compliance of proposed substitution with the requirements of the Contract Documents, including:

   a. Product identification, including manufacturer’s name and address and model number of products

   b. Manufacturer’s literature, identifying

      1) Product description

      2) Reference Standards

      3) Performance, testing, and relevant engineering data

   c. Samples, if applicable

   d. List two similar projects where substitution was utilized. Provide the following information for each project:

      1) Contact person name and phone number. Contact should be able to provide information on the use of the product.

      2) Location of installation

      3) Date of installation

      4) Quantity installed
5) Scope and description of project

2. Whether the evaluation and acceptance of the proposed substitution will prejudice the CONTRACTOR's achievement of Substantial Completion on time.

3. Whether acceptance of the substitution for use in the WORK will require a change in any of the Contract Documents to adapt the design to the proposed substitution.

4. Whether incorporation or use of the substitution in connection with the WORK is subject to payment of any license fee or royalty.

5. Whether all variations of the proposed substitution from the items originally specified are identified.

6. Whether available maintenance, repair, and replacement service are indicated. The manufacturer shall have a local service agency (within 50 miles of the site) which maintains properly trained personnel and adequate spare parts and is able to respond and complete repairs within 24 hours.

7. Whether an itemized estimate is included of all additional costs and cost savings that will result directly or indirectly from acceptance of such substitution, including cost of redesign; claims of other contractors affected by the resulting change; and any licensing fee or royalties.

8. Whether the proposed substitute item meets or exceeds the experience and/or equivalency requirements listed in the appropriate technical specifications.

E. In making the formal request for substitution, the CONTRACTOR represents that:

1. The substitution has been investigated and it has been determined that is equal to or superior in all respects to the specified product.

2. The CONTRACTOR will provide the same warranties and bonds for the substitution as the product specified.

3. The substitution will be coordinated into the installation of the WORK and any required changes to complete the WORK in all respects as a result of the substitution will be made by the CONTRACTOR at no additional cost to the OWNER.

4. The CONTRACTOR waives claims for additional cost caused by the substitution, which may subsequently become apparent.

5. All cost data provided is complete and accurate.

F. Without any increase in cost to the OWNER, the CONTRACTOR shall be responsible for and pay all costs in connection with proposed substitutions and of inspections and testing of equipment or materials submitted for review prior to the CONTRACTOR's purchase thereof for incorporation in the WORK, whether or not the ENGINEER accepts the
proposed substitution or proposed equipment or material. The CONTRACTOR shall reimburse the OWNER for the charges of the ENGINEER for evaluating each proposed substitution. In some instances, a credit may be due the OWNER. Unless specifically authorized by the ENGINEER in writing, no additional contract time will be allowed, and a decrease in time may be appropriate.

1.9 UNIT RESPONSIBILITY

A. Where unit responsibility for a system is required by the Contract Documents, the CONTRACTOR’s vendor shall provide a notarized “Unit Responsibility Certification Form” as part of the Submittal process. A copy of this form is attached to the end of this Specification. Following award of contract, an electronic copy of the form will be provided to the CONTRACTOR.

PART 2 -- PRODUCTS (NOT USED)

PART 3 -- EXECUTION (NOT USED)

END OF SECTION
PART 1 -- GENERAL

1.1 THE SUMMARY

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

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

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

1.2 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. The CONTRACTOR shall construct the WORK in accordance with the Contract Documents and the referenced portions of those referenced codes, standards, and specifications.

codes as approved by the Municipal Code and used by the local agency as of the date that the WORK is advertised for Bids shall apply to the WORK herein, including all addenda, modifications, amendments, or other lawful changes thereto.

C. Municipal Code and used by the local agency as of the date that the WORK is advertised for Bids shall apply to the WORK herein, including all addenda, modifications, amendments, or other lawful changes thereto.

D. In case of conflict between codes, reference standards, drawings, and the other Contract Documents, the most stringent requirements shall govern. All conflicts shall be brought to the attention of the ENGINEER for clarification and direction prior to ordering or providing any materials or furnishing labor. The CONTRACTOR shall bid for the most stringent requirements.

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


1.3 REGULATIONS RELATED TO HAZARDOUS MATERIALS

A. The CONTRACTOR shall be responsible that all WORK included in the Contract Documents, regardless if indicated or not, shall comply with all EPA, OSHA, RCRA, NFPA, and any other federal, state, and local regulations governing the storage and conveyance of hazardous materials, including petroleum products.

B. Where no specific regulations exist and the OWNER has not waived the requirement in writing, chemical, hazardous, and petroleum product piping and storage in underground locations shall be double containment piping and tanks or be installed in separate concrete trenches and vaults with an approved lining that cannot be penetrated by the chemicals.

PART 2 -- PRODUCTS (NOT USED)

PART 3 -- EXECUTION (NOT USED)

END OF SECTION
01 45 00 QUALITY CONTROL

PART 1 -- GENERAL

1.1 DEFINITION

A. Specific quality control requirements for the WORK are indicated throughout the Contract Documents. The requirements of this Section are primarily related to performance of the WORK beyond furnishing of manufactured products. The term “Quality Control” includes inspection, sampling and testing, and associated requirements.

1.2 INSPECTION AT PLACE OF MANUFACTURE

A. Unless otherwise indicated, all products, materials, and equipment shall be subject to inspection by the ENGINEER at the place of manufacture.

B. The presence of the ENGINEER at the place of manufacturer, however, shall not relieve the CONTRACTOR of the responsibility for providing products, materials, and equipment which comply with all requirements of the Contract Documents. Compliance is a duty of the CONTRACTOR and said duty shall not be avoided by any act or omission on the part of the ENGINEER.

1.3 SAMPLING AND TESTING

A. Unless otherwise indicated, all sampling and testing will be in accordance with the methods prescribed in the current standards of the ASTM, as applicable to the class and nature of the article or materials considered; however, the OWNER reserves the right to use any generally-accepted system of sampling and testing which, in the opinion of the ENGINEER will assure the OWNER that the quality of the workmanship is in full accord with the Contract Documents.

B. Any waiver by the OWNER of any specific testing or other quality assurance measures, whether or not such waiver is accompanied by a guarantee of substantial performance as a relief from the testing or other quality assurance requirements originally indicated, and whether or not such guarantee is accompanied by a performance bond to assure execution of any necessary corrective or remedial WORK, shall not be construed as a waiver of any requirements of the Contract Documents.

C. Notwithstanding the existence of such waiver, the ENGINEER reserves the right to make independent investigations and tests, and failure of any portion of the WORK to meet any of the requirements of the Contract Documents, shall be reasonable cause for the ENGINEER to require the removal or correction and reconstruction of any such WORK in accordance with the General Conditions.

1.4 INSPECTION AND TESTING SERVICE

A. Inspection and testing laboratory service shall comply with the following:
1. Unless indicated otherwise by the Technical Specifications, the OWNER will appoint, employ, and pay for services of an independent firm to perform inspection and testing or will perform inspection and testing itself.

2. The OWNER or independent firm will perform inspections, testing, and other services as required by the ENGINEER under Paragraph 1.3C above.

3. Reports of testing, regardless of whether the testing was the OWNER’S or the CONTRACTOR’S responsibility, will be submitted to the ENGINEER in [duplicate] indicating observations and results of tests and indicating compliance or non-compliance with Contract Documents.

4. The CONTRACTOR shall cooperate with the OWNER or independent firm and furnish samples of materials, design mix, equipment, tools, storage, and assistance as requested.

5. The CONTRACTOR shall notify ENGINEER 24 hours prior to the expected time for operations requiring inspection and laboratory testing services.

6. Retesting required because of non-conformance to requirements shall be performed by the same independent firm on instructions by the [ENGINEER]. The CONTRACTOR shall bear all costs from such retesting.

7. For samples and tests required for CONTRACTOR’S use, the CONTRACTOR shall make arrangements with an independent firm for payment and scheduling of testing. The cost of sampling and testing for the CONTRACTOR’S use shall be the CONTRACTOR’S responsibility.

1.5 EVALUATION OF THE WORK

A. The Work shall be conducted under the general observation of the ENGINEER and shall be subject to evaluation by representatives of the ENGINEER acting on behalf of the OWNER to ensure strict compliance with the requirements of the Contract Documents. Such evaluation may include mill, plant, and shop or field evaluation, as required. The ENGINEER and OWNER shall be permitted access to all parts of the Work, including plants where materials or equipment are manufactured or fabricated.

B. The presence of the ENGINEER or any evaluator; however, shall not relieve the Contractor of the responsibility for the proper execution of the Work in accordance with the Contract Documents. Compliance is a duty of the Contractor and is not be relieved by any act or omission on the part of the ENGINEER.

C. Materials and articles furnished by the Contractor shall be subject to evaluation, and acceptance by the ENGINEER prior to use for the Work. No Work shall be backfilled, buried, cast in concrete, hidden or otherwise covered until the ENGINEER, has completed his inspection or evaluation. Any Work so covered in the absence of evaluation shall be subject to uncovering. Where unevaluated Work cannot be uncovered, such as in concrete cast over reinforcing steel, all such Work shall be subject to demolition, removal,
and reconstruction under proper evaluation, and no additional payment will be allowed, therefore. If any portion of asphalt work is not accepted by the ENGINEER, OWNER or Engineering Inspector, the Contractor shall remove and reconstruct across the width of the lane and for the length of the lane. In the asphalt pavement area; no splicing, cut-in sections or patchwork will be accepted.

1.6 MATERIALS SAMPLING AND TESTING

A. Unless otherwise indicated, all sampling and testing will be in accordance with the methods prescribed in the current standards of the ASTM as applicable to the class and nature of the article or materials considered; however, the OWNER reserves the right to use any generally-accepted system of sampling and testing which, in the opinion of the ENGINEER will assure the OWNER that the quality of the workmanship is in full compliance with the Contract Documents.

B. Any waiver by the ENGINEER of any specific testing or other quality assurance measures, whether or not such waiver is accompanied by a guarantee of substantial performance as a relief from the testing or other quality assurance requirements originally indicated, and whether or not such guarantee is accompanied by a performance bond to assure execution of any necessary corrective or remedial WORK, shall not be construed as a waiver of any requirements of the Contract Documents.

C. The ENGINEER reserves the right to make independent investigations and tests, and failure of any portion of the WORK to meet any of the requirements of the Contract Documents

D. The Contractor shall employ and pay for the services of an independent testing laboratory for specified testing as indicated in the Contract Document or specified by the ENGINEER, OWNER or Engineering Inspector or Building Department Inspector.

E. The actions of the testing laboratory shall in no way relieve the Contractor of his obligations under the Contract. The laboratory testing work will include such evaluations and testing required by the Contract Documents, existing laws, codes, ordinances, etc. The testing laboratory will have no authority to change the requirements of the Contract Documents, nor perform, accept or approve any of the Contractor's Work.

F. The CONTRACTOR shall include the time required for testing of materials and equipment in his published schedule and the cost for testing of materials and equipment in its bid. The ENGINEER and OWNER will rely on this schedule to plan visits to manufacturing facilities and fabrication facilities for the purpose of inspecting workmanship and witness performance testing. Cost to the ENGINEER and OWNER for unscheduled or repeat inspections will be borne by the CONTRACTOR. The CONTRACTOR shall provide the services of representatives of the manufacturers of certain equipment, as specified in other sections of these Contract Documents. The CONTRACTOR shall, after the equipment has been field tested and prior to final acceptance certify in writing statements that the equipment has been installed to manufacturer requirements and is ready for functional operation.
G. Reports of testing, regardless of whether the testing was the OWNER'S or the CONTRACTOR'S responsibility, will be submitted to the ENGINEER in duplicate, indicating observations and results of tests and indicating compliance or non-compliance with Contract Documents.

H. The CONTRACTOR shall cooperate with the OWNER or independent firm and furnish samples of materials, design mix, equipment, tools, storage, and assistance as requested.

I. The CONTRACTOR shall furnish, all materials required by the ENGINEER, for testing, and is responsible for providing testing equipment, water, electric power, or fuel for the various evaluations and tests ordered. The CONTRACTOR will bear the cost of all tests, evaluations or investigations undertaken by the order of the ENGINEER for the purpose of determining conformance with the Contract Documents.

J. The CONTRACTOR shall notify the ENGINEER at least 5 working days in advance of asphalt work. CONTRACTOR shall provide certified testing of the temperature of each load as it is placed into the paver. Asphalt not meeting the temperature specification shall be rejected and returned to the plant.

K. The CONTRACTOR shall notify ENGINEER [32] hours prior to the expected time for operations requiring inspection and laboratory testing services.

L. For samples and tests required for CONTRACTOR'S use, the CONTRACTOR shall make arrangements with an independent firm for payment and scheduling of testing. The cost of sampling and testing for the CONTRACTOR'S use shall be the CONTRACTOR'S responsibility.

1.7 SITE INVESTIGATION AND CONTROL

A. The Contractor shall verify and control all dimensions for the WORK. The Contractor shall be solely responsible for any inaccuracies built in the Work due to its failure to comply with this requirement.

B. The Contractor shall evaluate ongoing related and appurtenant Work by others that conflicts with the CONTRACTOR’S ability to perform its WORK and report in writing to the ENGINEER the particular conditions that will prevent proper completion of the WORK. Failure to report any such changed conditions shall constitute acceptance of all site conditions.

1.8 RIGHT OF REJECTION

A. The ENGINEER and OWNER shall have the right, to reject any articles or materials that fail to meet the requirements of the Contract Documents or standards. If the ENGINEER through an oversight or otherwise, has accepted materials or Work which is defective or which fails to comply with to the Contract Documents, such materials, or WORK may be subsequently rejected by the ENGINEER.
B. The Contractor shall promptly remove rejected articles or materials from the site of the Work after notification of rejection. All costs of removal and replacement of rejected articles or materials as specified herein shall be borne by the Contractor.

C. Asphalt work rejected by the ENGINEER or OWNER shall be removed and reconstructed across the width of the lane and for the length of the lane. Cut-in sections or patchwork will not be accepted.

1.9 IMPERFECT WORK, EQUIPMENT, OR MATERIALS

A. Any defective or imperfect work, equipment, or materials furnished by the Contractor which is discovered before the final acceptance of the work, as established by the Certificate of Substantial Completion, or during the subsequent guarantee period, shall be removed and replaced.

B. The ENGINEER may order tests of imperfect or damaged work, equipment, or materials to determine its functional capability. The cost of such tests shall be borne by the Contractor, and the nature, tester, extent and supervision of the tests will be as determined by the ENGINEER. If the results of the tests indicate that the required functional capability of the work, equipment, or material is not impaired, consistent with the final general appearance of same, the work, or materials may be deemed acceptable. If the results of such tests reveal that the required functional capability is uncertain, or materials have been impaired, then such work or materials shall be deemed imperfect and shall be replaced.

1.10 ABANDONMENT AND SALVAGE OF EXISTING FACILITIES

A. General: The scope of work may require the Contractor to interface with existing structures, and piping which will be abandoned or otherwise removed and/or relocated as part of the work. The contractor shall submit a written plan of the intended operation to the ENGINEER a minimum of ten (10) days prior to a shut-down, disconnection or tie-in. The contractor’s plan of operation shall limit interruption of service to no more than a four (4) hour per occurrence. The Contractor shall not proceed without authorization from the ENGINEER, prior to performing the work. Prior to any shut-downs, tie-ins or disconnections to existing utilities the Contractor shall submit a plan of operation that include contingencies for spare materials and equipment to perform the work.

B. The Contractor shall abandon, salvage or otherwise remove existing pipelines or segments of existing pipelines shown to be abandoned in place, salvaged, or removed as part of the WORK. Pipe shown to be abandoned need only be removed a minimum three feet clear of new utilities. Abandon-in-place shall be defined as installing plugs, or other permanent closure, and grouting where indicated. The abandon-in-place pipe will remain buried unless otherwise noted.

C. Piping indicated on the Drawings as being removed, or any piping to be abandoned that interferes with new structures or piping, shall be excavated and removed using methods which will not disturb adjacent piping or other facilities. All pipe materials shall be subject to salvage by the OWNER as defined below.
D. Salvage: The OWNER may desire to salvage certain items of existing equipment which are to be dismantled and removed during the course of construction. Prior to removal of any existing equipment or piping from the site of work, the Contractor shall ascertain from the OWNER whether or not the particular item or items are to be salvaged. Items to be salvaged shall be stockpiled at a location as designated by the OWNER. All other items of equipment shall be disposed of off-site by the Contractor at his own expense, in accordance with applicable laws, ordinances and regulations. All existing meters removed must be salvaged.

1.11 SUBSURFACE INVESTIGATIONS

A. The Contractor shall be responsible for having determined to his satisfaction, prior to the submission of his bid, the nature and location of the work, the conformation of the ground, the character and quality of the substrata, the types and quantity of materials to be encountered, the nature of the groundwater condition, the character of equipment and facilities required preliminary to and during the performance of the work, the general and local conditions and all other matters which can in any way affect the work under this Contract. The prices established for the work to be done shall reflect all costs pertaining to the work. Any claims for extras based on the substrata or ground water table conditions will be disallowed.

B. The Contractor further acknowledges that he assumes all risk contingent upon the nature of the subsurface conditions actually encountered by him in performing the work covered by the Contract, even though such actual conditions may result in the Contractor performing more or less work than he originally anticipated.

C. The OWNER as part of Report of Geotechnical Engineering Services to this Contract Document is providing subsurface and water table data as part of the information to bidders but makes no guarantee, either expressed or implied, as to their accuracy or to the accuracy of any interpretation thereof.

1.12 OBSTRUCTIONS

A. All water pipes, storm drains, sanitary sewers, force mains, gas or other pipe, telephone or power cables or conduits and all other obstructions, whether or not shown, shall be temporarily supported across utility line excavations or relocated at the Contractor's expense. The Contractor shall be responsible for any damage to any such pipes, conduits, or structures. Approximate locations of known water, sanitary, drainage, power and telephone installations along route of new pipelines or in the vicinity of new work are shown but must be verified in the field by the Contractor. Any discrepancies or differences found shall be brought to the attention of the ENGINEER.

1.13 PROTECTION OF PROPERTY AND EXISTING FACILITIES

A. The CONTRACTOR shall protect all property that may be affected by his work or operations. The location and extent of underground and covered facilities are not
guaranteed, and the CONTRACTOR is cautioned to proceed with care in order to prevent the undermining or damage to existing structures, piping, or facilities.

B. When potable water is being used, the supply source shall be protected against contamination in accordance with existing codes and regulations. The CONTRACTOR shall contact and coordinate water use connections with the OWNER.

C. If the CONTRACTOR’s work disrupts or endangers any existing facilities or systems, the CONTRACTOR shall at its own expense make all necessary repairs or replacements necessary to correct the situation to the satisfaction of the ENGINEER and OWNER. Such corrective work shall progress CONTINUOUSLY to completion. The CONTRACTOR shall be responsible for the services of repair crews on call 24 hours per day for emergencies that arise involving WORK under this Contract.

D. Land Monuments - The CONTRACTOR shall notify the ENGINEER of any Federal, State, County, or private land monuments encountered. When government monuments are encountered, the CONTRACTOR shall notify the ENGINEER.

1.14 PROMPT REPAIR OF DAMAGES

A. Damages to any utilities are the responsibility of the CONTRACTOR and shall be promptly repaired at no cost to the OWNER. The CONTRACTOR will not be eligible for any delay claims ensuing from this damage.

1.15 WEATHER CONDITIONS

A. Work that may be adversely affected by inclement weather shall be suspended until proper conditions prevail. In the event of impending named storms, the CONTRACTOR shall take necessary precautions to protect all work, materials and equipment from exposure. The OWNER reserves the right, to order that additional protection measures over and beyond those proposed by the CONTRACTOR, be taken to safeguard all components of the project. The CONTRACTOR shall not claim any compensation for such precautionary measures so ordered, nor claim any compensation from the OWNER for damage to the work from the elements of weather.

1.16 FIRE PROTECTION

A. The CONTRACTOR shall take all necessary precautions to prevent fires at or adjacent to the work, including his own buildings and trailers. Adequate fire extinguisher and hose line stations shall be provided throughout the work area.

B. No new Fire Hydrants shall be installed on water lines until the lines can be pressurized and made operational.

C. The CONTRACTOR shall notify the City of Hallandale Beach Fire Marshall before any existing fire hydrant can be rendered inactive by the WORK. Inactive hydrants shall be clearly marked as prescribed by the City’s Fire Marshall.
PART 2 -- PRODUCTS (NOT USED)

PART 3 -- EXECUTION

3.1 INSTALLATION

A. Inspections: The CONTRACTOR shall inspect materials or equipment upon the arrival on the job site and immediately prior to installation and reject damaged and defective items.

B. Measurements: The CONTRACTOR shall verify measurements and dimensions of the WORK, as an integral step of starting each installation.

C. Manufacturer's Instructions: Where installations include manufactured products, the CONTRACTOR shall comply with manufacturer’s applicable instructions and recommendations for installation, to whatever extent these are more explicit or more stringent than applicable requirements indicated in Contract Documents.

END OF SECTION
01 50 00 MOBILIZATION

PART 1 -- GENERAL

1.1 THE SUMMARY

A. CONTRACTOR shall mobilize as required for the proper performance and completion of the WORK and in accordance with the Contract Documents.

B. Mobilization includes, but is not limited to, the following items:

1. Providing final Certificates of Insurance and Payment and Performance Bonds
2. Applying for submitting all required information for necessary permits.
3. Completing preconstruction videos and photographs
4. Arranging for and erection of CONTRACTOR’s Staging Area.
5. Moving equipment and materials necessary for the first month of operations onto the Work Site.
6. Having OSHA required notices and establishing safety programs.
7. Having the CONTRACTOR’s superintendent at the Site full time.
8. Submitting initial submittals.
9. Project coordination with the OWNER, ENGINEER, and Permitting Agencies

1.2 PAYMENT FOR MOBILIZATION

A. Payment for mobilization shall not exceed 5% of the contract price.

B. Payment for mobilization will be made at the lump sum bid price named on the Bid Summary form.

C. Partial payments for mobilization will be made as follows:
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<th>Construction % Complete</th>
<th>Allowable % of Lump Sum for Mobilization</th>
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PART 2 -- PRODUCTS (NOT USED)

PART 3 -- EXECUTION (NOT USED)

END OF SECTION
01 50 10  PROTECTION OF EXISTING FACILITIES

PART 1 -- GENERAL

1.1 GENERAL

A. The CONTRACTOR shall protect all existing utilities and improvements not designated for removal and shall restore damaged or temporarily relocated utilities and improvements to a condition equal to or better than prior to such damage or temporary relocation, all in accordance with the Contract Documents.

1.2 EXISTING UTILITIES AND IMPROVEMENTS

A. General: Existing utilities have been shown on the Drawings insofar as information was reasonable available; however, it is the CONTRACTOR’S responsibility to preserve all existing utilities whether shown on the plans or not. The CONTRACTOR shall protect underground Utilities and other improvements which may be impaired during construction operations, regardless of whether or not the Utilities are indicated on the Drawings. The CONTRACTOR shall take all possible precautions for the protection of unforeseen Utility lines to provide for uninterrupted service and to provide such special protection as may be necessary.

B. The CONTRACTOR shall be responsible for exploratory excavations as it deems necessary to determine the exact locations and depths of Utilities which may interfere with its work. All such exploratory excavations shall be performed as soon as practicable after Notice to Proceed and, in any event, a sufficient time in advance of construction to avoid possible delays to the CONTRACTOR's progress. When such exploratory excavations show the Utility location as shown on the Drawings to be in error, the CONTRACTOR shall so notify the ENGINEER.

C. The number of exploratory excavations required shall be that number which is sufficient to determine the alignment and grade of the Utility.

D. Damages to any utilities shall be promptly be repaired at the CONTRACTOR’S expense and at no additional cost to the OWNER. At the sole discretion of the OWNER, such repairs shall be repaired by the CONTRACTOR or another contractor retained by the CONTRACTOR. All repairs to existing utilities shall be in accordance with the utility owner’s current standards and the repairs shall be inspected and approved by the utility owner prior to acceptance by the OWNER. Any delays ensuing from repairing damage utilities will be considered inexcusable and the OWNER will have the right to hire a contractor to repair the damage and charge the CONTRACTOR for the costs associated.

E. Utilities to be Moved: In case it shall be necessary to move the property of any public utility or franchise holder, such utility company or franchise holder will, upon request of the CONTRACTOR, be notified by the OWNER to move such property within a specified reasonable time. When utility lines are to be removed are encountered within the area of
operations the CONTRACTOR shall notify the ENGINEER a sufficient time in advance for the necessary measures to be taken to prevent interruption of service.

F. Utilities to be Removed: Where the proper completion of the WORK requires the temporary or permanent removal and/or relocation of an existing Utility or other improvement which is indicated, the CONTRACTOR shall remove and, without unnecessary delay, temporarily replace or relocate such Utility or improvement in a manner satisfactory to the ENGINEER and the owner of the facility. In all cases of such temporary removal or relocation, restoration to the former location shall be accomplished by the CONTRACTOR in a manner that will restore or replace the Utility or improvement as nearly as possible to its former locations and to as good or better condition than found prior to removal.

G. OWNER's Right of Access: The right is reserved to the OWNER and to the owners of public utilities and franchises to enter at any time upon any public street, alley, right-of-way, or easement for the purpose of making changes in their property made necessary by the WORK of this Contract.

H. Underground Utilities Indicated: Existing Utility lines that are indicated or the locations of which are made known to the CONTRACTOR prior to excavation and that are to be retained, and all Utility lines that are constructed during excavation operations shall be protected from damage during excavation and backfilling and, if damaged, shall be immediately repaired or replaced by the CONTRACTOR, unless otherwise repaired by the owner of the damaged Utility. If the owner of the damaged facility performs its own repairs, the CONTRACTOR shall reimburse said owner for the costs of repair.

I. Underground Utilities Not Indicated: In the event that the CONTRACTOR damages existing Utility lines that are not indicated or the locations of which are not made known to the CONTRACTOR prior to excavation, a verbal report of such damage shall be made immediately to the ENGINEER and a written report thereof shall be made promptly thereafter. The ENGINEER will immediately notify the owner of the damaged Utility. If the ENGINEER is not immediately available, the CONTRACTOR shall notify the Utility owner of the damage.

J. Approval of Repairs: All repairs to a damaged Utility or improvement are subject to inspection and approval by an authorized representative of the Utility or improvement owner before being concealed by backfill or other work.

K. Maintaining in Service: Unless indicated otherwise, oil and gasoline pipelines, power, and telephone or the communication cable ducts, gas and water mains, irrigation lines, sewer lines, storm drain lines, poles, and overhead power and communication wires and cables encountered along the line of the WORK shall remain continuously in service during all the operations under the Contract, unless other arrangements satisfactory to the ENGINEER are made with the owner of said pipelines, duct, main, irrigation line, sewer, storm drain, pole, or wire or cable. The CONTRACTOR shall be responsible for and shall repair all damage due to its operations, and the provisions of this Section shall not be abated even in the event such damage occurs after backfilling or is not discovered until after completion of the backfilling.
1.3 TREES OR SHRUBS WITHIN PROJECT LIMITS

A. General: Except where trees or shrubs are indicated to be removed, the CONTRACTOR shall exercise all necessary precautions so as not to damage or destroy any trees or shrubs, including those lying within street rights-of-way and project limits, and shall not trim or remove any trees unless such trees have been approved for trimming or removal by the jurisdictional agency or OWNER. Existing trees and shrubs which are damaged during construction shall be trimmed or replaced by the CONTRACTOR or a certified tree company under permit from the jurisdictional agency and/or the OWNER. Tree trimming and replacement shall be accomplished in accordance with the following paragraphs.

B. Trimming: Symmetry of the tree shall be preserved; no stubs or splits or torn branches left; clean cuts shall be made close to the trunk or large branch. Spikes shall not be used for climbing live trees. Cuts over 1-1/2 inches in diameter shall be coated with a tree paint product that is waterproof, adhesive, and elastic, and free from kerosene, coal tar, creosote, or other material injurious to the life of the tree.

C. Replacement: The CONTRACTOR shall immediately notify the jurisdictional agency and/or the OWNER if any tree or shrub is damaged by the CONTRACTOR's operations. If, in the opinion of said agency or the OWNER, the damage is such that replacement is necessary, the CONTRACTOR shall replace the tree or shrub at its own expense. The tree or shrub shall be of a like size and variety as the one damaged, or, if of a smaller size, the CONTRACTOR shall pay to the owner of said tree a compensatory payment acceptable to the tree or shrub owner, subject to the approval of the jurisdictional agency or OWNER. The size of the tree or shrub shall be not less than 1-inch diameter nor less than 6 feet in height.

1.4 LANDSCAPED AREAS

A. Landscaped or sodded areas damaged during construction shall be repaired to match the pre-construction condition to the satisfaction of the OWNER.

1.5 NOTIFICATION BY CONTRACTOR LANDSCAPED AREAS

A. The CONTRACTOR shall contact all existing utility companies and owners to determine the location of all existing utility lines and services not less than 3 days nor more than 7 days prior to excavation so that a representative of said owners or agencies can be present during such work if they so desire.

1. The CONTRACTOR shall contact “Sunshine State One-Call” a minimum of 48 hours in advance of any excavation. The CONTRACTOR shall provide the ENGINEER and OWNER with a copy of the ticket.

2. The CONTRACTOR shall provide written notification to owners of utilities that are not a member of Sunshine State One-Call or when utilities are located on private property a minimum of 72 hours prior to excavation.

1.6 PROTECTION OF STREET OR ROADWAY MARKERS
The CONTRACTOR shall not destroy, remove, or otherwise disturb any existing survey markers or other existing street or roadway markers without proper authorization. No pavement breaking or excavation shall be started until all survey or other permanent marker points that will be disturbed by the construction operations have been properly referenced. Survey markers or points disturbed by the CONTRACTOR shall be accurately restored after street or roadway resurfacing has been completed.

1.7 RESTORATION OF PAVEMENT

A. General: All paved areas including asphaltic concrete berms cut or damaged during construction shall be replaced with similar materials of equal thickness to match the existing adjacent undisturbed areas, except where specific resurfacing requirements have been called for in the Contract Documents or in the requirements of the agency issuing the permit. The pavement restoration requirement to match existing sections shall apply to all components of existing sections, including sub-base, base, and pavement. Temporary and permanent pavement shall conform to the requirements of the affected pavement owner. Pavements which are subject to partial removal shall be neatly saw cut in straight lines.

B. Temporary Resurfacing: Wherever required by the public authorities having jurisdiction, the CONTRACTOR shall place temporary surfacing promptly after backfilling and shall maintain such surfacing for the period of time fixed by said authorities before proceeding with the final restoration of improvements.

C. Permanent Resurfacing: In order to obtain a satisfactory junction with adjacent surfaces, the CONTRACTOR shall saw cut back and trim the edge so as to provide a clean, sound, vertical joint before permanent replacement of an excavated or damaged portion of pavement. Damaged edges of pavement along excavations and elsewhere shall be trimmed back by saw cutting in straight lines. All pavement restoration and other facilities restoration shall be constructed to finish grades compatible with adjacent undisturbed pavement.

D. Restoration of Sidewalks or Private Driveways: Wherever sidewalks or private roads have been removed for purposes of construction, the CONTRACTOR shall place suitable temporary sidewalks or roadways promptly after backfilling and shall maintain them in satisfactory condition for the period of time fixed by the authorities having jurisdiction over the affected portions. If no such period of time is so fixed, the CONTRACTOR shall maintain said temporary sidewalks or roadways until the final restoration thereof has been made.

PART 2 -- PRODUCTS (NOT USED)

PART 3 -- EXECUTION (NOT USED)
MAINTENANCE OF TRAFFIC PLAN

PART 1 -- GENERAL

1.1 GENERAL

A. The CONTRACTOR shall maintain traffic within the limits of the project for the duration of the construction period, including any temporary suspensions of the work, construct and maintain detours, provide facilities for access to residences, clubhouse, businesses, etc., along the project, furnish, install and maintain traffic control and safety devices during construction, furnish and install work zone pavement markings for maintenance of traffic in construction areas and provide any other special requirements for safe and expeditious movement of traffic specified on the plans. Maintenance of Traffic includes all facilities, devices and operations as required for safety and convenience of the public within the work zone and shall include provisions for pedestrian and school student traffic as well as vehicular traffic.

B. The CONTRACTOR shall not maintain traffic over those portions of the project where no work is to be accomplished or where construction operations will not affect existing roads. Do not obstruct or create a hazard to any traffic during the performance of the work and repair any damage to existing pavement open to traffic.

C. **Beginning Date of Contractor's Responsibility:** Maintain traffic starting the day work begins on the project or on the first day Contract time is charged, whichever is earlier. No work shall commence without approved and constructed Traffic Control Plans in place.

D. **Worksite Traffic Supervisor:** The CONTRACTOR shall provide a Certified Worksite Traffic Supervisor. Requirements are as follows:

1. Ensure that the Worksite Traffic Supervisor is available on a 24-hour per day basis, participates in all changes to traffic control and reviews the project on a day-to-day basis.

2. Ensure that the Worksite Traffic Supervisor is present to direct the initial setup of the traffic control plan and any changes. Provide the Worksite Traffic Supervisor with all equipment and materials needed to set up and maintain traffic control and handle traffic-related situations.

3. Ensure that the Worksite Traffic Supervisor immediately corrects all safety deficiencies. Do not allow minor deficiencies that are not immediate safety hazards to remain uncorrected for more than 24 hours.

4. Ensure that the Worksite Traffic Supervisor is available within 45 minutes after notification of an emergency situation and is prepared to positively respond to repair the work zone traffic control or to provide alternate traffic arrangements.
5. The City may disqualify and remove from the project a Worksite Traffic Supervisor that fails to comply with the provisions of this specification. The OWNER may suspend all activities, except traffic and erosion control and such other activities that are necessary for project maintenance and safety, for failure to comply with these provisions.

6. Ensure that the Worksite Traffic Supervisor performs a drive-through inspection and observes traffic flow as soon as the work zone is activated and in each subsequent phase of work as they are opened to traffic. Provide to the ENGINEER a report listing any deficiencies and proposed corrective measures.

7. Ensure that the Worksite Traffic Supervisor conducts within the limits of the project, daily daytime and weekly night time inspections within the limits of the project for projects with predominate daytime work activities and daily nighttime and weekly daytime inspections for projects with predominate nighttime work, of all traffic control devices, traffic flow, pedestrian, bicyclist, and business accommodations.

8. Advise the project personnel of the schedule of these inspections and give them the opportunity to join in the inspection as is deemed necessary. Submit a comprehensive weekly report to the ENGINEER and include condition of all traffic control devices (including pavement markings) being used. The inspection report shall also include assurances that pedestrians are accommodated with a safe travel path around work sites and safely separated from mainline traffic, that existing or detoured bicyclist paths and bus routes and stops are being maintained satisfactorily throughout the project limits, and that existing businesses in work areas are being provided with adequate entrances for vehicular and pedestrian traffic during business hours. The Worksite Traffic Supervisor shall sign the report and certify that all of the above issues are being handled in accordance with the Contract Documents. If deficiencies are noted, the Worksite Traffic Supervisor shall note such deficiencies and include the proposed corrective actions.

E. Traffic Control Plan:

1. The CONTRACTOR is responsible for preparing a Traffic Control Plan (TCP) to be signed and sealed by a licensed Florida ENGINEER competent and trained in the preparation of a TCP. The TCP shall meet the requirements of the MUTCD Part VI, the ENGINEER, and the following jurisdictional agencies.

   a. City of Hallandale
   
   b. School Board of Broward County
   
   c. Broward County Traffic Engineering Department

2. The CONTRACTOR shall be responsible for contacting and coordinating with all emergency services from the City of Hallandale Beach and Broward County and notifying them of road closures, detours, and other elements of the TCP and WORK that may impact emergency services from access.
F. **Standards:** FDOT Design Standards (DS) are the minimum standards for the use in the development of all traffic control plans. The MUTCD Part VI is the minimum national standard for traffic control for highway construction, maintenance, and utility operations. Follow the basic principles and minimum standards contained in these documents for the design, application, installation, maintenance, and removal of all traffic control devices, warning devices and barriers which are necessary to protect the public and workers from hazards within the project limits.

G. The CONTRACTOR shall provide sufficient time in the construction schedule to develop and obtain approval for each TCP.

**PART 2 -- PRODUCTS (NOT USED)**

**PART 3 -- EXECUTION**

3.1 **EXECUTION**

A. **Maintenance of Roadway Surfaces:** Maintain all lanes that are being used for the maintenance of traffic, including those on detours and temporary facilities, under all weather conditions. Keep the lanes free of dust, dirt, muck, potholes and rutting. Provide the lanes with the drainage facilities necessary to maintain a smooth riding surface under all weather conditions.

B. **Traffic Lanes:**

1. The CONTRACTOR shall provide continuous access for all residents to and from their homes.

2. If required to complete the WORK, the CONTRACTOR may close a roadway to thru traffic. However, access to residents and emergency vehicles shall be maintained at all times.

3. During all non-construction hours, the CONTRACTOR shall adequately mark and secure the WORK area to ensure the safety of residents and vehicular traffic.

C. **Crossings and Intersections:** Provide and maintain adequate accommodations for intersecting and crossing traffic. Do not block or unduly restrict any road or street crossing the project unless approved by the ENGINEER. Maintain all existing actuated or traffic responsive mode signal operations for main and side street movements for the duration of the Contract. Restore any loss of detection within 12 hours. Use only detection technology approved by the ENGINEER to restore detection capabilities. Before beginning any construction, provide the ENGINEER a plan for maintaining detection devices for each intersection and the name(s) and phone numbers of persons that can be contacted when signal operation malfunctions.

D. **Access for Residences and Businesses:** Provide continuous access to all residences and all places of business, residences and clubhouses.
E. **Protection of the Work from Injury by Traffic:** Where traffic would be injurious to a base, surface course, or structure constructed as a part of the work, maintain all traffic outside the limits of such areas until the potential for injury no longer exists.

F. **Use of High Visibility Safety:** Provide personnel with appropriate high visibility safety garments. Ensure that these garments be worn whenever the workers are within 15 feet of the edge of the travel way and during nighttime operations. Workers operating machinery or equipment in which loose clothing could become entangled during operation shall be required to wear appropriate high visibility clothing that will not be subject to entanglement such as orange shirts or jackets. Require CONTRACTOR personnel to wear reflective orange vest/garment during nighttime operations.

G. **Existing Pavement Markings:** Where a detour changes the lane use or where normal vehicle paths are altered during construction, remove all existing pavement markings that will conflict with the adjusted vehicle paths. Do not overpaint. Remove existing pavement markings using a method that will not damage the surface texture of the pavement and which will eliminate the previous marking pattern regardless of weather and light conditions. Remove all pavement markings that will be in conflict with “next phase of operation” vehicle paths as described above, before opening to traffic.

H. **Detours:**

1. General: Construct and maintain detour facilities wherever it becomes necessary to divert traffic from any existing roadway or bridge, or wherever construction operations block the flow of traffic.

2. Construction: Plan, construct, and maintain detours for the safe passage of traffic in all conditions of weather. Provide the detour with all facilities necessary to meet this requirement.

3. Construction Methods: Select and use construction methods and materials that provide a stable and safe detour facility. Construct the detour facility to have sufficient durability to remain in good condition, supplemented by maintenance, for the entire period that the detour is required.

4. Removal of Detours: Remove detours when they are no longer needed and before the Contract is completed. Restore the area used for detours to a condition equal to or better than existed before beginning of construction. Take ownership of all materials from the detour and remove them.

5. Detours Over Existing Roads and Streets: When the TCP specifies that traffic be detoured over roads or streets outside the project area, do not maintain such roads or streets. However, maintain all signs and other devices placed for the purpose of the detour.

I. **Traffic Control Officer:**
1. Provide uniformed law enforcement officers, including marked law enforcement vehicles, to assist in controlling and directing traffic in the work zone when traffic control in a signalized intersection is necessary when signals are not in use.

J. Driveway Maintenance:

1. General: Ensure that each residence and or business has safe, stable, and reasonable access.

2. Construction Methods: Place, level, manipulate, compact, and maintain the material, to the extent appropriate for the intended use. As permanent driveway construction is accomplished at a particular location, the CONTRACTOR may salvage and reuse previously placed materials that are suitable for reuse on other driveways.

K. Temporary Traffic Control Devices:

1. Installation and Maintenance: Install and maintain adequate traffic control devices, warning devices and barriers to protect the traveling public and workers, and to safeguard the work area. Erect the required traffic control devices, warning devices and barriers to prevent any hazardous conditions and in conjunction with any necessary traffic re-routing. Immediately remove, turn or cover any devices or barriers that do not apply to existing conditions.

2. Notify the ENGINEER of any scheduled operation, which will affect traffic patterns or safety, sufficiently in advance of commencing such operation to permit his review of the plan for the proposed installation of traffic control devices, warning devices or barriers.

3. Ensure an employee is assigned the responsibility of maintaining the position and condition of all traffic control devices, warning devices and barriers throughout the duration of the Contract. Keep the ENGINEER advised at all times of the identification and means of contacting this employee on a 24-hour basis.

4. Keep traffic control devices, warning devices, safety devices and barriers in the correct position, properly directed, clearly visible and clean, at all times. Immediately repair, replace or clean damaged, defaced or dirty devices or barriers.

L. Work Zone Signs: Provide signs in accordance with the approved TCPs and Design Standards.

M. Warning/Channelizing Devices: Furnish warning/channelizing devices in accordance with the approved TCPs and Design Standards.

N. Reflective Collars for Traffic Cones: At night use cone collars, designed to properly fit the taper of the cone when installed. Place the upper 6 inches collar a uniform 3 1/2-inch distance from the top of the cone and the lower 4-inch collar a uniform 2-inch distance below the bottom of the upper 6 inch collar. Ensure that the collars are capable of being removed for temporary use or attached permanently to the cone in accordance with the
manufacturer’s recommendations. Provide white sheeting having a smooth outer surface and that essentially has the property of a retroreflector over its entire surface.

O. **Barrier Wall (Temporary):** Furnish, install, maintain, remove and relocate a temporary barrier wall in accordance with the approved TCPs.

P. **Glare Screen (Temporary):** Furnish, install, maintain, remove and relocate glare screen systems in conjunction with temporary barrier wall at locations identified in the approved TCPs. Ensure the anchorage of the glare screen to the barrier is capable of safely resisting an equivalent tensile load of 600 lb/ft of glare screen, with a requirement to use a minimum of three fasteners per barrier section. When glare screen is utilized on temporary barrier wall, warning lights will not be required.

Q. **Advance Warning Arrow Panel:** Furnish advance warning panel in accordance with the plans and Design Standards approved TCPs

R. **Temporary Traffic Control Signals:** Furnish, install and operate temporary traffic control signals as indicated in approved TCPs. Temporary traffic control signals will consist of either portable or fixed traffic signals. Provide certification that the portable traffic signals meet the requirements of the Design Standards. The ENGINEER may approve used signal equipment if it is in acceptable condition.

S. **Work Zone Pavement Marking:**

1. Description: Furnish and install Work Zone Pavement Markings for maintenance of traffic in construction areas as required. Measure the reflectivity of white and yellow stripes in accordance with Florida Method FM 5-541. Re-stripe anytime the reflectivity falls below the final values shown in FM 5-541. Use only pavement marking materials that do not contain any lead or chromium compounds.

2. Where the existing roadway has pavement markings, centerlines, lane lines, edge lines, stop bars and turn arrows in work zones will be required in accordance with the MUTCD with the following additions:

   a. Apply Work Zone Pavement Markings, including arrows and messages as determined by the ENGINEER or permitting agencies to be required for the safe operation of traffic. Channelizing devices may be used to direct traffic during the day before placing the Work Zone Pavement Markings.

   b. Work Zone Pavement Markings shall be designated in the approved TCPs as removable or non-removable.

END OF SECTION
01 53 00    HURRICANE PREPAREDNESS

PART 1 -- GENERAL

1.1 THE REQUIREMENT

A. The CONTRACTOR is responsible for having plans for protection of the WORK site during
   hurricanes and shall prepare and submit a Hurricane Preparedness Plan prior to any
   construction activity and mobilization.

B. The Hurricane Preparedness Plan shall be submitted to the ENGINEER and the OWNER
   at the Preconstruction Meeting for approval and shall include the following:

   1. Items and equipment that must be removed from the WORK site.

   2. Methods and materials that will be utilized to secure the materials and WORK site.

   3. Methods and materials that will be utilized to protect uncompleted WORK items.

   4. Plan for maximizing traffic lanes for evacuation.

   5. Items that must commence at the time of hurricane watch in order to be completed prior
      to evacuation.

C. When the National Weather Service issues a Hurricane Watch for Broward, Miami-Dade,
   or Palm Beach County, the CONTRACTOR shall begin preparations to implement the
   Hurricane Preparedness Plan. When the National Weather Service issues a Hurricane
   Warning for Broward County, the CONTRACTOR shall immediately implement the
   Hurricane Preparedness Plan.

D. The cost of preparing and implementing the Hurricane Preparedness Plan shall be the
   responsibility of the CONTRACTOR. Hurricane watch and warning will be grounds for
   contract time extensions.

1.2 CONTRACTOR SUBMITTALS

A. Submittals of the Hurricane Preparedness Plan shall be in accordance with Section 01300
   Contractor Submittals

PART 2 -- PRODUCTS (NOT USED)

PART 3 -- EXECUTION (NOT USED)

END OF SECTION
01 55 00  SITE ACCESS AND STORAGE

PART 4 -- GENERAL

4.1 ROADWAY LIMITATIONS

A. The CONTRACTOR shall make its own investigation of the condition of available public and private roads and of clearances, restrictions, bridge load limits, and other limitations affecting transportation and ingress and egress to the site of the WORK.

B. It shall be the CONTRACTOR's responsibility to determine the maximum loads, height, and size of trucks on the existing access roads to the Site for delivery of equipment and parts.

4.2 TEMPORARY ACCESS

A. General: Continuous, unobstructed, safe, and adequate pedestrian and vehicular access shall be provided to fire hydrants, commercial and industrial establishments, churches, schools, parking lots, service stations, motels, fire and police stations, and hospitals. Safe and adequate public transportation stops and pedestrian crossings at intervals not exceeding 300-feet shall be provided. The CONTRACTOR shall cooperate with parties involved in the delivery of mail and removal of trash and garbage so as to maintain existing schedules for such services. Vehicular access to residential driveways shall be maintained to the property line except when necessary construction precludes such access for reasonable periods of time.

B. Temporary Bridges: Wherever necessary, to maintain vehicular crossings, the CONTRACTOR shall provide suitable temporary bridges or steel plates over unfilled excavations, except in such cases as the CONTRACTOR shall secure the written consent of the responsible individuals or authorities to omit such temporary bridges or steel plates, which written consent shall be delivered to the ENGINEER prior to excavation. Such bridges or steel plates shall be maintained in service until access is provided across the backfilled excavation. Temporary bridges or steel plates for street and highway crossing shall conform to the requirements of the authority having jurisdiction in each case, and the CONTRACTOR shall adopt designs furnished by said authority for such bridges or steel plates, or shall submit designs to said authority for approval, as may be required.

C. Street Use: Nothing herein shall be construed to entitle the CONTRACTOR to the exclusive use of any public street, alleyway, or parking area during the performance of the WORK hereunder, and it shall conduct its operations to not interfere unnecessarily with the authorized work of utility companies or other agencies in such streets, alleyways, or parking areas. No street shall be closed to the public without first obtaining permission of the ENGINEER and proper governmental authority. Where excavation is being performed in primary streets or highways, one lane in each direction shall be kept open to traffic at all times unless otherwise indicated. Toe boards shall be provided to retain excavated material if required by the ENGINEER or the agency having jurisdiction over the street or highway. Fire hydrants on or adjacent to the WORK shall be kept accessible to fire-fighting
equipment. Temporary provisions shall be made by the CONTRACTOR to assure the use of sidewalks and the proper functioning of gutters, storm drain inlets, and other drainage facilities.

D. Traffic Control: Traffic control shall be provided by CONTRACTOR as specified in Specification 01 52 50 – Maintenance of Traffic Plan

E. Temporary Driveway Closure: The CONTRACTOR shall notify the owner or occupant (if not owner-occupied) of the closure of the driveways to be closed at least 3 working days prior to the closure. The CONTRACTOR shall minimize the inconvenience and minimize the time period that the driveways will be closed. The CONTRACTOR shall fully explain to the owner/occupant how long the closure will take and when closure will start.

4.3 CONTRACTOR’S WORK AND STORAGE AREA

A. The CONTRACTOR shall make its own arrangements for any necessary off-Site storage or shop areas necessary for the proper execution of the WORK.

B. The CONTRACTOR’S staging areas shall be kept in a clean and orderly fashion at all times. The areas will be sloped to drain off all storm runoff. The entrance to the storage areas shall be constructed in accordance with the drawings with a drainage pipe to protect the swale and an entrance driveway of 6 inches of crushed stone road base laid on suitable geotextile (filter fabric). Sediment control traps shall be positioned so as to ensure that downstream catch basins and drains are protected from runoff containing silt from the temporary areas. A sedimentation trap can be constructed by either excavating below grade or building an embankment across a swale and an open-channel spillway provided. Silt fence shall be provided around all central storage areas, limerock and central soil stockpiles.

C. The CONTRACTOR shall construct and use a separate storage area for hazardous materials used in constructing the WORK.

D. For the purpose of this paragraph, hazardous materials to be stored in the separate area are products labeled with any of the following terms: Warning, Caution, Poisonous, Toxic, Flammable, Corrosive, Reactive, or Explosive. In addition, whether or not so labeled, the following materials shall be stored in the separate area: diesel fuel, gasoline, new and used motor oil, hydraulic fluid, cement, paints and paint thinners, 2 part epoxy coatings, sealants, asphaltic products, glues, solvents, wood preservatives, sand blast materials, and spill absorbent.

1. Hazardous materials shall be stored in groupings according to the Material Safety Data Sheets.

2. The CONTRACTOR shall develop and submit to the ENGINEER a plan for storing and disposing of the materials above.

3. The CONTRACTOR shall obtain and submit to the ENGINEER a single EPA number for wastes generated at the Site.
4. The separate storage area shall meet the requirements of authorities having jurisdiction over the storage of hazardous materials. Such authorities include the Florida Department of Environmental Protection and Broward County Environmental Protection Department.

5. Hazardous materials that are delivered in containers shall be stored in the original containers until use. Hazardous materials delivered in bulk shall be stored in containers which meet the requirements of authorities having jurisdiction.

PART 5 -- PRODUCTS (NOT USED)

PART 6 -- EXECUTION (NOT USED)

END OF SECTION
TEMPORARY ENVIRONMENTAL CONTROLS

PART 1 -- GENERAL

1.1 EXPLOSIVES AND BLASTING

A. The use of explosives to accomplish any of the Work will not be permitted.

1.2 DUST ABATEMENT

A. The CONTRACTOR shall furnish all labor, equipment, and means required and shall carry out effective measures wherever and as often as necessary to prevent its operation from producing dust in amounts damaging to property, cultivated vegetation, or domestic animals, or causing a nuisance to persons living in or occupying buildings in the vicinity. The Contractor shall be responsible for any damage resulting from any dust originating from its operations. The dust abatement measures shall be continued until the Contractor is relieved of further responsibility by the ENGINEER, CITY, and the City of Hallandale Beach. No separate payment will be allowed for dust abatement measures and all costs thereof shall be included in the Contractor's bid price. The Contractor shall control dust and sedimentation and provide abatements measures in accordance with rules, regulations and City Ordinances.

B. All disturbed areas, unpaved streets, roads, parking areas, detours, or haul-roads used in the construction or storage areas must utilize approved dust-preventive treatment or periodically apply water to prevent dust as practical, and as directed by the ENGINEER or CITY. Applicable environmental regulations for dust prevention shall be strictly enforced.

1.3 RUBBISH CONTROL

A. During the progress of the Work, the Contractor shall keep the site of the Work and other areas used by it in a neat and clean condition, and free from any accumulation of rubbish. The Contractor shall dispose of all rubbish and waste materials of any nature occurring at the Work site and shall establish regular intervals of collection and disposal of such materials and waste. The Contractor shall also keep its haul roads and storage areas free from dirt, rubbish, and unnecessary obstructions resulting from its operations. Disposal of all rubbish and surplus materials shall be off the site of construction in accordance with local codes and ordinances governing locations and methods of disposal, and in conformance with all applicable safety laws, and to the particular requirements of Part 1926 of the OSHA Safety and Health Standards for Construction.

B. The Contractor shall furnish and pay for disposal of waste to include garbage and construction and demolition debris in accordance with applicable City codes and exclusive solid waste franchise agreements. All solid waste containers and roll-offs shall be provided in accordance with the City of Hallandale requirements and exclusive solid waste
franchise agreements. All solid waste containers and roll-offs within the City of Hallandale for garbage shall be provided by Waste Management or in accordance with subsequent agreements; construction and demolition debris in the City shall be provided by any of the following four (4) haulers: All Service Refuge, Waste Management, Choice Environmental or Southern Waste Systems or in accordance with subsequent agreements.

1.4 CHEMICALS

A. All chemicals used during project construction or furnished for project operation, whether defoliant, soil sterilant, herbicide, pesticide, disinfectant, polymer, paint, fuel, solvent or reactant of other classification, shall show approval of either the U.S. Environmental Protection Agency or the U.S. Department of Agriculture. The handling, storage, use and disposal of all such chemicals and disposal of residues shall be in strict accordance with all applicable rules and regulations of Federal, State and local jurisdictional agencies and the printed instructions of the manufacturer and all regulatory requirements. Copies of antidote literature and a supply of antidotes shall be kept at the storage site and at the Contractor's job site office.

1.5 NOISE CONTROL

A. Noise resulting from the Contractor's work shall not exceed the noise levels and other requirements stated in local ordinances. The Contractor shall be responsible for curtailing noise resulting from its operation. He shall, upon written notification from the ENGINEER, CITY or the City of Hallandale Beach noise control officers, make any repairs, replacements, adjustments, additions and furnish mufflers when necessary to fulfill requirements.

1.6 PRECAUTIONS DURING ADVERSE WEATHER

A. During adverse weather, and against the possibility thereof, the Contractor shall take all necessary precautions so that the Work may be properly done and satisfactory in all respects. When required, protection shall be provided by use of tarpaulins, wood and building paper shelters, or other acceptable means. The Contractor shall be responsible for all changes caused by adverse weather.

B. The ENGINEER or CITY may suspend construction operations at any time when, in its judgment, the conditions are unsuitable or the proper precautions are not being taken, whatever the weather conditions may be, in any season.

1.7 HURRICANE AND STORM WARNINGS

A. The Contractor shall take all precautions necessary to protect the job site during hurricane and storm watches and warnings as outlined in Specification 01 53 00 - Hurricane Preparedness.
PART 2 -- PRODUCTS (NOT USED)

PART 3 -- EXECUTION (NOT USED)

END OF SECTION
PART 1 -- GENERAL

1.1 DEFINITIONS

A. The word "Products," as used in the Contract Documents, is defined to include purchased items for incorporation into the WORK, regardless of whether specifically purchased for the project or taken from CONTRACTOR's stock of previously purchased products. The word "Materials," is defined as products which must be substantially cut, shaped, worked, mixed, finished, refined, or otherwise fabricated, processed, installed, or applied to form WORK. The word "Equipment" is defined as products with operational parts, regardless of whether motorized or manually operated, and particularly including products with service connections (wiring, piping, and other like items). Definitions in this paragraph are not intended to negate the meaning of other terms used in the Contract Documents, including "specialties," "systems," "structure," "finishes," "accessories," "furnishings," special construction," and similar terms, which are self-explanatory and have recognized meanings in the construction industry.

B. Neither "Products" nor "Materials" nor "Equipment" includes machinery and equipment used for preparation, fabrication, conveying, and erection of the WORK.

1.2 QUALITY ASSURANCE

A. **Source Limitations:** To the greatest extent possible for each unit of WORK, the CONTRACTOR shall provide products, materials, and equipment of a singular generic kind from a single source.

B. **Compatibility of Options:** Where more than one choice is available as options for CONTRACTOR's selection of a product, material, or equipment, the CONTRACTOR shall select an option which is compatible with other products, materials, or equipment. Compatibility is a basic general requirement of product, material and equipment selections.

1.3 PRODUCT DELIVERY AND STORAGE

A. The CONTRACTOR shall deliver and store the WORK in accordance with manufacturer's written recommendations and by methods and means which will prevent damage, deterioration, and loss including theft. Delivery schedules shall be controlled to minimize long-term storage of products at the Site and overcrowding of construction spaces. In particular, the CONTRACTOR shall ensure coordination to ensure minimum holding or storage times for flammable, hazardous, easily damaged, or sensitive materials to deterioration, theft, and other sources of loss.
1.4 TRANSPORTATION AND HANDLING

A. Products shall be transported by methods to avoid damage and shall be delivered in undamaged condition in manufacturer's unopened containers and packaging.

B. The CONTRACTOR shall provide equipment and personnel to handle products, materials, and equipment [including those furnished by OWNER,] by methods to prevent soiling and damage.

C. The CONTRACTOR shall provide additional protection during handling to prevent marring and otherwise damaging products, packaging, and surrounding surfaces.

1.5 STORAGE AND PROTECTION

A. Products shall be stored in accordance with manufacturer's written instructions and with seals and labels intact and legible. Sensitive products shall be stored in weather-tight climate-controlled enclosures and temperature and humidity ranges shall be maintained within tolerances required by manufacturer's recommendations.

B. For exterior storage of fabricated products, products shall be placed on sloped supports above ground. Products subject to deterioration shall be covered with impervious sheet covering and ventilation shall be provided to avoid condensation.

C. Loose granular materials shall be stored on solid flat surfaces in a well-drained area and shall be prevented from mixing with foreign matter.

D. Storage shall be arranged to provide access for inspection. The CONTRACTOR shall periodically inspect to assure products are undamaged and are maintained under required conditions.

E. Storage shall be arranged in a manner to provide access for maintenance of stored items and for inspection.

1.6 MAINTENANCE OF PRODUCTS IN STORAGE

A. Stored products shall be periodically inspected on a scheduled basis. The CONTRACTOR shall maintain a log of inspections and shall make the log available on request.

B. The CONTRACTOR shall comply with manufacturer's product storage requirements and recommendations.

C. The CONTRACTOR shall maintain manufacturer-required environmental conditions continuously.

D. The CONTRACTOR shall ensure that surfaces of products exposed to the elements are not adversely affected and that weathering of finishes does not occur.
E. For mechanical and electrical equipment, the CONTRACTOR shall provide a copy of the manufacturer’s service instructions with each item and the exterior of the package shall contain notice that instructions are included.

F. Products shall be serviced on a regularly scheduled basis, and a log of services shall be maintained and submitted as a record document prior to final acceptance by the OWNER in accordance with the Contract Documents.

1.7 PROPOSED SUBSTITUTIONS OR “OR-EQUAL” ITEM

A. The CONTRACTOR’S bid price shall include materials or equipment meeting the specifications. Proposed substitutions will only be considered following award of the Contract as described herein.

B. Whenever materials or equipment are indicated in the Contract Documents by using the name of a proprietary item or the name of a particular manufacturer, the naming of the item is intended to establish the type, function, and quality required. If the name is followed by the words "or equal" indicating that a substitution is permitted, materials or equipment of other manufacturers may be accepted if sufficient information is submitted by the CONTRACTOR to allow the ENGINEER to determine that the material or equipment proposed is equivalent or equal to that named, subject to the following requirements:

1. The burden of proof as to the type, function, and quality of any such substitution product, material or equipment shall be upon the CONTRACTOR.

2. The ENGINEER will be the sole judge as to the type, function, and quality of any such substitution and the ENGINEER’s decision shall be final.

3. The ENGINEER may require the CONTRACTOR to furnish additional data about the proposed substitution.

4. The OWNER may require the CONTRACTOR to furnish a special performance guarantee or other surety with respect to any substitution.

5. Acceptance by the ENGINEER of a substitution item proposed by the CONTRACTOR shall not relieve the CONTRACTOR of the responsibility for full compliance with the Contract Documents and for adequacy of the substitution.

6. The CONTRACTOR shall pay all costs of implementing accepted substitutions, including redesign and changes to WORK necessary to accommodate the substitution.

C. The procedure for review by the ENGINEER will include the following:

1. Prior to proposing any substitute item, CONTRACTOR shall satisfy itself that the item proposed is: equal or better to that specified; that such item will fit into the space allocated; that such item affords comparable ease of operation, maintenance and service; that the appearance, longevity and suitability for the climate are comparable; that by reason of costs savings, reduced construction time or similar demonstrable
benefit, the substitution of such item will be in OWNER’S interest and will in no way detrimentally impact the project schedule. The burden of proof that such an item offered is equal in all respects to that specified shall be CONTRACTOR’S.

2. If the CONTRACTOR wishes to provide a substitution item, the CONTRACTOR shall make written application to the ENGINEER on the “Substitution Request Form.” A copy of this form is attached to the end of this Specification. Following award of contract, an electronic copy of the Substitution Request Form will be provided to the CONTRACTOR.

3. Unless otherwise provided by law or authorized in writing by the ENGINEER, the "Substitution Request Form(s)" shall be submitted within the 20-day period after award of the Contract. After the end of the 20-day period, substitutions will only be considered in the case of the product being unavailable.

4. Wherever a proposed substitution item has not been submitted within said 20-day period, or wherever the submission of a proposed substitution material or equipment has been judged to be unacceptable by the ENGINEER, the CONTRACTOR shall provide the material or equipment indicated in the Contract Documents.

5. The CONTRACTOR shall certify by signing the form that the list of paragraphs on the form are correct for the proposed substitution.

6. The ENGINEER will evaluate each proposed substitution within a reasonable period of time, not to exceed 14 days.

7. As applicable, no shop drawing submittals shall be made for a substitution item nor shall any substitution item be ordered, installed, or utilized without the ENGINEER’S prior written acceptance of the CONTRACTOR’S "Substitution Request Form."

8. The ENGINEER will record the time required by the ENGINEER in evaluating substitutions proposed by the CONTRACTOR and in making changes by the CONTRACTOR in the Contract Documents occasioned thereby.

D. The CONTRACTOR’s application shall address the following factors which will be considered by the ENGINEER in evaluating the proposed substitution:

1. Complete data substantiating compliance of proposed substitution with the requirements of the Contract Documents, including:

   a. Product identification, including manufacturer’s name and address and model number of products

   b. Manufacturer’s literature, identifying

       1) Product description

       2) Reference Standards
3) Performance, testing, and relevant engineering data

c. Samples, if applicable

d. List two similar projects where substitution was utilized. Provide the following information for each project:

1) Contact person name and phone number. Contact should be able to provide information on the use of the product.

2) Location of installation

3) Date of installation

4) Quantity installed

5) Scope and description of project

2. Whether the evaluation and acceptance of the proposed substitution will prejudice the CONTRACTOR's achievement of Substantial Completion on time.

3. Whether acceptance of the substitution for use in the WORK will require a change in any of the Contract Documents to adapt the design to the proposed substitution.

4. Whether incorporation or use of the substitution in connection with the WORK is subject to payment of any license fee or royalty.

5. Whether all variations of the proposed substitution from the items originally specified are identified.

6. Whether available maintenance, repair, and replacement service are indicated. The manufacturer shall have a local service agency (within 50 miles of the site) which maintains properly trained personnel and adequate spare parts and is able to respond and complete repairs within 24 hours.

7. Whether an itemized estimate is included of all additional costs and cost savings that will result directly or indirectly from acceptance of such substitution, including cost of redesign; claims of other contractors affected by the resulting change; and any licensing fee or royalties.

8. Whether the proposed substitute item meets or exceeds the experience and/or equivalency requirements listed in the appropriate technical specifications.

E. In the making the formal request for substitution, the CONTRACTOR represents that:

1. The substitution has been investigated and it has been determined that is equal to or superior in all respects to the specified product.
2. The CONTRACTOR will provide the same warranties and bonds for the substitution as the product specified.

3. The substitution will be coordinated into the installation of the WORK and any required changes to complete the WORK in all respects as a result of the substitution will be made by the CONTRACTOR at no additional cost to the OWNER.

4. The CONTRACTOR waives claims for additional cost caused by the substitution, which may subsequently become apparent.

5. All cost data provided is complete and accurate.

F. Without any increase in cost to the OWNER, the CONTRACTOR shall be responsible for and pay all costs in connection with proposed substitutions and of inspections and testing of equipment or materials submitted for review prior to the CONTRACTOR's purchase thereof for incorporation in the WORK, whether or not the ENGINEER accepts the proposed substitution or proposed equipment or material. The CONTRACTOR shall reimburse the OWNER for the charges of the ENGINEER for evaluating each proposed substitution.

PART 2 -- PRODUCTS (NOT USED)

PART 3 -- EXECUTION (NOT USED)

END OF SECTION
01 77 00  PROJECT CLOSEOUT

PART 1 -- GENERAL

1.1 REQUIREMENT's INCLUDED

A. Comply with requirements stated in the Contract Documents and in the Specifications for administrative procedures in closing out the Work.

B. The CONTRACTOR shall promptly remove from the vicinity of the completed WORK, all rubbish, unused materials, construction equipment, and temporary structures and facilities used during construction. Final acceptance of the WORK by the OWNER will be withheld until the CONTRACTOR has satisfactorily performed the final cleanup of the Site.

1.2 SUBSTANTIAL COMPLETION

A. Approximately 2 weeks before CONTRACTOR considers the Work will be Substantially Complete, the CONTRACTOR shall submit to the ENGINEER:

1. A written notice that the Work, or designated portion thereof, 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 the reasons therefor.

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 re-inspect the Work.

D. When the ENGINEER finds that the Work is Substantially Complete, the ENGINEER will:

1. 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, the ENGINEER will execute and deliver to the OWNER and the CONTRACTOR a definite Certificate of Substantial Completion with a revised tentative list of items to be completed or corrected.

2. Request the CONTRACTOR to initiate closeout submittals.
1.3 FINAL CLEANUP

A. When CONTRACTOR considers the Work is complete, the CONTRACTOR 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. Equipment and systems have been tested in the presence of the OWNER’S representative and are 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 re-inspect the Work.

D. When the ENGINEER finds that the Work is acceptable under the Contract Documents, the ENGINEER shall request the CONTRACTOR to complete any remaining closeout submittals.

E. The CONTRACTOR shall promptly remove from the vicinity of the completed WORK, all rubbish, unused materials, concrete forms, construction equipment, and temporary structures and facilities used during construction. Final acceptance of the WORK by the OWNER will be withheld until the CONTRACTOR has satisfactorily performed the final cleanup of the Site.

1.4 RE-INSPECTION FEES

A. Should the ENGINEER perform re-inspections 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 to the CONTRACTOR.
1.5 CONTRACTOR’S CLOSEOUT SUBMITTALS TO ENGINEER

A. Evidence of compliance with requirements of governing authorities.

B. Maintenance stock items; spare parts; special tools.

C. Certificate of Insurance for Products and Completed Operations.

1.6 CLOSEOUT TIMETABLE

A. The CONTRACTOR shall establish dates for equipment testing, acceptance periods, and on-site instructional periods (as required under the Contract). Such dates shall be established not less than one week prior to beginning any of the foregoing items, to allow the OWNER, the ENGINEER, and their authorized representatives sufficient time to schedule attendance at such activities.

1.7 FINAL ADJUSTMENTS OF ACCOUNTS

A. Submit a 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. Penalties and Bonuses
   f. Deductions for re-inspection payments
   g. Deductions for liquidated damages
   h. Other adjustments

3. Total Contract Sum, as adjusted

4. Previous payments

5. Sum remaining due
C. ENGINEER will prepare a final Change Order, reflecting approved adjustments to the Contract Sum which were not previously made by Change Orders.

1.8 FINAL SUBMITTALS

A. The CONTRACTOR, prior to requesting final payment, shall obtain and submit the following items to the ENGINEER for transmittal to the OWNER:

1. Written guarantees, where required.
2. Technical Manuals and instructions.
3. New permanent cylinders and key blanks for all locks.
4. Maintenance stock items; spare parts; special tools.
5. Completed record drawings.
6. Bonds for roofing, maintenance, etc., as required.
7. Certificates of inspection and acceptance by local governing agencies having jurisdiction.
8. Releases from all parties who are entitled to claims against the subject project, property, or improvement pursuant to the provisions of law.

1.9 MAINTENANCE AND GUARANTEE

A. The CONTRACTOR shall comply with the maintenance and guarantee requirements contained in the Contract Documents.

B. Replacement of earth fill or backfill, where it has settled below the required finish elevations, shall be considered as a part of such required repair work, and any repair or resurfacing constructed by the CONTRACTOR which becomes necessary by reason of such settlement shall likewise be considered as a part of such required repair work unless the CONTRACTOR shall have obtained a statement in writing from the affected private owner or public agency releasing the OWNER from further responsibility in connection with such repair or resurfacing.

C. The CONTRACTOR shall make all repairs and replacements promptly upon receipt of written order from the OWNER. If the CONTRACTOR fails to make such repairs or replacements promptly, the OWNER reserves the right to do the WORK and the CONTRACTOR and its surety shall be liable to the OWNER for the cost thereof.

1.10 BOND

A. The CONTRACTOR hall provides a bond to guarantee performance of the provisions contained in the Contract Documents.
1.11  FINAL APPLICATION FOR PAYMENT

A.  CONTRACTOR shall submit the final Application for Payment in accordance with procedures and requirements stated in the Contract for Construction.

PART 2 -- PRODUCTS (NOT USED)

PART 3 -- EXECUTION (NOT USED)

END OF SECTION
01 77 10  CLEANING

PART 1 -- GENERAL

1.1 DESCRIPTION

A. Perform cleaning, during progress of Work, and at completion of Work, as required by General Conditions.

1.2 DISPOSAL REQUIREMENTS

A. Conduct cleaning and disposal operations to comply with codes, ordinances, regulations, and anti-pollution laws.

1.3 GOOD "HOUSEKEEPING" PRACTICES

A. Contractor shall maintain good housekeeping practices throughout the duration of the project.

B. If the City is dissatisfied with the cleanliness of the site, a written notice to improve cleanliness with specific instructions for improvement may be issued. If the Contractor does not improve cleanliness to the satisfaction of the City, payment may be denied and a separate contractor may be hired to complete Dust Control and Clean-up operations. Denied payments and cost of independent contractor will be subtracted from the lump-sum amount for this pay item and from the retainage amount if necessary, through a change order.

PART 2 -- PRODUCTS

2.1 MATERIALS

A. Use only those cleaning materials which do not create hazards to health or property and which do not damage surfaces.

B. Use only those cleaning materials and methods recommended by manufacturer of surface material to be cleaned.

C. Use cleaning materials only on surfaces recommended by cleaning material manufacturer.

PART 3 -- EXECUTION

3.1 DURING CONSTRUCTION

A. Perform periodic cleaning to keep Work, site and adjacent properties free from accumulations of waste materials, rubbish and windblown debris, resulting from construction operations.
B. Provide on-site containers for collection of waste materials, debris, and rubbish.

C. Remove waste materials, debris, and rubbish from site daily and dispose of at legal disposal areas away from site.

3.2 DURING CONSTRUCTION

A. Employ skilled personnel for final cleaning.

B. Broom clean exterior paves surfaces and rake clean other surfaces of grounds.

C. Wash and shine glazing and mirrors.

D. Polish glossy surfaces to clear shine

E. Ventilating Systems:

1. Clean permanent filters and replace disposable filters if units were operated during construction.

2. Clean ducts, blowers, and coils if units were operated without filters during construction.

3. Upon completion, provide two spare sets of filters to the OWNER.

F. Remove grease, mastic, adhesives, dust, dirt, stains, fingerprints, labels, and other foreign materials from sight-exposed interior and exterior surfaces.

G. Before Final Completion, or OWNER occupancy, conduct inspection of sight-exposed interior and exterior surfaces, and all Work areas, to verify Work is clean.

H. Remove paving materials and clean all castings, exiting and new after final paving is completed.

I. Clean all drainage structures and drainage components which may have received construction runoff, debris, and contaminants during construction operations.

J. Maintain cleaning until acceptance and occupation by the OWNER.

END OF SECTION
01 77 20  AS-BUILT DOCUMENTS

PART 1 -- GENERAL

1.1 THE SUMMARY

A. CONTRACTOR shall maintain and provide the ENGINEER with record documents as specified below, except where otherwise specified.

1.2 MAINTENANCE OF DOCUMENTS

A. Maintain in CONTRACTOR'S field office in clean, dry, legible condition complete sets of the following: Drawings, Specifications, Addenda, approved Shop Drawings, Samples, photographs, Change Orders, other modifications of Contract Documents, test records, survey data, Field Orders, and all other documents pertinent to CONTRACTOR'S Work.

B. Provide files and racks for proper storage and easy access. File in accordance with filing format of Construction Specification Institute (CSI), unless otherwise approved by ENGINEER.

C. Make documents available at all times for inspection by ENGINEER and OWNER.

D. As-built documents shall not be used for any other purpose and shall not be removed from the CONTRACTOR'S office without ENGINEER'S approval.

1.3 MARKING SYSTEM:

A. Provide colored pencils or felt tipped pens for marking changes, revisions, additions and deletions, to the record set of Drawings. Use following color code unless otherwise approved by the ENGINEER:

   1. Process and Mechanical: Red

   2. Other Printer Notations: Black

1.4 RECORDING

A. Label each document "PROJECT AS-BUILTS" in 2-inch high printed letters.

B. Keep record documents current.

C. Do not permanently conceal any Work until required information has been recorded.

D. Drawings: Mark-up actual installations, which vary substantially from the work as originally shown. Mark whichever drawing is most capable of showing the as-built condition fully
and accurately; however, where shop drawings are used for mark-up, record a cross-reference at the corresponding location on the contract drawings. Mark-up new information, which is recognized to be of importance to the OWNER, but was not shown on either the contract drawings or shop drawings. Give particular attention to concealed work, which would be difficult to measure and record at a later date. Note related change order numbers where applicable. Organize as-built drawing sheets into manageable sets, bind with durable paper cover sheets, and print suitable titles, date and other identification of the cover of each set. The following minimum information shall be included, as applicable:

1. Depths of various elements of foundation in relation to datum.

2. Horizontal and vertical location of underground utilities and appurtenances referenced to permanent surface improvements.

3. Location of internal utilities and appurtenances Concealed in construction referenced to visible and accessible features of structure.

4. Field changes of dimensions and details.

5. Changes made by Change Order or Field Order.

6. Details not on original Drawings.

7. Information to be shown for potable water mains, reuse water mains, and sanitary force mains shall include the location of valves, tees, bends and crosses dimensioned to the baseline survey or monument, including the station and offset. Elevations at top of pipe shall be provided every 50’ and at locations where design elevations were shown on the plans. For situations where the pipeline is being adjusted to avoid conflicts with other utilities (less than 50’ in total length), then elevations shall be provided at the beginning of the deflection (i.e. the first bend), middle of the deflection (i.e. the point where the conflict would have occurred with the utility), and the end of the deflection (i.e. the last bend).

8. Information to be shown for gravity sanitary sewer mains shall include invert elevations at manholes.

9. Information regarding all trenchless technologies horizontal and vertical location including bore/jacking, micro tunneling, and directional drilling. All as-built drawings shall show the geometry, horizontal, and vertical location of the directional drill path including the starting point, end point, and resulting curvatures.

E. Specifications and Addenda: Legibly mark up each Section to record:

1. Manufacturer, trade name, catalog number, and supplier of each product and item of equipment actually installed.

2. Changes made by Change Order or Field Order.
3. Other matters not originally specified.

1.5 SUBMITTAL

A. Upon Substantial Completion of the Work, deliver record drawings to ENGINEER. Final payment will not be made until satisfactory "as-built' drawings are received by ENGINEER.

B. Accompany submittal with transmittal letter containing:
   1. Date
   2. Project Title and Number
   3. CONTRACTOR’s name and address
   4. Title and number of each record drawings
   5. Certification that each document as submitted is complete and accurate
   6. Signature of CONTRACTOR, or his/her authorized representative

C. Final Surveys - The CONTRACTOR shall provide the ENGINEER with two signed and sealed copies by a registered land surveyor and a CD of the final survey in a digital format compatible with Auto CAD 2019 software.

D. CADD Files - The CONTRACTOR shall provide a CD of the "as-built" drawings in a digital format compatible with AutoCAD 2019 software.

E. The CONTRACTOR must submit partial plot files or hard copies of As-Built drawings showing completed work with each partial payment requisition.

F. The CONTRACTOR shall be held responsible for the accuracy of such data and shall bear any costs incurred in finding utilities as a result of incorrect data furnished by the CONTRACTOR.

PART 2 -- PRODUCTS (NOT USED)

PART 3 -- EXECUTION (NOT USED)
01 77 40 PERMITS

PART 1 -- GENERAL

1.1 SCOPE OF WORK

A. Where permits have been obtained for this Project, copies will be appended at the rear of the Specifications.

B. The Contractor shall be familiar with, and comply with, all requirements of these permits.

C. The Contractor's particular attention is called to any Special Conditions of the permits relating to construction procedures, excavation and backfill requirements, open trench restrictions, turbidity control and all other general and special conditions, including flowable fill and pavement details. In the event any of the conditions of the permits are in conflict with the requirements of these Specifications, the more stringent conditions shall take precedence. The Contractor is to conform to all regulations of the governmental agencies having jurisdiction over this work, whether or not included in the permit.

D. Any deviations from the Plans, Specifications or permits appended thereto, must first be approved by the Engineer even if approval for the change has been given by the permitting agency.

E. The Contractor shall assume throughout the life of the Contract all obligations and responsibilities imposed on City of Hallandale or other County departments as permittee of the above-mentioned permits. All expenses necessary for compliance with the regulations and requirements of each permitting agency and its permit shall be borne by the Contractor and shall be included in the overall bid price.

F. All surveying required by the Project permits shall be done by the Contractor's Florida Registered Surveyors and Mapper. This includes staking out limits of construction, maintaining baselines and preparing monthly as-builts.

1.2 PERMITS BY CITY

A. The ENGINEER will obtain permits on behalf of the CITY from the following agencies

1. Florida Department of Department – Water Main Extension Construction Permit

B. Copies of these permits will be provided to the CONTRACTOR following award. The CONTRACTOR shall keep copies of these permits on the project site at all times.

C. The CONTRACTOR shall identify and make sure all the necessary permits and licenses are in place prior to the commencement of the WORK. The following table presents a list of state and local organizations and some of the permits that they administer. This list is for reference only and it shall be the CONTRACTOR’S responsibility to identify an obtain all required permits.
<table>
<thead>
<tr>
<th>AGENCY</th>
<th>PERMIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Florida Department of Health in West Palm Beach</td>
<td>• Water Main Extension Construction Permit</td>
</tr>
<tr>
<td></td>
<td>• Certificate of Construction Completion</td>
</tr>
<tr>
<td>1150 45th Street</td>
<td></td>
</tr>
<tr>
<td>West Palm Beach, FL 33407</td>
<td></td>
</tr>
<tr>
<td>561-514-5300</td>
<td></td>
</tr>
<tr>
<td>Joselaine Pateau</td>
<td>• City of Hallandale Beach Public Works</td>
</tr>
<tr>
<td>City of Hallandale Beach</td>
<td>Permit</td>
</tr>
<tr>
<td>630 NW 2nd Street</td>
<td></td>
</tr>
<tr>
<td>Hallandale Beach, FL 33009</td>
<td></td>
</tr>
<tr>
<td>954-457-1607</td>
<td></td>
</tr>
<tr>
<td>South Florida Water Management District</td>
<td>• Form 0445 Mining/Dewatering Permit</td>
</tr>
<tr>
<td>Central Broward Water Control Drainage District</td>
<td>• CBWCD Permit Application Form</td>
</tr>
</tbody>
</table>

1.3 PERMIT FEES

A. The OWNER shall be responsible for all permitting fees except for the permits obtained by the ENGINEER as identified in Part 1.2.A.

B. The CONTRACTOR shall be responsible for posting the required security deposit with the Broward County Highway Construction and Engineering Division prior to initiating work within Broward County Right of Way.

C. The cost of any fees such as impact fees, inspection fees, etc. and the cost of all required permits shall be borne by the OWNER. The CONTRACTOR shall pay the required fees, obtain the permit(s) and then upon submission of proof of cost to the OWNER, be reimbursed for said cost out of the Approved Permit Fee Reimbursement Item. This shall apply only to required permits and fees. Permits obtained or fees paid for the advantage of the CONTRACTOR or non-required permits obtained for whatever reason shall not be reimbursed. The necessity or non-necessity of a permit or fee shall be determined by the ENGINEER whose word shall be final. As specified in Part 1.1.E, all costs of compliance with the permit(s) shall be borne by the CONTRACTOR and included in the bid price.
1.4 PERMITTING MEETINGS

A. The CONTRACTOR shall schedule, coordinate and attend all meetings as required for applying for and obtaining all required permits.

1.5 PERMITTING SUBMITTALS

A. Within 45 days of the date of the NTP, the CONTRACTOR shall apply for and submit all required documentation including shop drawings and calculations, in full and complete, to obtain all permits required by Laws and Regulation from the agencies having jurisdiction.

B. The CONTRACTOR shall apply for permits and respond to permitting agencies questions and requests for additional information and respond to comments within ten (10) days of receipt from permitting agencies. Within 7 days of receipt of permits, the CONTRACTOR shall submit one (1) copy to the ENGINEER and one (1) copy to the OWNER.

C. The CONTRACTOR shall obtain all required permits with 120 calendar days of the NTP.

1.6 PERMIT REQUIREMENTS

A. The CONTRACTOR shall obtain proof of satisfaction of conditions of permit from each agency prior to acceptance of WORK by the CITY. The CONTRACTOR shall furnish one (1) copy of proof to the ENGINEER and one (1) copy to the OWNER.

PART 2 -- PRODUCTS (NOT USED)

PART 3 -- EXECUTION (NOT USED)

END OF SECTION
DIVISION 03 – CONCRETE

03 60 00  GROUTING

PART 1 -- GENERAL

1.1 THE SUMMARY

A. The CONTRACTOR shall provide grout, complete and in place, in accordance with the Contract Documents

B. The following types of grout are covered in this Section:
   1. Cement Grout
   2. Non-Shrink Grout - Class I (cement-based)
   3. Non-Shrink Grout - Class II (cement-based)
   4. Non-Shrink Epoxy Grout
   5. Epoxy Anchor Grout for Post Installed Adhesive Anchors
   6. Topping Grout and Concrete/Grout Fill
   7. Structural Repair Grout

1.2 CONTRACTOR SUBMITTALS

A. Furnish submittals in accordance with Specification 01 33 00 - Contractor Submittals.

   1. Certified testing lab reports for tests indicated herein.

   2. Test results and service report from the field tests and the demonstration and training session verifying the requirements indicated herein.

   3. Certifications that grouts used on the project contain no chlorides or other chemicals that cause corrosion.

   4. Manufacturer’s literature containing instructions and recommendations on the mixing, handling, placement, curing, and appropriate uses for each type of grout used in the WORK, and location of use. The current ICC-ES or IAPMO-UES report shall be submitted for all epoxy anchor grouts for adhesive anchors.
5. Manufacturer’s certification that its non-shrink grout does not contain aluminum, zinc, or magnesium powders as a method of expansion.

6. Submit manufacturer’s written warranty as indicated herein.

7. Name and telephone number of grout manufacturer's representative who will give on-Site service. The representative shall have at least one year of experience with the indicated grouts.

1.3 QUALITY ASSURANCE

A. Field Tests

1. Compression test specimens will be taken from the first placement of each type of grout, and at intervals thereafter selected by the ENGINEER. The specimens will be made by the ENGINEER or its representative.

2. Compression tests and fabrication of specimens for cement grout and cement based non-shrink grout will be performed in accordance with ASTM C 1107 – Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Non-shrink), at intervals during construction selected by the ENGINEER. As a minimum, a set of 3 specimens will be made for testing at 7 Days, 28 Days, and each additional time period as appropriate.

3. Compression tests and fabrication of specimens for epoxy grouts will be performed in accordance with ASTM C 579 – Standard Test Methods for Compressive Strength of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes, Method B, at intervals during construction selected by the ENGINEER. A set of 3 specimens will be made for testing at 7 Days and each earlier time period as appropriate.

4. The cost of laboratory tests on grout will be paid by the OWNER except where test results show the grout to be defective. In such case, the CONTRACTOR shall pay for the tests, removal and replacement of Defective Work, and re-testing, all as part of the WORK.

5. The CONTRACTOR shall assist the ENGINEER in obtaining specimens for testing and shall furnish materials necessary for fabricating the test specimens.

B. Pre-Installation Demonstration and Training

1. Cement and Epoxy-Based Non-Shrink Grouts

   a. The grout manufacturer shall give a demonstration and training session for the cement based non-shrink and epoxy grouts to be used on the project, before any installation of grout is allowed.
b. Training session shall use a minimum of 5 bags of cement-based non-shrink class I grout mixed to fluid consistency. Tests shall be conducted for flow cone and bleed tests. Six cubes for testing at 1, 3, and 28 Days shall be made. The remaining grout shall be placed, and curing may be initiated on actual project placements such as baseplates and tie holes to provide on-the-job training for the CONTRACTOR and ENGINEER. The CONTRACTOR employees who will be doing the grouting shall participate in this training and demonstration session. The training session shall include methods for curing the grout.

c. The manufacturer shall mix enough cement-based non-shrink class II grout for a minimum of 15 tie holes and shall train the CONTRACTOR's employees in how to perform the WORK and cure the grout. The CONTRACTOR shall have the employees assisting in the mixing and sealing of the tie holes.

d. If the project includes patching, through bolt holes, epoxy anchors, and/or block outs, the manufacturer shall also train the CONTRACTOR's employees in the mixing and curing of the epoxy grouts for each of these applications.

e. The CONTRACTOR shall transport the test cubes to an independent test laboratory, obtain the test reports, and report these demonstration and training test cube strengths to the ENGINEER.

2. Epoxy Anchor Grout for Adhesive Anchors

a. Special inspection for all adhesive anchor installations shall be provided:

1) As recommended or required by the ICC-ES or IAPMO-UES report.

2) As required by the enforceable building code.

3) As otherwise indicated in the Contract Documents.

b. The most stringent of the above requirements shall be used. The cost of special inspection of adhesive anchors shall be paid for by the OWNER.

c. Before installing adhesive anchors in the WORK, adhesive anchor installers shall be trained and qualified at the Site by the manufacturer's representative. Training and qualification for each installer shall include at least:

1) Hole drilling procedure, hole preparation and cleaning techniques, adhesive injection technique and dispenser training/maintenance, rebar dowel preparation and installation, and proof loading/torquing.

2) Anchors installed in both the vertical and horizontal positions in a mock-up concrete panel of adequate size and thickness. Anchors shall be tested in tension. A minimum of 3 anchors shall be tested for each installation position.
3) Anchors shall be tested at 2 times the published allowable tension load or 1-1/4 times the maximum design strength of the anchors in tension as indicated in the ICC-ES or IAPMO-UES report. The test load need not exceed 80 percent of the nominal yield strength of the anchor, based on steel strength, as determined by ACI 318 Appendix D.

4) If any of the 3 test bolts in any installation position fail to reach the test loads, the installer shall be re-tested with the same procedure. Re-testing is required only for the failed installation position.

5) An installer who has 3 consecutive successful bolt tests in the first or second trial is considered qualified for adhesive anchor installation for this project. The manufacturer's representative shall issue a certificate to the qualified installer, and a copy of the certificate shall be filed with the CONTRACTOR and be submitted to the ENGINEER.

6) The test anchor size shall be the largest size adhesive anchor used on the project. The anchor embedment length and edge distances shall be adequate to resist the test loads listed above.

7) Each installer shall be re-qualified every 6 months for the duration of the project by the same qualifying procedure.

8) The certification of each qualified installer shall be available for verification at the Special Inspector's request.

9) Defective anchors noted by the Special Inspector shall be replaced and re-installed by the CONTRACTOR without any additional compensation.

1.4 SPECIAL CORRECTION OF DEFECTS PROVISIONS

A. Manufacturer's Warranty

1. Furnish one-year warranty for WORK provided under this section.

2. Manufacturer's warranty shall not contain a disclaimer limiting responsibility to the purchase price of products or materials.

PART 2 -- PRODUCTS

2.1 APPLICATION

A. Unless indicated otherwise, grouts shall be provided as listed below whether indicated on the Drawings or not.

<table>
<thead>
<tr>
<th>Application</th>
<th>Type of Grout</th>
</tr>
</thead>
</table>

City of Hallandale Beach
12" Water Main
Foster Road
Transmission and Distribution

03 60 00
<table>
<thead>
<tr>
<th>Description</th>
<th>Grout Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anchor bolts, anchor rods and reinforcing steel required to be set in grout</td>
<td>Non-Shrink - Class I</td>
</tr>
<tr>
<td>in which the average working or operating temperature will be over 100</td>
<td></td>
</tr>
<tr>
<td>degrees F or in high fire risk areas.</td>
<td></td>
</tr>
<tr>
<td>Anchor bolts, anchor rods and reinforcing steel required to be set in</td>
<td>Epoxy Anchor Grout</td>
</tr>
<tr>
<td>grout that is not in high temperature or high fire risk areas.</td>
<td></td>
</tr>
<tr>
<td>Beam and column (1 or 2 story) base plates less than 16-inches in the least</td>
<td>Non-Shrink - Class I</td>
</tr>
<tr>
<td>dimension.</td>
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<tr>
<td>Column base plates (greater than 2 story or larger than 16-</td>
<td>Non-Shrink - Class I</td>
</tr>
<tr>
<td>inches in the least dimension.</td>
<td></td>
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<tr>
<td>Storage tanks and other non-motorized equipment and machinery under 30</td>
<td>Non-Shrink - Class I</td>
</tr>
<tr>
<td>horsepower.</td>
<td></td>
</tr>
<tr>
<td>Pumps over 1000 horsepower, unless indicated otherwise</td>
<td>Non-Shrink Epoxy</td>
</tr>
<tr>
<td>Filling block out spaces for embedded items such as railing</td>
<td>Non-Shrink - Class I (Class II</td>
</tr>
<tr>
<td>posts, gate guide frames, etc.</td>
<td>where placement time exceeds 20</td>
</tr>
<tr>
<td>Under precast concrete elements</td>
<td>min.)</td>
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<tr>
<td>Toppings and concrete/grout fill less than 3-inches thick</td>
<td>Topping Grout</td>
</tr>
<tr>
<td>Toppings and concrete/grout fill greater than 3-inches thick</td>
<td>Structural Concrete</td>
</tr>
<tr>
<td></td>
<td>per 03 31 00</td>
</tr>
<tr>
<td>Surface repairs</td>
<td>Cement Grout</td>
</tr>
<tr>
<td>Repair of small (largest dimension less than 12 inches) holes and defects</td>
<td>Non-Shrink - Class I or Non-</td>
</tr>
<tr>
<td>in concrete members which are not water bearing and not in contact with</td>
<td>Shrink - Class II or</td>
</tr>
<tr>
<td>soil or other fill material.</td>
<td>Structural Repair Grout</td>
</tr>
<tr>
<td>Repair of small (largest dimension less than 12 inches) holes and defects</td>
<td>Non-Shrink - Class II or</td>
</tr>
<tr>
<td>in concrete members which are water bearing or in contact with soil or</td>
<td>Structural Repair Grout</td>
</tr>
<tr>
<td>other fill materials.</td>
<td></td>
</tr>
<tr>
<td>Repair of large (largest dimension greater than 12 inches) holes and</td>
<td>Structural Repair Grout</td>
</tr>
<tr>
<td>defects in concrete members.</td>
<td></td>
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<tr>
<td>Any application not listed above, where grout is indicated</td>
<td>Non-Shrink Class I, unless</td>
</tr>
<tr>
<td></td>
<td>specifically indicated</td>
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<td></td>
<td>otherwise</td>
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</tbody>
</table>
2.2 CEMENT GROUT

A. Cement grout shall be composed of one-part cement, 3 parts sand, and the minimum amount of water necessary to obtain the desired consistency. Where needed to match the color of adjacent concrete, white portland cement shall be blended with regular cement as needed. The minimum compressive strength at 28 Days shall be 4000 psi.

2.3 NON-SHRINK GROUTS (cement-based)

A. General

1. Cement-based non-shrink grout shall be a prepackaged, inorganic, fluid, non-gas liberating, non-metallic, cement type grout requiring only the addition of water. Cement from kilns burning metal-rich hazardous waste fuel shall not be used.

2. Manufacturer’s instructions shall be printed on each bag or other container in which the materials are packaged. The specific formulation for each class of non-shrink grout shall be as recommended by the manufacturer for the particular application.

3. Grout shall not contain chlorides or additives that may contribute to corrosion.

4. Grout shall be formulated to be used at any consistency from fluid to plastic.

5. Cement-based non-shrink grout shall have the following minimum properties when tested at a fluid consistency, at 28 Days:


   c. Minimum bond strength (concrete to grout) of 1900 psi per modified ASTM C 882 - Standard Test Method for Bond Strength of Epoxy-Resin Systems Used with Concrete by Slant Shear.

   d. Grout shall be certified for use in a marine environment.

B. Non-Shrink Grout – Class I

1. Non-Shrink Grout – Class I shall have a minimum 28 Day compressive strength of 5000 psi when mixed at a fluid consistency.

2. Non-Shrink Grout – Class I shall meet the requirements of ASTM C 1107, Grade B or C, when mixed to fluid, flowable, and plastic consistencies.
3. Non-Shrink Grout – Class I shall have a maximum early age height change of 4.0 percent expansion and shall have no shrinkage (0.0 percent) in accordance with ASTM C 827 – Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mixtures. The grout when tested shall not bleed or segregate at maximum allowed water.

4. Non-Shrink Grout – Class I shall have no shrinkage (0.0 percent) and a maximum of 0.3 percent expansion in the hardened state when tested in accordance with ASTM C 1090 – Standard Test Method for Measuring Changes in Height of Cylindrical Specimens from Hydraulic-Cement Grout.

5. Furnish certification that the non-shrink property of grout is not based on gas production or gypsum expansion.

6. Non-Shrink Grout – Class I shall be Five Star Grout by Five Star Products, SikagROUT 212 by Sika Corporation, Duragrout by L&M Construction Chemicals; High-Flow Grout by Euclid Chemical Company, CG 200 PC by Hilti, or equal.

C. Non-Shrink Grout – Class II

1. Non-Shrink Grout – Class II shall be a high precision, fluid, extended working time, grout. The minimum 28-Day compressive strength shall be 7500 psi, when mixed at a fluid consistency.

2. Non-Shrink Grout – Class II shall have a maximum early age height change of 4.0 percent expansion and shall have no shrinkage (0.0 percent) in accordance with ASTM C 827.

3. Non-Shrink Grout – Class II shall have no shrinkage (0.0 percent) and a maximum of 0.3 percent expansion in the hardened state when tested in accordance with ASTM C 1090.

4. Non-Shrink Grout – Class II shall have an extended working time of 30 minutes minimum when mixed to a fluid consistency as defined in ASTM C 827 at temperature extremes of 45 to 90 degrees F in accordance with ASTM C 1107.

5. Non-Shrink Grout – Class II shall meet the requirements of ASTM C 1107, Grade B or C when tested using the amount of water needed to achieve fluid consistency per ASTM C 939.

6. The grout when tested shall not bleed or segregate at maximum allowed water content.

7. Provide certification that its non-shrink property is not based on gas production or gypsum expansion.

8. Non-Shrink Grout – Class II shall be Masterflow 928 by BASF, Five Star Fluid Grout 100 by Five Star Products, Crystex by L&M Construction Chemicals, or equal.
2.4 NON-SHRINK EPOXY GROUT

A. Non-shrink epoxy grout shall be a flowable, non-shrink, 100 percent solids system. The epoxy grout system shall have 3 components: resin, hardener, and specially blended aggregate, each premixed and prepackaged. The resin component shall not contain any non-reactive diluents. Resins containing butyl glycidyl ether (BGE) or other highly volatile and hazardous reactive diluents are not acceptable. Variation of component ratios is not permitted unless specifically recommended by the manufacturer. Manufacturer's instructions shall be printed on each container in which the materials are packaged.

B. Epoxy grout shall have a maximum early age height change of 4.0 percent expansion and shall have no shrinkage (0.0 percent) in accordance with ASTM C 827, (modified for epoxy grouts by using an indicator ball with a specific gravity between 0.9 and 1.1).

C. Epoxy grout shall have a negligible (less than 0.0006 in/in) length change after hardening, and a coefficient of thermal expansion less than 0.00003 in/in F when tested according to ASTM C 531 – Standard Test Method for Linear Shrinkage and Coefficient of Thermal Expansion of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes.

D. The epoxy grout shall develop a minimum compressive strength of 9000 psi in 24 hours and 13,000 psi in seven days when tested in accordance with ASTM C 579, method B.

E. The mixed epoxy grout shall have a minimum working life of 90 to 120 minutes at 70 degrees F.

F. The effective bearing area shall be a minimum of 95 percent EBA in accordance with ASTM C 1339 – Standard Test Method for Flowability and Bearing Area of Chemical-Resistant Polymer Machinery Grouts, for bearing area and flow.

G. The chemical formulation of the epoxy grout shall be that recommended by the manufacturer for the particular application. Do not reduce aggregate loading or add solvents to increase flowability.

H. Non-shrink epoxy grout shall have the following minimum properties when tested at 7 Days:

1. Minimum bond strength to concrete of 3000 psi per ASTM C 882 modified.


I. Non-shrink epoxy grout shall be Five Star DP Epoxy Grout by Five Star Products, Inc., Masterflow 648 CP Plus by BASF, Sikadur 42 Grout-Pak by Sika Corporation, or equal.
2.5 EPOXY ANCHOR GROUT

A. Epoxy anchor grout for use in concrete shall be certified for use in accordance with ICC-ES AC 308.

B. Epoxy anchor grout shall conform to ASTM C 881 – Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete, Type IV, Class B & C, Grade 3 with the exception of gel time.

C. Heat deflection temperature per ASTM D 648 – Standard Test Method for Deflection Temperature of Plastics Under Flexural Load in the Edgewise Position shall be a minimum 120 degrees F.

D. Manufacturer shall certify that the epoxy anchor grout will maintain 100 percent of its capacity up to a short-term temperature of 110 degrees F and 50 percent of its capacity up to a short-term temperature of 150 degrees F.

E. Grout shall come in a 2 chambered cartridge with a metering system that provides the proper ratio of hardener and resin. The grout shall also come with a static mixer nozzle to thoroughly mix the hardener and resin together.

F. Epoxy anchor grout shall be capable of being used in submerged applications once cured.


H. Whenever possible, overhead anchors subject to vibration, anchors in fire-resistive construction or high fire risk areas, and anchors subject to working or operating temperatures above 100 degrees F shall be cast-in-place anchors. Whenever cast-in-place anchors cannot be used in these applications, use cement based non-shrink grout and oversized holes.

I. Embedment of adhesive anchors/rebar shall be deep enough to develop the anchor/rebar unless otherwise noted on the Contract Documents. Embedment shall not exceed 67 percent of the member depth.

J. Epoxy anchor grout shall be Pure110+ by Powers Fasteners; HIT-RE 500-SD by Hilti, SET-XP by Simpson Strong-Tie, or equal.

2.6 TOPPING GROUT AND CONCRETE/GROUT FILL

A. Where fill thickness is 3-inches or greater, structural concrete as indicated in Section 03 31 00 - CAST-IN-PLACE CONCRETE, may be used when accepted by the ENGINEER. Fiber reinforcing shall be as indicated below.

B. Grout for topping of slabs and concrete/grout fill for built-up surfaces of tank, channel, and basin bottoms shall be composed of cement, fine aggregate, coarse aggregate, water, and admixtures proportioned and be mixed as indicated. Materials and procedures
indicated for structural concrete in Section 03 31 00 - CAST-IN-PLACE CONCRETE, shall apply unless indicated otherwise.

C. Topping grout and concrete/grout fill shall contain a minimum of 564 pounds of cement per cubic yard with a maximum water cement ratio of 0.45.

D. Coarse aggregate shall be graded as follows:

<table>
<thead>
<tr>
<th>U.S. Standard Sieve Size</th>
<th>Percent By Weight Passing</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/2 in</td>
<td>100</td>
</tr>
<tr>
<td>3/8 in</td>
<td>90-100</td>
</tr>
<tr>
<td>No. 4</td>
<td>20-55</td>
</tr>
<tr>
<td>No. 8</td>
<td>5-30</td>
</tr>
<tr>
<td>No. 16</td>
<td>0-10</td>
</tr>
<tr>
<td>No. 30</td>
<td>0</td>
</tr>
</tbody>
</table>

E. Strength: Minimum compressive strength of topping grout and concrete/grout fill at 28 Days shall be 4000 psi.

F. Topping grout used in clarifiers or where the fill thickness is 3 inches or greater shall contain fiber reinforcing, unless otherwise shown on the Contract Documents. Fiber shall be 100 percent virgin polypropylene fibrillated fibers specifically manufactured in a blended gradation for use as concrete secondary reinforcement. Fibers shall be added at a rate of 1.5 pounds per cubic yard of concrete. Fibers shall conform to ASTM C 1116 – Standard Specification for Fiber-Reinforced Concrete, Type III.

2.7 STRUCTURAL REPAIR GROUT

A. Structural repair grout shall be an extended set, pre-packaged cement-based mortar requiring only the addition of potable water. The material shall not contain any chlorides or lime other than the amounts contained within the hydraulic cement composition.

B. Structural repair grout shall have a minimum compressive strength per ASTM C 109 of 6,000 psi at 7 days.

C. Structural repair grout shall have a minimum bond strength per ASTM C 882 of 2,000 psi at 1 day.

D. For repairs larger than 2 cubic feet in volume, the structural repair grout may be extended by the addition of clean, damp, coarse aggregate per the manufacturer’s written recommendations.
E. Structural repair grout shall be **Structural Concrete ES** by **Five Star Products**, or equal.

2.8 **CONSISTENCY**

A. The consistency of grouts shall be that necessary to completely fill the space to be grouted for the particular application. Dry pack consistency is defined such that the grout is plastic and moldable but will not flow. Where "dry pack" is called for in the Contract Documents, it shall mean a grout of that consistency; the type of grout to be used shall be as indicated herein for the particular application.

B. The slump for topping grout and concrete/grout fill shall be adjusted to match placement and finishing conditions but shall not exceed 4-inches.

2.9 **MEASUREMENT OF INGREDIENTS**

A. Measurements for cement grout shall be made accurately by volume using containers. Shovel measurements shall not be allowed.

B. Prepackaged grouts shall have ingredients measured by means recommended by the manufacturer.

**PART 3 -- EXECUTION**

3.1 **PRODUCT DELIVERY, STORAGE AND HANDLING**

A. Grout shall be stored in accordance with manufacturer's recommendations.

3.2 **GENERAL**

A. CONTRACTOR shall arrange for the manufacturer of prepackaged grouts to provide on-Site technical assistance within 72 hours of request, as part of the WORK.

B. Grout shall not be placed until base concrete or masonry has attained its design strength, unless authorized otherwise by the ENGINEER.

C. When cementitious grouts are used on concrete surfaces, the concrete surface shall be saturated with water for 24 hours prior to placement. Upon completion of the saturation period, excess water shall be removed with clean, oil free compressed air prior to grouting. Concrete substrate shall not be wet prior to placement of epoxy grouts.

D. Surfaces that will be in contact with grout shall be free of dirt, loose rust, oil, wax, grease, curing compounds, laitance, loose concrete, and other deleterious materials.

E. Shade the WORK from sunlight for at least 24 hours before and 48 hours after grouting.

F. Contact the grout manufacturer's representative for assistance on hot and cold weather grouting techniques and precautions if applicable.
3.3 GROUTING PROCEDURES

A. General: Mixing, surface preparation, handling, placing, consolidation, curing, and other means of execution for prepackaged grouts shall be done according to the instructions and recommendations of the manufacturer.

B. Structural, equipment, tank, and piping support bases shall be grouted, unless indicated otherwise.

1. The original concrete shall be blocked out or finished off a sufficient distance below the plate to provide for a minimum one-inch thickness of grout or other thickness if indicated.

2. After the base plate has been set in position at the proper elevation by steel wedges or double nuts on the anchor bolts, the space between the bottom of the plate and the original pour of concrete shall be filled with non-shrink-type grout through a headbox of appropriate size. The mixture shall be of a fluid consistency and poured continuously into the space between the plate and the base concrete. Forms for grout shall be tight against retaining surfaces, and joints shall be sealed as recommended by the grout manufacturer to be liquid-tight. Forms shall be coated as recommended by the grout manufacturer for easy form release. Where this method of placement is not practical or where required by the ENGINEER, alternate grouting methods shall be submitted by the CONTRACTOR for acceptance by the ENGINEER.

3. Concrete equipment pads for equipment bases that will be epoxy-grouted shall be sized so that, when the equipment base is fully grouted, the epoxy grout is stopped not less than 4-inches from the edge of the pad.

C. Drilled Anchors and Reinforcing Bars

1. General

   a. Drilled anchors and reinforcing bars shall be installed in strict accordance with the manufacturer's instructions and applicable ICC-ES or IAPMO-UES report requirements. Holes shall be drilled, brushed and cleaned in accordance with the manufacturer’s instructions. Drilled anchors shall be installed in concrete having a minimum age of 21 days at the time of anchor installation. Anchors shall not be loaded until the grout has cured for the full cure time indicated by the manufacturer and reached its indicated strength in accordance with the manufacturer's instructions.

   b. The CONTRACTOR shall identify the position of reinforcing steel and other embedded items prior to drilling holes. Care shall be exercised in drilling to avoid damaging existing reinforcing or embedded items. The location of drilled holes shall be adjusted to avoid drilling through or cutting any existing reinforcing bars or embedded items. Notify the ENGINEER if reinforcing steel or other embedded items are encountered during drilling. Take precautions as necessary to avoid
damaging prestressing tendons, electrical and communications conduit, and piping.

2. The following requirements apply to adhesive anchors installed using cement based non-shrink grout and epoxy anchor grout:
   
a. Unless otherwise indicated, when adhesive anchors are used to resist tensile forces in structural applications, the minimum depth of embedment shall be greater than or equal to the development length \( l_d \) determined in accordance with ACI 318 for a cast in place reinforcing bar of the same diameter and grade, unless it can be shown by calculation that the anchor spacing and edge distance is sufficient to develop the tensile strength of the anchor in a lesser depth of embedment. Calculations shall be submitted in accordance with Specification 01 33 00 - Contractor Submittals.

b. Core drilling of holes is not allowed.

c. Relocation of drilled holes and adjustments or modifications to anchored or fastened items shall be considered part of the WORK and shall be provided at no additional cost to the OWNER.

d. All abandoned drilled holes shall be filled with Epoxy Anchor Grout.

3. Epoxy Adhesive Anchors

a. Grout shall be proportioned and mixed per the manufacturer's instructions.

b. Holes shall be dry.

4. Cement Based Non-Shrink Grout used for Anchorage

a. In places of high temperature or fire hazard, anchor bolts and anchor rods shall be grouted in using cement based non-shrink grout, Class I.

b. When the anchor bolt or anchor rod diameter is one-inch or less, the hole diameter shall be a minimum of 2-inches. When the anchor bolt/rod diameter is greater than one-inch, the hole diameter shall be at least twice the anchor bolt/rod diameter.

c. Drilled holes shall be saturated with water for not less than 24 hours before installation of anchor/rod/rebar.

d. The non-shrink grout shall be placed in the holes in a non-sag (trowelable) consistency. The grout shall be placed in the holes before the anchor bolt/rod and then the anchor bolt/rod inserted and vibrated to ensure proper coverage.
D. Topping Grout and Concrete/Grout Fill

1. Mechanical, electrical, and finish WORK shall be completed prior to placement of topping or concrete/grout fill. To ensure bonding to the base slab, the base slab shall be given an exposed aggregate finish. Alternatively, where accepted by the ENGINEER, the base slab shall be given a roughened textured surface by a close-spaced rake while the surface is green. After curing, high pressure washing shall expose the aggregates and produce not less than a 3/16-inch amplitude roughness. Jackhammers or chipping hammers shall not be used.

2. The minimum thickness of grout topping, and concrete/grout fill shall be one inch. Where the finished surface of concrete/grout fill is to form an intersecting angle of less than 45 degrees with the concrete surface it is to be placed against, a key shall be formed in the concrete surface at the intersection point. The key shall be a minimum of 3-1/2 inches wide by 1-1/2 inches deep.

3. The base slab shall be thoroughly cleaned and wetted to saturated surface dry (SSD) condition per the International Concrete Repair Institute (ICRI) -- Technical Guide for Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, and Polymer Overlays, prior to placing topping and fill. No topping concrete shall be placed until the slab is completely free from standing pools or ponds of water. A thin coat of neat cement grout shall be broomed into the surface of the slab just before topping or fill placement. The neat cement grout shall not be allowed to dry before topping placement. If it does dry, it must be immediately removed using wet stiff brooms and reapplied. The topping and fill shall be compacted by rolling or thorough tamping, brought to established grade, and floated. Grouted fill for tank and basin bottoms where scraping mechanisms are to be installed shall be screeded by blades attached to the revolving mechanism of the equipment in accordance with the procedures outlined by the equipment manufacturer after the grout is brought to the established grade. Coat surface with evaporation retardant as needed to prevent plastic shrinkage cracks.

4. Topping grout placed on sloping slabs shall proceed uniformly from the bottom of the slab to the top, for the full width of the placement.

5. The surface shall be tested with a straight edge to detect high and low spots which shall be immediately eliminated. When the topping or fill has hardened sufficiently, it shall be steel troweled to a smooth surface free from pinholes and other imperfections. An approved type of mechanical trowel may be used as an assist in this operation, but the last pass over the surface shall be by hand-troweling. During finishing, no water, dry cement, or mixture of dry cement and sand shall be applied to the surface.

6. As soon as topping or fill finishing is completed, coat surface with curing compound. After the topping is set and sufficiently hard in clarifiers and where required by the ENGINEER, the tank shall be filled with sufficient water to cover the entire floor for 14 days.
3.4 CONSOLIDATION

A. Grout shall be placed in such a manner, for the consistency necessary for each application, to assure that the space to be grouted is completely filled.

END OF SECTION
DIVISION 04 – MASONRY (NOT USED)

DIVISION 05 – METALS

05 50 00   MISCELLANEOUS METALWORK

PART 1 -- GENERAL

1.1 THE SUMMARY

A. Provide miscellaneous metalwork and appurtenances, complete and in place, as indicated in accordance with the Contract Documents.

1.2 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Commercial Standards

AA-M32C22A41    Aluminum Association.

AASHTO HS-20    Truck Loading

AISC             Manual of Steel Construction

AISI             Design of Light Gauge, Cold-Formed Steel Structural Members

ASTM A 36        Carbon Structural Steel

ASTM A 48        Gray Iron Castings

ASTM A 123       Zinc (Hot Dip Galvanized) Coatings on Iron and Steel Products

ASTM A 153       Zinc Coating (Hot Dip) on Iron and Steel Hardware

ASTM A 193       Alloy Steel and Stainless-Steel Bolting Materials for High Temperature Service

ASTM A 194       Carbon and Alloy Steel Nuts for Bolts for High Pressure and High Temperature

ASTM A 307       Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength

ASTM A 325       Structural Bolts, Steel, Heat Treated, 120/105 ksi minimum Tensile
1.3 CONTRACTOR SUBMITTALS

A. Furnish submittals in accordance with the requirements of Specification 01 33 00 – Contractor Submittals

B. Shop Drawings

   1. Shop Drawings shall conform to AISC recommendations and specifications, and shall show holes, and the like, as may be required for other parts of the WORK.

1.4 QUALITY ASSURANCE

A. Weld procedures and welder qualifications shall be available in the CONTRACTOR’s field office for review.

PART 2 -- PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Steel

<table>
<thead>
<tr>
<th>Product</th>
<th>Specification</th>
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<tbody>
<tr>
<td>Wide Flange Shapes</td>
<td>ASTM A 992</td>
</tr>
<tr>
<td>Shapes, Plates, Bars</td>
<td>ASTM A 36</td>
</tr>
<tr>
<td>Pipe, Pipe Columns, Bollards</td>
<td>ASTM A 53, Type E or S, Grade B standard weight unless indicated otherwise</td>
</tr>
<tr>
<td>HSS</td>
<td>ASTM A 500 Grade B</td>
</tr>
</tbody>
</table>

B. Corrosion Protection
1. Unless otherwise indicated, fabricated steel metalwork which will be used in a corrosive environment and/or will be submerged in water or wastewater shall be coated in accordance with the requirements of Section 09 96 00 – Protective Coating and shall not be galvanized prior to coating.

2. Other miscellaneous steel metalwork shall be hot-dip galvanized after fabrication.

C. Stainless Steel

1. Unless otherwise indicated, stainless steel metalwork and bolts shall be fabricated from Type 316 Stainless Steel

D. Aluminum

1. Unless otherwise indicated, aluminum metalwork shall be fabricated from Alloy 6061-T6.

2. Aluminum in contact with concrete, masonry, wood, porous materials, or dissimilar metals shall have contact surfaces coated in accordance with the requirements of Section 09 96 00 – Protective Coating.

E. Cast Iron

1. Unless otherwise indicated, iron castings shall conform to the requirements of ASTM A 48, Class 50B, or better.

2.2 IRON CASTINGS

A. General:

1. Iron castings shall be of uniform quality, free from blowholes, porosity, hard spots, shrinkage, distortion, or other defects.

2. The castings shall be smooth and well cleaned by shot blasting.

3. Covers and grates shall fit together evenly, such that the cover fits flush with the surrounding finished surface and such that the cover does not rock or rattle when a loading is applied.

4. Round covers and frames shall be provided with machined bearing surfaces.

B. Covers and grates with matching frames shall be provided with machined bearing surfaces.

1. Where located within a structure, the design loading shall match that required for the adjacent floor area, or, if no floor loading is indicated, a minimum of 300 pounds per square foot.
2. Exterior covers and grates shall be designed for AASHTO HS-20 loading unless indicated otherwise.

2.3 BOLTS AND ANCHORS

A. Standard Service (Non-Corrosive Application)

1. Unless otherwise indicated, bolts, anchor bolts, washers, and nuts shall be fabricated from steel as indicated.

2. Threads on galvanized bolts and nuts shall be formed with suitable taps and dies such that they retain their normal clearance after hot-dip galvanizing.

3. Except as otherwise indicated, steel for bolt material, and cap screws shall be in accordance with the following requirements:

4. Pipe and Equipment Flange Bolts: ASTM A 193, Grade B-7

B. Corrosive Service

1. Bolts, nuts, and washers in locations listed below shall be fabricated from stainless steel as indicated.

   a. Buried locations

   b. Inside buried vaults, manholes, and structures that do not drain through a gravity sewer or to a sump with a pump.

   c. Locations indicated or designated by the ENGINEER to be provided with stainless steel bolts.

2. Unless otherwise indicated, stainless steel bolts, anchor bolts, nuts, and washers shall be fabricated from Type 316 stainless steel, Class 2, conforming to ASTM A 193 for bolts and to ASTM A 194 for nuts. Buried pipe flange bolts and nuts on pipe of Class 275 and greater shall be in accordance with ASTM A193/A194, Grade B7.

3. Coating

   a. Threads on stainless steel bolts shall be protected with an anti-seize lubricant suitable for submerged stainless-steel bolts, meeting government specification MIL-A-907E.

   b. Buried bolts in poorly drained soil shall be coated the same as the buried pipe.

   c. Anti-seize lubricant shall be classified as acceptable for potable water use by the NSF.
d. Anti-seize lubricant shall be "PURE WHITE" by Anti-Seize Technology, Franklin Park, IL, 60131, AS-470 by Dixon Ticonderoga Company, Lakehurst, NJ, 08733, or equal.

4. Bolt Requirements
   a. The bolt and nut material shall be free-cutting steel.
   b. The nuts shall be capable of developing the full strength of the bolts.
   c. Threads shall be Coarse Thread Series conforming to the requirements of the American Standard for Screw Threads.
   d. Bolts and cap screws shall have hexagon heads and nuts shall be Heavy Hexagon Series.
   e. Bolts and nuts shall be installed with washers fabricated from material matching the base material of bolts, except that hardened washers for high-strength bolts shall conform to the requirements of the AISC Specification.
   f. Lock washers fabricated from material matching the bolts shall be installed where indicated.
   g. The length of each bolt shall be such that the bolt extends at least 1/8 inch beyond the outside face of the nut before tightening, except for anchor bolts which shall be flush with the face of the nut before tightening.

2.4 CONTRACTOR SUBMITTALS

A. Shop Drawings

   1. Shop Drawings shall conform to AISC recommendations and specifications, and shall show holes, and the like, as may be required for other parts of the WORK.

   2. Shop Drawings shall include complete details of members and connections, anchor bolt layouts, schedules for fabrication procedures, and diagrams for the sequence of erection.

2.5 QUALITY ASSURANCE

A. Weld procedures and welder qualifications shall be available in the CONTRACTOR’s field office for review.

PART 3 -- EXECUTION

3.1 FABRICATION AND INSTALLATION REQUIREMENTS
A. **Fabrication and Erection:** Except as otherwise indicated, the fabrication and erection of structural steel shall conform to the requirements of the American Institute of Steel Construction "Manual of Steel Construction."

3.2 WELDING

A. Method

1. Welding shall be performed by the metal-arc method or gas-shielded arc method as described in the American Welding Society "Welding Handbook" as supplemented by other pertinent standards of the AWS.

2. The qualification of the welders shall be in accordance with the AWS Standards.

B. Quality

1. In assembly and during welding, the component parts shall be adequately clamped, supported, and restrained in order to minimize distortion and for control of dimensions.

2. Weld reinforcement shall be as indicated by the AWS Code.

3. Upon completion of welding, remove weld splatter, flux, slag, and burrs left by attachments.

4. Welds shall be repaired in order to produce a workmanlike appearance, with uniform weld contours and dimensions.

5. Sharp corners of material that is to be painted or coated shall be ground to a minimum of 1/32 inch on the flat.

3.3 GALVANIZING

A. Structural steel plates shapes, bars, and fabricated assemblies required to be galvanized shall, after the steel has been thoroughly cleaned of rust and scale, be galvanized in accordance with the requirements of ASTM A 123.

B. Any galvanized part that becomes warped during the galvanizing operation shall be straightened.

C. Bolts, anchor rods, anchor bolts, nuts, and similar threaded fasteners, after being properly cleaned, shall be galvanized in accordance with the requirements of ASTM A 153.

D. Field Repairs

1. Field repairs to damaged galvanizing shall be performed by preparing the surface and applying a coating.
2. Surface preparation shall consist of removing oil, grease, soil, and soluble material by cleaning with water and detergent (SSPC SP1) followed by brush-off blast cleaning (SSPC SP7) over an area extending at least 4 inches into the undamaged area.

3. The coating shall be applied to at least 3 mils dry film thickness, and shall be **Zinc-Clad XI** by Sherwin-Williams, **Galvax** by Alvin Products, **Galvite** by ZRC Worldwide, or equal.

END OF SECTION
DIVISION 06 – WOOD AND PLASTICS (NOT USED)

DIVISION 07 – THERMAL AND MOISTURE PROTECTION (NOT USED)

DIVISION 08 – OPENINGS (NOT USED)

DIVISION 09 – FINISHES

09 96 00 PROTECTIVE COATING

PART 1 -- GENERAL

1.1 THE SUMMARY

A. The CONTRACTOR shall provide protective coatings, complete and in place, in accordance with the Contract Documents.

B. Definitions

1. The term "paint," "coatings," or "finishes" as used herein, shall include surface treatments, emulsions, enamels, paints, epoxy resins, and other protective coatings, excepting galvanizing or anodizing, whether used as a pretreatment, primer, intermediate coat, or finish coat.

2. The term "DFT" means minimum dry film thickness, without any negative tolerance.

C. The following surfaces shall not be coated:

1. Concrete, unless required by items on the concrete coating schedule below or the Drawings.

2. Stainless steel

3. Machined surfaces

4. Grease fittings

5. Glass

6. Equipment nameplates
7. Platform gratings, stair treads, door thresholds, and other walk surfaces, unless specifically indicated to be coated.

8. Platform gratings, stair treads, door thresholds, and other walk surfaces, unless specifically indicated to be coated.

D. The coating system schedules summarize the surfaces to be coated, the required surface preparation, and the coating systems to be applied. Coating notes on the Drawings are used to show or extend the limits of coating schedules, to show exceptions to the schedules, or to clarify or show details for application of the coating systems.

1.2 CONTRACTOR SUBMITTALS

A. Furnish submittals in accordance with Specification 01 33 00 – Contractor Submittals.

B. Submittals shall include the following information and be submitted at least 30 Days prior to commencing protective coating WORK:

1. Materials List: Eight copies of a coating materials list showing the manufacturer and the product number, keyed to the coating systems herein. The list shall be submitted prior to or at the time of submitting samples.

2. Manufacturer's Information: For each coating system to be used, the following data:
   a. Manufacturer's data sheet for each product proposed, including statements on the suitability of the material for the intended use.
   b. Technical and performance information that demonstrates compliance with the system performance and material requirements.
   c. Paint manufacturer's instructions and recommendations on surface preparation and application.
   d. Colors available for each product (where applicable).
   e. Compatibility of shop and field applied coatings (where applicable).
   f. Material Safety Data Sheet for each product proposed.

C. Samples

1. Samples of paint, finishes, and other coating materials shall be submitted on 8-1/2 inch by 11-inch sheet metal. Each sheet shall be completely coated over its entire surface with one protective coating material, type, and color.

2. Two sets of color samples to match each color selected by the ENGINEER from the manufacturer's standard color sheets. If custom mixed colors are indicated, the color samples shall be made using color formulations prepared to match the color samples
3. One 5-pound sample of each abrasive proposed to be used for surface preparation for submerged and severe service coating systems.

4. The manufacturer shall state whether or not it has verified that the CONTRACTOR is going to use the proper mixing, coating application, heating, and environmental control equipment for the specified coating products. Only heated plural component equipment shall be used for the 100% solids coating application. Equipment shall be capable of performing a ratio test.

5. The Shop Coating Applicator shall provide SSPC QP 3 Certification or the coating manufacturer's certification of the applicator for selected coating system.

PART 2 -- PRODUCTS

2.1 GENERAL

A. Suitability: The CONTRACTOR shall use suitable coating materials as recommended by the manufacturer. Materials shall comply with Volatile Organic Compound (VOC) limits applicable at the Site.

B. Material Sources: Where manufacturers and product numbers are listed, it is to show the type and quality of coatings that are required. If a named product does not comply with VOC limits in effect at the time of Bid opening, that product will not be accepted, and the CONTRACTOR shall propose a substitution product of equal quality that does comply. Proposed substitute materials will be considered as indicated below.

C. Compatibility: In any coating system only compatible materials from a single manufacturer shall be used in the WORK. Particular attention shall be directed to compatibility of primers and finish coats. If necessary, a barrier coat shall be applied between existing prime coat and subsequent field coats to ensure compatibility.

D. Containers: Coating materials shall be sealed in containers that plainly show the designated name, formula or specification number, batch number, color, date of manufacture, and name of manufacturer, all of which shall be plainly legible at the time of use.

E. Colors: Colors and shades of colors of coatings shall be as indicated or selected by the ENGINEER.

F. Substitute or "Or-Equal" Products

1. To establish equality under Specification 01 60 00 - Products, Materials, Equipment and Substitutions, the CONTRACTOR shall furnish satisfactory documentation from the manufacturer of the proposed substitute or "or-equal" product that the material meets the indicated requirements and is equivalent or better in the following properties:
a. Minimum and maximum recoat times
b. Minimum and maximum cure time for immersion
c. Abrasion resistance per ASTM D4060 using CS17 Wheel
d. Maximum and minimum dry film thickness per coat
e. Compatibility with other coatings
f. Suitability for the intended service
g. Resistance to chemical attack
h. Temperature limitations during application and in service
i. Type and quality of recommended undercoats and topcoats
j. Ease of application
k. Ease of repairing damaged areas
l. Stability of colors

2. Protective coating materials shall be standard products produced by recognized manufacturers who are regularly engaged in production of such materials for essentially identical service conditions. When requested, the CONTRACTOR shall provide the ENGINEER with the names of not less than 10 successful applications of the proposed manufacturer's products that comply with these requirements.

3. If a proposed substitution requires changes in the WORK, the CONTRACTOR shall bear such costs involved as part of the WORK.

2.2 COATING SYSTEMS

A. Above ground piping and piping with manholes shall be painted with Tnemec.

B. System 106 – Fusion Bond Epoxy

1. Material

<p>| Type | 100 Percent Solids Fusion Bond Epoxy |</p>
<table>
<thead>
<tr>
<th>Demonstrated suitable for</th>
<th>Fluidized bed or electrostatic spray application, recommended for pumps, valves, pipe appurtenances, tanks, pipe hangers, flow meters, and hydrants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Certification requirement</td>
<td>NSF 61</td>
</tr>
</tbody>
</table>

2. Application in accordance with AWWA C213 and the following:

<table>
<thead>
<tr>
<th>Type</th>
<th>100 Percent Solids Fusion Bond Epoxy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demonstrated suitable for</td>
<td>Fluidized bed or electrostatic spray application, recommended for pumps, valves, pipe appurtenances, tanks, pipe hangers, flow meters, and hydrants</td>
</tr>
<tr>
<td>Certification requirement</td>
<td>NSF 61</td>
</tr>
</tbody>
</table>

PART 3 -- EXECUTION

3.1 MANUFACTURER'S SERVICES

A. The CONTRACTOR shall require the protective coating manufacturer to furnish a qualified technical representative to visit the Site for technical support as may be necessary to resolve field problems.

3.2 WORKMANSHP

A. Skilled craftsmen and experienced supervision shall be used on coating WORK.

B. Coating shall be done in a workmanlike manner so as to produce an even film of uniform thickness. Edges, corners, crevices, and joints shall receive special attention to insure thorough surface preparation. The finished surfaces shall be free from runs, drops, ridges, waves, laps, brush marks, and variations in color, texture, and finish. The hiding shall be so complete that the addition of another coat would not increase the hiding. Special attention shall be given so that edges, corners, crevices, welds, and similar areas receive a film thickness equivalent to adjacent areas, and installations shall be protected by the use of drop cloths or other precautionary measures.

C. Damage to other surfaces resulting from the WORK shall be cleaned, repaired, and refinished to original condition.
3.3 STORAGE, MIXING, AND THINNING OF MATERIALS

A. Manufacturer's Recommendations: Unless otherwise indicated, the coating manufacturer's printed recommendations and instructions for thinning, mixing, handling, applying, and protecting its coating materials, for preparation of surfaces for coating, and for other procedures relative to coating shall be strictly observed.

B. Coating materials shall be used within the manufacturer's recommended shelf life.

C. Storage and Mixing: Coating materials shall be stored under the conditions recommended by the Product Data Sheets, and shall be thoroughly stirred, strained, and kept at a uniform consistency during application. Coatings from different manufacturers shall not be mixed together.

3.4 PREPARATION FOR COATING

A. General: Surfaces to receive protective coatings shall be prepared as indicated prior to application of coatings. The CONTRACTOR shall examine surfaces to be coated and shall correct surface defects before application of any coating material. Marred or abraded spots on shop-primed and on factory-finished surfaces shall receive touch-up restoration prior to any field coating application. Surfaces to be coated shall be dry and free of visible dust.

B. Protection of Surfaces Not to be Coated: Surfaces that are not to receive protective coatings shall be protected during surface preparation, cleaning, and coating operations.

C. Hardware, lighting fixtures, switch plates, machined surfaces, couplings, shafts, bearings, nameplates on machinery, and other surfaces not to be painted shall be removed, masked, or otherwise protected. Drop cloths shall be provided to prevent coating materials from falling on or marring adjacent surfaces. The working parts of mechanical and electrical equipment shall be protected from damage during surface preparation and coating operations. Openings in motors shall be masked to prevent entry of coating or other materials.

D. Care shall be exercised not to damage adjacent WORK during blasting operations. Spraying shall be conducted under carefully controlled conditions. The CONTRACTOR shall be fully responsible for and shall promptly repair any and all damage to adjacent WORK or adjoining property occurring from blasting or coating operations.

E. Protection of Painted Surfaces: Cleaning and coating shall be coordinated so that dust and other contaminants from the preparation process will not fall on wet, newly coated surfaces.

3.5 SURFACE PREPARATION STANDARDS

A. The following referenced surface preparation specifications of the Steel Structures Painting Council shall form a part of this specification:
1. Solvent Cleaning (SSPC SP1): Removal of oil, grease, soil, salts, and other soluble contaminants by cleaning with solvent, vapor, alkali, emulsion, or steam.

2. White Metal Blast Cleaning (SSPC SP5): Removal of all visible rust, oil, grease, soil, dust, mill scale, paint, oxides, corrosion products and foreign matter by blast cleaning.

3. Near-White Blast Cleaning (SSPC SP10): Removal of all visible oil, grease, soil, dust, mill scale, rust, paint, oxides, corrosion products, and other foreign matter, except that staining shall be limited to no more than 5 percent of each square inch of surface area.

3.6 FERROUS METAL SURFACED PREPARATION (UN GALVANIZED)

A. The minimum abrasive blasting surface preparation shall be as indicated in the coating system schedules included at the end of this Section. Where there is a conflict between these requirements and the coating manufacturer's printed recommendations for the intended service, the higher degree of cleaning shall apply.

B. Workmanship for metal surface preparation shall be in conformance with the current SSPC Standards and this Section. Blast-cleaned surfaces shall match the standard samples available from the National Association of Corrosion Engineers, NACE Standard TM-01-70 - Visual Standard for Surfaces of New Steel Air Blast Cleaned with Sand Abrasive and TM-01-75 - Visual Standard for Surfaces of New Steel Centrifugally Blast Cleaned with Steel Grit.

C. Oil, grease, welding fluxes, and other surface contaminants shall be removed by solvent cleaning per SSPC SP1 - Solvent Cleaning prior to blast cleaning.

D. Sharp edges shall be rounded or chamfered, and burrs and surface defects and weld splatter shall be ground smooth prior to blast cleaning.

E. The type and size of abrasive shall be selected to produce a surface profile that meets the coating manufacturer's recommendation for the particular product and service conditions. Abrasives for submerged and severe service coating systems shall be clean, hard, sharp cutting crushed slag. Automated blasting systems shall not be used for surfaces that will be in submerged service. Metal shot or grit shall not be used for surfaces that will be in submerged service, even if subsequent abrasive blasting will use hard, sharp cutting crushed slag.

F. Abrasive shall not be reused unless an automated blasting system is used for surfaces that will be in non-submerged service. For automated blasting systems, clean oil-free abrasives shall be maintained. The abrasive mix shall include at least 50 percent grit.

G. The CONTRACTOR shall comply with the applicable federal, state, and local air pollution control regulations for blast cleaning.

H. Compressed air for air blast cleaning shall be supplied at adequate pressure from well-maintained compressors equipped with oil and moisture separators that remove at least 95 percent of the contaminants.
I. Surfaces shall be cleaned of dust and residual particles of the cleaning operation by dry air blast cleaning, vacuuming, or another approved method prior to painting.

J. Enclosed areas and other areas where dust settling is a problem shall be vacuum cleaned and wiped with a tack cloth.

K. Damaged or defective coating shall be removed by the blast cleaning to meet the clean surface requirements before recoating.

L. If the required abrasive blast cleaning will damage adjacent WORK, the area to be cleaned is less than 100 square feet, and the coated surface will not be submerged in service, then SSPC SP2 or SSPC SP3 may be used.

M. Shop-applied coatings of unknown composition shall be completely removed before the indicated coatings are applied. Valves, castings, ductile or cast-iron pipe, and fabricated pipe or equipment shall be examined for the presence of shop-applied temporary coatings. Temporary coatings shall be completely removed by solvent cleaning per SSPC SP1 before the abrasive blast cleaning has been started.

N. Shop primed equipment shall be solvent cleaned in the field before finish coats are applied.

3.7 FERROUS METAL SURFACE PREPARATION (GALVANIZED)

A. Galvanized ferrous metal shall be alkaline cleaned per SSPC SP1 to remove oil, grease, and other contaminants detrimental to adhesion of the protective coating system, followed by brush off blast cleaning per SSPC SP7.

B. Pretreatment coatings of surfaces shall be in accordance with the printed recommendations of the coating manufacturer.

3.8 SURFACE PREPARATION OF FERROUS SURFACES WITH EXISTING COATINGS

A. General: Grease, oil, heavy chalk, dirt, or other contaminants shall be removed by solvent or detergent cleaning prior to abrasive blast cleaning. The generic type of the existing coatings shall be determined by laboratory testing.

B. Abrasive Blast Cleaning: The CONTRACTOR shall provide the degree of cleaning indicated in the coating system schedule for the entire surface to be coated. If the degree of cleaning is not indicated in the schedule, deteriorated coatings shall be removed by abrasive blast cleaning to SSPC SP6. Areas of tightly adhering coatings shall be cleaned to SSPC SP7, with the remaining thickness of existing coating not to exceed 3-mils.

C. Incompatible Coatings: If coatings to be applied are not compatible with existing coatings the CONTRACTOR shall apply intermediate coatings per the manufacturer's recommendation for the indicated coating system or shall completely remove the existing coating prior to abrasive blast cleaning. A small trial application shall be conducted for compatibility prior to painting large areas.
D. Unknown Coatings: Coatings of unknown composition shall be completely removed prior to application of new coatings.

E. Water Abrasive or Wet Abrasive Blast Cleaning: Where indicated or where Site conditions do not permit dry abrasive blasting for industrial coating systems due to dust or air pollution considerations, water abrasive blasting or wet abrasive blasting may be used. In both methods, paint-compatible corrosion inhibitors shall be used, and coating application shall begin as soon as the surfaces are dry. Water abrasive blasting shall be done using high pressure water with sand injection. In both methods, the equipment used shall be commercially produced equipment with a successful service record. Wet blasting methods shall not be used for submerged or severe service coating systems unless indicated.

3.9 SHOP COATING REQUIREMENTS

A. Unless otherwise indicated, items of equipment or parts of equipment which are not submerged in service shall be shop-primed and then finish-coated in the field after installation with the indicated or selected color. The methods, materials, application equipment, and other details of shop painting shall comply with this Section. If the shop primer requires top coating within a specific period of time, the equipment shall be finish-coated in the shop and then be touched up after installation.

B. Items of equipment or parts and surfaces of equipment which are submerged or inside an enclosed hydraulic structure when in service, with the exception of pumps and valves, shall have surface preparation and coating performed in the field.

C. The interior surfaces of steel water reservoirs, except for Part A surfaces, shall have surface preparation and coating performed in the field.

D. For certain pieces of equipment, it may be undesirable or impractical to apply finish coatings in the field. Such equipment may include engine generator sets, equipment such as electrical control panels, switchgear or main control boards, submerged parts of pumps, ferrous metal passages in valves, or other items where it is not possible to obtain the indicated quality in the field. Such equipment shall be primed and finish-coated in the shop and touched up in the field with the identical material after installation. The CONTRACTOR shall require the manufacturer of each such piece of equipment to certify as part of its Shop Drawings that the surface preparation is in accordance with these specifications. The coating material data sheet shall be submitted with the Shop Drawings for the equipment.

E. For certain small pieces of equipment, the manufacturer may have a standard coating system that is suitable for the intended service conditions. In such cases, the final determination of suitability will be made during review of the Shop Drawing submittals. Equipment of this type generally includes only indoor equipment such as instruments, small compressors, and chemical metering pumps.

F. Shop-painted surfaces shall be protected during shipment and handling by suitable provisions including padding, blocking, and the use of canvas or nylon slings. Primed
surfaces shall not be exposed to the weather for more than 2 months before being top coated or less time if recommended by the coating manufacturer.

G. Damage to shop-applied coatings shall be repaired in accordance with this Section and the coating manufacturer's printed instructions.

H. The CONTRACTOR shall make certain that the shop primers and field topcoats are compatible and meet the requirements of this Section. Copies of applicable coating manufacturer's data sheets shall be submitted with equipment Shop Drawings.

3.10 APPLICATION OF COATINGS

A. The application of protective coatings to steel substrates shall be in accordance with SSPC PA1 - Paint Application Specification No. 1.

B. Cleaned surfaces and each coat shall be inspected prior to applying each succeeding coat. The CONTRACTOR shall schedule such inspection with the ENGINEER in advance.

C. Blast cleaned ferrous metal surfaces shall be painted before any rusting or other deterioration of the surface occurs. Blast cleaning shall be limited to only those surfaces that can be coated in the same day.

D. Coatings shall be applied in accordance with the manufacturer's instructions and recommendations and this Section, whichever has the most stringent requirements.

E. Special attention shall be given to edges, angles, weld seams, flanges, nuts and bolts, and other places where insufficient film thicknesses are likely to occur. Use stripe painting with a brush in these areas.

F. Special attention shall be given to materials that will be joined so closely that proper surface preparation and application are not possible. Such contact surfaces shall be coated prior to assembly or installation.

G. Finish coats, including touch-up and damage repair coats shall be applied in a manner that will present a uniform texture and color matched appearance.

H. Coatings shall not be applied under the following conditions:

1. Temperatures exceeding the manufacturer's recommended maximum and minimum allowable.

2. Dust or smoke laden atmosphere.

3. Damp or humid weather.

4. Substrate or air temperature is less than 5 degrees F above the dew point.
5. Air temperature is expected to drop below 40 degrees F or less than 5 degrees F above the dew point within 8 hours after application of coating.

6. Wind conditions are not calm.

I. Dew point shall be determined by use of a sling psychrometer in conjunction with U.S. Dept. of Commerce, Weather Bureau psychometric tables.

J. Finish coats shall be applied after concrete, masonry, and equipment installation is complete, and the working areas are clean and dust free.

3.11 CURING OF COATINGS

A. The CONTRACTOR shall maintain curing conditions in accordance with the conditions recommended by the coating material manufacturer or by this Section; whichever is the most stringent, prior to placing the completed coating system into service.

B. In the case of enclosed areas, forced air ventilation, using heated air if necessary, may be required until the coatings have fully cured.

3.12 IDENTIFICATION OF PIPING

A. Identification of above ground piping shall be in accordance with the table provided below and with additional requirements set forth in Section 15000 – Mechanical, General.

B. Tnemec Safety Paint colors shall be used for this project as indicated below.

C. All above-ground pipe and fittings, Polyvinyl Chloride (PVC) pipe and fittings, metallic and non-metallic marking tapes, and any other marking device, will be color coded in accordance with the APWA Uniform Color Guide, which is as follows:

<table>
<thead>
<tr>
<th>Color</th>
<th>Paint Color Number</th>
<th>Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red</td>
<td>Candy Apple Red/Safety - 06SF</td>
<td>Potable Water Hydrant Bonnet</td>
</tr>
<tr>
<td>Yellow</td>
<td>Lemon Yellow/Safety - 02SF</td>
<td>Potable Water Hydrant Body</td>
</tr>
<tr>
<td>Green</td>
<td>Spearmint Green/Safety - 09SF</td>
<td>Sewer Force main, Sewer</td>
</tr>
<tr>
<td>Blue</td>
<td>True Blue/Safety - 11SF</td>
<td>Potable Water Main</td>
</tr>
</tbody>
</table>

D. **Surface Preparation**: The exterior surfaces of pipes, valves, hydrants, and other above ground items that will be exposed to the atmosphere inside structures or above ground will be abrasive blasted to a maximum commercial Grade SSPC-SP-6, NACE 3 and given a high solids epoxy primer coat of Tnemec Series 66 Hi-Build Epoxoline, 4.0 mils DFT at the factory. A finish coat will be applied after installation according the color schedule.
specified in this Section or as listed in Section 15000 – Mechanical, General. Evaluation of blast cleaned surface preparation WORK will be based upon comparison of the blasted surfaces with the standard samples available from the NACE, using NACE standards TM-01-70 and TM-01-75.

E. Finish coat shall have a DFT of 2 to 4 mils.

3.13 COATING SYSTEM SCHEDULE, FERROUS METAL

<table>
<thead>
<tr>
<th>Item</th>
<th>Surface Preparation</th>
<th>System No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>FM-7</td>
<td>Ferrous surfaces in water passages of all valves 2-inch size and larger, exterior surfaces of submerged valves.</td>
<td>White metal blast cleaning SSPC SP5</td>
</tr>
<tr>
<td>FM-9</td>
<td>Ferrous surfaces of sleeve couplings.</td>
<td>Solvent cleaning SSPC SP1, followed by white metal blast cleaning SSPC-SP10</td>
</tr>
</tbody>
</table>

3.14 ENVIRONMENTAL REQUIREMENTS

A. No coating work shall be performed under the following conditions:

1. Surface or ambient temperatures exceed the manufacturer’s recommended maximum or minimum allowable.

2. Dust or smoke laden atmosphere.

3. Damp or humid conditions, where the relative humidity is above the manufacturer’s maximum allowable.

4. Substrate and ambient temperatures are less than 5°F above the dew point and are decreasing. Dew point shall be measured by use of an instrument such as a Sling Psychrometer in conjunction with U.S. Department of Commerce, Weather Bureau psychrometric tables. Elcometer 319 Dew Point meter or equal may also be used.

5. Ambient temperature that is expected to drop below 50°F or less than 5°F above the dew point within 8 hours after application of coating.

END OF SECTION
DIVISION 10 – SPECIALTIES (NOT USED)

DIVISION 11 – EQUIPMENT (NOT USED)

DIVISION 12 – FURNISHING (NOT USED)

DIVISION 13 – SPECIAL CONSTRUCTION (NOT USED)

DIVISION 21 – FIRE SUPPRESSION (NOT USED)

DIVISION 22 – PLUMBING (NOT USED)

DIVISION 23 – HEATING, VENTILATING AND AIR CONDITIONING (NOT USED)

DIVISION 26 – ELECTRICAL (NOT USED)

DIVISION 27 – COMMUNICATIONS (NOT USED)

DIVISION 28 – ELECTRONIC SAFETY & SECURITY (NOT USED)
DIVISION 31 – EARTHWORK

31 10 00 SITE PREPARATION

1.1 THE SUMMARY

A. In its initial move onto the Site, the CONTRACTOR shall protect existing fences, houses and associated improvements, streets, and utilities downslope of construction areas from damage due to boulders, trees, or other objects dislodged during the construction process and clear, grub, strip; and regrade certain areas, in accordance with the Contract Documents.

1.2 SITE INSPECTION

A. Prior to moving onto the Site, the CONTRACTOR shall inspect the Site conditions and review maps of the Site.

PART 2 -- PRODUCTS (NOT USED)

PART 3 -- EXECUTION

3.1 CLEARING, GRUBBING, AND STRIPPING

A. Construction areas shall be cleared of grass and weeds to at least a depth of 6-inches and cleared of structures, pavement, sidewalks, concrete or masonry debris, trees, logs, upturned stumps, loose boulders, and any other objectionable material of any kind which would interfere with the performance or completion of the WORK, create a hazard to safety, or impair the subsequent usefulness of the WORK, or obstruct its operation. Loose boulders within 10-feet of the top of cut lines shall be incorporated in landscaping or removed from the Site. Trees and other natural vegetation outside the actual lines of construction shall be protected from damage during construction.

B. Within the limits of clearing, the areas below the natural ground surface shall be grubbed to a depth necessary to remove stumps, roots, buried logs, and other objectionable material. Septic tanks, drain fields, and connection lines and any other underground structures, debris or waste shall be removed if found on the Site. Objectionable material from the clearing and grubbing process shall be removed from the Site and wasted in approved safe locations.

C. Unless otherwise indicated, native trees larger than 3-inches in diameter at the base shall not be removed without the ENGINEER’s approval. The removal of any trees, shrubs, fences, or other improvements outside of rights-of-way, if necessary, for the CONTRACTOR's choice of means and methods, shall be arranged with the owner of the property, and shall be removed and replaced, as part of the WORK.
3.2 OVEREXCAVATION, REGRADING, AND BACKFILL UNDER FILL AREAS

A. After the fill areas have been cleared, grubbed, and excavated, the areas to receive fill will require over excavation, regrading, and backfill, consisting of the removal and/or stockpiling of undesirable soils. The ground surface shall be recontoured for keying the fill and removing severe or abrupt changes in the topography of the Site.

1. Topsoil: This soil mantles the siltstone/claystone which comprises much of the hillslope on the southern, approximately two-thirds of the plant site.

2. Colluvium: This material is also present on the hillsides and covers the valley floor of the Site.

3. Artificial Fill (Quarry Waste): Most of this material is present on the west side of the plant site near Rosalind Lane.

B. Any undesirable topsoil and colluvium shall be removed to the level designated by the ENGINEER and stockpiled for subsequent use as the first material to be placed in the compacted fill.

END OF SECTION
PART 1 -- GENERAL

1.1 THE SUMMARY

A. The CONTRACTOR shall dewater trench and structure excavations, in accordance with the Contract Documents and applicable regulatory agencies with jurisdiction. The CONTRACTOR shall secure all necessary permits from the Central Broward Water Control District, South Florida Water Management District, and other regulatory agencies as required to complete the requirements of this Section of the Specifications.

B. All dewatering operations shall discharge to existing storm drainage systems or canals, unless otherwise directed by regulatory agencies. The CONTRACTOR shall flush clean all existing storm drainage structures and piping utilized for dewatering operations to remove sediment that may have been deposited during dewatering operations.

C. The CONTRACTOR shall furnish an install all turbidity barriers, settling tanks, and other equipment as required by the Central Broward Water Control District, South Florida Water Management District, City of Hallandale Beach, and any other regulatory agency.

1.2 CONTRACTOR SUBMITTALS

A. Prior to commencement of excavation, the CONTRACTOR shall submit a detailed plan and operation schedule for dewatering of excavations. The detailed plan shall include mitigation measures to prevent settlement of nearby structures and a contingency plan for restoring nearby structures if settlement is observed as a result of the CONTRACTOR’s dewatering operations. The CONTRACTOR may be required to demonstrate the system proposed and to verify that adequate equipment, personnel, and materials are provided to dewater the excavations at all locations and times. The CONTRACTOR's dewatering plan is subject to review by the ENGINEER.

B. All dewatering shall comply with the regulations of the South Florida Water Management District and Central Broward Water Control District

1.3 QUALITY CONTROL

A. It shall be the sole responsibility of the CONTRACTOR to control the rate and effect of the dewatering in such a manner as to avoid all objectionable settlement and subsidence.

B. All dewatering operations shall be adequate to assure the integrity of the finished project and shall be the responsibility of the CONTRACTOR.

C. Where critical structures or facilities exist immediately adjacent to areas of proposed dewatering, reference points shall be established and observed at frequent intervals to...
detect any settlement which may develop. The responsibility for conducting the
dewatering operation in a manner which will protect adjacent structures and facilities rests
solely with the CONTRACTOR. The cost of repairing any damage to adjacent structures
and restoration of facilities shall be the responsibility of the CONTRACTOR.

D. CONTRACTOR shall survey, record and report the reference points on a daily basis, and
submit the written log to the ENGINEER at the completion of construction. The
ENGINEER shall be immediately notified should any sign of settlement is observed. The
cost of repairing any damage to adjacent structures and restoration of facilities shall be
the responsibility of the CONTRACTOR.

PART 2 -- PRODUCTS

2.1 EQUIPMENT

A. Dewatering, where required, may include the use of well points, sump pumps, temporary
pipelines for water disposal, rock or gravel placement, and other means. Standby
pumping equipment shall be maintained on the Site.

PART 3 -- EXECUTION

3.1 GENERAL REQUIREMENTS

A. The CONTRACTOR shall provide all equipment necessary for dewatering. It shall have
on hand, at all times, sufficient pumping equipment and machinery in good working
condition and shall have available, at all times, competent workmen for the operation of
the pumping equipment. Adequate standby equipment shall be kept available at all times
to insure efficient dewatering and maintenance of dewatering operation during power
failure.

B. Dewatering for structures and pipelines shall commence when groundwater is first
encountered and shall be continuous until such times as water can be allowed to rise in
accordance with the provisions of this Section or other requirements.

C. At all times, site grading shall promote drainage. Surface runoff shall be diverted from
excavations. Water entering the excavation from surface runoff shall be collected in
shallow ditches around the perimeter of the excavation, drained to sumps, and be pumped
or drained by gravity from the excavation to maintain a bottom free from standing water.

D. Dewatering shall at all times be conducted in such a manner as to preserve the
undisturbed bearing capacity of the subgrade soils at proposed bottom of excavation.

E. The CONTRACTOR shall maintain the water level below the bottom of excavation in all
work areas where groundwater occurs during excavation construction, backfilling, and up to
acceptance.
F. Flotation shall be prevented by the CONTRACTOR by maintaining a positive and continuous removal of water. The CONTRACTOR shall be fully responsible and liable for all damages which may result from failure to adequately keep excavations dewatered.

G. If foundation soils are disturbed or loosened by the upward seepage of water or an uncontrolled flow of water, the affected areas shall be excavated and replaced with drain rock.

H. The CONTRACTOR shall maintain the water level below the bottom of excavation in all work areas where groundwater occurs during excavation construction, backfilling, and up to acceptance.

I. If well points or wells are used, they shall be adequately spaced to provide the necessary dewatering and shall be sandpacked and/or other means used to prevent pumping of fine sands or silts from the subsurface. A continual check by the CONTRACTOR shall be maintained to ensure that the subsurface soil is not being removed by the dewatering operation.

J. The CONTRACTOR shall dispose of water from the WORK in a suitable manner without damage to adjacent property. CONTRACTOR shall be responsible for obtaining any permits that may be necessary to dispose of water. No water shall be drained into work built or under construction without prior consent of the ENGINEER. Water shall be filtered using an approved method to remove sand and fine-sized soil particles before disposal into any drainage system.

K. Dewatering of trenches and other excavations shall be considered as incidental to the construction of the WORK and all costs thereof shall be included in the various contract prices in the Bid Forms, unless a separate bid item has been established for dewatering.

L. The CONTRACTOR’S attention is directed to the geotechnical reports included in Appendix of the technical specifications.

M. Discharge directly or indirectly through existing storm drains into canals shall meet the requirements of the Central Broward Drainage District, South Florida Water Management District, City of Hallandale Beach, and all other applicable regulatory agencies.

N. The CONTRACTOR shall flush clean all existing storm drainage and structures and piping utilized for dewatering operations to remove sediment that may have been deposited during dewatering operations.

END OF SECTION
31 30 00  EARTHWORK

PART 1 -- GENERAL

1.1 THE SUMMARY

A. The CONTRACTOR shall perform earthwork as indicated and required for construction of the WORK, complete and in place, in accordance with the Contract Documents.

B. The work included under this Section includes excavating, backfilling and compaction as required for the construction of the piping system specified herin.

C. Sheet ing and Bracing: The CONTRACTOR’S attention is directed to the provisions of 29 C.F.Rs. 1926.650 Subpart of the OSHA excavation safety standards which require that all banks and trenches over 5 feet high shall be shored or sloped to the angle of repose. Trench excavation in excess of 5 feet shall conform to the Florida Trench Safety Act (F.S. Ch. 553). Excavations shall be sloped or otherwise supported in a safe manner in accordance with the Florida Trench Safety Act (F.S. Ch. 553) and the requirements of OSHA Safety and Health Standards for Construction (29CFR1926).

D. See Section 31 30 20 for Shoring specifications.

1.2 CONTRACTOR SUBMITTALS

1. The CONTRACTOR shall submit samples of materials proposed for the WORK in conformance with the requirements of Section 01300 – Contractor Submittals.

2. Sample sizes shall be as determined by the testing laboratory.

1.3 Submittals shall be in accordance with Specification 01 33 00 – Contractor Submittals.

1.4 UNIFIED SOIL CLASSIFICATION SYSTEM

A. References in this Section to soil classification types and standards shall have the meanings and definitions indicated in ASTM D 2487.

B. The CONTRACTOR shall be bound by applicable provisions of ASTM D 2487 in the interpretation of soil classifications.

PART 2 -- PRODUCTS

2.1 FILL AND BACKFILL MATERIAL REQUIREMENTS

A. General
1. Fill, backfill, and embankment materials shall be selected or shall be processed and clean fine earth, rock, gravel, or sand, free from grass, roots, brush, other vegetation and organic matter.

2. Fill and backfill materials that are to be placed within 6 inches of any structure or pipe shall be free of rocks or unbroken masses of earth materials having a maximum dimension larger than 3 inches.

B. The following types of materials are defined:

1. Common Fill: Common fill material shall be non-cohesive (Pl ≤ 10) and shall consist of mineral soil substantially free of clay, organic material, loam, wood, trash and other objectionable material which may be compressible, or which cannot be properly compacted. Common fill shall not contain stones larger than 6 inches in any dimension, asphalt, broken concrete, masonry, rubble or other similar materials. The common fill shall have physical properties such that it can be readily spread and compacted during filling. Additionally, common fill shall be no more than 35 percent by weight finer than the No. 200 mesh sieve unless finer material is approved for use in a specific location by the ENGINEER.

2. Select Common Fill: Select common fill material shall be as specified above with the exception that the material shall contain no stones more than 1-1/2 inches in largest dimension and shall be no more than 5 percent by weight finer than the No. 200 mesh sieve. Select backfill for copper tubing shall be limerock screenings or sand. Sand shall be graded sand with 100 percent passing a 3/8-inch sieve and not more than 5 percent passing a No. 200 sieve. Select backfill material may be material resulting from excavation, if suitable in the opinion of the OWNER, carefully selected to comply with these requirements.

3. Bedding Rock: Bedding rock material used in pipe trench within pipe zone, under abutments, and under concrete structures shall be crushed stone or gravel meeting the gradation and durability requirements of FDOT No. 89 and FDOT No. 57 stone, as indicated on the Drawings. Number 131 and 132 Screenings may be substituted for FDOT No. 89. Only FDOT No. 57 and FDOT No. 89 stone can be used in excavations below the transitional water table. Onsite materials proposed by the CONTRACTOR for bedding materials will be considered by the ENGINEER on a case-by-case basis.

4. Structural Fill: Materials for structural fill shall be bedding rock or select common fill as specified herein or suitable material as approved by the ENGINEER.

5. Suitable Material: Materials classified by AASHTO as A-1-a, A-1-b, A-3, or A-2-4 shall be considered suitable material.

6. Mixing or blending of materials to obtain a suitable composite is the CONTRACTOR's option but is subject to the approval of the ENGINEER.

7. Suitable materials may be obtained from on-Site excavations, may be processed on-Site materials, or may be imported.
8. If imported materials are required by this Section or are required in order to meet the quantity requirements of the WORK, the CONTRACTOR shall provide the imported materials as part of the WORK.

9. Unsuitable Material: Materials deemed not suitable for use on the project by the ENGINEER. Unsuitable materials are defined as follows:

10. Soils that have more than 35% by weight finer than the #200 mesh sieve or a PI of 10 or greater.

11. Soils with highly organic materials with 5% or greater organic content by weight.

12. Soils which, when classified under ASTM D 2487 - Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System), fall in the classifications of Pt, OH, CH, MH, or OL.

C. Piping Backfill: Piping backfill shall be as indicated on the drawings. Backfill materials shall be used as indicated in the Table below.

<table>
<thead>
<tr>
<th>Piping Backfill – Refer to Broward Standard Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pipe Bedding</td>
</tr>
<tr>
<td>Pipe Zone Backfill</td>
</tr>
<tr>
<td>Trench zone backfill</td>
</tr>
<tr>
<td>Final backfill under unpaved areas</td>
</tr>
<tr>
<td>Final backfill under paved areas</td>
</tr>
<tr>
<td>Replace pipeline trench over excavation</td>
</tr>
<tr>
<td>Underneath manholes and vaults</td>
</tr>
<tr>
<td>Where pipes pass through structure walls, manholes, or catch basin inlets</td>
</tr>
</tbody>
</table>
D. Suitable Materials

1. Suitable backfill material shall be clean, shall not be expansive nor have high organic content, shall be free of clay, marl, unstable materials, debris, lumps and clods, and shall meet the following requirements:

   • Maximum Liquid Limit shall not exceed 12 as determined by ASTM D 423.

   • Maximum Plasticity Index shall not exceed 35 as determined by ASTM D 424.

   • Not more than 10 percent of weight shall be finer than 74-micron (No. 200) U.S. Standard Sieve.

2. Materials not defined below as unsuitable will be considered as suitable materials and may be used in fills, backfilling, and embankment construction, subject to the indicated requirements.

3. If acceptable to the ENGINEER, some of the material listed as unsuitable may be used when thoroughly mixed with suitable material to form a stable composite.

4. Mixing or blending of materials to obtain a suitable composite is the CONTRACTOR's option but is subject to the approval of the ENGINEER.

5. The CONTRACTOR shall submit certification to the ENGINEER that the chloride concentration in imported materials within the pipe zone does not exceed 100 ppm, when tested in accordance with the requirements of AASHTO T291-94 – Standard Method of Test for determining Water-Soluble Chloride Ion Content in Soil.

6. Suitable materials may be obtained from on-Site excavations, may be processed on-Site materials, or may be imported.

2.2 MATERIALS TESTING

A. Samples

1. The CONTRACTOR shall be responsible for material sampling testing.

2. The CONTRACTOR shall provide test trenches and excavations as required for materials sampling and testing.

3. The CONTRACTOR shall obtain the services of a certified testing company for all materials testing. The CONTRACTOR shall submit the name and contact information of the testing company to the ENGINEER for approval prior to initiating construction.

4. The CONTRACTOR shall submit all material testing results to the ENGINEER within one (1) week of receipt.
5. The ENGINEER may direct the CONTRACTOR to supply samples for testing of any material used in the WORK.

B. Particle size analysis of soils and aggregates will be performed using ASTM D 422 - Standard Test Method for Particle-Size Analysis of Soils.

C. Determination of sand equivalent value will be performed using ASTM D 2419 - Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate.

2.3 IDENTIFICATION TAPE

A. Unless otherwise indicated, identification tape shall be placed above buried pipelines that are not comprised of magnetic components at least in part.

PART 3 -- EXECUTION

3.1 EXCAVATION AND BACKFILLING - GENERAL

A. General

1. Except when specifically provided to the contrary, excavation shall include the removal of materials, including obstructions, that would interfere with the proper execution and completion of the WORK.

2. The removal of such materials shall conform to the lines and grades indicated or ordered.

3. Unless otherwise indicated, the entire Site shall be stripped of vegetation and debris and shall be grubbed, and such material shall be removed from the Site prior to performing any excavation or placing any fill.

4. Sheeting and Shoring: The CONTRACTOR shall furnish, place, and maintain supports and shoring that may be required for the sides of excavations. Excavations shall be sloped or otherwise supported in a safe manner in accordance with applicable state safety requirements and the requirements of OSHA Safety and Health Standards for Construction (29CFR1926) and the Florida Trench Safety Act (F.S. Ch. 553).

   a. The CONTRACTOR shall construct, brace, and maintain the excavation as required to support the sides of excavations and to prevent any movement which could in any way diminish the width of the excavation below that necessary for proper construction and to protect adjacent structures, existing piping and/or foundation material from disturbance, undermining or other damage.

   b. Care shall be taken to prevent voids outside of the sheeting, but if voids are formed, they shall be immediately filled and compacted to the degree required for the material to be placed in the area inside of the sheeting excavation.
5. The CONTRACTOR shall provide quantity surveys where so required to verify quantities for Unit Price Contracts.

6. Surveys shall be performed prior to beginning WORK and upon completion by a surveyor licensed in the state where the Site is located.

B. Removal and Exclusion of Water (Dewatering)

1. The CONTRACTOR shall complete dewatering in accordance to Specifications 31 23 19 - Dewatering

2. The CONTRACTOR shall remove and exclude water, including stormwater, groundwater, irrigation water, and wastewater, from excavations.

3. Dewatering wells, wellpoints, sump pumps, or other means shall be used to remove water and continuously maintain groundwater at a level at least 2 feet below the bottom of excavations before the excavation WORK begins at each location.

4. Water shall be removed and excluded until backfilling is complete and field soils testing has been completed.

3.2 OVER-EXCAVATION

A. Indicated

1. Where areas are indicated to be over-excavated, excavation shall be to the depth indicated, and backfill shall be installed to the grade indicated.

B. Not Indicated

1. When ordered to over-excavate areas deeper and/or wider than required by the Contract Documents, the CONTRACTOR shall over-excavate to the dimensions ordered and backfill to the indicated grade.

C. Neither Indicated nor Ordered

1. Any over-excavation carried below the grade that is neither ordered or nor indicated shall be backfilled and compacted to the required grade with the indicated material as part of the WORK

3.3 EXCAVATION IN LAWN AREAS

A. Where excavation occurs in lawn areas, the sod shall be carefully removed, dampened, and stockpiled in order to preserve it for replacement.

B. Excavated material may be placed on the lawn, provided that a drop cloth or other suitable method is employed to protect the lawn from damage, but the lawn shall not remain covered for more than 72 hours.
C. Immediately after completion of backfilling and testing of the pipeline, the sod shall be replaced and lightly rolled in a manner as to restore the lawn as near as possible to its original condition.

D. The CONTRACTOR shall provide new sod if the stockpiled sod has not been replaced within 72 hours.

3.4 EXCAVATION IN VICINITY OF TREES
A. Except where trees are indicated to be removed, trees shall be protected from injury during construction operations.

B. No tree roots larger than 2 inches in diameter shall be cut without the express permission of the ENGINEER.

C. Trees shall be supported during excavation by any means previously reviewed and accepted by the ENGINEER.

3.5 ROCK EXCAVATION
A. Rock excavation and disposal shall be performed by the CONTRACTOR where rock is encountered in the installation of the WORK at his own expense.

B. Blasting will not be permitted.

3.6 BLASTING
A. Explosives and Blasting: Blasting will not be permitted.

3.7 DISPOSAL OF EXCESS EXCAVATED MATERIAL
A. The CONTRACTOR shall be responsible for the removal and disposal of all excess excavated material.

B. No excess material shall be stored within the ROW during non-working hours. Excess excavated material can be stored temporarily at the Contractor’s laydown area at the Park City WTP until such time that it can be removed from the site for disposal.

C. Material shall be disposed of at an approved on-Site disposal area or off-Site at a location arranged by the CONTRACTOR in accordance with laws and regulations regarding the disposal of such material.

3.8 BACKFILL
A. General
   1. Backfill shall not be dropped directly upon any structure or pipe.
2. Backfill shall not be placed around or upon any structure until the concrete has attained sufficient strength to withstand the loads imposed.

3. Backfill over and around pipes shall begin as soon as practical after the pipe has been laid, jointed, and inspected.

4. Except for drainrock materials being placed in over-excavated areas or trenches, backfill shall be placed after water is removed from the excavation and the trench sidewalls and bottom have been dried to moisture content suitable for compaction.

B. Except for drainrock materials being placed in over-excavated areas or trenches, backfill shall be placed after water is removed from the excavation and the trench sidewalls and bottom have been dried to moisture content suitable for compaction.

C. Pre-Placement Conditions

1. Immediately prior to placement of backfill materials, the bottoms and sidewalls of trenches and structure excavations shall have any loose, sloughing, or caving soil and rock materials removed.

2. Trench sidewalls shall consist of excavated surfaces that are in a relatively undisturbed condition before placement of backfill materials.

D. Layering

1. Backfill materials shall be placed and spread evenly in layers.

2. When compaction is achieved using mechanical equipment, the layers shall be evenly spread such that when compacted, each layer shall not exceed 12 inches in thickness.

E. Moisture Content

1. Where the backfill material moisture content is below the optimum moisture content, water shall be added before or during spreading until the proper moisture content is achieved.

2. Where the backfill material moisture content is too high to permit the indicated degree of compaction, the material shall be dried until the moisture content is satisfactory.

G. The surface of filled areas shall be graded to smooth true lines, strictly conforming to the grades shown on the Drawings. Neither soft spots nor un-compacted areas will be permitted in the WORK.
3.9 PIPELINE AND UTILITY TRENCH EXCAVATION AND BACKFILL

A. General:

1. Unless otherwise indicated or ordered, excavation for pipelines and utilities shall be open-cut trenches with minimum widths as indicated.

2. Where pavements or sidewalks are cut, they shall be cut by means of a mechanical pavement saw to form true and straight edges which shall in general be either parallel or at right angles with the centerline of the pipe.

B. Trench Bottom

1. Except where pipe bedding is required, the bottom of the trench shall be excavated uniformly to the grade of the bottom of the pipe. Excavate pipe trenches to a minimum of 6-inches below the outside bottom of the proposed pipe barrel to provide for the installation of bedding material.

2. Excavations for pipe bells and welding shall be made as required.

3. Where pipe bedding is required, the bottom of the trench shall be excavated uniformly to the grade of the bottom of the pipe bedding.

C. Open Trenches

1. The maximum amount of open trench permitted in any one location shall be 500 feet or the length necessary to accommodate the amount of pipe installed in a single Day, whichever is greater.

2. Trenches shall be fully backfilled at the end of each Day or, in lieu thereof, shall be covered by heavy steel plates adequately braced and capable of supporting vehicular traffic in those locations where it is impractical to backfill at the end of each Day.

3. These requirements for backfilling or use of steel plate will be waived in cases where the trench is located further than 100 feet from any traveled roadway or occupied structure; in such cases, however, barricades and warning lights meeting appropriate safety requirements shall be provided and maintained.

D. Embankments, Fills, and Structural Backfills

1. Where pipelines are to be installed in embankments, fills, or structure backfills, the fill shall be constructed to a level at least one foot above the top of the pipe before the trench is excavated.

2. Upon completion of the embankment or structural backfill, a trench conforming to the appropriate detail may be excavated and the pipe may be installed.

E. Trench Shield
1. If a moveable trench shield is used during excavation operations, the trench width shall be wider than the shield such that the shield is free to be lifted and then moved horizontally without binding against the trench sidewalls and causing sloughing or caving of the trench walls.

2. If the trench walls cave or slough, the trench shall be excavated as an open excavation with sloped sidewalls or with trench shoring, as indicated and as required by the pipe structural design.

3. If a moveable trench shield is used during excavation, pipe installation, and backfill operations, the shield shall be moved by lifting the shield free of the trench bottom or backfill and then moving the shield horizontally.

4. The CONTRACTOR shall not drag trench shields along the trench causing damage or displacement to the trench sidewalls, the pipe, or the bedding and backfill.

F. Placing and Spreading of Backfill Materials

1. Each layer of coarse granular shall be compacted by means of at least 2 passes from a vibratory compactor that is capable of achieving the required density in 2 passes and that is acceptable to the ENGINEER.

2. Where such materials are used for pipe zone backfill, vibratory compaction shall be used at vertical intervals of the lesser of:
   a. One-half the diameter of the pipe; or
   b. 24 inches measured in the un-compacted state.

3. In addition, these materials shall be subjected to vibratory compaction at the springline of the pipe and the top of the pipe zone backfill, regardless of whether that dimension is less than 24 inches or not.

4. The material shall be placed and compacted under the haunch of the pipe and up each side evenly so as not to move the pipe during the placement of the backfill.

5. The material shall be placed in lifts that will not exceed 12 inches when compacted to the required density.

G. Mechanical Compaction

1. Backfill around and over pipelines that is mechanically compacted shall be compacted using light, hand-operated vibratory compactors and rollers that do not damage the pipe.

2. After completion of at least 2 feet of compacted backfill over the top of pipeline, compaction equipment weighing no more than 8,000 pounds may be used to complete the trench backfill.
H. Pipe and Utility Trench Backfill

1) Backfilling of pipe trenches will not be allowed until the work has been approved by the OWNER, pressure tested if required, and the OWNER indicates that backfilling may proceed. Any work which is covered or concealed without the knowledge and consent of the OWNER shall be uncovered or exposed for inspection. Partial backfill may be made to help restrain the pipe during pressure testing, if previously authorized by the OWNER.

2) The Contractor shall backfill all trenches and other excavations made in the process of installing the pipe. He shall maintain the surface of the backfill free from major irregularities and potholes.

3) Select backfill material shall be placed under and around the pipe to one foot above the crown (or to two feet above crown for PVC) in 6-inch layers. Each layer shall be thoroughly compacted to at least 100 percent of maximum density as defined by AASHTO Standard No. T-180, "Moisture-Density Relations of Soils using a 10-lb. (4.54 kg.) Rammer and an 18-in. (457 mm) Drop". The material in the ditch may be compacted by either hand tamper or a mechanized power tamper, provided the results obtained meet the continued approval of the OWNER. Particular attention and care shall be exercised in obtaining thorough support for the branch of all service connection fittings. Care shall be taken to preserve the alignment and gradient of the installed pipe.

4) Backfilling and compacting of material lying above a point one foot (or two feet for PVC pipe), above the crown of the pipe and below the pavement base or the surface of the ground, if out of pavement, shall be accomplished in layers not exceeding 9 inches in thickness. Each layer shall be thoroughly compacted with a powered hand tamper or a mechanized power tamper to at least 100 percent of maximum density as determined by AASHTO Specification T-180 or such greater density as may be required by the governing authority over the area in which the work is performed. A testing laboratory will make periodic field tests to determine the density being obtained in each lift, or layer, or the backfill. When compacted backfill fails to meet the specified percentage of maximum density as shown by test results, it shall be reworked and recompacted, and then retested. The reworking, recomping and retesting of the backfill shall be repeated as many times as may be necessary to obtain compacted backfill with density meeting or exceeding the specified percentage as indicated by test results.

5) The Contractor shall exercise proper care to ensure that no pipe will be broken or displaced through the use of the type of mechanical compacting equipment he selects. Water shall be added as required to obtain optimum moisture to facilitate compaction but ponding or inundation of backfill will not be permitted. These ponding limitations shall not prohibit backfill in a wet trench up to the level of the natural water table if the "Alternate Method of Construction" is utilized.

6) Backfill shall in general be kept up with the rate of pipe laying. The backfill up to the springline of the pipe shall be placed as soon as practical after the laying of the pipe.
7) In the event that sufficient suitable material is not available at any point to properly backfill the trench, the Contractor shall transport suitable material from points of the line where such material is available or shall otherwise furnish suitable material.

8) Suitable material in excess of all backfill requirements and all unsuitable material shall be removed from the work and disposed by the Contractor.

9) Where cuts have been made through unpaved, stabilized rock roadways, driveways and parkways, surface restoration shall consist of 3 inches of compacted limerock overlaid by inches of gravel or graded and washed rock with a maximum diameter of ½-inch, except as otherwise directed by the OWNER. The rock shall be installed over the entire width of the disturbed area and shall closely match the existing rock at each location. Several grades of rock may be required to attain this end, but it is not anticipated that more than one grade will have to be used at any one location.

10) As described above, all pipe trenches shall be excavated to a level 6-inches below the outside bottom of the proposed pipe barrel. The resulting excavation shall be backfilled with approved pipe bedding material, up to the level of the outside bottom of the proposed pipe barrel. This material shall be tamped and compacted to provide a proper bedding for the pipe and shall then be shaped to receive the pipe, including recesses for the pipe bells and couplings. Placing and compacting bedding up to the level of the lower one-third of the pipe barrel shall immediately follow the installation of the pipe. Bedding shall be provided under the branch of all fittings to furnish adequate support and bearing under the fitting.

11) Select backfill material may be utilized where the excavated trench bottom is above water.

12) Any excavation below the levels required for installation of the pipe bedding shall be backfilled with approved bedding material, tamped, compacted and shaped to provide proper support for the proposed pipe.

I. Trench Shield

1. If a moveable trench shield is used during backfill operations, the shield shall be lifted to a location above each layer of backfill material prior to compaction of the layer.

2. The CONTRACTOR shall not displace the pipe or backfill while the shield is being moved.

J. Compaction Requirements
1. Maximum density of backfill materials within road base or sub-base shall be determined by AASHTO T-99C, latest revision (ASTM D698). Maximum density of backfill materials not located within road base or sub-base shall be determined by AASHTO T-99, latest revision (ASTM D698).

<table>
<thead>
<tr>
<th>Location</th>
<th>Percentage of Maximum Dry Density</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pipe embedment backfill</td>
<td>100</td>
</tr>
<tr>
<td>Over-excavated zones under bedding</td>
<td>100</td>
</tr>
<tr>
<td>Pipe zone backfill portion above embedment</td>
<td>100</td>
</tr>
<tr>
<td>Final backfill, beneath paved areas or structures. See Specification 02510 for Roadway Base requirements.</td>
<td>100</td>
</tr>
<tr>
<td>Final backfill, not beneath paved areas or structures</td>
<td>95</td>
</tr>
<tr>
<td>Trench zone backfill, beneath paved areas and structures</td>
<td>100</td>
</tr>
<tr>
<td>Trench zone backfill, not beneath paved areas or structures</td>
<td>95</td>
</tr>
</tbody>
</table>

3.10 FIELD TESTING

A. General:

1. The CONTRACTOR shall be responsible for all compaction and material testing. The CONTRACTOR shall provide test trenches and excavations as required.

2. All costs for compaction and material testing shall be the responsibility of the CONTRACTOR.

3. The CONTRACTOR shall obtain the services of a certified testing company for all proctors and compaction testing. The CONTRACTOR shall submit the name and contact information of the testing company to the ENGINEER for approval prior to initiating construction.

4. The CONTRACTOR shall notify the ENGINEER a minimum of 48 hours in advance of all proctor, compaction, and material testing. The ENGINEER or CITY INSPECTOR shall be present for all sampling and testing.
5. The CONTRACTOR shall submit all proctor, compaction, and material testing results to the ENGINEER within one (1) week of receipt.

6. The CONTRACTOR shall provide compaction testing at a minimum frequency of 50 feet on center for all new pipelines installations. The CONTRACTOR shall provide additional compaction testing at all pipeline bends, deflections, and offsets; at roadway intersections; and as required by the ENGINEER or CITY to verify conformance with the Contract Documents.

B. Density:

1. Where soil material is required to be compacted to a percentage of maximum density, the maximum density at optimum moisture content will be determined in accordance with Method C of ASTM D 1557.

2. Where cohesionless, free draining soil material is required to be compacted to a percentage of relative density, the calculation of relative density will be determined in accordance with ASTM D 4253 and D 4254.

3. Field density in-place tests will be performed in accordance with ASTM D 1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method, ASTM D 2922 - Standard Test Methods for Density of Soil and Soil-Aggregate in Place By Nuclear Methods (Shallow Depth), or by such other means acceptable to the ENGINEER.

4. Density tests shall be made at every 100 linear feet at each lift, with test locations staggered at 25 feet each lift.

5. First test shall be made on the backfill layer 12-inches above the top of the pipe or at the water table, whichever is lower, and on 6-inch lifts thereafter.

C. Remediation

1. In case the test of the fill or backfill shows non-compliance with the required density, the CONTRACTOR shall accomplish such remedy as may be required to ensure compliance.

2. Subsequent testing to show compliance shall be by a testing laboratory selected by the OWNER and paid by the CONTRACTOR.

D. CONTRACTOR’S Responsibilities

1. The CONTRACTOR shall provide test trenches and excavations, including excavation, trench support and groundwater removal for the OWNER’s field soils testing operations.

2. The trenches and excavations shall be provided at the locations and to the depths as required by the OWNER.
3. Lawn areas destroyed by test trenching and excavation shall be re-graded and re-landscaped with sod.

3.11 EXPLORATORY EXCAVATIONS

A. The CONTRACTOR shall excavate and expose buried points of connection to existing utilities as indicated.

B. Excavation shall be performed prior to the preparation of Shop Drawings for connections and before the fabrication of the pipe.

C. The data obtained from exploratory excavations shall be used in preparing the Shop Drawings.

D. Data, including dates, locations excavated, and dimensioned sketches, shall be submitted to the ENGINEER within one week of excavation.

E. Unless otherwise indicated or ordered, excavation for pipelines and utilities shall be open-cut trenches with minimum widths as indicated.

F. Trench Bottom

1. Except where pipe bedding is required, the bottom of the trench shall be excavated uniformly to the grade of the bottom of the pipe.

2. Excavations for pipe bells and welding shall be made as required.

3. Where pipe bedding is required, the bottom of the trench shall be excavated uniformly to the grade of the bottom of the pipe bedding.

END OF SECTION
31 30 20  SHORING

PART 1 -- GENERAL

A.  Sheetings and shoring shall be installed where necessary to control trench width, protect the workmen and the general public, and prevent damage to this or adjacent work, or structures.

B.  For excavations five (5) feet deep or less, sheeting and shoring shall be installed where necessary to control trench width, protect the workmen and the general public, and prevent damage to this or adjacent work, or structures. When an excavation is in excess of five (5) feet deep, the Contractor shall comply with the provisions of the "Trench Safety Act," Florida Statute 553, Part 3. Method(s) of compliance used shall protect the workmen and the general public, prevent damage to this or adjacent work, structures, utilities, pavements, sidewalks, curbs, gutters and similar improvements both public and private, and provide for proper maintenance of traffic. The trench width may vary to accomplish this and to comply with the "Trench Safety Act," Florida Statute 553, Part 3, but only from a point one (1) foot above the top of the pipe.

C.  Trench widths, when measured at a point 12 inches above the top of the pipe, shall provide a 12-inch maximum clearance on each side, between the outside of the pipe barrel and the face of the excavation, or sheeting if used. Minimum trench width shall provide at least 6-inches clearance on each side, between the outside of the pipe barrel and the face of the excavation, or sheeting if used.

D.  Where wood sheeting or certain designs of steel sheeting are used, the OWNER may require that the sheeting be cut of at a level two (2) feet above the top of the installed pipe and that portion below that level be left in place. If ordered left in place, sheeting and shoring shall be paid for under the appropriate Quotation Item.

E.  If interlocking steel sheeting is used, the OWNER may permit its complete removal in lieu of the cut-off, providing removal can be accomplished without disturbing the bedding, pipe or pipe alignment. Any damage to the pipe bedding, pipe or pipe alignment shall be cause for rejection of the affected portion of the work.

F.  In areas where trench widths are not limited by right-of-way and/or easement widths, property line restrictions, existing adjacent improvements, including pavements, structures and other utilities, and maintenance of traffic, the trench sides may be sloped to a suitable angle of repose of the excavated material, but only from a point one foot above the crown of the pipe.
PART 2 -- **PRODUCTS** (NOT USED)
PART 3 -- **EXECUTION** (NOT USED)

END SECTION
PART 1 -- GENERAL

1.1 THE REQUIREMENT

A. The CONTRACTOR shall provide effective temporary erosion control and sediment control measures during construction or until permanent erosion controls become effective so as to prevent pollution of water, detrimental effects to public or private property adjacent to the project and damage to WORK on the project.

B. The CONTRACTOR’S attention is called to comply with all necessary NPDES and SFWMD dewatering permit requirements (e.g. erosion control measures) during the execution of the WORK.

1.2 CONTRACTOR SUBMITTALS

A. Submittals shall be in accordance with Specification 01 33 00 – Contractor Submittals.

B. Product Data: Manufacturer’s catalog sheets on geotextile fabrics.

PART 2 -- PRODUCTS

2.1 GENERAL

A. Temporary erosion and water pollution control features consist of, but are not limited to temporary grassing, temporary sodding, temporary mulching, baled hay, silt fences, and rock dikes.

2.2 SODDING

A. Sodding material will be in accordance with Specification 32 92 00 – Seeding and Sodding

2.3 HAY BALES

A. Baled hay or straw dams shall be constructed in accordance with the FDOT Standards Section 104-6.4.9

2.4 ROCK DIKES

A. Rock dikes shall be constructed in accordance with the FDOT Standards Section 104-6.4.12 using FDOT No. 57 stone with ½" x ½" wire mesh.

B. All temporary erosion control facilities shall be removed upon completion of the project.
2.5 FABRIC

A. Fabric shall be woven or non-woven consisting of long-chain polymeric filaments or yarns such as polypropylene, polyethylene, polyester or polyamide. The base plastic shall contain stabilizers and/or inhibitors to make the filaments resistant to deterioration due to ultra-violet light, heat exposure and chemicals. The fabric shall be free of any treatment that may significantly alter its physical properties. The edges of the fabric shall be salvaged or otherwise finished to prevent the outer yarn from pulling away from the fabric.

B. Fabric shall have the following properties:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Standard Method</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grab tensile strength</td>
<td>ASTM D 4632</td>
<td>100 lb</td>
</tr>
<tr>
<td>Burst strength</td>
<td>ASTM D 3786</td>
<td>200 psi</td>
</tr>
<tr>
<td>Apparent opening size</td>
<td>ASTM D 4751</td>
<td>Between 200 and 70 sieve size</td>
</tr>
</tbody>
</table>

C. Fabric Manufacturer, or equal

1. Mirafi

2.6 FENCING

A. Woven wire fabric fencing shall be galvanized, mesh spacing of 6-inches, maximum 14-gauge, at least 30-inches tall.

2.7 FASTENERS

A. Fasteners to wood posts shall be steel, at least 1-1/2 inches long.

B. Fasteners to steel posts shall be galvanized clips.

PART 3 -- EXECUTION

3.1 GENERAL

A. The CONTRACTOR shall prevent pollution of streams, canals, lakes, reservoirs, and other water impoundments by fuels, oils, bitumens, calcium chloride, silt or other disturbing materials. The CONTRACTOR shall conduct and schedule operations to avoid or otherwise minimize pollution by siltation.

B. The CONTRACTOR shall provide and maintain, for the duration of the project, erosion control barriers as required to prevent erosion and silt loss from the Site. Erosion control
measures shall remain in place until an adequate stand of grass has been established, per FDOT and NPDES standards.

C. The CONTRACTOR shall not commence clearing, grubbing, earthwork, or other activities that may cause erosion until barriers are in place.

D. The CONTRACTOR shall provide silt fences around the perimeter of all dirt stockpiles storage or processing areas. The CONTRACTOR shall provide silt fences along the canal side of any waterfront properties used for any construction purposes.

E. The CONTRACTOR flush and clean existing storm drainage system from deposits caused by the WORK. This will be identified by the OWNER.

3.2 BALED HAY AND BARRIERS

A. Baled hay and barriers when used shall be constructed in accordance with the details shown in the Drawings and in accordance with Section 104 of the FDOT Standards, 2000 edition. The CONTRACTOR shall construct baled hay or straw dams across water flow paths and place baled hay or straw barriers around drainage structures during the construction to protect against downstream or lateral accumulations of silt and debris. Baled hay or straw dams shall be constructed in accordance with the FDOT Standards, Section 104-6.4.9. The dams shall be placed so as to effectively control silt and debris dispersion under the conditions present on the project, or any conditions created during construction activities, which might tend to produce erosion or the accumulation of silt and debris. Top of bales shall also be placed below the edge of pavement to prevent flooding of the roadway.

B. The CONTRACTOR shall re-establish, at no increase in the Contract Price, all baled hay or straw dams, or sections thereof, which may become damaged, destroyed, or otherwise rendered unsuitable for their intended function during the construction of the project. All such temporary erosion control facilities shall be removed upon completion of the project.

3.3 ROCK DIKES

A. Rock dikes shall be constructed in accordance with the FDOT Standards Section 104-6.4.12 using FDOT No. 57 stone with ½” x ½” wire mesh. The CONTRACTOR shall construct rock dikes across water flow paths and place rock dikes around drainage structures during the construction to protect against downstream or lateral accumulations of silt and debris. The dikes shall be placed so as to effectively control silt and debris dispersion under the conditions present on the project, or any conditions created during construction activities, which might tend to produce erosion or the accumulation of silt and debris. Rock dikes shall also be placed below the edge of pavement to prevent flooding of the roadway.

B. The CONTRACTOR shall re-establish, at no increase in the Contract Price, all rock dikes, or sections thereof, which may become damaged, destroyed, or otherwise rendered unsuitable for their intended function during the construction of the project. All such temporary erosion control facilities shall be removed upon completion of the project.
3.4 INSTALLATION

A. Barrier systems shall be installed in such a manner that surface runoff will percolate through the system in sheet flow fashion and allow sediment to be retained and accumulated.

B. Drop Inlets shall have a ½” x ½” wire mesh screen over the throat (existing inlets) or grate (for new inlets). A #57 stone barrier shall be provided in front of the throat (existing inlets) or around the inlet structure (new inlets) approximately 4” above the grate/throat. This will allow for water to be filter in moderate rain events and to overflow unobstructed into the inlet in major rain events.

C. Attach the woven wire fencing to the posts that are spaced a maximum of 6 feet apart and embedded a minimum of 12-inches. Install posts at a slight angle toward the source of the anticipated runoff.

D. Trench in the toe of the filter fabric barrier with a spade or mechanical trencher so that the downward face of the trench is flat and perpendicular to the direction of flow. Lay fabric along the edges of the trench. Backfill and compact.

E. Securely fasten the fabric materials to the woven wire fencing with tie wires.

F. Reinforced fabric barrier shall have a height of 18-inches.

G. Provide the filter fabric in continuous rolls and cut to the length of the fence to minimize the use of joints. When joints are necessary, splice the fabric together only at a support post with a minimum 6-inch overlap and seal securely.

3.5 HANDLING AND STORAGE

A. The geotextile fabric shall be wrapped in a protective covering, which is sufficient to protect it from sunlight, dirt and other debris during shipment and storage.

3.6 MAINTENANCE

A. Weekly inspection and repair or replacement of damaged components of the barrier, and within 24 hours of a 1/2 inch or greater rain event. Maintenance includes removing debris from wire mesh and #57 stone at all protected inlets. Unless otherwise directed, maintain the erosion control system until final acceptance; then remove erosion and sediment control systems promptly.

B. Remove sediment deposits when silt reaches a depth of 6-inches or 1/2 the height of the barrier, whichever is less. Dispose of sediments on the Site, if a location is indicated on the Contract Drawings, or at a site arranged by the CONTRACTOR which is not in or adjacent to a stream or floodplain.

C. During periods of heavy rain (1” or greater as reported by the National Weather Service), the CONTRACTOR shall monitor the temporary erosion control measures to ensure that
they are not causing localized flooding. The CONTRACTOR may be required to cut slits in the fabric to drain flooded areas. Fabric shall be replaced after heavy rain events.

END OF SECTION
DIvision 32 – Exterior Improvements

32 11 13 AC Pavement and Base

Part 1 -- General

1.1 The Summary

A. The CONTRACTOR shall provide A.C. pavement and base, complete and in place, in accordance with the Contract Documents.

B. The work specified in this Section consists of the application of bituminous material on previously prepared base in accordance with these specifications and in conformity with the line, grades, dimensions and notes shown on the Drawings.

C. The CONTRACTOR shall restore asphaltic concrete pavement over the top of new pipe installation as detailed on the Drawings and as specified herein.

1. Following successful pressure testing, the CONTRACTOR shall mill the existing pavement to a depth of 1-inch and provide a new 1-inch asphalt overlay for the entire width of the roadway to the limits indicated. The CONTRACTOR shall mill, saw cut, remove and/or replace the existing asphalt as needed so the final lift of asphalt matches existing grades of driveways and storm drains.

D. The CONTRACTOR shall construct asphaltic concrete pavement in accordance typical sections as indicated on the Drawings, and as specified herein. The CONTRACTOR shall provide leveling courses and taper asphalt thicknesses to accommodate varying grades, slopes, side slopes and asphalt thicknesses on the existing roadway or adjacent structures.

E. The CONTRACTOR shall possess an asphalt contractor license issued by Broward County, Florida or provide an asphalt SUBCONTRACTOR with an asphalt contractor license issued by Broward County, Florida. The CONTRACTOR or SUBCONTRACTOR shall have a minimum of three (3) satisfactory asphalt projects in Broward County, Florida where the projects were of equivalent scope, area, and type to this Work. The references shall be submitted to the ENGINEER for review and approval.

F. The CONTRACTOR shall provide adequate supervision, labor, equipment, materials, testing equipment and hot asphalt meeting the specifications and shall place asphalt to provide a smooth driving surface free of ponding. The CONTRACTOR shall flood the existing asphalt prior to the Work and shall flood the new asphalt at the request of the ENGINEER, OWNER, or City of Hallandale Beach to test and assure that the new asphalt drains properly without ponding.
G. The CONTRACTOR shall re-grade, add, remove and recompact the lime rock base as needed or as requested by the ENGINEER or OWNER or as required to provide a finished roadway surface that is smooth, provides a smooth ride and drains without ponding. Any asphalt not meeting the Contract Documents and not providing a smooth, level and comfortable driving surface shall be removed in its entirety and replaced by the CONTRACTOR at the CONTRACTOR's expense and with no additional cost to the OWNER.

1.2 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Commercial Standards

AASHTO M 82     Cut-Back Asphalt (Medium Curing Type)
AASHTO M 140     Emulsified Asphalt
AASHTO M 208     Cationic Emulsified Asphalt
AASHTO M 226     Viscosity Graded Asphalt Cement
ASTM D 242       Mineral Filler for Bituminous Paving Mixtures
ASTM D 692       Coarse Aggregate for Bituminous Paving Mixtures
ASTM D 977       Emulsified Asphalt
ASTM D 1073      Fine Aggregate for Bituminous Paving Mixtures
ASTM D 1188      Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Paraffin-Coated Specimens
ASTM D 1557      Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf per cu ft)
ASTM D 2027      Cutback Asphalt (Medium Curing Type)
ASTM D 2397      Cationic Emulsified Asphalt
ASTM D 2726      Bulk Specific Gravity and Density of Non-Absorptive Compacted Bituminous Mixtures.
ASTM D 3381      Viscosity-Graded Asphalt Cement for Use in Pavement Construction
ASTM D 3515      Hot-Mixed, Hot-Laid Bituminous Paving Mixtures

B. DOT Specifications: the phrases, "DOT Specifications" or "FDOT Specifications", shall refer to the Florida Department of Transportation Standard Specifications for Road and
Bridge Construction. The DOT Specifications are referred to herein and are hereby made a part of this Contract to the extent of such references and shall be as binding upon the Contract as though reproduced herein in their entirety.

DOT 160  Stabilizing
DOT 200  Lime rock Base
DOT 300  Prime and Tack Coats for Base Courses
DOT 320  Hot Bituminous Mixtures - Plant Methods and Equipment
DOT 330  Hot Bituminous Mixtures - General Construction Requirements
DOT 331  Type S Asphaltic Concrete
DOT 337  Asphaltic Concrete Friction Courses
DOT 902  Fine Aggregate
DOT 911  Lime rock Material for Base and Stabilized Base
DOT 916  Bituminous Materials

1.3 CONTRACTOR SUBMITTALS

A. The CONTRACTOR shall submit, in writing, materials testing reports, job-mix formulas, notarized certificates of compliance signed by material producer and CONTRACTOR, certifying that each material item complies with, or exceeds, requirements, and other pertinent information satisfactory to the ENGINEER and OWNER demonstrating that proposed materials and methods will comply with the provisions of this Section. The CONTRACTOR shall submit his proposed job-mix formula for the asphaltic concrete paving and required information for review along with the FDOT requirements for the type of asphalt to be used a minimum of ten (10) days prior to the placement of asphalt.

B. The CONTRACTOR shall submit a location map, travel route and travel time calculation from the asphalt mix supplier. The CONTRACTOR shall provide documentation that indicates the number and capacities of vehicles that will be provided for the transport and placement of the asphalt.

C. The CONTRACTOR shall provide documentation of the number and type of equipment, testing equipment and qualified supervisory and labor personnel to be provided to ensure that the asphalt is placed hot and smooth.

D. Suitability Tests of Proposed Materials: Tests for conformance with the Specifications shall be performed prior to start of the WORK. The samples shall be identified to show the name of the material, aggregate source, name of the supplier, contract number, and the segment of the WORK where the material represented by the sample is to be used.
Results of all tests shall be submitted to the ENGINEER for approval. Materials to be tested shall include aggregate base, coarse and fine aggregate for paving mixtures, mineral filler, and asphalt cement.

E. **Trial Batch:** Before placing any paving material, a testing laboratory acceptable to the ENGINEER shall prepare a trial batch of asphalt concrete for each job-mix formula to be used by the CONTRACTOR for the work. The trial batch shall be prepared using the aggregates and asphalt cement proposed by the CONTRACTOR and approved by the ENGINEER. The compacted trial batch shall provide a basis for computing the voids ratio, provide an indication of the optimum asphalt content, and establish a basis for controlling compaction during construction. The cost of not more than 2 laboratory trial batch tests will be paid by the OWNER but the CONTRACTOR shall be responsible for the materials. Performing and paying for any additional trial batch testing shall be the CONTRACTOR’s responsibility.

**PART 2 -- PRODUCTS**

2.1 **MATERIALS**

A. **Limerock Base:** The lime rock base shall consist of either one (1) or two (2) courses of Miami Oolite lime rock conforming to DOT Sections 200 and 911.

B. **Prime Coat:** The material used for the prime coat shall be cut-back Asphalt Grade RC-70 conforming to DOT Sections 300 and 916 for prime to be used on Miami Oolite formation lime rock.

C. **Tack Coat:** The material used for the tack coat shall be Emulsified Asphalt Grade RS-2 conforming to DOT Sections 300 and 916.

D. **Asphaltic Concrete:** The materials and construction of the asphaltic concrete patch and surface courses shall be Type S-III and S-I Asphaltic Concrete conforming to DOT Sections 330, 331, 337 and 916. Final wearing surface shall be Type S-III. Asphaltic concrete mixtures shall be obtained only from plants which comply with the requirements of DOT Section 320 as applicable, using materials specified herein, and producing the specified mixture. General construction requirements for all hot bituminous mixtures specified herein shall conform to DOT Section 330, as applicable.

E. **Reclaimed asphalt shall not be used.**

F. **Liquid Asphalt for Prime Coat** shall be Asphalt Emulsion Prime (AEP) meeting the requirements of D.O.T. Specifications Section 916-4 and Section 300.

G. **Liquid Asphalt for Tack Coat** shall be Asphalt Emulsion Prime (AEP), conforming to the requirements of D.O.T. Specification Section 916-4 and Section 300.

2.2 **AGGREGATE BASE**
A. Materials for aggregate base shall be Type G material in accordance with Specification 31 30 00 - Earthwork.

2.3 PRIME COAT

A. Prime coat shall be Grade SC-250 liquid asphalt complying with the requirements of AASHTO M 82 (ASTM D 2027). Grade SC-70 liquid asphalt may be used when acceptable to the ENGINEER.

2.4 TACK COAT

A. Tack coat shall be emulsified asphalt Grade SS-1 or SS-1h, CSS-1 or CSS-1h diluted with one-part water to one-part emulsified asphalt, undiluted asphalt Grade RS-1 or CRS-1, or paving asphalt Grade AR-1000. Emulsified asphalt shall comply with the requirements of AASHTO M 140 (ASTM D 977) or M 208 (ASTM D 2397); paving asphalt shall comply with the requirements of AASHTO M 226 (ASTM D 3381).

2.5 PAVEMENT MARKING PAINT

A. Pavement marking paint shall be a product specifically formulated for use on asphalt concrete pavement and shall have a proven record of performance and durability.

2.6 EQUIPMENT

A. The pressure distributor used for placing the tack or prime coat shall be equipped with pneumatic tires having sufficient width of rubber in contact with the road surface to avoid breaking the bond of or forming a rut in the surface. The distance between the centers of openings of the outside nozzles of the spray bar shall be equal to the width of the application required, within an allowable variation of 2-inches. The outside nozzle at each end of the spray bar shall have an area of opening of not less than 25 percent, nor more than 75 percent in excess of the other nozzles which shall have uniform openings. When the application covers less than the full width, the normal opening of the end nozzle at the junction line may remain the same as those of the interior nozzle.

B. Application of prime or tack coat shall be done with a distributor approved by the Engineer of Record.

PART 3 -- EXECUTION

3.1 PAVEMENT REMOVAL AND REPLACEMENT

A. General: All existing utility castings, including valves boxes, junction boxes, manholes, hand holes, pull boxes, inlets and similar structures in the areas of trench restoration and pavement replacement shall be adjusted by the CONTRACTOR to bring them flush with the surface of the finished work, at no additional cost to the OWNER. The CONTRACTOR shall install concrete collars and identification tags on all existing and new water and wastewater valves within the limits of construction.
The CONTRACTOR shall be responsible for the protection from damage from his construction operations, all pavements, including all lime rock base courses and asphaltic surface courses, within the work area. Any base course or surface course, damaged as a result of the CONTRACTOR's operation, shall be restored in accordance with the applicable requirements of these Contract Documents, to the satisfaction of the ENGINEER and City of Hallandale Beach, and to the satisfaction of the governing authority having jurisdiction over the work area at no additional cost to the OWNER. In order to protect himself from being held liable for any existing damaged pavement, including detour routes, the CONTRACTOR is advised to notify the City of Hallandale Beach, in writing, the street where such defective pavement exists prior to proceeding with any work in the vicinity. A copy of all such notices shall be forwarded to the ENGINEER and OWNER.

Wherever the line of the nominal repaving for trenches extends to within a travel lane, the CONTRACTOR shall repave the entire roadway width.

Permanent pavement repair shall be in accordance with the details shown on the Drawings, with edges straight and parallel and patches rectangular in plan. Any paving replacement required beyond the limits shown in the details, and as called for in the Specifications, shall be at the CONTRACTOR's expense.

No mixture shall be spread when the air temperature is less than 40 degrees F.

Any mixture caught in transit by a sudden rain may be laid at the CONTRACTOR's risk, if the base is in suitable condition. Under no circumstances shall asphalt material be placed while rain is falling or when there is water on the area to be covered.

3.2 PREPARATION

Before applying any bituminous material, all loose material, dust, dirt, and foreign material, which might prevent proper bond with the existing surface, shall be removed. Particular care shall be taken to clean the outer edges of the strip to be treated in order to ensure that the prime or tack coat will adhere.

When the prime or tack coat is applied adjacent to curb and gutter, or any other concrete surface (except where they are to be covered with a bituminous wearing course) such concrete surfaces shall be protected by heavy paper or other protective material while the prime or tack coat is being applied. Any bituminous material deposited on such concrete surfaces shall be removed immediately.

3.3 WEATHER LIMITATIONS

No bituminous material shall be applied when the air temperature is less than 50EF in the shade, or when the weather conditions or the condition of the existing surface is unsuitable. In no case shall bituminous material be applied while rain is falling or when there is water on the surface to be covered.
3.4 APPLICATION OF PRIME COAT

A. After the base has been finished, the full width of surface shall be swept with a power broom supplemented with hand brooms and mechanical blowers prior to the application of the prime coat. Care shall be taken to remove all loose dust, dirt and objectionable matter. If deemed necessary, the base shall be lightly sprinkled with water immediately in advance of the prime coat. The prime coat shall be applied to the full width of the base.

B. The temperature of the prime material shall be such as to insure uniform distribution. The material shall be applied with a pressure distributor as specified above. The amount to be applied shall be sufficient to coat the surface thoroughly and uniformly without any excess to form pools or to flow off the base. For limerock base, the rate of application shall not be less than 0.10 gallons per square yard.

C. If the roadway is to be opened for use following the application of the prime material, a light uniform application of clean sand shall be applied and rolled. The sand shall be non-plastic, shall be free from silt and rock particles and shall not contain any sticks, vegetation, grass, roots or organic matter. After the sand covering has been applied, the surface may be opened to traffic.

3.5 APPLICATION OF TACK COAT

A. In general, a tack coat will not be used on primed bases except in areas which have become excessively dirty and cannot be cleaned or where the prime has cured and lost all of its bonding effect.

B. No tack coat shall be applied until the primed base or leveling course or new or existing asphaltic concrete has been cleaned and is free from sand, dust or other objectionable material.

C. The tack coat shall be applied with a pressure distributor as specified above. It shall be heated to a suitable consistency and applied in a thin uniform layer at the rate of between 0.05 gallons and 0.15 gallons per square yard.

D. The tack coat shall be applied sufficiently in advance of the laying of the wearing surface to permit drying but shall not be applied so far in advance or over such an area as to lose its adhesiveness as a result of being covered with dust or other foreign material. The tack coat shall not advance ahead of the paving by more than 300 feet in business or residential areas unless otherwise approved by the Engineer. Suitable precautions shall be taken by the Contractor to protect the surface while the tack coat is drying and until the wearing surface is applied.

3.6 AGGREGATE BASE

A. Aggregate base shall be provided where indicated to the thickness indicated. Imported aggregate bases shall be delivered to the Site as uniform mixtures and each layer shall be spread in one operation. Segregation shall be avoided, and the base shall be free of pockets of coarse or fine material. Where the required thickness is 6-inches or less, the
base materials may be spread and compacted in one layer. Where the required thickness is more than 6-inches; the base material shall be spread and compacted in two or more layers of approximately equal thickness, and the maximum compacted thickness of any one layer shall not exceed 6-inches. The relative compaction of each layer of aggregate base shall be not less than 95 percent of maximum density when measured in accordance with ASTM D 1557. The compacted surface of the finished aggregate shall be hard, uniform, smooth and at any point shall not vary more than 0.02 foot from the indicated grade or cross-section.

3.7 PRIME COAT

A. Prior to placing of pavement, a prime coat of cutback asphalt shall be applied to the compacted base or subgrade at a rate between 0.10 and 0.25 gal/sq yd.

3.8 TACK COAT

A. A tack coat shall be applied to existing paved surfaces where new asphalt concrete is to be placed on existing pavement. It shall also be applied to the contact surfaces of all cold pavement joints, curbs, gutters, manholes and the like immediately before the adjoining asphalt pavement is placed. Care shall be taken to prevent the application of tack coat material to surfaces that will not be in contact with the new asphalt concrete pavement. Diluted emulsified asphalt shall be applied at the rate of 0.05 to 0.15 gal/sq yd. Undiluted emulsified asphalt shall be applied at the rate of 0.025 to 0.075 gal/sq yd. Paving asphalt shall be applied at the rate of approximately 0.05 gal/sq yd.

3.9 PAVEMENT REPAIR

A. All damage to pavement as a result of work under this Contract shall be repaired in a manner satisfactory to the ENGINEER and City of Hallandale Beach and at no additional cost to the OWNER. The repair shall include the preparation of the subgrade, the placing and compacting of the lime rock base, the priming of the base, the placing and maintaining of the surface treatment, all as specified herein.

B. The width of all repairs shall extend at least twelve (12) inches beyond the limit of the damage. The edge of the pavement to be left in place shall be cut to a true edge with a saw or other method acceptable to the ENGINEER so as to provide a clean edge to abut the repair. The line of the repair shall be reasonably uniform with no unnecessary irregularities.

C. When a pipeline is installed in the middle of the road or the trench is partially on two traffic lanes, pavement shall be milled, saw-cut along the edges and asphalt shall be placed for the width of the two traffic lanes that have been disturbed unless otherwise shown on the Drawings.
3.10 PAVING

A. Final paving cannot be installed until all pipelines are satisfactorily pressure tested. Any pipeline defects identified during the testing process must be repaired prior to the placement of asphalt concrete.

B. The asphaltic concrete surface required is one lift of ¾ inches FDOT Type S-III overlay, 1-inch FDOT Type S-I structural course (over the trench and replacement lime rock base (over the trench) as shown on the drawings.

C. Lime rock of the Miami formation shall be used, having a minimum carbonate content of 60% and a minimum Load Bearing Ration (LBR) of 100. All lime rock bases must be constructed in lifts with a maximum thickness of 6-inches. The base material shall be compacted to a minimum density of 98% of maximum dry density as determined by AASHTO-180.

D. The maximum paving application tolerance is ¼-inch.

E. Prior to placement of asphalt a design mix for the asphalt gradation of all material, content of mix, Marshall Stability and laboratory density shall be provided to the ENGINEER, and City of Hallandale Beach. The design mix shall be subject to review and approval by the City of Hallandale Beach ENGINEER. Density testing shall be in compliance with FDOT Standard Specification for Road and Bridge Construction (latest edition).

F. After asphalt is placed, the CONTRACTOR shall obtain from an independent testing laboratory at minimum intervals of 300 feet, core borings of the asphalt to determine: thickness and density, Marshall Stability, Sieve Analysis of Aggregate and Bitumen content of Asphalt.

G. The graded aggregate base material shall be of uniform quality throughout, substantially free from vegetative matter, shale, lumps and clay balls and shall have an LBR of not less than 100. The material retained on the No. 10 sieve shall be composed of aggregate meeting the following requirements:

1. Soundness Loss, Sodium, Sulfate: AASHTO T 104-15%

2. Percent Wear: AASHTO T 96 (Grading A)

H. All lime rock shall be primed and compacted to 98% of the modified proctor density, AASHTO T-180, and be installed on a stabilized subgrade. In addition, a minimum LBR of 100 is required.

I. Certification from a testing laboratory shall be submitted to the ENGINEER and City of Hallandale Beach and will be subject to review and approval by the City of Hallandale Beach. The certification shall indicate that the material used for the base meets the specified criteria and contains less than 1% by weight asbestos and a minimum of 60% of calcium and magnesium.
J. After the base is completed, the CONTRACTOR shall obtain from an independent testing laboratory at minimum intervals of 300 feet, cores to determine base thickness and density. The tests shall be submitted to the ENGINEER and City of Hallandale Beach ENGINEER approval.

K. All sub-grades shall meet or exceed 98% modified proctor density AASHTO Y-180. In addition, a minimum L.B.R. of 40 will be required of all roadway and sub-grades.

L. All sub-grades are to be a minimum of six (6) inches beyond the base course layer where curbing is omitted. All rock bases shall be a minimum of six (6) inches beyond the asphalt concrete layer where curbing is omitted.

M. After the sub-grade is complete the CONTRACTOR shall obtain from an independent testing laboratory at minimum intervals of 300 feet, density and L.B.R. ratio tests on the sub-grade. The tests shall be submitted to the ENGINEER and the City of Hallandale approval.

3.11 ASPHALT CONCRETE

A. At the time of delivery to the Site, the temperature of mixture shall not be lower than 260 degrees F or higher than 320 degrees F, the lower limit to be approached in warm weather and the higher in cold weather.

B. Asphalt concrete shall not be placed when the atmospheric temperature is below 40 degrees F or during unsuitable weather.

C. The asphalt concrete shall be evenly spread upon the subgrade or base to such a depth that, after rolling, it will be of the required cross section and grade of the course being constructed.

D. The depositing, distributing, and spreading of the asphalt concrete shall be accomplished in a single, continuous operation by means of a self-propelled mechanical spreading and finishing machine designed especially for that purpose. The machine shall be equipped with a screed or strike-off assembly capable of being accurately regulated and adjusted to distribute a layer of the material to a definite pre-determined thickness. When paving is of a size or in a location that use of a self-propelled machine is impractical, the ENGINEER may waive the self-propelled requirement.

E. Spreading, once commenced, shall be continued without interruption.

F. The mix shall be compacted immediately after placing. Initial rolling with a steel-wheeled tandem roller, steel three-wheeled roller, vibratory roller, or a pneumatic-tired roller shall follow the paver as closely as possible. If needed, intermediate rolling with a pneumatic-tired roller shall be done immediately behind the initial rolling. Final rolling shall eliminate marks from previous rolling. In areas too small for the roller, a vibrating plate compactor or a hand tamper shall be used to achieve thorough compaction.
G. Upon completion the pavement shall be true to grade and cross-section. When a 10-ft straightedge is laid on the finished surface parallel to the center of the roadway, the surface shall not vary from the edge of the straightedge more than 1/8-in except at intersections or changes of grade. In the transverse direction, the surface shall not vary from the edge of the straightedge more than 1/4-in.

H. The relative density after compaction shall be 95 percent of the density obtained by using ASTM D 1188 or D 2726. A properly calibrated nuclear asphalt testing device shall be used for determining the field density of compacted asphalt concrete, or slabs or cores may be laboratory tested in accordance with ASTM D 1188.

3.12 PAVEMENT MARKING

A. Pavement marking paint shall be applied where indicated only when the pavement surface is dry and clean, and when the air temperature is above 40 degrees F. All equipment used in the application of pavement marking shall produce stripes and markings of uniform quality with clean and well-defined edges that conform to the details and dimensions indicated. Drips, overspray, improper markings, and paint material tracked by traffic shall be immediately removed from the pavement surface by methods previously reviewed by the ENGINEER.

END OF SECTION
32 17 23 PAVEMENT MARKING AND SIGNS

PART 1 -- GENERAL

1.1 THE SUMMARY

A. The CONTRACTOR shall provide pavement marking and striping, complete and in place, in accordance with the Contract Documents.

B. This Section consists of reflective pavement markers, traffic stripes and markings and traffic signs as specified herein, and as required for a complete installation.

C. The Contractor shall replace any existing reflective pavement markers, traffic stripes and markings damaged during construction to match the existing conditions.

1.2 QUALITY ASSURANCE

A. Perform WORK in accordance with the requirements of local agencies.

B. The phrase “DOT Specifications” shall refer to the Florida Department of Transportation Standard Specifications for Road and Bridge Construction. The DOT Specifications are referred to herein and are hereby made a part of this Contract to the extent of such references and shall be as binding upon the Contract as though reproduced herein in their entirety.

1.3 CERTIFICATION

A. The Contractor shall furnish the manufacturer’s certification that all signs furnished conform to these specifications and shall replace or repair at his expense all signs that fail to meet this requirement.

PART 2 -- PRODUCTS

2.1 MATERIALS

A. Chlorinated Rubber-alkyd Type: Per Fed Spec. No. TT-P-115, Type III, or Code T-1, conforming to Section 971-12.2 of the Florida Department of Transportation Standard Specifications.

B. Paint shall be factory mixed, quick drying and non-bleeding type.

C. Color shall be as per D.O.T. requirements.

D. Striping, arrows, lane markers and stop bars shall be provided with paint containing reflective additive.

E. Thermoplastic Paint: Conform to the applicable Technical Specifications (Section 711) of the Florida Department of Transportation and Broward County Standards.
F. Traffic Paint: Conform to the applicable Technical Specifications (Section 710) of the Florida Department of Transportation and Broward County Standards.

2.2 PAVEMENT MARKING

A. Paint or traffic stripes and markings shall be in conformance with DOT specification “Thermoplastic Traffic Stripes and Markings Paint” 711-12. The colors of the paint shall be yellow or white as existed before the repair.

B. Temporary pavement markings shall be used for the phase between final overlay and when final thermoplastic markings can be placed. Temporary markings shall consist of paint or traffic tape. All such markings shall be fully retro-reflectorized.

C. Reflective pavement markers shall be in conformance with DOT specification Section 706-2.

2.3 TRAFFIC SIGNS

A. General: The Contractor shall replace signs damaged during construction. Traffic regulating signs shall conform to the colors, dimensions and requirements of the Manual on Uniform Traffic Control Devices (ANSI).

B. Sign Panels and Support Members: Sign panels and support members shall conform to Aluminum Association Alloy 6061-T6.

C. Bolts: Bolts shall conform to Aluminum Association Alloy 2024-T4 with an anodic coating 0.0002-inches thick minimum and chromate sealed.


E. Reflective Sheeting: Reflective sheeting shall conform to DOT Type A requirements.

F. Construction Warning Signs: The Contractor shall install traffic and warning signs during construction in accordance with OSHA, DOT and County requirements.

G. All signage shall be in accordance with Broward County Traffic Engineering Division standards and the FHWA issued “Manual on Uniform Traffic Control Devices”, current edition.

PART 3 -- EXECUTION

3.1 TRAFFIC AND LANE MARKINGS

A. Sweep dust and loose material from the sealed surface.

B. Apply paint striping as indicated with suitable mechanical equipment to produce uniform straight edges. Apply not less than 2 coats at manufacturer’s recommended rates of application.
C. Protect pavement markings until completely dry in accordance with manufacturer's recommendations.

3.2 PAVEMENT MARKINGS

A. Temporary pavement markings shall be installed as soon as practical following paving. Pavement markings are required on all new asphalt, prior to night fall. All pavement markings shall be visible at night and shall be retro-reflective. In the event of inclement weather, the project shall be striped as soon as practical, once the weather has improved.

B. Permanent thermoplastic markings shall not be placed until new asphalt has cured for a minimum of four (4) weeks.

C. The surface, which is to be painted shall be cleaned, by compressed air or other effective means, immediately before the start of painting, and shall be clean and dry when the paint is applied. Any vegetation or soil shall be removed from the pavement before edge striping is begun.

D. The traffic stripe shall be of the specified width, with clean, true edges and without sharp breaks in the alignment. A uniform coating of paint shall be obtained, and the finished stripe shall contain no light spots or paint skips. Any stripes which do not have a uniform, satisfactory appearance, both day and night, shall be corrected.

E. All newly painted stripes, including edge stripes, shall be protected until the paint is sufficiently dry to permit vehicles to cross the stripe without damage from the tires. While the center line stripes are being painted, all traffic shall be routed away from the painting operations and the newly painted stripe. When necessary, a pilot car shall be used to protect the painting operations from traffic interference.

F. Any portions of the stripes damaged during construction shall be repainted at the Contractor’s expense.

G. Thermoplastic Traffic Stripes and Markings: The thermoplastic compound shall be extruded or sprayed onto the pavement surface in a molten state by mechanical means, with surface application of glass spheres, when required, and upon cooling to ambient pavement temperature shall produce an adherent pavement marking of specified thickness and width and capable of resisting deformation.

H. The portion of the pavement surface or thermoplastic marking to which the marker is attached by the adhesive shall be cleaned of dirt, curing compound, grease, oil, moisture, loose or unsound pavement and any other material which would adversely affect the adhesive. Reflective markers shall be installed in such a manner that the reflective face of the marker is perpendicular to a line parallel to the roadway centerline. No markers shall be installed over longitudinal or transverse joints of the pavement surface. The adhesive shall be spread on the bonding surface (not the marker) so that 100 percent of the bonding area of the marker will be covered. The adhesive application shall be of sufficient thickness so that when the marker is pressed into the adhesive, excess adhesive shall be forced out around the entire perimeter of the marker. All excessive adhesive shall
be removed from in front of the reflective faces, if any adhesive or foreign matter adheres to the reflective face of the marker, the marker shall be replaced. The Engineer shall determine the minimum time necessary to cure the adhesive for sufficient set to bear traffic.

I. Reflective pavement markings shall be placed at locations of fire hydrants and watermain valves as required by CITY standards.

3.3 SIGN FABRICATION

A. Preparation of sign blanks and fabrication of reflectorized faces shall conform to the applicable requirements of DOT Section 700-4 and 700-5.

3.4 INSTALLATION

A. Sign and supports shall be erected in conformance to DOT requirements and as specified herein.

B. All damaged signs and reflective pavement markers and traffic stripes and markings shall be replaced in conformance with this Section and DOT requirements.

END OF SECTION
32 92 00  SODDING

PART 1 -- GENERAL

1.1 THE SUMMARY
A. The CONTRACTOR shall apply grass sodding, complete and in place, in accordance with the Contract Documents.

1.2 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS
A. Federal Specifications:
   FS O-F-241D  Fertilizer, Mixed, Commercial.

B. Commercial Standards:
   ANSI/ASTM D 422  Method for Particle-Size Analysis of Soils.

1.3 CONTRACTOR SUBMITTALS
A. Materials List: A list of all materials to be used in the turfing and seeding operations together with the source of those materials. The list shall include mulches, soil amendments, sod species, and erosion control blanketing. Manufacturer’s literature showing physical characteristics, applications, and installation instrumentation shall be included.

B. Schedules: The following work plans, before work is started.
   1. Delivery schedule at least 10 days prior to the intended date of the first delivery.
   2. Pesticide Treatment Plan, giving proposed sequence of pesticide treatment work, before work is started. The pesticide trade name, chemical composition, formulation, concentration, application rate of active ingredients and methods of application for all materials furnished, and the name and state license number of the state-certified applicator shall be included.
   3. Turfing Operation. A list of seeding and mulching equipment to be used in performance of turfing operation, descriptive data, and calibration tests.
   4. Plant Establishment Period. Written calendar time period for the beginning of the plant and turf establishment period. When there is more than one establishment period, the boundaries of the planted and turf areas covered for each period shall be described.
1.4 CLEANUP

A. Upon completion of all seeding/sodding operations, the portion of the Site used for a work or storage area by the CONTRACTOR shall be cleaned of all debris, superfluous materials, equipment, and garbage.

B. Walks and pavement shall be swept or washed clean upon completion of the WORK of this Section.

1.5 MAINTENANCE PRIOR TO ACCEPTANCE OF PROJECT

A. General: The CONTRACTOR shall be responsible for protecting, watering, fertilizing, and maintaining turf and seeded areas until final acceptance of the WORK.

B. Maintain sod by watering, fertilizing, weeding, mowing, trimming, and other operations such as rolling, regarding and replanting as required to establish a smooth, acceptable lawn, free of eroded or bare areas.

C. Maintain lawns for not less than a minimum of 30 days after substantial completion, until final acceptance.

D. Upon completion of seeding/sodding, the entire planted area shall be soaked to saturation by a fine spray. The new planting shall be kept watered by the sprinkling system on the Site during dry weather or whenever necessary for proper establishment of the turf. Care shall be taken to avoid excessive washing or puddling on the surface and any such damage caused thereby shall be repaired by the CONTRACTOR.

E. Protection: The CONTRACTOR shall provide adequate protection to all newly sodded areas including the installation of approved temporary fences to prevent trespassing and damage, as well as erosion control, until the end of the one-year correction period.

F. The CONTRACTOR shall replace any materials or equipment it has damaged, or which has been damaged by its employees or subcontractors.

G. Partial utilization of the project shall not relieve the CONTRACTOR of any of the requirements of this Section

H. Mowing of Turf Areas: First mowing of turf areas shall begin as soon as the grass has reached a height of 3 inches and subsequent mowing shall be at least once a week, or as often as necessary to maintain turf areas at a uniform height of 1-1/2 to 2 inches.

I. Maintenance shall include, in addition to the foregoing, cleaning, edging, the repair of erosion, and other maintenance work. Sidewalks and other paved areas shall be kept clean while planting and maintenance are in progress.

J. Turf areas shall be fertilized with percentage of nitrogen required to provide not less than 1 pound of actual nitrogen per 1,000 sq. ft. of lawn area and not less than 4 percent phosphoric acid and 2 percent potassium. Provide nitrogen in a form that will be available
to sod during initial period of growth; at least 50 percent of nitrogen to be in organic form. The chemical designation shall be 8-8-8.

1.6 FINAL INSPECTION AND GUARANTEE

A. Inspection of sodded areas will be made at final acceptance

B. Written notice requesting inspection shall be submitted to the ENGINEER at least 10 days prior to the anticipated inspection date.

C. Any delay in completing the WORK of this Section beyond a single season will be cause for extending the correction of defects period an equal time.

D. The CONTRACTOR shall, without additional expense to the OWNER, replace sodding which develops defects or dies during the correction period.

PART 2 -- PRODUCTS

2.1 GENERAL

A. Materials for soil conditioning and weed abatement shall be first-grade, commercial quality and shall have certificates indicating the source of material, analysis, quantity, or weight attached to each sack or container or furnished with each delivery. Delivery certificates shall be given to the ENGINEER as each shipment of material is delivered. A list of the materials used, together with typical certificates of each material, shall be submitted to the ENGINEER prior to final acceptance.

2.2 TOPSOIL

A. Topsoil shall be the existing soil stripped to the depth indicated and stockpiled at a location directed by the ENGINEER in accordance with Section 31 30 00 - Earthwork.

B. Additional topsoil, if needed, shall comply with the following:

1. Topsoil shall be obtained from naturally drained areas and shall be fertile, friable loam suitable for plant growth. Topsoil shall be subject to inspection and approval at the source of supply and upon delivery.

2. Topsoil shall be of uniform quality, free from subsoil, stiff or lumpy clay, hard clods, hardpan, rocks, disintegrated debris, plants, roots, seeds, and any other materials that would be toxic or harmful to plant growth. Topsoil shall contain no noxious weeds or noxious weed seeds.

3. Topsoil shall be 4% to 12% organic matter of the total dry weight.

4. pH and nutrient content shall be adjusted as necessary to conform with recommendations made by testing laboratory.
5. Mechanical analysis shall be performed and shall conform to ASTM D 422.

2.3 FERTILIZER AND ADDITIVES

A. Fertilizer shall be furnished in bags or other standard containers with name, weight, and guaranteed analysis of contents clearly marked thereon.

B. Chemical fertilizers shall be a mixed commercial fertilizer conforming to FS O-F-24c(1), Grade A or B, with percentages of nitrogen, phosphoric acid, and potash at 8-8-8. The combined N-P-K content shall be the following percentages of total weight: 50 percent nitrogen, 4 percent phosphoric acid and 2 percent potash. Fertilizers shall be uniform in composition, dry, and free flowing.

2.4 SOD

A. Provide sod to restore any damage caused by construction operations, lay-down area, or bypassing to the existing grass areas at the project site.

B. Sod shall match the existing grass type.

C. The sod shall be deeply rooted, not less than 2 years old, relatively free of thatch, diseases, nematodes, soil-borne insects, weeds or undesirable plants, stones larger than 1-inch in any dimension, woody plant roots and other material detrimental to a healthy stand of turf. Sod that has become dry, moldy, or yellow from heating, or has irregularly shaped pieces of sod and torn or uneven ends shall be rejected.

D. Provide sod uniform pad sizes with maximum 5 percent deviation in either length or width. Broken pads with uneven ends will not be acceptable. Sod pads incapable of supporting their own weight when suspended vertically with a firm grasp on upper 10 percent of pad will be rejected.

E. Sod shall be nursery grown on cultivated mineral agricultural soils. Sod shall have been mowed regularly and carefully maintained from planting to harvest.

F. American Sod Producers Association (ASPA) Grade: Nursery grown or Approved. Field grown sod not acceptable.

G. The sod shall be nursery grown. It shall be uniformly cut in pads at a length of 24 inches, plus or minus 5% and a width of 18 inches, plus or minus 5%. Thickness shall be 1-1/2 inches excluding top growth and thatch. Pads shall not be stretched, broken or torn.

H. Sod shall be inspected and found free of disease, nematodes, pests and pest larvae, by entomologist of State Department of Agriculture.

I. Sod shall be uniform in color, leaf texture, and density.
2.5 MULCH

A. Wood Cellulose Fiber: Mulch shall not contain any growth or germination-inhibiting factors and shall be dyed an appropriate color to aid visual monitoring during application. Composition on air-dry weight basis: 9 to 15 percent moisture and pH range from 4.5 to 6.0.

B. Straw mulch or native hay for a soil/seed stabilizer shall be clean hay or straw applied at a rate of 3 tons per acre. Mulch shall be crimped into soil with a mulch crimper. Spacing on the blades of the mulch crimper shall be 6-inches minimum and 9-inches maximum. Blades shall be sufficiently weighted to penetrate the ground 3-inches.

2.6 EROSION CONTROL MATERIAL

A. Soil Erosion Control Blanket: Blanket shall be machine-produced mat of wood excelsior formed from a web of interlocking wood fibers, covered on one side with either knitted straw blanket-like mat-construction, covered with biodegradable plastic mesh, or interwoven with biodegradable thread, plastic netting or twisted kraft paper cord netting.

B. Soil Erosion Control Fabric: Control fabric shall be knitted construction of polypropylene yarn with uniform mesh openings of 314 per 1-inch square with strips of biodegradable paper. Filler paper strips shall last 6 to 8 months.

C. Soil Erosion Control Net: Control net shall be heavy, twisted jute mesh weighing approximately 1.22 pounds per linear yard and 4-feet wide with mesh openings of approximately 1-inch square.

D. Anchors: Erosion control anchors shall be as recommended by the manufacturer.

2.7 PESTICIDE

A. Pesticide shall be insecticide, herbicide, fungicide, nematocide, rodenticide, and miticide. Pesticide material shall be labeled for use and applied only as registered by EPA and approved.

B. Herbicide shall contain maximum 54 percent allyphosate as an active ingredient. The herbicide shall not contain a surfactant. The herbicide shall allow seeding/sodding to take place 3 days after application of the herbicide.

PART 3 -- EXECUTION

3.1 PREPARATION OF GROUND SURFACE

A. For sod, mix planting soil either prior to planting or apply on surface of topsoil and mix thoroughly before planting.
3.2 SODDING

A. Lay sod within 24 hours from time of stripping.

B. Lay sod to form solid mass with tightly fitted joints. Butt ends and sides of sod strips; do not overlap. Stagger strips to offset joints in adjacent courses. WORK from boards to avoid damage to subgrade or sod. Tamp or roll lightly to ensure contact with subgrade. WORK sifted soil into minor cracks between pieces of sod; remove excess to avoid smothering of adjacent grass.

C. Water sod thoroughly with a fine spray immediately after planting.

3.3 APPLICATION OF PESTICIDE MATERIAL

A. When pesticide becomes necessary to remove a disease or pest, a state-certified applicator shall apply required pesticide in accordance with State EPA label restrictions and recommendations. Hydraulic equipment for the liquid application of pesticides shall consist of a leak-proof tank, positive agitation methods, controlled application pressure, and metering gauges. A pesticide treatment plan shall be furnished to the ENGINEER as indicated above.

3.4 SOD PLACEMENT

A. Areas shall be sodded as indicated. Adequate soil moisture shall be ensured prior to sodding by spraying water on the area to be sodded and wetting the soil to a minimum depth of 1 inch.

B. Placing Sod: Rows of sod shall be placed parallel to and tightly against each other. joints shall be staggered laterally. The sod strips shall not be stretched or overlapped. All joints shall be butted tight. Voids and air drying of roots shall be prevented. On long slopes, sod shall be laid at right angles to slopes. In ditches, sod shall be laid at right angles to the flow of water. When required, the sod shall be anchored by placing anchors a minimum distance of 2-feet on center with a minimum of 2 anchors per sod section.

C. Finishing: All air pockets shall be eliminated, and a true and even surface shall be provided by tamping or rolling the sod in place. Displacement of the sod shall be assured by knitting of sod to the soil. Frayed edges shall be trimmed, and holes or missing corners shall be patched in the sod.

D. Water Sod: Watering shall be started immediately after completing each day of sodding. Water shall be applied at a rate of 1-1/2 inches of water per week and at sufficient intervals to ensure moist soil conditions to a minimum depth of 1-inch. Run-off and puddling shall be prevented.

3.5 EROSION CONTROL INSTALLATION

A. Erosion control material is required on slopes greater than 4 to 1. Erosion control material shall be installed in accordance with manufacturer's instructions. Placement of the erosion material shall be verified by the ENGINEER.
control material shall be accomplished without damage to installed material or without deviation to finished grade.

3.6 INSPECTION AND ACCEPTANCE

A. Sod areas will be accepted when in compliance with all the following conditions:
   1. The roots are thoroughly attached to the soil.
   2. Absence of visible joints.
   3. All areas show a uniform stand of specified grass in healthy condition.
   4. At least 60 days have elapsed since the completion of the WORK in this section.

B. When inspected sod WORK does not comply with requirements, replace rejected WORK and continue specified maintenance until re-inspected by ENGINEER and found to be acceptable.

C. Procedure:
   1. The CONTRACTOR shall submit a request for acceptance in writing to the ENGINEER. Request must be received not less than 10 days before the anticipated date for final inspection.
   2. Upon completion of all repairs and/or renewals required by ENGINEER at the inspection, the ENGINEER will verify the completeness of the WORK and then notify the OWNER in writing that the WORK is accepted.
   3. Upon completeness, the OWNER will assume maintenance of all sod areas.

END OF SECTION
32 92 10  CURBS, GUTTERS, SIDEWALKS AND DRIVEWAYS

PART 1 -- GENERAL

1.1 GENERAL

A. Work covered under this Section covers the furnishing of all labor, equipment and material required for cutting, removing, protecting and replacing all existing concrete driveways, sidewalks, and curb and gutter of the various types encountered, removed or damaged under this Contract.

B. The Contractor shall be responsible for the protection from damage from his construction operations, all concrete driveways, sidewalk, and curb and gutter within the work area. If payment items are established in the Quotation for the removal and replacement of concrete driveway, sidewalk, and curb and gutter, payment will be made only if such items are encountered within the limits of the trench width plus 2 feet (shoulders). Any concrete driveway, sidewalk, or curb and gutter beyond those limits, damaged as a result of the Contractor's operation, shall be restored in accordance with the applicable requirements of these Specifications, and to the satisfaction of the Engineer, at no additional cost to the OWNER. In order to protect himself from being held liable for any existing damaged concrete driveways, sidewalks or curb and gutter, the Contractor is advised to notify in writing the authority having jurisdiction over the street where such damage exists prior to proceeding with any work in the vicinity. A copy of all such notices shall be forwarded to the Engineer.

C. No payment will be made for removal and replacement of concrete driveway, sidewalk, or curb and gutter necessitated by the installation of thrust blocks or other appurtenant items which fall outside the above described limits. The cost for said removal and replacement shall be included in the price bid for the applicable item.

D. If payment items have not been established in the Quotation for the removal and replacement of concrete driveways, sidewalks, and curb and gutter, the cost for such work shall be included in the overall Project cost bid. No other compensation will be provided.

E. No form shall be set higher than the elevation of the adjacent concrete surface.

F. As used herein, "driveway" shall mean concrete driveway, and "curb and gutter" shall mean free standing curb, gutter, or combination curb and gutter.

G. All concrete shall be treated with a liquid curing compound, and in some cases, concrete colorant shall be required in order to match the color of the existing concrete being replaced. In each such case the curing compound, the colorant, and the color, shall meet with the approval of the Engineer and the municipality having jurisdiction over the work area. All additives to the concrete shall be applied in strict conformance with the recommendations of the manufacturer.
H. The Contractor shall provide adequate means to protect each driveway, sidewalk, and curb and gutter installation from damage from vandals, animals, weather or other causes, until the concrete is hard. Should damage occur from such causes, the Contractor shall remove and replace the damaged item at his own expense.

1.2 CONCRETE DRIVEWAYS

A. Concrete driveways, and sidewalks crossing driveways, shall be restored in full sections or blocks rather than trench width plus 2 feet (shoulders), if the original construction was divided into such sections or blocks. The existing driveway (or sidewalk) shall be cut with an abrasive disc saw to trim the edges to straight and true lines, with edges parallel and rectangular in plan. The interior concrete shall then be broken up and removed from the site.

B. Driveways, and sidewalks crossing driveways, shall be replaced with a concrete slab having a minimum thickness of 6 inches. Steel reinforcement is not required unless the existing driveway (or sidewalk) is so reinforced, in which case the replaced driveway shall also be reinforced to match the existing.

C. Such forms as are necessary shall be set up and the subgrade regraded for a slab 6 inches thick. The subgrade shall be thoroughly compacted and wet down prior to placing the concrete. The surface shall be given a surface and edging to match, as nearly as possible, that of the existing driveway (or sidewalk). The finish and edging shall be obtained through the use of screeds, trowels, edges and any other tool normally required by the trade in performing this kind of work.

D. All forms for driveways (or sidewalks) including those for expansion joints, shall be metal and shall be clean and well-oiled prior to placing concrete. The forms shall be set in place far enough in advance of concrete placing for the Engineer to check line and grade. Abrupt changes in line and grade will not be permitted, and forms shall be set to ensure smooth curvature and alignment both vertically and horizontally. Forms shall be left in place for a minimum of 24 hours after concrete has been placed.

E. Replacement driveways (and sidewalks) shall match the elevation and alignment of existing driveways (and sidewalk) wherever a connection is made.

1.3 SIDEWALKS

A. Sidewalks shall be restored in full section rather than trench width plus 2 feet (shoulder).

B. Removal of existing sidewalk, installation of forms, preparation of subgrade, and the final finish shall be performed as specified hereinabove for driveways, except that the minimum thickness of the sidewalk shall be 4 inches thick.

1.4 CURB AND GUTTER

A. Curb and gutter shall be restored in lengths equal to trench width plus 2 feet (shoulders) or 10 feet, whichever is greater, unless otherwise permitted or ordered by the Engineer.
PART 2 -- PRODUCTS (NOT USED)
PART 3 -- EXECUTION (NOT USED)

END OF SECTION
DIVISION 33 – UTILITIES

33 01 10 CLEANING OF WATER UTILITY PIPING

PART 4 -- GENERAL

4.1 SCOPE OF WORK

A. The Contractor shall furnish and install all material, labor and equipment necessary to clean and test the force main and/or water main.

B. Pipelines for Potable Water Mains shall be pressure tested at 155 psi for a minimum of two (2) hours in accordance with Health Department requirements.

C. The Contractor is advised that he is solely responsible for any damage caused to the main or its lining by cleaning operations and he shall be required to repair or replace, as required by the OWNER, any damaged pipe or lining.

D. Potable water mains shall be disinfected and approved for use by the Health Department prior to placing the main in operation.

4.2 SUBMITTALS

A. Prior to cleaning operations, submit in writing to the Engineer, the make, model and characteristics of the pig to be used in cleaning operations.

B. If the pig has not been previously approved for this use by the OWNER, the submittal shall be a formal shop drawing submittal for approval and accompanied by a letter signed by a responsible officer of the manufacturing firm specifically stating that the submitted item will not damage the lining or pipe and that it is suitable for cleaning pipe of the diameter and lining type utilized in the project.

C. Single submittals may be made to qualify different types of pigs for different linings or sizes of pipe but only one manufacturer’s products shall be included in a particular submittal.

4.3 QUALITY ASSURANCE

A. Testing shall be in accordance with ANSI/AWWA Standard C-600, latest edition.

B. Cleaning and testing shall be performed in strict accordance with these specifications.

C. The Contractor is cautioned that Miami Dade County or other governing body having jurisdiction over the work location may have regulatory rules and ordinances prohibiting or limiting the discharge of water from any excavation into sanitary and storm sewer systems, or to canals and drainage ditches. The Contractor shall comply with all regulations of all governing agencies.
PART 5 -- PRODUCTS

5.1 MATERIALS

A. Pig or cleaning lines: Bare Swab No. 5B; density, 1 lb./ft.3; Knapp Polly Pig, Inc., 1209 Hardy Street, Houston, Texas 77020, 1-800-231-7205, or approved equal.

PART 6 -- EXECUTION

6.1 CLEANING

A. As soon as the installation of each run of force main and/or water main is completed, and prior to installation of valves on the main in positions which would interfere with the cleaning operation, the line shall be cleaned by use of a pig with characteristics as specified above. The pig shall be driven through the line by water pressure and no cables, push rods or other mechanisms that might damage the pipe or lining shall be utilized in this operation.

B. Thorough pigging will be required, and operations shall be sufficient to remove all deleterious materials left in the pipe by construction and shall meet the Engineer's approval. If required by the OWNER, pigging operations shall be scheduled to allow observation by the OWNER and no extra compensation will be allowed for such scheduling.

C. The Contractor shall furnish and install all piping necessary to carry out pigging operations, dispose of water and debris from the operation, and shall exercise care to prevent any damage to the surrounding area and adjoining or adjacent properties. The Contractor shall furnish either a new or in new condition pig for cleaning operations and the OWNER reserves the right to reject the pig and require provision by the Contractor of a new replacement at no additional cost to the OWNER.

D. The Contractor is required to install nightcaps, plugs or other devices acceptable to the Engineer at the open ends of the pipe installation at the end the workday. This requirement shall apply to installations both above and below the water table.

END OF SECTION
33 01 11 PRESSURE PIPE TESTING AND DISINFECTION

PART 1 -- GENERAL

1.1 THE REQUIREMENT

A. The CONTRACTOR shall test and disinfect potable water pipelines and appurtenant piping, in accordance with the Contract Documents.

B. The CONTRACTOR shall be responsible for obtaining permits for discharging excess testing and disinfection water and dechlorination of such water if required to satisfy permit limits.

C. The CONTRACTOR shall coordinate all disinfection with the OWNER a minimum of 48 hours before starting the work. The 48 hours’ notice shall apply to normal working days only; weekends and holidays exempted.

1.2 CONTRACTOR SUBMITTALS

A. Furnish: A testing plan and schedule, including method for water conveyance, control, disposal, and disinfection shall be submitted in writing to the ENGINEER for review and approval. The plan shall be submitted a minimum of ten (10) working days prior to the scheduled date of testing.

B. The OWNER will perform all bacteriological samples and analysis.

C. Resume of experienced technician, if liquid chlorine is proposed.

PART 2 -- PRODUCTS

2.1 MATERIAL REQUIREMENTS

A. All test equipment, chemicals for chlorination, temporary valves, bulkheads, and other water control equipment, and choice of disinfectant shall be as determined by the CONTRACTOR. No materials shall be used which would be injurious to the WORK for future conveyance of potable water.

B. Chlorine for disinfection may be in the form of liquid chlorine, sodium hypochlorite solution, or calcium hypochlorite granules or tablets.

1. Liquid chlorine shall be in accordance with the requirements of ANSI/AWWA B301 - Liquid Chlorine, and shall be used only when each of the following conditions are satisfied:

   a. Appropriate gas flow chlorinators and ejectors are used.

   b. An experienced technician directly supervises.
c. Appropriate safety practices are observed.

2. Sodium and calcium hypochlorite shall be in accordance with ANSI/AWWA B300 - Hypochlorites.

C. Dechlorination agents may be sodium bisulfate, sodium sulfite, or sodium thiosulfate.

PART 3 -- EXECUTION

3.1 GENERAL

A. Water for testing and disinfecting water pipelines will be furnished by the OWNER; however, the CONTRACTOR shall convey the water from the OWNER-designated source to the points of use.

B. All pressure pipelines shall be tested; those for potable water shall be disinfected. All chlorinating and testing operations shall be performed in the presence of the ENGINEER Or OWNER.

C. Disposal of flushing water and water containing chlorine shall be included in the testing plan and meet the requirements of the Central Broward Water Control District and all other applicable permitting agencies.

D. Disinfection operations of each phased construction area shall be scheduled at the end of successful pressure testing and as close as possible to the proposed time of connection to existing in service piping to maximize the degree of sterility of the facilities at the time the WORK is accepted by the OWNER. Bacteriological Sampling and testing shall be performed by the OWNER. Results of the bacteriological testing shall be satisfactory with the Broward County Health Department.

3.2 HYDROSTATIC TESTING OF PIPELINES

A. Prior to hydrostatic testing, pipelines shall be flushed or blown out as appropriate.

B. The CONTRACTOR shall test pipelines in sections. Sections to be tested shall be defined by isolation valves in the pipeline. Where such valves are not present, the CONTRACTOR shall install temporary bulkheads or plugs for the purpose of testing. Sections that do not have isolation valves shall be tested in lengths not to exceed 2,000 feet. Sections that have a zero-leakage allowance may be tested as a unit.

C. No section of the pipeline shall be tested until field-placed concrete or mortar has attained an age of 14 Days.

D. The test shall be made by closing valves when available or by placing bulkheads and filling the line slowly with water. The CONTRACTOR shall be responsible for ascertaining that test bulkheads are suitably restrained to resist the thrust of the test pressure without damage to or movement of the adjacent pipe. Unharnessed sleeve-type couplings,
expansion joints, or other sliding joints shall be restrained or suitably anchored prior to the test to avoid movement and damage to piping and equipment.

E. Remove or protect any pipeline-mounted devices that may be damaged by the test pressure.

F. The pipeline shall be filled at a rate which will not cause any surges or exceed the rate at which the air can be released through the release valves at a reasonable velocity. All the air within the pipeline shall be allowed to escape completely. The CONTRACTOR shall provide sufficient temporary tappings in the pipelines to allow for trapped air to exit. After completion of the tests, such taps shall be permanently plugged. The differential pressure across the orifices in the air release valves shall not be allowed to exceed 5 psi at any time during filling.

G. The CONTRACTOR shall furnish the pressure gauge to be used for pressure testing. The pressure gauge must be in 2 psi increments with a minimum of 200 psi total reading.

H. The OWNER’S procedures for Official Pressure Testing is as follows:

1. Pipeline segment to be pressure tested must be in a backfilled and compacted trench. If beneath a roadway, finished limerock must be installed unless prior approval from the OWNER has been granted.

2. Fill pipeline segment to be pressure tested.

   a. If the pipeline segment under test is tied into an existing main with the required double valves, then there must always be attest one fill and flush with a vent to atmosphere with all required ports for testing between the double valves and a single vent to atmosphere between all other double valve connections. All vents to atmosphere must always be open while the pipeline section under test is pressurized and all double valves must be closed.

   b. If the pipeline segment under test is not tied into the existing live main, then a fill and flush with a vent to atmosphere must be installed with all required ports for testing. This vent to atmosphere must always be open while the pipeline section is pressurized.

3. After the pipeline or section thereof has been filled, it shall be allowed to stand under a slight pressure for at least 24 hours to allow the concrete or mortar lining, as applicable, to absorb water and to allow the escape of air from air pockets. All air shall be expelled from the pipeline segment. During this period, bulkheads, valves, and connections shall be examined for leaks. If leaks are found, corrective measures satisfactory to the ENGINEER shall be taken.

4. The pipeline segment shall be pressurized to the test pressure of 155 psi. The official pressure test shall not begin until the pipeline segment has held the pressure to the allowable leakage for a minimum of 48 hours.
5. The official hydrostatic pressure test shall consist of holding the indicated test pressure on the pipeline segment for a period of two (2) hours. The test pressure shall be 155 psi, measured at the lowest point of the pipeline section being tested. At no point during the official pressure test shall the total pressure loss be more than 5 psi (pressure drop below 150 psi).

6. Pressure testing requirements and allowable leakage are summarized in the following table:

<table>
<thead>
<tr>
<th>Pipe Type</th>
<th>Testing Standard</th>
<th>Test Pressure (P)</th>
<th>Test Duration</th>
<th>Allowed Leakage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ductile iron, all joint types</td>
<td>AWWA C600</td>
<td>155 psi</td>
<td>2 hours</td>
<td>See Equation A</td>
</tr>
<tr>
<td>PVC</td>
<td>AWWA C605</td>
<td>155 psi</td>
<td>2 hours</td>
<td>See Equation A</td>
</tr>
</tbody>
</table>

**Equation A:** \[ Q = \frac{(L \cdot D \cdot \sqrt{P})}{148,000} \]

Where:
- \( Q \) = allowable leakage (make-up water), gallons per hour
- \( L \) = length tested or maximum test length allowed (2,000 feet), whichever is smaller, feet
- \( D \) = nominal pipe diameter, inches
- \( P \) = test pressure, psi

7. There shall be no intermediate pumping during the official pressure test. The CONTRACTOR may pump the allowable makeup water at the end of the two-hour test. The amount of allowable makeup water shall be based on the total footage of the pipeline segment under test, with a maximum of 2,000 feet. There shall be no allowable makeup water for valves, fittings, short lines less than 10 linear feet and any line less than 4-inches in diameter.

8. All sections of the pipeline under test must vent water and show a pressure loss on the pressure gauge at the end of the test. The gauge must read zero after all water pressure is expelled at the end of the test.

In the case of pipelines that fail to pass the leakage test, the CONTRACTOR shall determine the cause of the leakage, shall take corrective measures necessary to repair the leaks, and shall again test the pipelines; repeating as necessary until the pipeline passes the pressure test.

3.3 DISINFECTING PIPELINES
A. **General:** Potable water pipelines shall be disinfected in accordance with the requirements of ANSI/AWWA C651 - Disinfecting Water Mains, using the Continuous-Feed Method as modified herein.

B. **Chlorination:** A chlorine-water mixture shall be uniformly introduced into the pipeline by means of a solution-feed chlorinating device. The chlorine solution shall be introduced at one end of the pipeline through a tap in such a manner that as the pipeline is filled with water, the dosage applied to the water entering the pipe shall be approximately 50 mg/l. A backflow preventer shall be used to prevent the strong chlorine solution in the line being disinfected from flowing back into the line supplying the water.

C. **Retention Period:** Chlorinated water shall be retained in the pipeline for at least 24 hours. After the chlorine-treated water has been retained for the required time, the free chlorine residual at the pipeline extremities and at other representative points shall be a minimum of 25 mg/l. If testing does not demonstrate a residual of 25 mg/l or greater, the disinfection procedure above shall be repeated.

D. **Chlorinating Valves:** During the process of chlorinating the pipelines, valves and other appurtenances shall be operated from closed to full open to closed while the pipeline is filled with the heavily chlorinated water.

E. **Sampling Ports:** The CONTRACTOR shall provide sampling ports along the pipeline as defined on AWWA C651. Taps may be made at manways and air valves to help facilitate the spacing requirement.

F. **Final Flushing:** After the applicable retention period, the heavily chlorinated water shall be flushed from the pipeline until chlorine measurements show that the concentration in the water leaving the pipeline is no higher than that generally prevailing in the system or is acceptable for domestic use. Any release of chlorinated water shall comply with federal, state, and local regulation and the permits for the project. Chlorine in excessive amounts shall be treated before discharge.

G. **Bacteriological Testing:** After final flushing and before the pipeline is placed in service, a sample, or samples shall be collected from the end of the line and shall be tested for bacteriological quality in accordance with the requirements of the Florida Department of Health. For this purpose, the pipe shall be re-filled with fresh potable water and left for a period of 24 hours before any sample is collected. If testing does not demonstrate a free chlorine residual after the 24-hour period, the disinfection procedure above shall be repeated. If the initial disinfection treatment fails to produce satisfactory bacteriological test results, the disinfection procedure shall be repeated until acceptable results are obtained.

### 3.4 CONNECTIONS TO EXISTING SYSTEM

A. Where connections are to be made to an existing potable water system, the interior surfaces of all pipe and fittings used in making the connections shall be swabbed or sprayed with a one percent hypochlorite solution before installation. Thorough flushing
shall be started as soon as the connection is completed and shall be continued until discolored water is eliminated.

END OF SECTION
1.2  SPECIFICATIONS, CODES AND STANDARDS

ASTM A 48  Gray Iron Castings

ASTM C 150  Portland Cement

ASTM C 443  Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets

ASTM C 478  Precast Reinforced Concrete Manhole Sections

ASTM C 913  Standard Specification for Precast Concrete Water and Wastewater Structures

ASTM C 923  Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and Laterals

1.3  CONTRACTOR SUBMITTALS

A.  Shop Drawings

1.  Show dimensions, locations, lifting inserts, reinforcement, and joints.

2.  Structural design calculations for vaults, signed by a registered engineer.

B.  Manufacturer’s Certification for Vaults:  Written certification that the vault complies with the requirements of this Section.

1.4  QUALITY ASSURANCE

A.  Inspection:  After installation, the CONTRACTOR shall demonstrate that manholes and vaults have been properly installed, level, with tight joints, at the correct elevations and orientations, and that the backfilling has been carried out in accordance with the Contract Documents.
PART 2 -- PRODUCTS

2.1 MANHOLES

A. The CONTRACTOR shall provide precast manhole sections and conical sections conforming to ASTM C 478 and the requirements of this Section. Adjusting rings shall be standard items from the manufacturer of the manhole sections. Minimum wall thickness of rings shall be 4-inches if steel reinforced and 6-inches if not reinforced.

B. Axial length of sections shall be selected to provide the correct total height with the fewest joints.

C. Conical sections shall be designed to support cast iron frames and covers under an H-20 loading, unless indicated otherwise.

D. Where the manhole barrel diameter is greater than 48-inches, a flat slab-transition, either concentric or eccentric, shall be used to transition to 48-inch diameter riser sections. Underside of the transition shall be at least 7-feet above the top of the bench.

E. Where indicated on the Drawings, manholes supplied for 48-inch and larger pipes shall be of a “T” Base-style fabrication. The pipeline portion of the “Base T” section shall conform to ASTM C-76 and be of the same pipe class as the deepest connected sewer. The riser section shall conform to ASTM C-478.

F. Design Criteria: Manhole walls, transitions, conical sections, and base shall be designed per ASTM C 478 for the depths indicated and the following:

1. AASHTO H-20 loading applied to the cover.

2. Internal fluid pressure based on unit weight of 63 pcf with manhole filled from invert to cover with no balancing external soil pressure.

3. Dead load of manhole sections fully supported by the base and transition.

4. Additional reinforcing steel in walls to transfer stresses at openings.

5. The minimum clear distance between the edges of any 2 wall penetrations shall be 12-inches or one-half of the diameter of the smaller penetration, whichever is greater.

G. Joints shall be sealed with o-ring gaskets conforming to ASTM C 443.

H. Concrete for base and channel formation shall be 4000 psi concrete.

I. Except were otherwise indicated on the Drawings, manholes shall have a precast concrete base and a factory installed bench.
J. Barrel section to sewer pipe connections shall be sealed with resilient connectors complying with ASTM C 923. Mechanical devices shall be stainless steel.

K. Manhole Manufacturers, or Equal
   1. Oldcastle Precast
   2. TJ Precast
   3. Landmark Precast Concrete Products of the Palm Beacher
   4. United Concrete Products
   5. US Concrete Products Corporation

2.2 FRAMES AND COVERS

A. Castings: Castings for manhole frames and covers shall be non-rocking and shall conform to the requirements of ASTM A 48, Class 30. Unless otherwise indicated, cast iron covers and frames shall be heavy traffic type, with embossed lettering saying "Sewer" to meet the requirements of the City Frame and cover shall be designed for H-20 traffic loading.

B. Castings Manufacturers, or Equal
   1. Alhambra Foundry Co., Ltd.
   2. Neenah Foundry Co.
   3. Vulcan Foundry, Inc

PART 3 -- EXECUTION

3.1 GENERAL

A. Pre-cast concrete sections shall be transported and handled with care in accordance with the manufacturer's written recommendations. Where lifting devices are provided in pre-cast sections, such lifting devices shall be used as intended. Where no lifting devices are provided, the CONTRACTOR shall follow the manufacturer’s recommendations for lifting procedures to provide proper support during lifting.

B. Buried pre-cast concrete vaults shall be assembled and placed in excavations on properly compacted soil foundations as indicated. Pre-cast concrete vaults shall be set to grade and oriented to provide the required dimensions and clearances from pipes and other structures.

C. Prior to backfilling, all cracks and voids in pre-cast concrete vaults shall be filled with non-shrink grout or polyurethane sealant, or both. Around pipe and conduit penetrations, openings shall be sealed with polyurethane sealant. With the authorization of the
ENGINEER, grout or a closed-cell flexible insulation may be used as filler material prior to placing a final bed of polyurethane sealant.

END OF SECTION
33 12 13 WATER SERVICE CONNECTIONS

PART 1 -- GENERAL

1.1 THE REQUIREMENT

A. The CONTRACTOR shall provide and furnish all labor, material, equipment and all miscellaneous small valve systems indicated, complete and operable, in accordance with the Contract Documents. The installation of water services shall be done in accordance with AWWA C600, C901, and C-902 and additional requirements by the CITY.

B. The drawings define the general location of service connections. The CONTRACTOR shall adjust the location of service connections as dictated by actual field conditions to avoid existing driveways, mailboxes, trees, concrete, carports, and other features.

C. It is the CONTRACTOR’s responsibility to develop the details necessary to construct the connections and to provide and install all spools, spacers, adapters, and connectors for a complete and functional system.

1.2 CONTRACTOR SUBMITTALS

A. Contractor to submit manufacturer’s catalog sheets providing information on materials and installation procedures.

1.3 LEAD FREE REQUIREMENT

A. It is a requirement that all components of water service installations be certified lead free. All brass components for water service installations shall comply with the S3874 amendment (Reduction of Lead in Drinking Water Act) to Section 1417 of the Federal Safe Drinking Water Act.

B. All meters, meter accessories, copper pipe, brass pipe, fittings, corporation stops, saddles, washers, tailpieces, couplings and other appurtenant items used for water services shall be “NL” no lead Type for installation in the WASD system. Solders and flux shall contain no more than 0.2% lead.

C. All brass components shall be marked “NL” to indicate no lead.

D. All valves 2-inch and smaller shall conform to the No Lead, NL, requirement. Valves larger than 2-inches are exempt.

PART 2 -- PRODUCTS

2.1 WATER METERS

A. Water meters shall be provided for all lots as indicated on the drawings. Meters shall be installed as detailed on the drawings in accordance with the Contract Documents.
2.2 METER BOXES

A. Meter boxes shall be provided for all new meters. Meter boxes shall be installed as
detailed on the drawings in accordance with the Contract Documents. Meter boxes shall
be lightweight to exceed 20k lb vertical load as manufactured by Carson Heavywall™ BCF
or approved equal.

2.3 SERVICE SADDLES

A. Service addles shall be double band, bronze ASTM A536 which tightens to conform to the
curvature of the pipe sealing O-Ring gasket confined in a retaining groove.

B. Saddles shall be sized to fit the pipe material of the line being tapped. For AWWA C 900
PVC pipe the saddle shall be sized for the exact outside diameter of the pipe.

C. The saddles shall have a bearing area of sufficient width along the axis of the pipe so that
the pipe will not be distorted when the saddle is made tight.

D. Sealing gaskets shall be BUNA-N rubber and straps shall be corrosion resistant alloy
steel.

E. An internal shell cutter shall be used to drill through the corporation stop to minimize PVC
shavings, retain the coupon, and reduce stress. Single fluted shell cutters, twist drills or
hole saws are not acceptable. Shell cutter will have sufficient depth to handle the heavy
wall PVC pipe.

F. Service Saddles must be used on all pipes that are to be tapped.

G. Manufacturers or Equal:

1. Ford Meter Box Company – F 202B
2. Mueller - BR2B Series

2.4 CORPORATION STOPS

A. Corporation stops shall be designed and manufactured to conform to AWWA C-800
(ASTM B-62).

B. Corporation stops shall be ball valve type and constructed of brass alloy.

C. Inlet threads shall be AWWA iron pipe thread in all sizes. Outlet connection shall have a
compression type fitting.

D. The corporation stops shall all be compatible with tapping machines of current design.

E. Corporation stops shall be designed to withstand working pressures up to 300 psi.
F. Corporation stops shall be individually inspected and tested for leaks with air pressure.

G. Manufacturers or Equal:
   1. Mueller – 110 Compression Outlet, B25028-I.P
   2. Ford Meter Box Company – Ball Corp FB 11000

2.5 METER VALVES

A. Meter valves shall be designed and manufactured to conform to AWWA C-800 (ASTM B-62).

B. Corporation stops shall be ball type and constructed of brass.

C. Meter valves shall be closed bottom design and resilient O-ring sealed against external leakage at the top. Shutoff shall be affected by a resilient pressure actuated seal so positioned in the plug as to completely enclose the flow way in the closed position.

D. The inlet side of all meter valves shall have compression type fittings. Meter valves for meter sizes 1-1/2" and smaller shall be equipped with a coupling nut on the outlet sides. Meter valves for 1-1/2" and 2’ meters shall have flanged connections on the outlet sides.

E. Manufacturers or Equal:
   1. McDonald
   2. Mueller
   3. Ford Meter Box Company

2.6 CURB STOPS

A. Curb stops shall be designed and manufactured to conform to AWWA C-800 (ASTM B-62).

B. Curb stops shall be ball valve type and the same size as the connecting service line.

C. Curb stops shall be constructed of cast red brass containing copper, tin, lead, and zinc. The ball shall be Teflon coated brass and shall be held in position by and seal off against seats of Buna-N rubber that are held securely in place with epoxy adhesive.

D. Curb stops shall be compression fitting and ensure tightness in both directions at all pressures, easy turning, non-binding, with minimum pressure loss. Curb stops shall be a solid one-piece tee-head and stem. Curb stops shall allow 90° motion and shall be enclosed and protected. The stem that turns the ball shall exert no other force on it except to open or close the ball and shall be held securely in place by means of a bronze ring.
The minimum diameter of the stem at the point of attachment to the valve body shall be as follows:

<table>
<thead>
<tr>
<th>Valve Size</th>
<th>Minimum diameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>¾&quot;</td>
<td>11/16&quot;</td>
</tr>
<tr>
<td>1&quot;</td>
<td>11/16&quot;</td>
</tr>
<tr>
<td>1-1/4&quot;</td>
<td>7/8&quot;</td>
</tr>
<tr>
<td>1-1/2&quot;</td>
<td>7/8&quot;</td>
</tr>
<tr>
<td>2&quot;</td>
<td>1&quot;</td>
</tr>
</tbody>
</table>

E. Curb stops shall be designed to withstand working pressures up to 300 psi.

F. Manufacturers or Equal:
   1. Mc Donald – Angle Ball Type
   2. Mueller
   3. Ford Meter Box Company – BA 43 Series and BFA-43 Series

2.7 POLYETHYLENE TUBING

A. Polyethylene tubing shall be used for all water service connections in accordance with the details on the Drawings.

B. The polyethylene compound from which the tubing is made shall be an ethylene hexane copolymer and shall comply with the applicable requirements as specified in ASTM D3350 providing a cell classification of 355434C and simultaneously be as specified in ASTM D1248 for Type 111 Category 5, Grade P34, Class C, PE3408 very high molecular weight, high density polyethylene plastic material.

C. Polyethylene shall comply with the following:

1. Tubing shall have a working pressure at 200 PSI at 73.4 degrees F.

2. All tubing furnished under these specifications shall conform to the following standards:


3. Tubing dimensions and tolerances shall conform to the following requirements:

   a. Polyethylene tubing surfaces shall be mirror smooth and shall be free from bumps and irregularities. Materials must be completely homogenous and uniform in appearance.
4. Tubing dimensions and tolerances shall correspond with the values listed in AWWA C901 with a dimension ration (DR) of 9.

5. Tubing shall be fully labeled at intervals of not more than 5 feet with brand name and manufacturer, the nominal size, PE 3408, the word “Tubing” and DR9, PC 200, AWWA C901-88, and the seal, or mark, of the testing agency.

6. 1" Tubing shall be used for single services and 1-1/2" tubing shall be used for double services.

D. Manufacturers or Equal:

1. Phillips, Driscopipe Ultra Line

2.8 HDPE PIPE FOR SERVICES

A. All 2-inch high density polyethylene pipe used for services shall be IPS-O.D. Controlled with Standard Outside Dimension Ratio (SODR) of 9, pressure rating of 250 psi, nominal outside diameter of 2.375-inches, minimum wall thickness of 0.264-inches, in conformance with Materials Standard PE 4710 "Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter". Pipe shall conform with ANSI/AWWA C901 "Polyethylene (PE) Pressure Pipe and Tubing, ½ In. (13 mm) Through 3 In. (76 mm), for Water Service" as modified herein. Pipe shall have a (natural) inner core with a blue colored outer shell. Pipe shall have footage marks at a maximum interval of every two feet. Polyethylene material shall have a minimum cell classification in accordance with ASTM D3350 "Polyethylene Plastics Pipe and Fitting Materials" of 445576D for the core, which shall be 100% virgin material, and 445576E for the outer shell. Note that both of these materials are UV stabilized as signified by the "D" for natural colored and "E" for the colored shell. Pipe shall conform with NSF 61 or 14. Manufacturer shall supply certification of compliance with all of the above requirements. Certification shall ship with the pipe on material sold to the OWNER and shall always be submitted with shop drawings and catalogue cuts.

B. All 1-inch high density polyethylene tubing used for services shall be CTS-O.D. Controlled with Standard Outside Dimension Ratio (SODR) of 9, pressure rating of 250 psi, nominal outside diameter of 1.315-inches, minimum wall thickness of 0.125-inches, PE 3408, all in conformance with Materials Standard PE 4710 "Polyethylene (PE) Plastic Tubing". Tubing shall conform with ANSI/AWWA C901 "Polyethylene (PE) Pressure Pipe and Tubing, ½ In. (13 mm) Through 3 In. (76 mm), for Water Service" as modified herein. Tubing shall have a (natural) inner core with a blue colored outer shell. Tubing shall have footage marks at a maximum interval of every two feet. Polyethylene material shall have a minimum cell classification in accordance with ASTM D3350 "Polyethylene Plastics Pipe and Fitting Materials" of 445576D for the core, which shall be 100% virgin material, and 445576E for the outer shell. Note that both of these materials are UV stabilized as signified by the "D" for natural colored and "E" for the colored shell. Tubing shall conform with NSF 61 or 14. Manufacturer shall supply certification of compliance with all of the above requirements. Certification shall ship with the tubing on material sold to the OWNER and
shall always be submitted with shop drawings and catalogue cuts. When required by the OWNER or his designee, certification shall be signed and sealed by a professional engineer licensed to practice in the state in which the manufacturer is located or in the State of Florida.

C. All HDPE services require the use of a 10 gauge direct bury stranded copper blue tracer wire tapped every four feet with poly or duct tape for location purposes. The tracer wire shall be accessible at the meter box and connected to the corporation stop for continuity of the signal. The 10 AWG standard tracer wire shall have 0.030" HDPE insulation and measure 0.162" min O.D.

PART 3 -- EXECUTION

3.1 MATERIAL DELIVERY, STORAGE, AND PROTECTION

A. All service connection appurtenances shall be delivered in a clean and undamaged condition and stored off the ground for protection against oxidation caused by ground contact. All defective or damaged materials shall be replaced with new materials.

B. The CONTRACTOR shall be responsible for transporting the OWNER furnished meter boxes and meters from the OWNERS storage to the work site. The CONTRACTOR shall coordinate the scheduled installation/ the number of meter boxes/meters required; and the pickup date and time; with the OWNER.

C. Meter boxes and meters will be stored by the OWNER at the following location:

   City of Hallandale Beach
   
   630 NW 2\textsuperscript{nd} St
   
   Hallandale Beach, FL 33009

3.2 WATER METER INSTALLATION

A. All CONTRACTOR shall adjust the location of service connections as dictated by actual field conditions to avoid existing driveways, mailboxes, trees, concrete, carports, and other features.

B. Meter boxes shall be located within the grass or sidewalk and as uniformly as possible. If meter box is located on a driveway, meter box shall be traffic rated.

C. Services from the new water mains shall consist of corporation stops, HDPE or copper tubing and terminal fittings as shown in the Standard Details. All service installations from the new main shall be installed by the Contractor. Service installations from existing mains, if required, will be installed by Contractor, and the cost for materials and labor furnished by the OWNER shall be borne by the Contractor.
D. The CONTRACTOR shall field locate meter boxes to avoid having to cross existing driveways with new service lines whenever possible. The CONTRACTOR shall field route service piping from the meter box to the existing trailer connection to minimize damage and replacement of existing landscaping, trees, and other features.

E. The pit for the meter must be large enough to facilitate the use of hand tools to install the meter.

F. Where meter boxes are located in existing sidewalks, the whole flag of sidewalk shall be removed and replaced with new concrete. The concrete walk shall be 4 inches thick and finished with the proper tools and techniques to resemble the existing walk. The concrete support for meter boxes shall be eliminated when the box is installed in an existing sidewalk. Where meter boxes are located out of sidewalk areas, a concrete support is required. Concrete supports shall be to the established line and grade. Meters must be set to grade after plumbing work is completed.

G. Meter boxes shall be set flush with the finished grade if in sidewalks, or flush with the top of the ground if out of sidewalk areas.

H. All bends in copper tubing shall be made with an approved type tube bender to the satisfaction of the Department. Flattened, out of round or kinked tubing will not be permitted.

I. One-inch service connections shall be one of the following:

1. Short single – Consisting of a short run of HDPE or copper tubing from the main on the same side of the street as the proposed meter, to the meter installation approximately 2 ½ feet from property line. Single meter box installation included.

2. Long single – Same as above but from a main on the opposite side of the street from the proposed meter.

3. Short dual – Consisting of a short run of HDPE or copper tubing from the main on the same side of the street as the proposed meter to the meter installation, approximately 2 ½ feet from the property line and branched off to serve an additional customer. Dual meter box installation included.

4. Long dual – Same as above but from a main on the opposite side of the street from the proposed.

J. Galvanized or black steel casing pipe for services is required when crossing existing pavement. The pipe may be driven from the side of the street which affords the most room for the driving trench, thus resulting in the least number of couplings in the casing. Extra care shall be used in leveling and heading the first length of casing in the proper direction. One method of driving casing, known to work in this area and offered here as a suggestion, is to use an ordinary coupling screwed on the leading end of the casing as a cutting edge, and driving against a coupling screwed on the tailing end with a special tool in a pneumatic hammer, while maintaining a steady pull forward on the hammer with a small winch. Each
length of casing as driven shall be cleaned out with compressed air introduced through a one-half-inch pipe at least as long as the casing. The purpose of driving casing pipe is to make it unnecessary to repair paving over one-inch service cuts. Should the Contractor elect to open-trench any 1-inch service line across pavement, he will be required to repair the paving.

K. The Contractor shall install the meter box, 1-inch branch assembly, 30-inch tailpieces and perforated spacers.

L. When installing services, the Contractor shall temporarily plug the ends of the tail pieces for protection against dirt.

END OF SECTION
33 92 20 DUCTILE IRON PIPING

PART 1 -- GENERAL

1.1 THE SUMMARY

A. The CONTRACTOR shall provide ductile iron pipe and appurtenant WORK, complete and in place, in accordance with the Contract Documents.

1.2 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

AWWA C104 Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water
AWWA C105 Polyethylene Encasement for Ductile-Iron Pipe Systems
AWWA C110 Ductile-Iron and Gray-Iron Fittings, 3 in through 48 in for Water
AWWA C111 Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
AWWA C115 Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges
AWWA C150 Thickness Design of Ductile-Iron Pipe
AWWA C151 Ductile-Iron Pipe, Centrifugally Cast for Water
AWWA C153 Ductile-Iron Compact Fittings. for Water Service
AWWA C600 Installation of Ductile Iron Water Mains and Their Appurtenances
AWWA C606 Grooved and Shouldered Joints
ASTM C 150 Portland Cement
NSF/ANSI Standard 61 Drinking Water System Components – Health Effects

1.3 CONTRACTOR SUBMITTALS

A. Shop Drawings

1. Certified dimensional drawings of valves, fittings, and appurtenances.

2. Line layout and marking diagrams which indicate the specific number of each fitting and the location and the direction of each fitting in the completed line. In
addition, the line layouts shall include: the pipe station and invert elevation at all changes in grade or horizontal alignment; all elements of curves and bends, both in horizontal and vertical alignment; and the limits of each reach of restrained joints, or of concrete encasement.

B. Certifications: Certified affidavit of compliance for pipe and other products or materials furnished under this Section and as specified in the referenced standards and the following supplemental requirements:

1. Physical and chemical properties.

2. Hydrostatic test reports.

C. The CONTRACTOR shall be responsible for performing and paying for sampling and testing as necessary for the certifications.

1.4 QUALITY ASSURANCE

A. Tests: Except as modified herein, materials used in the manufacture of the pipe shall be tested in accordance with the requirements of the referenced standards as applicable.

B. The CONTRACTOR shall perform said material tests as part of the WORK. The ENGINEER shall have the right to witness testing conducted by the CONTRACTOR; provided, that the CONTRACTOR's schedule is not delayed for the convenience of the ENGINEER.

C. In addition to those tests specifically required, the ENGINEER may request additional samples of any material including lining and coating samples for testing by the OWNER. The additional samples shall be furnished as a part of the WORK.

D. Inspection: Pipe shall be subject to inspection at the place of manufacture in accordance with the provisions of the referenced standards, as supplemented by the requirements herein. The CONTRACTOR shall notify the ENGINEER in writing of the manufacturing starting date not less than 14 Days prior to the start of any phase of the pipe manufacture.

E. During the manufacture of the pipe, the ENGINEER shall be given access to areas where manufacturing is in process and shall be permitted to make inspections necessary to confirm compliance with the Specifications.

PART 2 -- PRODUCTS

2.1 PIPE GENERAL

A. Mortar-lined ductile iron pipe shall conform to AWWA C151 and C104, subject to the supplemental requirements in this Section. The pipe shall be manufactured in the USA, of the diameter and class indicated, and shall be provided complete with rubber gaskets, specials, and fittings as required under the Contract Documents.
B. Markings: The CONTRACTOR shall legibly mark specials in accordance with the laying schedule and marking diagram. Each fitting shall be marked at each end with top field centerline.

C. Color Coding: All ductile iron pipe shall be color coded or marked to identify the service type. Piping shall have three equally spaced pairs of longitudinal stripes that run parallel to the axis of the pipe of the color specified below.

   1. Potable Water Main Piping - BLUE

D. Handling and Storage: The pipe shall be handled as a minimum at the 1/3 points by use of wide slings, padded cradles, or other devices designed and constructed to prevent damage to the pipe coating/exterior. The use of chains, hooks, or other equipment that might injure the pipe coating/exterior will not be permitted. Stockpiled pipe shall be supported on padded skids, sand or earth berms free of rock exceeding 3-inches diameter, sandbags, or suitable means so that the coating will not be damaged. The pipe shall not be rolled and shall be secured to prevent accidental rolling.

E. Defective pipe shall be immediately removed from the site by the CONTRACTOR.

F. Laying Lengths: Nominal pipe laying lengths shall be 20-feet.

G. Finish: The pipe shall have smooth dense interior surfaces and shall be free from fractures, excessive interior surface crazing, and roughness.

H. Closures and Correction Pieces: Closures and correction pieces shall be provided as required so that closures may be made due to different headings in the pipe laying operation and so that correction may be made to adjust the pipe laying to conform to pipe stationing on the Drawings. The locations of correction pieces and closure assemblies are indicated. Any change in location or number of said items shall only be as accepted by the ENGINEER.

2.2 SPECIALS AND FITTINGS

A. Fittings for ductile iron pipe shall conform to the requirements of AWWA C153 or AWWA C110 and shall have a minimum pressure rating of 350 psi.

2.3 DESIGN OF PIPE

A. The pipe shall be designed, manufactured, tested, inspected, and marked according to AWWA C150 and C 151 except where modified by this Section.

B. Pressure Class: Pipe shall be pressure Class 350.

C. All potable water piping shall be cement mortar lined.

D. Fitting Dimensions: The fittings shall be of the diameter and class indicated.

E. Joint Design: Ductile iron pipe and fittings shall be furnished with mechanical joints, push-on joints, flanged joints, or restrained joints as required.
1. Mechanical and push-on joints shall conform to AWWA C111.

2. Flanged joints shall conform to AWWA C115. Where threaded flanges are provided, the pipe wall thickness under the cut threads shall not be less than the calculated net thickness required for the pressure class of the pipe.

3. Restrained joints shall be “Flex-Ring” restrained joint by American Ductile Iron Pipe, "TR FLEX" restrained joint by U.S. Pipe, or equal.

4. Joint restraining devices that impart point loads and/or wedging action on the pipe wall as a means of joint restraint shall not be allowed unless there are no other options for joint restraint available. Under such circumstances, the CONTRACTOR may propose such devices provided the following conditions are met and the request is made as a substitution:

   a. A formal request for substitution is submitted stating the location(s) where the devices are intended to be used and a statement from the device manufacturer and the pipe manufacturer that the proposed device is appropriate for the intended installation and rated at least for the class of the pipe being supplied.

   b. A statement from the pipe manufacturer is provided accepting the use of the retaining devices and indicating that the use of such devices will in no way affect the warranty of the pipe and/or the performance of the pipe.

   c. The manufacturer of the device and the pipe manufacturer jointly provide instruction on the proper installation of the device to the personnel installing the units and provide certification to the OWNER that the installers are adequately trained in the installation of the units and that all warranties are in full affect for the project.

   d. The devices shall be MegaLug Model 1100 as manufactured by EBAA Iron or equal.

F. For bell-and-spigot ends with rubber gaskets, the clearance between the bells and spigots shall be such that when combined with the gasket groove configuration and the gasket itself, will provide watertight joints under all operating conditions when properly installed. The CONTRACTOR shall require the pipe manufacturer to submit details complete with significant dimensions and tolerances and also to submit performance data indicating that the proposed joint has performed satisfactorily under similar conditions. In the absence of a history of field performance, the results of a test program shall be submitted.

2.4 CEMENT-MORTAR LINING

A. Cement-Mortar Lining for Shop Application: Except as otherwise provided herein, interior surfaces of ductile iron pipe, fittings, and specials shall be cleaned and lined in the shop with cement-mortar lining applied centrifugally in conformity with AWWA C104. During the lining operation and thereafter, the pipe shall be maintained in a round condition by suitable bracing or strutting. The lining machines shall be of a type that has been used
successfully for similar work. Every precaution shall be taken to prevent damage to the lining. If lining is damaged or found defective at the Site, the damaged or unsatisfactory portions shall be replaced with lining conforming to these Specifications.

1. Cement: Cement for mortar lining shall conform to the requirements of AWWA C104; provided, that cement for mortar lining shall be Type II or V. Cement shall not originate from kilns that burn metal-rich hazardous waste fuel, nor shall a fly ash or pozzolan be used as a cement replacement.

B. The minimum lining thickness shall be as follows:

<table>
<thead>
<tr>
<th>Nominal Pipe Diameter, inches</th>
<th>Minimum Lining Thickness, inches</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 - 12</td>
<td>1/16</td>
</tr>
</tbody>
</table>

C. Protection of Pipe Lining/Interior: Shop-applied cement mortar lining shall be given a seal coat of asphaltic material in conformance with AWWA C104.

PART 3 -- EXECUTION

3.1 HANDLING AND STORAGE

A. The pipe shall be handled as a minimum at the 1/3 points by use of wide slings, padded cradles, or other devices designed and constructed to prevent damage to the pipe coating/exterior. The use of chains, hooks, or other equipment that might injure the pipe coating/exterior will not be permitted. Stockpiled pipe shall be supported on padded skids, sand or earth berms free of rock exceeding 3 inches in diameter, sandbags, or suitable means so that the coating will not be damaged.

3.2 INSTALLATION OF PIPE

A. The CONTRACTOR shall inspect each pipe and fitting prior to installation to ensure that there are no damaged portions of the pipe. Pipe damaged prior to Substantial Completion shall be repaired or replaced by the CONTRACTOR.

B. Before placement of pipe in the trench, each pipe or fitting shall be thoroughly cleaned of any foreign substance which may have collected thereon and shall be kept clean at all times thereafter. For this purpose, the openings of pipes and fittings in the trench shall be closed during any interruption to the WORK.

C. Pipe Laying: The pipe shall be installed in accordance with AWWA C600.
D. Pipe shall be laid directly on the bedding material. No blocking will be permitted, and the bedding shall be such that it forms a continuous, solid bearing for the full length of the pipe. Excavations shall be made as needed to facilitate removal of handling devices after the pipe is laid. Bell holes shall be formed at the ends of the pipe to prevent point loading at the bells or couplings. Excavation shall be made as needed outside the normal trench section at field joints to permit adequate access to the joints for field connection operations and for application of coating on field joints.

E. Field Cutting: Pipe shall be cut by means of saws, power driven abrasive wheels, or pipe cutters, which will produce a square cut, or per the manufacturer's written procedure. No wedge-type roller cutters will be permitted. After cutting, the end of the pipe shall be beveled using a beveling tool, sander, or abrasive disc.

F. Where necessary to raise or lower the pipe due to unforeseen obstructions or other causes, the ENGINEER may change the alignment and/or the grades. Such change shall be made by the deflection of joints, by the use of bevel adapters, or by the use of additional fittings. However, in no case shall the deflection in the joint exceed 75 percent of the maximum deflection recommended by the pipe manufacturer. No joint shall be misfit any amount that will be detrimental to the strength and water tightness of the finished joint.

G. Except for short runs that may be permitted by the ENGINEER, pipes shall be laid uphill on grades exceeding 10 percent. Pipe that is laid on a downhill grade shall be blocked and held in place until sufficient support is furnished by the following pipe to prevent movement. Bends shall be properly installed as indicated.

H. Pipe and Specials Protection: The openings of pipe and specials shall be protected with suitable bulkheads to prevent unauthorized access by persons, animals, water, or any undesirable substance. At all times, means shall be provided to prevent the pipe from floating.

I. Pipe Cleanup: As pipe laying progresses, the CONTRACTOR shall keep the pipe interior free of debris. The CONTRACTOR shall completely clean the interior of the pipe of sand, dirt, mortar splatter, and any other debris following completion of pipe laying and shall perform any necessary interior repairs prior to testing and disinfecting the completed pipeline.

3.3 CONNECTIONS TO EXISTING PIPELINES

A. Where the new WORK is to be connected to existing pipelines, the CONTRACTOR shall verify size, material, location, depth, and type of joints/connections prior to ordering any materials.

B. The CONTRACTOR shall make arrangements with the ENGINEER a minimum of one week in advance of making connections to existing pipelines. The CONTRACTOR shall schedule and expedite the WORK to minimize outages to users and shutdown time of existing lift stations. The maximum duration of outage to users shall be four (4) hours. The WORK may need to be scheduled at night when sewage lift station flows are minimal.
C. The CONTRACTOR shall comply with all CITY and FDEP requirements when making connections to existing pipelines.

3.4 RUBBER GASKETED JOINTS

A. Rubber Gasketed Joints: Immediately before jointing pipe, the bell end of the pipe shall be thoroughly cleaned, and a clean rubber gasket shall be placed in the bell groove. The spigot end of the pipe and the inside surface of the gasket shall be carefully cleaned and lubricated. The lubricant shall be suitable for lubricating the parts of the joint for assembly and be a compound listed as in compliance with ANSI/NSF Standard 61. The lubricant shall be nontoxic, shall not support the growth of bacteria, and shall have no deleterious effects on the gasket material. The lubricant shall not impart taste or odor to water in the pipe. The spigot end of the pipe section shall then be inserted into the bell of the previously laid joint and telescoped into its proper position. Tilting of the pipe to insert the spigot into the bell will not be permitted.

3.5 INSTALLATION OF PIPE APPURTEANCES

A. Protection of Appurtenances: Where pipe is encased in polyethylene sleeves, buried appurtenances shall also be encased in polyethylene.

B. Installation of Valves: Valves shall be handled in a manner to prevent any injury or damage to any part of the valve. Joints shall be thoroughly cleaned and prepared prior to installation. The CONTRACTOR shall adjust stem packing and operate each valve prior to installation to insure proper operation.

C. Valves shall be installed so that the valve stems are plumb and, in the location, indicated.

3.6 FIELD TESTING AND DISINFECTION

A. Field testing and disinfection of water mains shall conform to the requirements of Specification 33 01 11 – Pressure Pipe Testing and Disinfection.

END OF SECTION
33 95 50 PVC PRESSURE PIPING (AWWA C900, MODIFIED)

PART 1 -- GENERAL

1.1 THE SUMMARY

A. Provide polyvinyl chloride (PVC) pressure pipe, complete in place, as indicated in accordance with the Contract Documents.

1.2 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Commercial Standards

<table>
<thead>
<tr>
<th>Reference</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AWWA C104/A21.5</td>
<td>Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water</td>
</tr>
<tr>
<td>AWWA C110/A21.10</td>
<td>Ductile-Iron and Gray-Iron Fittings 3-in Through 48-in for Water and Other Liquids</td>
</tr>
<tr>
<td>AWWA C111/A21.11</td>
<td>Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings</td>
</tr>
<tr>
<td>AWWA C600</td>
<td>Installation of Ductile-Iron Water Mains and Appurtenances</td>
</tr>
<tr>
<td>AWWA C900</td>
<td>Polyvinyl Chloride (PVC) Pressure Pipe 4-in Through 12-in for Water Distribution</td>
</tr>
<tr>
<td>ASTM D 2584</td>
<td>Test Method for Ignition Loss of Cured Reinforced Resins</td>
</tr>
<tr>
<td>AWWA Manual M23</td>
<td>PVC Pipe - Design and Installation</td>
</tr>
</tbody>
</table>

1.3 CONTRACTOR SUBMITTALS

A. Shop Drawings

1. Submit drawings of pipe, fittings, and appurtenances.

2. Submit design calculations in order to demonstrate compliance of pipe and fittings with the requirements of this Section.

3. Furnish manufacturer's literature for metallic locating tape.

B. Certifications
1. Furnish a certified affidavit of compliance for pipe and other products or materials under this Section and the following supplemental requirements:
   
a. hydrostatic proof test reports;
   b. sustained pressure test reports; and,
   c. burst strength test reports.

C. Perform and pay for sampling and testing as necessary for the certifications.

1.4 QUALITY ASSURANCE

A. Inspection

1. Pipe shall be subject to inspection at the place of manufacture.

2. Notify the ENGINEER in writing of the manufacturing starting date, not less than 14 Days prior to the start of any phase of the pipe manufacture.

3. During the manufacture of the pipe, give the ENGINEER access to areas where manufacturing is in process, and permit the ENGINEER to make inspections as necessary to confirm compliance with the indicated requirements.

B. Testing

1. Test the materials used in the manufacture of the pipe in accordance with the requirements of this Section and the referenced standards, as applicable.

2. The ENGINEER shall have the right to witness testing, provided that the CONTRACTOR'S schedule is not delayed for the convenience of the ENGINEER.

3. Additional Samples

   a. In addition to those tests specifically required, the ENGINEER may request additional samples of any material for testing by the OWNER.
   
   b. Furnish the additional samples as a part of the WORK.

PART 2 -- PRODUCTS

2.1 GENERAL

A. Provide PVC pressure pipe (4-inch through 12-inch) conforming to the applicable requirements of AWWA C900, and the requirements indicated in this Section.

B. PVC pipe shall have the following minimum thickness:
<table>
<thead>
<tr>
<th>Pipe Nominal Diameter</th>
<th>Minimum DR</th>
</tr>
</thead>
<tbody>
<tr>
<td>4” to 6”</td>
<td>DR 14</td>
</tr>
<tr>
<td>8” to 12”</td>
<td>DR 18</td>
</tr>
</tbody>
</table>

2.2 PIPE DESIGN CRITERIA

A. General

1. Design PVC pressure pipe wall thickness for internal pressure in accordance with the requirements of AWWA M23, as applicable, and the requirements indicated in this Section.

B. Determination of External Loads

1. Compute the dead (earth) loads using the following 2 equations for trench or embankment conditions, as applicable:

   a. Trench Condition:
      \[ W_d = HwB_c \]
      Where:  
      \( W_d \) = earth load in pounds per linear foot  
      \( H \) = height of soil cover, feet  
      \( w \) = 130 lb/cu ft  
      \( B_c \) = outside diameter of pipe, feet

   b. Positive Project Embankment Condition:
      \[ W_c = C_c w B_c^2 \]
      Where:  
      \( W_c \) = Earth load in pounds per linear foot  
      \( C_c \) = Calculation coefficient (based on \( r_{sdP} \) of 0.75)  
      \( K_u \) = 0.19  
      \( w \) = 130 lb/ft\(^3\)  
      \( B_c \) = Outside diameter of pipe, feet

C. Truck Live Loads
1. Determine the truck live loads using the method recommended by AASHTO in "Standard Specifications for Highway Bridges."

2. For depths of cover less than 10 feet, add HS-20 live loads to the earth loads in order to determine the total load.

3. For depths of cover 3 feet or less, include HS-20 live load plus impact.

D. Deflection Control

1. The deflection of the pipe after installation, as determined from the Modified Iowa Formula outlined in AWWA M23, shall not exceed 0.03 times the outside diameter.

2. If the calculated deflection exceeds 0.03 times the outside diameter, increase the pipe class or improve the quality of the pipe zone backfill in order to achieve a higher modulus of soil reaction, $E'$. 

3. For purposes of calculation, values of $E'$ shall be 1100 psi at 90 percent Standard Proctor; 1500 psi at 95 percent Standard Proctor; and 2500 psi at 100 percent Standard Proctor, and the deflection lag factor shall be 1.5.

2.3 PIPE

A. Provide pipe of the indicated diameter and pressure class, complete with rubber gaskets.

B. Provide specials and fittings as indicated.

C. Potable water PVC pipe shall be solid wall blue pipe.

D. Pipe shall be continuously and permanently marked with the manufacturer’s name, pipe, size, and DR rating or pressure rating.

E. The dimensions and pressure classes for Dimension Ratios for large PVC pressure pipe with Cast-Iron Pipe Equivalent O.D.s shall conform to the requirements of AWWA C900.

F. Dimension Ratio (DR):

Minimum dimension ratio series shall be as follows:

<table>
<thead>
<tr>
<th>Nominal Diameter</th>
<th>Service</th>
<th>Minimum Dimension Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>4&quot;, 6&quot;</td>
<td>Water/Sewer</td>
<td>14</td>
</tr>
<tr>
<td>8&quot;, 10&quot;, 12&quot;</td>
<td>Water/Sewer</td>
<td>18</td>
</tr>
</tbody>
</table>
G. The dimensions and pressure classes for Dimension Ratios for large PVC pressure pipe with Cast-Iron Pipe Equivalent O.D.s shall conform to the requirements of AWWA C900 and C905.

H. Additives and Fillers

1. Unless otherwise allowed in alternate qualification procedures of PPI-TR3, compounds which have a Hydrostatic Design Basis (HDB) of 4000 psi at 73.4 degrees F and for water shall not contain additives and fillers that exceed the recommended values in Table 1, Part Y of PPI-TR3 (e.g., allowable content range for calcium carbonate is 0.0-5.0 parts per hundred of resin).

2. If requested by the ENGINEER, determine the additive and filler content using the pyrolysis method as specified in ASTM D 2584.

I. The hall be marked with the extrusion or manufacturing code on the pipe. This coding shall be done in conjunction with records to be held by the manufacturer for 2 years, which indicates the date of manufacture, quality control tests, raw material batch number and other information deemed necessary by the manufacturer.

J. Joints

1. Joints for the buried PVC pipe shall be either an integral bell manufactured on the pipe or a separate coupling both employing a rubber ring joint.

2. Provide the bell and coupling of the same thickness as of the pipe barrel, or greater thickness.

3. Provide the sealing ring groove in the coupling of the same design as the groove in cast iron fittings and valves available from local water works supply distributors.

4. Where indicated, provide ductile iron restrained joint pipe.

5. No restrained joint PVC pipe will be accepted.

K. Joint Deflection

1. Deflection at the joint shall not exceed 75% of the maximum deflection recommended by the manufacturer.

2. No deflection of the joint will be accepted for joints that are over-belled or not belled to the stop mark.

L. Restrained joints for PVC pipe shall properly fit the pipe being installed and shall be manufactured by:

1. EBAA Iron, Inc., Series 2000PV
2. Romac Industries, Grip Ring
3. Ford, Uni-Flange
4. Stargrip series 4000
5. Sigma One Lok SLC Series

M. Bell restrained harnesses shall be used where in-line PVC restrained joints is required. Bell restrained harnesses for PVC pipe shall be manufactured by:
   1. EBBA Iron, Inc., Series 1600
   2. Stargrip Series 1100C
   3. Sigma PVP Series
   4. Ford, Uni-Flange series 1390

N. PVC Pipe Manufacturers or Equal:
   1. J-M Pipe, Model Blue Brute for water service and Model Ring-tite for sewer/force main service.
   2. Diamond Plastic Corporation
   3. Certain Teed

2.4 FITTINGS
A. Provide ductile iron fittings conforming to the requirements of AWWA C110, Class 350.
B. PVC pipe fittings shall be mechanical joint.
C. Fittings shall be cement lined and seal coated per ANSI/AWWA C104 in accordance with the requirements of Specification 09 96 00 – Protective Coating.
D. Clearly label each fitting in order to identify its size and pressure class.

2.5 IDENTIFICATION AND LOCATING DEVICES
A. All PVC pipes shall be provided with “early warning” protection tape, 3-inches wide installed continuously along the pipeline alignment. Tape shall be installed during backfilling 12-inches to 18-inches directly above the centerline of the pipe.
   1. Tape shall be color coded and marked based on the type of service as follows:

<table>
<thead>
<tr>
<th>Service</th>
<th>Color</th>
<th>Marking</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
2. The tape shall be as manufactured by Terra Tape, Pro-Line Safety Products or approved equal.

B. Markers shall be installed at all fittings (horizontal and vertical) and valves, as detailed in the Drawings.

PART 3 -- EXECUTION

3.1 GENERAL

A. Perform laying, jointing, and testing for defects and leakage in the presence of the ENGINEER and obtain the ENGINEER's approval before acceptance.

B. Material found to have defects will be rejected, and the CONTRACTOR shall promptly remove such defective materials from the Site.

C. Installation shall conform to the requirements of AWWA M23, instructions furnished by the pipe manufacturer, and to the supplementary requirements indicated herein.

D. Wherever the provisions of this Section and the aforementioned requirements are in conflict, the more stringent provision shall apply.

3.2 HANDLING AND STORAGE

A. Handling

1. Carefully inspect pipe, fittings, and accessories before and after installation, and reject those found to be defective.

2. Pipe and fittings shall be free from fins and burrs.

3. Before being placed in position, clean the pipe, fittings, and accessories and maintain them in a clean condition.

4. Provide proper facilities for lowering sections of pipe into trenches.

5. Under no circumstances drop or dump pipe, fittings, or any other material into trenches.

B. Storage

1. Store pipe, if possible, at the Site in unit packages provided by the manufacturer.

2. Exercise caution to avoid compression damage or deformation to bell ends of the pipe.
3. Store pipe in such a way as to prevent sagging or bending and protect pipe from exposure to direct sunlight by covering with an opaque material while permitting adequate air circulation above and around the pipe.

4. Store gaskets in a cool, dark place out of the direct rays of the sun, preferably in original cartons.

3.3 TRENCHING AND BACKFILL

A. Trench excavation and backfill shall conform to the requirements of Specification 31 30 00 – Earthwork.

3.4 INSTALLATION

A. Lay bell-and-spigot pipe with the bell end pointing in the direction of laying.

B. Grade the pipe in straight lines, taking care to avoid the formation of any dips or low points.

C. Do not lay pipe when the conditions of trench or weather are unsuitable.

D. At the end of each day's WORK, temporarily close the open ends of pipe with wood blocks or bulkheads.

E. Supports

1. Support pipe at its proper elevation and grade, taking care to provide firm and uniform support.

2. Wood support blocking will not be accepted.

3. The full length of each section of pipe and fittings shall rest solidly on the pipe bed, with a recessed excavation in order to accommodate bells, joints, and couplings.

4. Provide anchors and supports where indicated and where necessary for fastening WORK into place.

5. Independently support fittings.

F. Use short lengths of pipe in and out of each rigid joint or rigid structure.

G. Replace piping that does not allow sufficient space for proper installation of jointing material with piping of proper dimensions.

H. Blocking or wedging between bells and spigots will not be accepted.

I. Install joints in accordance with the manufacturer's recommendations.
J. Keep trenches free of water until joints have been properly made.

K. The maximum combined deflection at couplings shall be in accordance with the manufacturer's recommendations.

L. Rubber Gasketed Joints: Immediately before jointing pipe, the bell end of the pipe shall be thoroughly cleaned, and a clean rubber gasket lubricated with a lubricant recommended by the pipe manufacturer shall be placed in the bell groove. The spigot end of the pipe shall be carefully cleaned and lubricated with the same lubricant. The spigot end of the pipe shall then be inserted into the bell of the previously laid joint and pushed into its proper position. The spigot and bell end of rubber gasketed joints shall not be forced together by the use of excessive mechanical force. Tilting of the pipe to insert the spigot into the bell will not be permitted.

M. Cutting

1. Cut the pipe by means of saws, power-driven abrasive wheels, or pipe cutters, which will produce a square cut.

2. Cuts by wedge-type roller cutters will not be accepted.

3. After cutting, bevel the end of the pipe using a beveling tool, portable type sander, or abrasive disc.

3.5 INSTALLATION OF TRACER WIRE

A. Provide polyvinyl chloride pipelines with 14-gauge multi strand copper wire, laid along the top of the pipe and held in place with ties or hitches of the same kind of wire and spaced not more than 13 feet apart.

B. Tracer wire shall be brought up to grade and a minimum of four (4) feet of excess wire shall be coiled at each valve. A blue wire shall be used for water mains.

C. Furnish manufacturer's literature, completely describing the tape proposed to be furnished.

D. No tape shall be used prior to receipt of written approval of the ENGINEER.

3.6 SERVICE CONNECTIONS

A. PVC Pipe Service Connections: No direct tapping or threading of PVC will be permitted. Double strap ductile iron service saddles anchored by a minimum of four (4) bolts shall be used for all service connections. Service saddles shall be sized exactly to the pipe outside diameter and shall have a bearing area of sufficient width along the axis of the pipe, so that the pipe will not be distorted when the saddle is made tight. Sealing gaskets shall be BUNA-N rubber and straps shall be corrosion resistant alloy steel. An internal shell cutter shall be used to drill through the corporation stop to minimize PVC shavings, retain the coupon, and reduce stress. Single fluted shell cutters, twist drills, or
hole saws are not acceptable. Shell cutter shall have sufficient throat depth to handle the heavy wall PVC pipe. Maximum outlet size permitted with service clamps or saddles is 2 inches.

B. Tapping sleeves and valves for full body fittings shall be used for all outlet sizes greater than 2 inches in diameter. Tapping sleeves shall be assembled and installed in accordance with the manufacturer’s recommendations.

C. Use double-strap bronze service clamps for service connections.

D. Provide service clamps with a bearing area of sufficient width along the axis of the pipe such that the pipe will not be distorted when the saddle is made tight.

E. Cutting

1. Use an internal shell cutter to drill through the corporation stop in order to minimize PVC shavings, retain the coupon, and reduce stress.

2. Cuts by single-fluted shell cutters or twist drills will not be accepted.

3. Lubricate the cutting and tapping edges of the tool with cutting lubricant.

4. Make the cuts slowly, use the follower very lightly, and do not force the cutter through pipe wall.

5. Provide the shell cutter with sufficient throat depth to handle the heavy-wall PVC pipe.

3.7 INSTALLATION OF PIPE APPURTENANCES

A. Installation of Valves: Valves shall be handled in a manner to prevent any injury or damage to any part of the valve. Joints shall be thoroughly cleaned and prepared prior to installation. The CONTRACTOR shall adjust all stem packing and operate each valve prior to installation to insure proper operation.

B. Valves shall be installed so that the valve stems are plumb and, in the location, indicated.

3.8 CONNECTIONS TO EXISTING WATERLINES

A. Locate underground improvements and install the pipelines to the indicated depths.

B. Where the new WORK is to be connected to existing pipelines, the CONTRACTOR shall verify size, material, location, depth, and type of joints/connections prior to ordering any materials. Where sections of existing distribution mains are taken permanently out of service and abandoned in place, plug the cut ends solid with concrete to a depth of not less than one pipe diameter.

C. The CONTRACTOR shall make arrangements with the ENGINEER a minimum of one week in advance of making connections to existing pipelines. The CONTRACTOR shall
schedule and expedite the WORK to minimize outages to users and shutdown time of existing lift stations. The maximum duration of outage to users shall be four (4) hours. The WORK may need to be scheduled at night when lift station flows are minimal.

D. The CONTRACTOR shall comply with all CITY and FDEP requirements when making connections to existing pipelines.

3.9 FIELD TESTING AND DISINFECTION

A. Field testing and disinfection of water mains shall conform to the requirements of Specification 33 01 11 – Pressure Pipe Testing and Disinfection.

END OF SECTION
DIVISION 34 – TRANSPORTATIONS (NOT USED)

DIVISION 35 – WATERWAY AND MARINE CONSTRUCTION (NOT USED)

DIVISION 40 – PROCESS INTERCONNECTIONS

40 05 00 PIPING GENERAL

1.1 THE SUMMARY

A. The CONTRACTOR shall provide piping systems indicated, complete and operable, in accordance with the Contract Documents.

B. The provisions of this Section shall apply to piping in Divisions 33 and 40, and on the Drawings and as indicated in the Piping Schedule.

C. The Drawings define the general layout, configuration, routing, method of support, pipe size, and pipe type. The Drawings are not pipe construction or fabrication drawings. The CONTRACTOR shall prepare pipe spooling and fabrication drawings and shall submit them to the ENGINEER for review. The drawings are not detailed pipe construction or fabrication drawings.

D. Where pipe supports, fittings, specials, and spacing are indicated on the drawings and are reference to Standard Details, CONTRACTOR to use the Detail.

E. Where pipe supports, fittings, specials, details, and spacers are not indicated on the Drawings, it is the CONTRACTOR’S responsibility to develop the details necessary to construct piping systems to accommodate the specific piping needs and equipment provided, and to provide spacers, adapters, and connectors for a complete and functional system.

1.2 SUBMITTALS

A. Shop Drawings: Shop Drawings shall contain the following information:

1. Drawings: Layout drawings including necessary dimensions, details, pipe joints, fittings, specials, bolts and nuts, gaskets, valves, appurtenances, anchors, guides, and material lists. Fabrication drawings shall indicate spacers, adapters, connectors,
fittings, and pipe supports to accommodate the equipment and valves in a complete and functional system.

2. Gasket Material: Submit gasket manufacturer's catalog indicating that the recommended product is suitable for each fluid service application.

3. Modular Seals for Pipe: Manufacturer's catalog sheet showing materials and installation procedures.

B. Samples

1. Performing and paying for sampling and testing as necessary for certifications are the CONTRACTOR'S responsibility.

C. Certifications

1. Necessary certificates, test reports, and affidavits of compliance shall be obtained by the CONTRACTOR.

2. A certification from the pipe fabricator that each pipe will be manufactured subject to the fabricator's or a recognized Quality Control Program. An outline of the program shall be submitted to the ENGINEER for review prior to the manufacture of any pipe.

1.3 DEFINITIONS

A. Pipe, piping, pipe work, pipe system, piping system, or similar words, singular or plural shall mean and include, any type of pipes, tubes, fittings, valves, piping specialties, appurtenances, supports, restraints, anchors, coatings and linings and items related to piping.

B. Submerged piping, underwater piping or similar words, shall include any piping located two feet above water surface in basins or tanks

C. Potable water or similar words, shall mean and include any type of potable water or process water that be deemed potable after treatment processes.

D. Corrosive service shall mean and include in locations listed below:

a. Buried locations

b. Submerged locations or submerged piping.

c. Inside buried vaults, manholes, and structures that do not drain through a gravity sewer or to a sump with a pump.

d. Chemical handling areas

e. Inside trenches, containment walls, and curbed areas
f. Locations indicated or designated in the contract documents.

1.4 MATERIAL DELIVERY, STORAGE, AND PROTECTION

A. Piping materials, fittings, valves, and accessories shall be delivered in a clean and undamaged condition and stored off the ground for protection against oxidation caused by ground contact.

B. Defective or damaged materials shall be replaced with new materials.

PART 2 -- PRODUCTS

2.1 GENERAL

A. Extent of Work

1. Pipes, fittings, and appurtenances shall be provided in accordance with the requirements of the applicable Sections of Divisions 33 and 40 and as indicated.

2. Materials in contact with potable water shall be listed as compliant with NSF Standard 61 and FDEP.

B. Lining

1. Application, thickness, and curing of pipe lining shall be in accordance with the applicable Sections of Division 33, unless otherwise indicated.

C. Coating

1. Application, thickness, and curing of coating on buried pipe shall be in accordance with the applicable Sections of Division 2, unless otherwise indicated.

2. Pipes above ground or in structures shall be coated in accordance with Specification 09 96 00 – Protective Coating.

D. Pressure Rating

1. Piping systems shall be designed for the maximum expected pressure as defined in Specification 33 01 11 – Pressure Pipe Testing and Disinfection, or as indicated on the individual pipe material sections.

E. Inspections

1. Pipe shall be subject to inspection at the place of manufacture.

2. During the manufacture, the ENGINEER shall be given access to areas where manufacturing is in progress and shall be permitted to make inspections necessary to confirm compliance with requirements.
F. Tests

1. Except where otherwise indicated, materials used in the manufacture of the pipe shall be tested in accordance with the applicable specifications and standards.

2. Welds shall be tested as indicated.

3. The CONTRACTOR shall be responsible for performing material tests.

G. Welding Requirements

1. Qualification of welding procedures used to fabricate pipe shall be in accordance with the provisions of AWS D1.1 - Structural Welding Code or the ASME Boiler and Pressure Vessel Code, Section 9, whichever is applicable.

2. Welding procedures shall be submitted for the ENGINEER’s review

H. Welder Qualifications

1. Welding shall be performed by skilled welders and welding operators who have adequate experience in the methods and materials to be used.

2. Welders shall be qualified under the provisions of AWS D1.1 or the ASME Boiler and Pressure Vessel Code, Section 9, by an independent local, approved testing agency not more than 6 months prior to commencing WORK on the piping whichever is applicable.

3. Machines and electrodes similar to those used in the WORK shall be used in qualification tests.

4. Qualification testing of welders and materials used during testing is part of the WORK.

2.2 PIPE FLANGES

A. General

B. Flanges shall be provided with flat faces and shall be attached with bolt holes straddling the vertical axis of the pipe unless otherwise indicated.

C. Attachment of the flanges to the pipe shall conform to the applicable requirements of AWWA C207.

D. Flange faces shall be perpendicular to the axis of the adjoining pipe.

E. Flanges for miscellaneous small diameter pipes shall be in accordance with the standards indicated for these pipes.
F. Pressure Ratings

1. 150 psig or less: Flanges shall conform to either AWWA C207 - Steel Pipe Flanges for Waterworks Service--Sizes 4 In. Through 144 In., Class D, or ASME B16.5 - Pipe Flanges and Flanged Fittings, 150 lb class.

2. 150 psig to 275 psig: Flanges shall conform to either AWWA C207 Class E or Class F, or ASME B16.5 150 lb class.

3. 275 psig to 700 psig: Flanges shall conform to ASME B16.5, 300 lb class.

4. Selection Based on Test Pressure
   a. Do not expose AWWA flanges to test pressures greater than 125 percent of rated capacity.
   b. For higher test pressures, the next higher rated AWWA flange or an ANSI-rated flange shall be selected.

G. Blind Flanges

1. Provide blind flanges in accordance with AWWA C207, or as indicated for miscellaneous small pipes.

2. Blind flanges for pipe sizes 12-inches and greater shall be provided with lifting eyes in the form of welded or screwed eye bolts.

H. Flange Coating

1. Machined faces of metal blind flanges and pipe flanges shall be coated with a temporary rust-inhibitive coating to protect the metal until the installation is completed.

I. Flange Bolts

1. Bolts and nuts shall conform to the requirements of Section 05500 – Miscellaneous Metalwork.

2. Use all-thread studs on valve flange connections where space restrictions preclude the use of regular bolts.

J. Insulating Flanges

1. Insulated flanges shall be provided with bolt holes 1-4-inch diameter greater than the bolt diameter.

K. Insulating Flange Sets
1. Provide insulating flange sets where indicated.

2. Each insulating flange set shall consist of an insulating gasket, insulating sleeves and washers, and a steel washer.

3. Insulating sleeves and washers shall be one piece when flange bolt diameter is 1-1/2 inch or smaller and shall be made of acetal resin.

4. For bolt diameters larger than 1-1/2 inches, insulating sleeves and washers shall be 2-piece and shall be made of polyethylene or phenolic material.

5. Steel washers shall be in conformance with ASTM A 325 - Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.

6. Insulating gaskets shall be full-face.

L. Insulating Flange Manufacturer, or Equal

1. JM red Devil, Type E

2. Maloney Pipeline Products Co.

3. PSI Products Inc

M. Flange Gaskets

1. Gaskets or flanged joints used in general water and wastewater service shall be full-faced type, with material and thickness in accordance with AWWA C207, suitable for temperatures to 700 degrees F, a pH of one to 11, and pressures to 1000 psig.

2. Blind flanges shall be provided with gaskets covering the entire inside face of the blind flange and shall be cemented to the blind flange.

3. Ring gaskets will not be accepted unless otherwise indicated.

4. Flange gaskets shall be: John Crane, Style 2160; Garlock, Style 3000 American DIP Toruseal; or equal.

5. Gaskets for flanged joints used in water with chloramines shall be: Gylon, Style 3500 as manufactured by Garlock or equal.

6. Gaskets for flanges for PVC and CPVC piping used in general water and wastewater service shall be full-faced, 1/8-inch thick, and made of ethylene propylene rubber (EPR) having a Type A durometer hardness of 50 to 70 when tested in accordance with ASTM D 2240.

7. When the mating flange has a raised face, provide a flat ring gasket filler between the PVC flange and gasket and the adjacent flange.
8. Gaskets for flanged joints used in chemicals, air, solvents, hydrocarbons, steam, chlorine and other fluids shall be made of materials compatible with the service, pressure, and temperature.

2.3 THREADED INSULATING CONNECTIONS

A. General:

1. Threaded insulating bushings, unions, or couplings, as appropriate, shall be used for joining threaded pipes of dissimilar metals and for piping systems where corrosion control and cathodic protection are involved.

B. Materials

1. Threaded insulating connections shall be constructed of nylon, Teflon, polycarbonate, polyethylene, or other non-conductive materials, and shall have ratings and properties to suit the service and loading conditions.

2.4 SLEEVE-TYPE COUPLINGS

A. General:

1. Provide sleeve-type couplings where indicated.

2. The CONTRACTOR will not be allowed to substitute a sleeve-split coupling or any other type in lieu of sleeve coupling unless approved by the ENGINEER.

B. Construction

1. Sleeve couplings shall be in accordance with AWWA C219 - Standard for Bolted Sleeve-Type Couplings for Plain-End Pipe.

2. Couplings shall be constructed of steel with steel bolts, without pipe stop.

3. Couplings shall be of sizes to fit the indicated pipe and fittings.

4. The middle ring shall be not less than 1/4-inch thick or at least the same wall thickness as the pipe to which the coupling is connected.

5. If the strength of the middle ring material is less than the strength of the pipe material, the thickness of the middle ring shall be increased to have the same strength as the pipe.

6. The coupling shall be either 5 or 7 inches long for sizes up to and including 30-inch and 10 inches long for sizes greater than 30-inch, for standard steel couplings, and 16 inches long for long-sleeve couplings.
7. The followers shall be single-piece contoured mill sections welded and cold-expanded as required for the middle rings and of sufficient strength to accommodate the number of bolts necessary to obtain adequate gasket pressures without excessive rolling.

8. The shape of the follower shall be of such design as to provide positive confinement of the gasket.

9. Bolts and nuts shall be in accordance with the requirements of Section 05 50 00 – Miscellaneous Metalwork.

10. Buried sleeve-type couplings shall be epoxy-coated at the factory as indicated.

C. Pipe Preparation

1. Where indicated, prepare the ends of the pipe for flexible steel couplings.

2. Plain ends for use with couplings shall be smooth and round for a distance of 12 inches from the ends of the pipe, with an outside diameter not more than 1/64 inch smaller than the nominal outside diameter of the pipe.

3. The middle ring shall be tested by cold-expanding a minimum of one percent beyond the yield point, in order to proof-test the weld to the strength of the parent metal.

4. The weld of the middle ring shall be subjected to air test for porosity.

D. Gaskets

1. Gaskets or sleeve-type couplings shall be rubber-compound material that will not deteriorate from age or exposure to air under normal storage or use conditions.

2. Gaskets for wastewater and sewerage applications shall be composed of Buna N, Grade 60, or equivalent suitable elastomer.

3. The rubber in the gasket shall meet the following specifications:
   a. Color: jet black
   b. Surface: non-blooming
   c. Durometer Hardness: 74, plus and minus 5
   d. Tensile Strength: 1000 psi minimum
   e. Elongation: 175 percent minimum

4. The gaskets shall be immune to attack by impurities normally found in water or wastewater.
5. Gaskets shall meet the requirements of ASTM D 2000 - Classification System for Rubber Products in Automotive Applications, AA709Z, meeting Suffix B13 Grade 3, except as indicated above.

6. Where sleeve couplings are used in water containing chloramines or other fluids which attack rubber materials, gasket material shall be compatible with the piping service and fluid utilized.

7. Gasket materials used in water with chloramines shall be: Gylon Style 3500 by Garlock or equal.

F. Insulating Sleeve Couplings

1. Where insulating couplings are required, both ends of the coupling shall be provided with a wedge-shaped gasket which assembles over a sleeve of an insulating compound material compatible with the fluid service in order to obtain insulation of coupling metal parts from the pipe.

G. Restrained Joints

1. Sleeve-type couplings on pressure lines shall be harnessed unless thrust restraint is provided by other means.

2. Harnesses shall be designed by the pipe manufacturer in accordance with AWWA Manual M11, or as indicated.

3. Harness sets shall be designed for the maximum test pressure of the pipe in which they are installed.

4. Where harness sets are installed near the suction and discharge of the pump, harness bolts shall have zero elongation in order to prevent misalignment of the pump imparted by the thrust within the piping system.

G. Sleeve-Type Couplings Manufacturer, or Equal

1. Dresser, Style 38

2. Ford Meter Box Co., Inc., Style FC1 or FC3

3. Smith-Blair, Style 411

2.5 FLANGED COUPLING ADAPTERS

A. Provide flanged coupling adapters where indicated.

B. The CONTRACTOR will not be allowed to substitute any other type in lieu of flange coupling adapter unless approved by the ENGINEER.
C. The coupling shall be rated as indicated.

D. Construction

1. Flanged coupling adapter bodies shall be fabricated from steel, ASTM A 512 - Cold-Drawn Buttweld Carbon Steel Mechanical Tubing or A 513 - Electric-Resistance Welded Carbon and Alloy Steel Mechanical Tubing with steel bolts, without pipe stop.

2. Provide flanges in conformance with AWWA C207.

3. Couplings shall be of sizes to fit the indicated pipe and fittings.

4. The body shall be not less than 1/4 inch thick or at least the same wall thickness as the pipe to which the coupling is connected.

5. If the strength of the body material is less than the strength of the pipe material, the thickness of the middle ring shall be increased to have the same strength as the pipe.

6. The follower flange shall be fabricated from steel, ASTM A 576 - Steel Bars, Carbon, Hot Wrought, Special Quality or AISI C1012.

7. The shape of the follower shall be of such design as to provide positive confinement of the gasket.

8. Restraint

   a. For flanged coupling adapters installed in piping system rated for positive pressure, the coupling shall be restrained with harness bolts or tie rods.

   b. Other means of restraining the coupling such as set screws will not be accepted.

9. Bolts and nuts shall be in accordance with the requirements of Section 05500 – Miscellaneous Metalwork.

10. Buried couplings shall be epoxy-coated at the factory as indicated.

E. Gaskets

1. Gaskets for flange coupling adapters shall be composed of a rubber-compound material that will not deteriorate from age or exposure to air under normal storage or use conditions.

2. Gaskets for wastewater and sewerage applications shall be composed of Buna N, Grade 60, NSF-approved, or equivalent suitable elastomer.

3. The rubber in the gasket shall meet the following specifications:

   a. Color: jet black
b. Surface: non-blooming

c. Durometer Hardness: 74, plus and minus 5

d. Tensile Strength: 1000 psi minimum

e. Elongation: 175 percent minimum

4. The gaskets shall be immune to attack by impurities normally found in water or wastewater.

5. Gaskets shall meet the requirements of ASTM D 2000 - Classification System for Rubber Products in Automotive Applications, AA709Z, meeting Suffix B13 Grade 3, except as noted above.

6. Where flanged coupling adapters are used in water containing chloramines or other fluids which attack rubber materials, the gasket material shall be compatible with the piping service and fluid utilized.

7. Gasket materials used in water with chloramines shall be: Gylon Style 3500 by Garlock or equal.

F. Piping Connections to Equipment

1. Where piping connects to mechanical equipment such as pumps, compressors, and blowers, bring the piping to the equipment connection aligned and perpendicular to the axis of the flange or fitting for which the piping is to be connected.

2. The piping shall not impose excessive stress to the equipment connection to cause misalignment of the equipment.

3. The CONTRACTOR shall assign the responsibility to the equipment manufacturer to review the piping connection to the equipment and submit any modifications to the ENGINEER for review.

G. Restrained Joints

1. Flange coupling adapters on pressure lines shall be harnessed unless thrust restraint is provided by other means.

2. Harnesses shall be designed by the pipe manufacturer in accordance with AWWA Manual M11, or as indicated.

3. Harness sets shall be designed for the maximum test pressure of the pipe in which they are installed.
4. Where harness sets are installed near the suction and discharge of the pump, harness bolts shall have zero elongation in order to prevent misalignment of the pump imparted by the thrust within the piping system.

H. Flanged Couplings Adapter Manufacturer, or Equal

1. Smith-Blair, Model 975
2. JCM, Model 309

2.6 PIPE THREADS

A. Pipe threads shall be in conformance with ASME B1.20.1 - Pipe Threads, General Purpose (inch), and be made up with Teflon tape unless otherwise indicated.

PART 3 -- EXECUTION

3.1 GENERAL

A. This section specifies the general installation requirements for piping, valves, and related items and shall be installed in accordance with the manufacturer’s technical data and printed instructions. Specific piping materials, systems, appurtenances, and related installation and testing requirements are specified in related sections of Divisions 01, 33, and 40, and as noted on the Drawings, Pipe and Valve Schedules.

B. Piping shall be installed in a neat and workmanlike manner, properly aligned and cut from measurements taken at the Site to avoid interferences with structural members, architectural features, openings, and equipment. Exposed pipe shall afford maximum headroom and access to equipment, and where necessary piping shall be installed with sufficient slopes for venting or drainage of liquids and condensate to low points.

C. CONTRACTOR shall obtain the assistance of the pipe manufacturer to instruct the pipe fitters in the correct installation and support of the piping system. Valves and flanges attached to the pipe shall be provided with adequate supports.

D. Lined Piping Systems

1. The lining manufacturer shall take full responsibility for the complete, final product and its application.

2. Pipe ends and joints of lined pipes at threaded flanges shall be epoxy-coated in order to assure continuous protection.

E. Proprietary manufactured couplings shall be installed in accordance with the coupling manufacturer’s recommendation

F. Care shall hall be taken to insure that piping flanges, mechanical-type couplings, sleeve-type couplings, flexible connectors, and expansion joints are properly installed as follows:
1. Gasket surfaces shall be carefully cleaned and inspected prior to making up the connection.

2. Each gasket shall be centered properly on the contact surfaces.

3. Connections shall be installed to prevent inducing stress to the piping system or the equipment to which the piping is connected.

4. Contact surfaces for flanges, couplings, and piping ends shall be aligned parallel, concentric, and square to each axis at the piping connections.

5. Flange Bolts
   a. Flange bolts shall be initially hand-tightened with the piping connections properly aligned.
   b. Bolts shall be tightened with a torque wrench in a staggered sequence to the AISC-recommended torque for the bolt material.

6. Harness, Thrust Restraint, and Tie Rod Bolts
   a. Harness, thrust restraint, and tie rod bolts used for sleeve couplings, flange coupling adapters, or flexible joints shall be tightened gradually and equally at diametrically opposite sides until snug, in order to prevent misalignment and to ensure that all studs carry equal loads.
   b. In order to prevent induced stress or misalignment, do not over-torque connections to adjoining pump or equipment.

7. Groove ends shall be clean and free from indentations, projections, and roll marks in the area from the pipe end to the groove.

8. After installation, joints shall not have any leakage that exceeds the allowable leakage rates.

9. Flanges shall not be deformed nor cracked.

G. Core Drilling

   1. Where ore drilling is required for pipes passing through existing concrete, core drilling locations shall be determined by radiograph of concrete construction in order to avoid damage to embedded raceways and reinforcing bars.

H. Cleanup

   1. After completion of the WORK, cuttings, joining and wrapping materials, and other scattered debris shall be removed from the Site.
2. The entire piping system shall be handed over in a clean and functional condition.

3.2 INSTALLATION

A. Installation shall be free from defects. Prior to installation, each pipe length shall be carefully inspected, be flushed clean of any debris or dust, and be straightened if not true straight. Ends of threaded pipes shall be reamed and filed smooth. Groove ends shall be clean and free from indentations, projections, and roll marks in the area from the pipe end to the groove. Fittings shall be equally cleaned before assembly.

B. Building gravity flow plumbing pipes shall be installed in a neat and workmanlike manner, in accordance with the prevailing plumbing and building codes. Pipes shall have the required slopes for proper drainage. Pipe locations inside buildings shall be coordinated with the rest of the WORK to avoid interferences and to provide sufficient headroom. Installations shall be acceptable to the local plumbing inspector.

C. Piping Joints: Pipe joints requirements shall conform to the applicable piping sections of Division 33 and Division 40.

1. Threaded Joints: Pipe threads shall be full and cleanly cut with sharp dies. Not more than 3 threads shall remain exposed after installation.

2. Welded Joints: Welded joints shall conform to the specifications and recommendations of ASME B 31.1 - Power Piping. Welding shall be done by skilled and qualified welders. Pipe surface residues, oxides, and heat stains are to be removed from a field weld and the affected areas adjacent by the use of stainless steel wire brushes. For alloy and stainless steel pipe, the post welding surfaces shall be cleaned with a pickle agent such as nitric/hydrofluoric acid solutions or pickle paste or equal, then complete removal of the agent by wash the surface thoroughly with clean water.

3. Flange Joints: Flanged joints shall be made with gaskets with bolts and nuts as specified. Care shall be taken not to over-torque the bolts, in accordance with the manufacturer's written recommendations.

4. Fusion-Welded Joints: Fusion-welded joints shall be made with the manufacturer's recommended equipment on clean, dry pipe ends. The joints shall be made up at the recommended ambient temperatures, to the pipe manufacturer's written recommendations. The pipe supplier shall be consulted to obtain machinery and expertise for the joining by fusion welded of pipe and fittings. No pipe or fittings shall be joined by fusion by any of the Contractor's personnel unless they are adequately trained and qualified in the techniques involved. Butt fusion joining shall yield a joint strength equal to or greater than the tensile strength of the pipe. Socket fusion, extrusion welding and hot gas welding shall not be used for field connections.

5. Brazed and Soldered Joints: Brazed and soldered joints shall conform to the manufacturer’s recommendations and to the specifications and recommendations of ASME B 31.1 - Power Piping. Brazing shall be done by skilled and qualified welders. Prior to the application of flux, the ends of tubes shall be thoroughly dried and cleaned.
6. Grooved Joints: Grooves for grooved couplings and fittings shall be made with specially designed grooving tools to the manufacturer's recommendations and conform to AWWA C 606 – Joints, Grooved and Shouldered Type. Grooves shall be clean and sharp without flaws, and the pipe ends shall be accurately cut at 90 degrees to the pipe axis.

7. Push On Joints: Push on joints and gasket installation shall be in accordance with the manufacturer's recommendations and lubricants. Pipe ends shall be beveled to facilitate assembly. Lubricants shall be suitable for potable water service and shall be kept clean in closed containers.

8. Solvent-Welded Joints: Solvent-welded joints shall be made with fresh primer and solvent cement on clean, dry pipe ends. The primer and cement cans shall be kept closed at all times and the joints shall be made up at the recommended ambient temperatures, to the pipe or cement manufacturer's written recommendations. PVC socket connections shall be joined with PVC cement conforming to ASTM D2564 Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC). CPVC socket connections shall be joined with CPVC solvent cement conforming to ASTM F493. For chemical service applications, solvent cement shall be formulated and labeled for use on that chemical.

9. Adhesive Joints: Adhesive joints shall be made with freshly-mixed 2-part epoxy on clean, dry pipe ends per pipe manufacturer recommendations. The joints shall be made up at the recommended ambient temperatures, to the pipe or adhesive manufacturer's written recommendations. Pipe ends shall be inserted to the full depth of the socket.

D. Valves and Unions: Unless otherwise indicated, connections to fixtures, groups of fixtures and equipment shall be provided with a shutoff valve and union, unless the valve has flanged ends. Unions shall be provided at threaded valves, equipment, and other devices requiring occasional removal or disconnection.

E. Branch Connections: Branch connections in horizontal runs of air and gas piping shall be made from the top of the pipe, to avoid drainage of condensate into the equipment. Unless otherwise indicated for threaded pipe connections between metal and plastic pipes, use metal FNPT and plastic MNPT.

1. Pipe ends and joints of lined pipes at threaded flanges shall be epoxy-coated in order to assure continuous protection.

F. Isolation Joints / Dielectric Protection: Provide electrically isolate connections between dissimilar metal piping connections. Electrical checks shall be made to assure no contact is made between dissimilar metal piping elements.

1. Use dielectric couplings specially designed for the prevention of galvanic reaction between dissimilar metals.
2. For flanged connections, use stainless steel bolts with isolation bushings, washers, and full-face flange gaskets.

G. Core Drilling: Where core drilling is required for pipes passing through existing concrete, core drilling locations shall be determined by radiograph of concrete construction in order to avoid damage to embedded raceways and reinforcing bars.

H. Coating: Exposed pipes shall be coated with a finish coat to the pipe manufacturer's standard protective coating, with the manufacturer's recommended prime coat and a finish coat in accordance with Section 09 96 00 - Protective Coating.

I. Low points in piping systems and driplegs in steam, gas, and air systems shall have drainage valves.

J. Care shall be taken to insure that piping flanges, mechanical-type couplings, sleeve-type couplings, flexible connectors, and expansion joints are properly installed as follows:

1. Gasket surfaces shall be carefully cleaned and inspected prior to making up the connection. Gasket shall be centered properly on the contact surfaces.

2. Connections shall be installed to prevent inducing stress to the piping system or the equipment to which the piping is connected.

3. Contact surfaces for flanges, couplings, and piping ends shall be aligned parallel, concentric, and square to each axis at the piping connections.

4. Flange Bolts

   a. Flange bolts shall be initially hand-tightened with the piping connections properly aligned.

   b. Bolts shall be tightened with a torque wrench in a staggered sequence to the recommended torque for the applicable piping material per AWWA or manufacturer's recommendation. Care shall be taken to avoid over-torquing the bolts especially on plastic flanged joints.

   c. Harness, thrust restraint, and tie rod bolts used for sleeve couplings, flange coupling adapters, or flexible joints shall be tightened gradually and equally at diametrically opposite sides until snug, in order to prevent misalignment and to insure that all studs carry equal loads.

   d. In order to prevent induced stress or misalignment, do not over-torque connections to adjoining pump or equipment. Flanges shall not be deformed nor cracked.
3.3 INSPECTION

A. After completion of the WORK, cuttings, joining and wrapping materials, and other scattered debris shall be removed from the Site. The entire piping system shall be in a clean and functional condition.

B. Inspection: Finished installations shall be carefully inspected for proper joints and supports, interferences, and damage to pipe, fittings, and coating. Temporary plugs and covers shall be removed from openings and floor drains. Defective WORK shall be repaired to the satisfaction of the field engineer or plumbing inspector.

3.4 FIELD TESTING FOR PRESSURE PIPING

A. Prior to enclosure or burying, piping systems shall be pressure tested as required in the Piping Schedule for a period of not less than two hours without exceeding the tolerances listed in the Piping Schedule. Where no pressures are indicated, the pipes shall be subject to 1-1/2 times the maximum working pressure. The CONTRACTOR shall furnish test equipment, labor, materials, and devices as part of the WORK. For additional testing requirements, refer to Section 33 01 11 - Pressure Pipe Testing and Disinfection.

B. Leakage may be determined by loss of pressure, soap solution, chemical indicator, or other positive and accurate method. Fixtures, devices, or other accessories which are to be connected to the lines and which would be damaged if subjected to the test pressure shall be disconnected and ends of the branch lines plugged or capped as required during the testing procedures.

C. Leaks shall be repaired, and the system shall be re-tested until no leaks are found.

3.5 MATERIAL DELIVERY, STORAGE, AND PROTECTION

All piping materials, fittings, valves, and accessories shall be delivered in a clean and undamaged condition and stored off the ground for protection against oxidation caused by ground contact. All defective or damaged materials shall be replaced with new materials.

END OF SECTION
**40 05 06 REPAIR CLAMPS AND TRANSITION COUPLINGS**

**PART 1 -- GENERAL**

1.1 THE REQUIREMENT

A. The WORK includes abandoning existing 2-inch galvanized potable water piping and potable water service connections connected to existing 6-inch, 8-inch, and 10-inch asbestos concrete (AC) pipe. The CONTRACTOR shall remove the existing tapping saddles on the existing asbestos concrete pipe and furnish and install full circle repair clamps to repair the taps and abandon the existing piping as shown on the Drawings, in accordance with the Contract Documents.

B. The WORK includes connecting new PVC and ductile iron piping to existing 6-inch, 8-inch, and 10-inch AC pipe as part of the new potable water and force main installation. The CONTRACTOR shall furnish and install PVC to AC pipe and DIP to AC pipe transition couplings as required to complete the designed connections of new piping to the existing AC pipe as shown on the Drawings, in accordance with the Contract Documents.

C. It is the CONTRACTOR’s responsibility to develop the details necessary to construct the connections and to provide and install all spools, spacers, adapters, and connectors for a complete and functional system.

D. The provisions of this Section shall apply to all piping sections in Divisions 33 and 40.

1.2 CONTRACTOR SUBMITTALS

A. Shop Drawings: Submit manufacturer’s catalog sheets providing information on materials and installation procedures.

**PART 2 -- PRODUCTS**

2.1 REPAIR CLAMPS

A. Repair clamps shall be full circle clamps sized for asbestos concrete outside diameter.

B. Repair clamps shall be constructed of 18-8 Type 304 stainless steel. Gaskets shall be Buna-N. Bolts and nuts shall be 18-8 Type 304 stainless steel.

C. Manufacturers or Equal:

1. Cascade Waterworks Manufacturing

2. Ford Meter Box Company

3. JCM Industries
4. Smith Blair

2.2 TRANSITION COUPLINGS

A. Transition couplings shall be designed and sized for PVC to asbestos concrete pipe and ductile iron to asbestos concrete pipe transitions.

B. Transition couplings shall be constructed of ductile iron pipe in accordance with ASTM A 536. Gaskets shall be Buna-N. Bolts and nuts shall be Type 18-8 type 304 stainless steel.

C. Manufacturers or Equal:
   1. Cascade Waterworks Manufacturing
   2. Ford Meter Box Company
   3. Romac Industries
   4. Smith Blair

PART 3 -- EXECUTION

3.1 MATERIAL DELIVERY, STORAGE, AND PROTECTION

A. Piping materials, fittings, valves, and accessories shall be delivered in a clean and undamaged condition and stored off the ground for protection against oxidation caused by ground contact.

B. Defective or damaged materials shall be replaced with new materials.

3.2 INSTALLATION

A. Repair clamps, transition couplings, and accessories shall be installed in accordance with the requirements of the applicable Sections of Divisions 2 and 15, and in accordance with the manufacturer’s instructions.

B. Piping and gaskets shall be carefully cleaned and inspected prior to making connections.

END OF SECTION
DIVISION 43 – MATERIAL HANDLING EQUIPMENT

43 30 00      VALVES, GENERAL

PART 1 -- GENERAL

1.1 THE SUMMARY

A. Provide valves, actuators, and appurtenances, complete and operable, as indicated in accordance with the Contract Documents.

B. The provisions of this Section shall apply to all valves and valve actuators except where otherwise indicated.

C. Valves and actuators in particular locations may require a combination of units, sensors, limit switches, and controls, as indicated.

D. Unit Responsibility

  1. A single manufacturer shall be responsible for the coordination of design, assembly, testing, and furnishing of each valve; however, the CONTRACTOR shall be responsible to the OWNER for compliance with the requirements of each valve Section.

  2. Unless indicated otherwise, the responsible manufacturer shall be the manufacturer of the valve.

E. Single Manufacturer

  1. Where 2 or more valves of the same type and size are required, the valves shall be furnished by the same manufacturer.

1.2 CONTRACTOR SUBMITTALS

A. Furnish the following information on Shop Drawings:

  1. Valve name, size, Cv factor, pressure rating, identification number (if any), and specification section number;
2. Complete information on the valve actuator, including size, manufacturer, model number, limit switches, and mounting;

3. Assembly drawings showing part nomenclature, materials, dimensions, weights, and relationships of valve handles, hand wheels, position indicators, limit switches, integral control systems, needle valves, and control systems;

B. Furnish a technical manual containing the required information for each valve, as indicated.

C. Furnish a spare parts list, containing the required information for each valve assembly, as indicated.

D. Factory Test Data
   
   1. Where indicated, submit signed, dated, and certified factory test data for each valve requiring certification, before shipping the valve.

   2. Furnish a certification of quality and test results for factory-applied coatings.

PART 2 -- PRODUCTS

2.1 PRODUCTS

A. General

   1. Provide valves and gates of new and current manufacture.

   2. Provide buried valves with valve boxes and covers containing position indicators and valve extensions.

B. Protective Coating

   1. Coat the exterior surfaces of valves and the wet interior surfaces of ferrous valves of sizes 4-inch and larger in accordance with the requirements of Specification 09 96 00 – Protective Coating.

   2. The valve manufacturer shall certify in writing that the required coating has been applied and tested in the manufacturing plant prior to shipment, in accordance with the indicated requirements.

   3. Do not epoxy-coat the flange faces of valves.

C. Valve Labeling

   1. Buried valves shall be equipped with a valve tag indicating size and type of valve located at the valve box in accordance with the detail on the Drawings.
D. Valve Testing

1. As a minimum, unless otherwise indicated or recommended by the reference standards, test valves 3 inches in diameter and smaller in accordance with the manufacturer's standard procedure.

2. Factory-test valves 4 inches in diameter and larger as follows:

   a. Hydrostatic Testing

      1) Subject valve bodies to an internal hydrostatic pressure equivalent to twice the water-rated pressure of the valve.

      2) Metallic valves rating pressures shall be based at 100 degrees F.

      3) Plastic valves rating pressures shall be based at 73 degrees F, or at a higher temperature according to material type.

      4) During the hydrostatic test, there shall be no visible leakage through the valve body, end joints, or shaft seals, nor shall parts of the valve be permanently deformed.

      5) Allow test duration of at least 10 minutes, in order to allow visual examination for leakage.

   b. Seat Testing

      1) Test the valves for leaks in the closed position, with the pressure differential across the seat equal to the water rated pressure of the valve.

      2) Provide test duration of at least 10 minutes, in order to allow visual examination for leakage.

      3) The leakage rate shall be the more stringent of the following:

         a) As recommended by the reference standard for that type of valve; or

         b) Leakage past the closed valve not to exceed one fluid ounce per hour per inch diameter for metal seated valves, and drop-tight for resilient seated valves.

   c. Performance Testing

      1) Shop-operate the valves from the fully-closed to the fully-open position, and reverse under no-flow conditions in order to demonstrate that the valve assembly operates properly.

E. Certification
1. Prior to shipment of valves with sizes larger than 12-inches in diameter, submit certified, notarized copies of the hydrostatic factory tests, showing compliance with the applicable standards of AWWA, ANSI, or ASTM.

F. Valve Markings


2.2 MATERIALS

A. General

1. Provide materials suitable for the intended application.

2. Provide materials in contact with potable water listed as compliant with NSF Standard 61.

3. Ensure that materials not indicated are of high-grade standard commercial quality, free from defects and imperfections that might affect the serviceability of the product for the purpose for which it is intended.

4. Unless otherwise indicated, provide valve and actuator bodies conforming to the following requirements:


   b. Ductile Iron: ASTM A 536 - Ductile Iron Castings, or to ASTM A 395 - Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures


   d. Bronze: ASTM B 62 - Composition Bronze or Ounce Metal Castings, and valve stems not subject to dezincification shall conform to ASTM B 584 - Copper Alloy Sand Castings for General Applications. Bronze materials in contact with potable water service shall be free of lead content meeting the Lead Reduction Act.

   e. Stainless Steel: Stainless steel valve and operator bodies and trim shall conform to ASTM A 351 - Steel Castings, Austenitic, for High-Temperature Service, Grade CF8M, or shall be Type 316 stainless steel

   f. PVC: Polyvinyl chloride materials for valve body, flanges, and cover shall conform to Cell Classification 12454
g. CPVC: Chlorinated Poly Vinyl Chloride materials for valve body, flanges, and cover shall conform to Cell Classification 23447

h. NSF Standard 61: Materials shall be listed for use in contact with potable water.

2.3 VALVE CONSTRUCTION

A. Bodies

1. Provide valve bodies that are cast, molded (in the case of plastic valves), forged, or welded, of the materials indicated, and with smooth interior passages.

2. Provide wall thicknesses uniform and in agreement with the applicable standards for each type of valve, without casting defects, pinholes, and other defects that could weaken the body.

3. Perform welds on welded bodies by certified welders and ground welds smooth.

4. Provide valve ends as indicated, and rated for the maximum temperature and pressure to which the valve will be subjected.

B. Valve End Connections

1. Unless otherwise indicated, valves 2-1/2 inches in diameter and smaller may be provided with threaded end connections.

2. Provide valves 3 inches in diameter and larger with flanged end connections.

3. Flanges, bolts and gaskets shall be as specified in Section 40 05 00 - Piping, General.

C. Bonnets

1. Connect valve bonnets to the body by clamping, screwing, or flanging.

2. Provide bonnets of the same material, temperature, and pressure rating as the body.

3. Make provisions for the stem seal with the necessary glands, packing nuts, and yokes.

D. Stems

1. Provide valve stems of the materials indicated, or, if not indicated, of the best commercially-available material for the specific service, with adjustable stem packing, O-rings, chevron V-type packing, or other suitable seal. Bronze materials in contact with potable water shall be NSF 61 approved and free of lead. Elastomeric materials shall be compatible with fluid service.

2. Where subject to dezincification, ensure that bronze valve stems conform to ASTM B 62, containing not more than 5 percent of zinc or more than 2 percent of aluminum.
with a minimum tensile strength of 30,000 psi, a minimum yield strength of 14,000 psi, and an elongation of at least 10 percent in 2 inches.

3. Where dezincification is not a problem, bronze conforming to ASTM B 584 may be used, except that the zinc content shall not exceed 16 percent.

E. Stem Guides

1. Provide stem guides paced 10 feet on centers, unless the manufacturer can demonstrate by calculation that a different spacing is acceptable.

F. Internal Parts

1. Provide internal parts and valve trim as indicated for each individual valve.

G. Nuts and Bolts

1. Unless otherwise indicated, provide nuts and bolts on valve flanges and supports in accordance with the requirements of Section 05 50 00 – Miscellaneous Metalwork and Section 40 05 00 – Piping, General.

2.4 VALVE ACTUATORS

A. Valve actuators shall be as indicated and as specified in Section 43 30 12 – Valve and Gate Actuators

2.5 VALVE ACCESSORIES

A. Provide valves complete with the accessories required to provide a functional system.

2.6 SPARE PARTS

A. Furnish the required spare parts, suitably packaged and labeled with the valve name, location, and identification number.

B. Furnish the name, address, and telephone number of the nearest distributor for the spare parts of each valve.

C. Spare parts are intended for use by the OWNER, after expiration of the correction of defects period.

2.7 MANUFACTURERS

A. Valve manufacturers shall have a successful record of not less than 5 years in the manufacture of the indicated valves.
PART 3 -- EXECUTION

3.1 VALVE INSTALLATION AND TRIAL OPERATION

A. General

1. Install valves, actuating units, stem extensions, valve boxes, and accessories in accordance with the manufacturer's written instructions and as indicated.

2. Adequately brace gates in order to prevent warpage and bending under the intended use.

3. Firmly support valves in order to avoid undue stresses on the pipe.

B. Access

1. Install valves in a manner to provide easy access for actuation, removal, and maintenance, and to avoid interference between valve actuators and structural members, handrails, and other equipment.

C. Valve Accessories

1. Where combinations of valves, sensors, switches, and controls are indicated, properly assemble and install such items such that systems are compatible and operating properly.

2. Clearly note the relationship between interrelated items on Shop Drawing submittals.

END OF SECTION
43 30 12   VALVES AND GATE ACTUATORS

PART 1 -- GENERAL

1.1   THE SUMMARY

A.   Provide valve and gate actuators and appurtenances, complete and operable, as indicated in accordance with the Contract Documents.

B.   The provisions of this Section apply to valves and gates except where otherwise indicated in the Contract Documents.

C.   Unit Responsibility

   1. Make the valve or gate manufacturer responsible for the coordination of design, assembly, testing, and installation of actuators on the valves and gates; however, the CONTRACTOR shall be responsible to the OWNER for compliance of the valves, gates, and actuators with the Contract Documents.

D.   Where 2 or more valve or gate actuators of the same type or size are required, the actuators shall be produced by the same manufacturer.

1.2   CONTRACTOR SUBMITTALS

A.   Furnish submittals in accordance with the requirements of Specification 43 30 00 – Valves, General.

B.   Submit Shop Drawing information for actuators with the valve and gate submittals as a complete package.

C.   Submit calculations showing dynamic seating and unseating torques versus the output torque of the actuator.

PART 2 -- PRODUCTS

2.1   GENERAL

A.   Provide actuators complete and operable with mounting hardware, gears, nuts, and extensions, as applicable.

B.   Provide actuators with torque ratings equal to or greater than required for valve seating and dynamic torques, whichever is greater, and capable of holding the valve in any intermediate position between fully-open and fully-closed without creeping or fluttering.

C.   Actuator torque ratings for butterfly valves shall be determined in accordance with AWWA C504 - Rubber-Seated Butterfly Valves.
D. Manufacturers

1. Where indicated, certain valves and gates may be provided with actuators manufactured by the valve or gate manufacturer.

2. Where actuators are furnished by different manufacturers, coordinate the selection to result in the fewest number of manufacturers possible.

E. Materials

1. Provide actuators of current models, of the best commercial quality materials, and liberally sized for the required torque.

2. Provide materials suitable for the environment in which the valve or gate is to be installed.

F. Actuator Mounting and Position Indicators

1. Securely mount actuators by means of brackets or hardware specially designed and sized for this purpose and of ample strength.

2. Cast the word "OPEN" on each valve or actuator, with an arrow indicating the direction to open in the counter-clockwise direction.

3. Equip gear and power actuators with position indicators.

G. Standards

1. Provide fasteners in accordance with the requirements of Section 05 50 00 – Miscellaneous Metalwork.

2. Provide coatings in accordance with the requirements of Section 09 96 00 – Protective Coating.

2.2 MANUAL ACTUATORS

A. General

1. Unless otherwise indicated, provide valves and gates with manual actuators.

2. Provide valves in sizes up to and including 4 inches with direct-acting lever or hand wheel actuators of the manufacturer's best standard design.

3. Provide valves and gates larger than 4-inch with gear-assisted manual actuators, with an operating pull of maximum 60 pounds on the rim of the hand wheel.

4. Provide buried valves with worm gear actuators, hermetically-sealed water-tight and grease-packed.
B. Buried Valves

1. Buried valves with extension stems to grade, with square nuts, position indicators, and cast-iron or steel pipe extensions with valve boxes, covers, and operating keys as detailed on the Drawings.

2. Provide wrench-nuts in compliance with AWWA C 500 - Metal-Seated Gate Valves for Water Supply Service.

C. Manual Worm Gear Actuator

1. Provide an actuator consisting of a single- or double-reduction gear unit contained in a weatherproof cast iron or steel body with cover, and a minimum 12-inch diameter hand wheel.

2. Provide the actuator to be capable of a 90-degree rotation, and equip the actuator with travel stops capable of limiting the valve opening and closing.

3. Provide the actuator with spur or helical gears and worm gearing.

4. Provide a self-locking gear ratio in order to prevent "back-driving."

5. Construct the spur or helical gears of hardened alloy steel, and the worm gear of alloy bronze.

6. Accurately cut gearing with hobbing machines.

7. Use ball or roller bearings throughout.

8. Provide the output shaft end with a spline in order to allow adjustable alignment.

9. Design gearing for a 100 percent overload.

10. The entire gear assembly shall be sealed weatherproof.

11. Actuator output gear changes shall be mechanically possible by simply changing the exposed or helical gear set ratio without further disassembly of the actuator.

12. Design and rate buried gear actuators for buried service, provide with a stainless steel input shaft, and double-seal on shaft and top cap.

D. Traveling-Nut Actuator
1. Provide the actuator with a traveling-nut and screw (Scotch yoke), contained in a weatherproof cast iron or steel housing with a spur gear and a minimum 12-inch diameter hand wheel.

2. The screw shall run in 2 end bearings, and provide a self-locking actuator in order to maintain the valve position under any flow condition.

3. Construct the screw and gear from hardened alloy steel or stainless steel, and the construct the nut and bushings from alloy bronze.

4. The bearings and gear shall be grease-lubricated by means of nipples.

5. Design gearing for a 100 percent overload.

2.3 VALVE BOXES
   A. Cast iron valve boxes shall be provided for all valves that are below finished grade elevations. Valve boxes shall be a two-piece screw type consisting of a cast iron base and adjustable cast iron top section with cover that shall be marked “WATER” or “SEWER” as appropriate.
   B. Manufacturers of Valve Boxes for Water, or equal:
      1. Tyler
      2. U.S. Foundry
      3. Wager Company

PART 3 -- EXECUTION

3.1 MATERIAL DELIVERY, STORAGE, AND PROTECTION
   A. All valves, valve boxes, and accessories shall be delivered in a clean and undamaged condition and stored off the ground for protection against oxidation caused by ground contact. All defective or damaged materials shall be replaced with new materials.

3.2 SERVICES OF MANUFACTURER
   A. The adjustment of actuator controls and limit switches in the field for the required function shall be performed by field representatives of the manufacturers of valves or gates with pneumatic, hydraulic, or electric actuators.

3.3 INSTALLATION
   A. Install valve and gate actuators and accessories in accordance with the requirements of Section 43 30 00 – Valves, General. Install valves and valve boxes as detailed on the Drawings and in accordance with the manufacturer’s recommendations.
43 30 22    GATE VALVES

PART 1 -- GENERAL

1.1    THE SUMMARY

A.    The CONTRACTOR shall provide gate valves and appurtenances, complete and operable, in accordance with the Contract Documents.

B.    The requirements of Section 43 30 00 - Valves, General apply to this Section.

C.    The requirements of Section 43 30 12 - Valve and Gate Actuators apply to this Section.

1.2    CONTRACTOR SUBMITTALS

A.    Furnish submittals in accordance with Section 43 30 00 – Valves, General.

PART 2 -- PRODUCTS

2.1    GENERAL

A.    Buried valves shall be of the inside screw, non-rising stem type. The valve actuators shall be as indicated, with counter-clockwise opening stems, in accordance with Section 43 30 12 – Valve and Gate Actuators.

B.    All gate valves shall be resilient-seated gate valves as specified below.

2.2    RESILIENT-SEATED GATE VALVES

A.    Construction: Resilient-seated gate valves shall conform to AWWA C509 - Resilient-Seated Gate Valves for Water and Sewerage Systems. The valves shall be suitable for a minimum design working water pressure of 200 psig, with flanged, bell and spigot, or mechanical joint ends as indicated. The valve body, bonnet, and disc shall be of cast iron or ductile iron and the disc or body shall be rubber-coated. Body and bonnet wall thickness shall be equal to or greater than the minimum wall thickness as listed in Table 1 of AWWA C509. The stem, stem nuts, glands, and bushings shall be bronze, with the stem seal per AWWA C509.

B.    Pressure Ratings: AWWA C509 valves that are 3, 4, 6, 8, and 12 inches in size shall be rated for 200 psig minimum design working water pressure, and 16-, 20-, 24-, and 30-inch valves shall be rated for 150 psig minimum design working water pressure.

C.    Protective Coating: Valve interior and exterior of body and bonnet shall be coated with a fusion bonded epoxy coating in accordance with Section 09800 - Protective Coating.

D.    Actuators: Unless otherwise indicated, resilient-seated gate valves shall have manual actuators in accordance with Section 43 30 12.
E. Manufacturers, or Equal

1. Mueller Company
2. Clow, F-6100
3. Kennedy Valve, Ken-Seal
4. American Flow Products, 500/2500 Series
5. U.S. Pipe, Metroseal

2.3 GATE VALVES (SMALLER THAN 3-INCHES)

A. Construction: Gate valves smaller than 3-inches, for general purpose use, shall be non-rising stem, heavy-duty type for industrial service, with screwed or soldered ends to match the piping. The bodies shall have union bonnets of bronze conforming to ASTM B 62 - Composition Bronze or Ounce Metal Castings. The stems shall be of bronze conforming to ASTM B 62, or ASTM B 371 - Copper-Zinc-Silicon Alloy Rod. The solid wedges shall be of bronze conforming to ASTM B 62. The valves shall have malleable iron handwheels unless otherwise indicated, and stem seals shall be of Teflon-impregnated or other acceptable non-asbestos packing. Valves shall have a pressure rating of minimum 125 psi steam and 200 psi coldwater, unless otherwise indicated.

B. Manufacturers, or Equal

1. Crane Company
2. Milwaukee Valve Company
3. Wm. Powell Company
4. Stockham Valves and Fittings
5. Walworth Company

PART 3 -- EXECUTION

3.1 GENERAL

A. Gate valves shall be installed in accordance with the provisions of Section 43 30 00 – Valves, General. Care shall be taken that valves in plastic lines are well supported at each end of the valve.

END OF SECTION
43 30 52  MISCELLANEOUS VALVES GENERAL

PART 1 -- GENERAL

1.1  THE SUMMARY

A.  The CONTRACTOR shall provide miscellaneous valves and appurtenances, complete and operable, in accordance with the Contract Documents.

B.  The requirements of Section 43 30 00 - Valves, General, apply to this Section.

1.2  CONTRACTOR SUBMITTALS

A.  Furnish submittals in accordance with Section 43 30 00 - Valves, General.

PART 2 -- PRODUCTS

2.1  AIR-VACUUM AND AIR-RELEASE VALVES

A.  Air and Vacuum Valves: Air and vacuum valves shall be capable of venting large quantities of air while pipelines are being filled, and allowing air to re-enter while pipelines are being drained. They shall be of the size indicated, with flanged or screwed ends to match piping. Bodies shall be of high-strength cast iron. The float, seat, and moving parts shall be constructed of Type 316 stainless steel. Seat washers and gaskets shall be of a material insuring water tightness with a minimum of maintenance. Valves shall be designed for minimum 150 psi water-working pressure, unless otherwise indicated.

B.  Air-Release Valves: Air-release valves shall vent accumulating air while system is in service under pressure and be of the size indicated. Valves shall meet the same general requirements as indicated for air and vacuum valves except that the vacuum feature will not be required. Valves shall be designed for a minimum water-working pressure of 150 psi, unless otherwise indicated.

C.  Combination Air Valves: Combination air valves shall combine the characteristics of air and vacuum valves and air release valves by exhausting accumulated air in systems under pressure and releasing or re-admitting large quantities of air while a system is being filled or drained, respectively. Valves shall have the same general requirements as indicated for air and vacuum valves.

2.2  METAL BALL VALVES (4-INCH AND SMALLER)

A.  General: Unless otherwise indicated, general purpose metal ball valves in sizes up to 4-inches shall have actuators in accordance with Section 15201 - Valve and Gate Actuators.

B.  Body: Ball valves up to and including 1-1/2 inches in size shall have bronze or carbon steel 2 or 3 piece bodies with screwed ends for a pressure rating of not less than 600 psi WOG. Valves 2-inches to 4-inches in size shall have bronze or carbon steel 2 or 3 piece...
bodies with flanged ends for a pressure rating of ANSI 125 psi or 150 psi unless otherwise indicated.

C. Balls: The balls shall be solid chrome-plated brass or bronze, or stainless steel, with standard port (single reduction) or full port openings.

D. Stems: The valve stems shall be of the blow-out proof design, of bronze, stainless steel, or other acceptable construction, with reinforced teflon seal.

E. Seats: The valve seats shall be of teflon or Buna-N, for bi-directional service and easy replacement.

F. Manufacturers, or Equal
   1. Conbraco Industries, Inc. (Apollo)
   2. ITT Engineered Valves
   3. Neles-Jamesbury, Inc.
   4. Watts Regulator
   5. Worcester Controls

PART 3 -- EXECUTION

3.1 INSTALLATION

A. Backflow preventers shall be installed in potable water lines where required by applicable codes or regulations, wherever there is any danger of contamination, and where indicated.

B. Valves shall be installed in accordance with the manufacturer's printed recommendations, and with Section 43 30 52 - Miscellaneous Valves.

C. Backflow preventers, as well as air and vacuum release valves, shall have piped outlets to the nearest acceptable drain, firmly-supported, and installed in such a way as to avoid splashing and wetting of floors and obstruction of traffic.

END OF SECTION
43 30 54  FIRE HYDRANTS

PART 1 -- GENERAL

1.1  THE SUMMARY

A.  The CONTRACTOR shall provide fire hydrants and appurtenances, complete and operable, in accordance with the Contract Documents.

B.  This Section covers the dry-barrel and the wet-barrel types of fire hydrant: however, unless otherwise indicated, the dry-barrel hydrant shall be provided.

C.  The CONTRACTOR shall submit manufacturer’s data.

PART 2 -- PRODUCTS

2.1  FIRE HYDRANTS

A.  Construction: Hydrants shall have 5 ¼-inch main valve opening and shall comply with AWWA Standard C502 for hydrants for water works service. Hydrants shall be designed for a 200-psi working pressure. Each hydrant shall have 6-inch mechanical joint ends with harnessing lugs (“dog ears”) and shall open by turning to the left (counter-clockwise). Hydrants shall be of ample length for 3 ½ -foot depth of bury. Hydrants shall be provided with 2 each, 2 ½-inch hose nozzles and one 4 ½-inch pumper nozzle, all having National Standard hose threads. Nozzles shall have caps attached by chains. Shoe and barrel shall be epoxy coated. Traffic model hydrants shall be provided. Operating nuts shall be AWWA Standard (pentagonal, measuring 1 ½ -inch point to flat). Hydrants shall be equipped with “O-Ring” packing. Grease containing acetate shall not be permitted.

B.  Hydrants shall be furnished with a breakable feature that will clearly break upon impact. This shall consist of a two part breakable safety flange with a breakable stem coupling.

C.  Painting: All iron parts of the hydrant, both inside and outside shall be painted, in accordance with AWWA C502. All inside surfaces and the outside surface below the ground line shall be coated with asphalt varnish. They shall be covered with the two coats, the first having dried thoroughly before the second is applied.

D.  The outside of the hydrant above the finished grade shall be thoroughly cleaned and painted with System 1, as specified in Specification 09 96 00- “Protective Coating” and in accordance with NFPA 291. Color shall be OSHA yellow reflective paint meeting the City of Hallandale Fire Department requirements.

E.  Manufacturers, or Equal:

1.  American Flow Control – B84B 6"

2.  Kennedy Valve – Guardian K-81-A
3. U.S Pipe – Metropolitan
4. Mueller – Centurion #A-423

2.2 HYDRANTS OFFSETS

A. In order meet the required location and grade, hydrants may be installed using an offset device to provide vertical and horizontal adjustment to the final setting of the hydrant. The hydrant offset shall be in accordance with AWWA C153/ANSI A21.53 Ductile Iron. The offset shall match the hydrant diameter center to center.

B. The hydrant offset shall have an anchoring feature on both ends to provide a restrained joint. The hydrant offset shall be tar coated outside and cement lined inside per AWWA C104 to provide corrosion protection.

C. Manufacturers or equal:

1. Gradelok, as supplied by Hughes Supply Inc.

PART 3 -- EXECUTION

3.1 INSTALLATION

A. All hydrants shall be installed in strict accordance with the manufacturer’s published recommendations, AWWA Standards, Broward County Standard Detail Figure 231 and all applicable codes and applicable provisions of Specification 43 30 00-Valves, General. All installations shall be to the satisfaction of the local and building department. After installation and until the hydrant is active, the Contractor will cover the hydrant with black polyethylene to denote a non-functional hydrant.

B. Bollards shall be installed with the new Fire Hydrants in accordance with Broward County Standard Detail Figure 194.

C. Hydrants shall not be placed within five-feet of power poles, communications pedestals, and other obstructions that will interfere with the proper operation of the hydrant. If obstructions are present, the CONTRACTOR shall inform the OWNER, and the OWNER will advise CONTRACTOR of new location.

D. Construction Details: Hydrants shall be plumb and shall be set so that the lowest hose connection is, at least, eighteen (18) inches above, but no more than twenty-four (24) inches above, the finished grade. All hydrants shall be inspected in the field upon delivery to the job to insure proper operation before installation. The resetting of existing hydrants and moving and reconnecting of existing hydrants shall be handled in a manner similar to a new installation. Hydrant assemblies shall be constructed in accordance with the Standard Details. Provide a single blue bi-directional reflective pavement marker with each potable water fire hydrant.
E. Raised reflective pavement marker in blue shall be used to identify the fire hydrant location. The marker shall be placed at the center line of the outside roadway lane unless otherwise directed by the City of Hallandale Beach Fire Marshall.

END OF SECTION
DIVISION 44 – POLLUTION CONTROL EQUIPMENT (NOT USED)

DIVISION 45 – INDUSTRY SPECIFIC MANUFACTURING EQUIPMENT (NOT USED)

DIVISION 46 – PROCESS EQUIPMENT (NOT USED)

DIVISION 48 – ELECTRICAL POWER GENERATION (NOT USED)
GEOTECHNICAL ENGINEERING SERVICES

PROPOSED 12-INCH PVC WATER MAIN IMPROVEMENT
ALONG FOSTER ROAD
CITY OF HALLANDALE, FLORIDA

Prepared For

STANTEC
901 Ponce de Leon Boulevard, Suite 900
Coral Gables FL 33134
May 9, 2019 (Revised July 10, 2019)

Dave E. Clarke P.E.
Project Manager
STANTEC
901 Ponce de Leon Boulevard, Suite 900
Coral Gables FL 33134-3070

Re: Geotechnical Engineering Services
Proposed 12-inch PVC Water Main Improvement along Foster Road
City of Hallandale, Florida
GCES Project No. G10191010

Dear Mr. Clarke:

GCES Engineering Services, LLC. (GCES) was engaged by STANTEC to conduct a
gEotechnical engineering exploration at the above referenced site. We are
submitting herein the results of the subsurface exploration for the proposed 12-inch
PVC Water Main Improvement.

The purpose of the geotechnical services was to obtain subsurface soil data to
evaluate the PVC water main excavations. The scope of this study included
subsurface exploration, field testing, laboratory testing, engineering analysis and
evaluation of the pipe foundation materials. This work was performed as
authorized in our agreement with STANTEC.

We appreciate the opportunity to provide our services on this project. If you have
any questions concerning the information provided, please do not hesitate to
contact our office.

GCES ENGINEERING SERVICES, LLC

Dhayana Chacon
Engineering Staff

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G10191010 – Proposed 12-inch PVC Water Main Improvement along Foster Road

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PROJECT INFORMATION

The site of the proposed water main improvements is located in the City of Hallandale, Broward County, Florida. A Vicinity map is included in the Appendix as Figure 1.

GCES understands that the project will consist of the installation of approximately 3,400 LF of 12-inch Polyvinyl chloride (PVC) Water Main along Foster Road from NW 9th Avenue to NW 4th Avenue, and approximately 2,400 LF of 8-inch PVC water main along NW 9th Street from NW 9th Avenue to NW 8th Avenue, along NW 8th Avenue from NW 9th Street.

Cross sections were not provided at the time of our geotechnical exploration, therefore, we anticipate that the water main will be installed by excavating trenches to depths of no more than 8 feet. If the information herein is not accurate GCES should be contacted to re-assess our recommendations.

FIELD EXPLORATION

Field Test Location

The field exploration conducted consisting of six Standard Penetration Test (SPT) borings performed along the proposed PVC water main. The boring locations were located in the field existing features encountered in the field and the conceptual drawing provided by STANTEC.

A summary of the field test locations performed is presented in Table 1: Summary of Test Boring Locations. The boring locations can be found on the Boring Location Plan, Figure 2, in the Appendix. Due to the scale of the drawing, the boring with their respective station and offset references shown on the Boring Location Plan should be considered approximate.

<table>
<thead>
<tr>
<th>Boring No.</th>
<th>Roads</th>
<th>Test Boring Location</th>
<th>Depth of Boring (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>B-1</td>
<td>Along NW 9th Street from NW 8th Terrace to NW 8th Avenue</td>
<td>Eastbound Travel Lane, South of NW 9th Street</td>
<td>15</td>
</tr>
<tr>
<td>B-2</td>
<td>Along NW 8th Avenue from NW 9th Street to Foster Road</td>
<td>Northbound Travel Lane, East Side of NW 8th Avenue</td>
<td>15</td>
</tr>
</tbody>
</table>
**TABLE 1: (Continued) Summary of Test Boring Locations**

<table>
<thead>
<tr>
<th>Boring</th>
<th>Location</th>
<th>Test Boring Lane, North side of Foster Road</th>
<th>Depth (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>B-3</td>
<td>Along Foster Road between NW 9th Avenue to NW 8th Terrace</td>
<td>Westbound Travel Lane, North side of Foster Road</td>
<td>15</td>
</tr>
<tr>
<td>B-4</td>
<td>Along Foster Road between NW 8th Terrace to NW 8th Avenue</td>
<td>Westbound Travel Lane, North side of Foster Road</td>
<td>15</td>
</tr>
<tr>
<td>B-5</td>
<td>Along Foster Road between NW 7th Terrace to NW 7th Avenue</td>
<td>Westbound Travel Lane, North side of Foster Road</td>
<td>15</td>
</tr>
<tr>
<td>B-6</td>
<td>Along Foster Road between NW 6th Avenue to NW 4th Avenue</td>
<td>Westbound Travel Lane, North side of Foster Road</td>
<td>15</td>
</tr>
</tbody>
</table>

**Standard Penetration Test (SPT)**

GCES’s field exploration consisted of performing six Standard Penetration Test (SPT) borings, B-1 through B-6 to depths of 15 feet below existing grades. The field exploration was conducted on May 1, 2019. The SPT borings were performed using a truck-mounted drill rig equipped with a calibrated automatic hammer. The boreholes were advanced using drilling mud techniques and casing. The borings were performed in general accordance with ASTM Standard D-1586.

The SPT boring was continuously sampled in the upper 15 feet. Thereafter, the sampling interval was every 5 feet. Each boring was logged by the on-site personnel during the field exploration. The field logs included visual classifications of the materials encountered during drilling as well as interpretation of the subsurface conditions between samples. Disturbed soil samples were placed in glass jars or sealed plastic bags and returned to our laboratory for additional visual classification by a GCES Engineer. Upon completion of the SPT borings, the boreholes were backfilled with cement grout, the surface restored (with cold mix asphalt where applicable), and the site cleaned as required. A brief description of the field exploration procedures employed in our subsurface investigation is provided in the Appendix of this report.

The results of the SPT tests are presented on the generalized soil profiles, Report of Core Borings, and on the logs included in the Appendix. These sheets and the boring logs present generalized soil profiles along with groundwater levels along the proposed PVC water main pipe alignment. The Report of Core Borings and logs represent an interpretation of the field logs and includes modifications based on a geotechnical engineer’s visual classification of the samples returned to the laboratory.
SAMPLE DISPOSAL

All samples were delivered to our laboratory. Samples not tested in the laboratory will be stored for a period of 60 days subsequent to submittal of this report and will be discarded after this period, unless GCES is notified otherwise.

SITE CONDITIONS

Existing Site Conditions

Based on our visual observations during our field exploration, the site consists of a relatively flat asphalt-paved roadway located within a residential area where utilities, overhead cables and lighting have already been established.

The paved roadway was a two-lane divided roadway with rights of way spanning in a south/north direction. The proposed pipe alignment lies within the Westbound Travel Lane. Existing utilities and commercial traffic flow were monitored while work was in progress.

Soil Survey

In the vicinity of the site, the Natural Resources Conservation Service (NRCS) Soil Survey of Broward County, dated December 1996, depicts the soil as Dade-Urban land complex. A Soil Survey Map of the area is included in the Appendix as Figure 3. Following is the description of this map unit.

Dade-Urban land complex. This complex consists of Dade fine sand, which makes up the open areas, and of Urban land, which concrete and buildings cover. The Dade soil in the open areas is nearly level, well drained, and sandy and has limestone at varying depths. In most places, a thin layer of gravelly sand has been
spread over the surface of these soils to stabilize the loose, dry sands of the natural surface. We note that the maximum depth of the survey is approximately 6 feet.

**USGS Geological Survey Quadrangle Map**

The Quadrangle Survey Map published by the United States Geological Survey (USGS) was reviewed for the proposed project alignment. Based on the review, the project is located within the USGS "North Miami" Quadrangle Map (1994), Township 51 South, Range 42 East, Section 218. A reproduction of the USGS map for the project area, Figure 4, is illustrated in the Appendix of this report.

**Subsurface Conditions**

**SPT Boring Results**

A total of six borings were performed for the subsurface exploration for the proposed PVC water main construction described herein. The locations of the SPT borings are shown on the Boring Location Plan as Figure 2 which is included in the Appendix.

Soil stratification is based on an examination of the recovered soil samples, the laboratory testing, and interpretation of field boring logs by a geotechnical engineer or geologist. Stratification boundaries on the boring logs represent the approximate depths of changes in soil types; however, the transition between soil types in the field may be gradual. This report does not reflect variations that may occur between borings, across the site, or due to the modifying effects of weather. The nature and extent of such variations may not become evident until during or after construction. If variations appear, we should be immediately notified so that further evaluation and supplemental recommendations can be provided. All references to depths of the various soil types encountered are from existing grade at the time of drilling.

The site stratigraphy along the proposed pipe main alignment generally consists of three (3) distinct strata consisting of an upper layer of granular fill that varied in thickness and found to depths ranging from 1 to 6 feet below existing ground surface. Below the fill materials, at boring locations B-1, B-5 and B-6, a layer of fine sand was encountered to depths varying from 6 to 8 feet below existing ground surface. At the remaining boring locations, B-2, B-3 and B-4, and below the aforementioned sand layers, alternating layers of natural limestone, interbedded...
limestone/sand, and sand was found to the termination depths the borings, 15 feet below existing ground surface.

Asphalt was encountered at boring locations B-2 and B-6 and topsoil at the other boring locations. Asphalt fragments were encountered within the fill materials in boring B-2 between 4 and 6 feet below exiting ground surface. Based on the results of the SPT borings, the soil subsurface conditions at the SPT boring locations can be generalized as indicated Table 2 shown below.

<table>
<thead>
<tr>
<th>STRATUM</th>
<th>GENERAL DEPTH INTERVAL (FEET)</th>
<th>SOIL DESCRIPTION</th>
<th>USCS SOIL CLASSIFICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0.0 to 0.58</td>
<td>ASPHALT/TOPSOIL</td>
<td>-</td>
</tr>
<tr>
<td>1</td>
<td>0.0 to 6.0</td>
<td>Granular FILL comprised of FINE SAND Trace Limerock Fragments</td>
<td>FILL/SP</td>
</tr>
<tr>
<td>2</td>
<td>1.0 to 8.0</td>
<td>SAND</td>
<td>SP</td>
</tr>
<tr>
<td>3</td>
<td>4.0 to 15</td>
<td>Alternating layers of LIMESTONE, interbedded LIMESTONE/SAND, SILTY SAND with Limestone Fragments and FINE SAND</td>
<td>SP for Sand Layers SM for Silty Sand Layers</td>
</tr>
</tbody>
</table>

Standard Penetration Values (N-values) within the upper fill material, Stratum 1, varied from 4 to 30 blows per foot (bpf). N values within the Sand/Silty Sand, Stratum 2 and 3, ranged from 3 to 9 bpf. For Stratum 3, the alternating layers of limestone fine sand and silty sand recorded N-values in the range of 3 to 20 bpf. The lowest N-values were encountered in borings B-5 and B-6.

For a more detailed description of the subsurface conditions encountered, please refer to the Boring Logs in the Appendix.

**Groundwater Conditions**

Groundwater levels were measured from the existing grade when first encountered during the drilling for the presence and level of groundwater. Groundwater levels observed at these times are indicated on the boring logs. During the subsurface exploration, groundwater was encountered at approximate depths ranging from 8.5 to 9 feet below existing ground surface.
These groundwater level observations provide an approximate indication of the groundwater conditions existing on site at the time the borings were drilled. It should be noted that fluctuations in the groundwater levels can occur due to seasonal variations, tidal conditions, recent rainfall conditions and other site specific conditions.

**EVALUATIONS AND RECOMMENDATIONS**

The following recommendations are based upon the data obtained in our field exploration and laboratory testing programs, the project information provided to us, and on our experience from sites with similar subsurface conditions.

**Geotechnical Considerations**

The results of the borings performed provided a general subsurface profile of the soil/rock conditions alone the proposed PVC water main alignment project. The soil/rock conditions may vary from one location to another.

We anticipate that soil excavations to install the proposed PVC water main pipeline will generally not exceed 8 feet below the existing grades. Based on the results of our field exploration, it is our opinion that unsupported vertical cut on the existing subsurface profile is not considered stable or safe during construction at this site. Therefore, in our opinion and following the current regulations established by OSHA for excavations, a temporary ground support system will be required for this project. Estimated design geotechnical parameters were developed from the results of the SPT borings and can be utilized for the design of the temporary ground support system.

During the subsurface exploration (May 2019), groundwater was encountered at approximate depths ranging from 8.5 to 9 feet below existing ground surface. Please note that the groundwater table fluctuates seasonally depending upon intensity and duration of rainfall presence and the proximity of any artificial drainage facilities. Based upon our observations at the site, observations in the borings and a review of the Soil Survey of Broward County, Florida, it is GCES’s opinion that the seasonal high groundwater level would be at least 18 inches foot above the encountered groundwater levels shown on the Report of SPT Borings. Therefore, depending on the time of construction and depth of cover, some forms of dewatering may be required during pipe installation. We recommend construction notes be included in the contract documents to require the
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contractor be responsible for dewatering, regardless of the groundwater level. The following sections present general recommendations for pipe installation, excavation support evaluation and estimated design soil parameters based on the results of the SPT borings.

**Geotechnical Parameters**

Estimated design soil parameters were developed from the results of the SPT borings and geotechnical parameters were derived empirically using established relationships between the SPT “N” values and soil/rock properties, literature review and our local experience. For the design geotechnical parameter correlations, the SPT N-values for the automatic hammer were converted to safety (manual) hammer SPT N-values (N_{safety} = 1.24 \times N_{automatic}) using the conversion equation obtained from the FDOT Soils and Foundation Handbook. The following table, Table 3, summarize the estimated geotechnical parameters, and lateral at-rest, active and passive pressure coefficients, where applicable, for design of temporary shoring systems.

**TABLE 3: Summary of Geotechnical Design Geotechnical Parameters**

<table>
<thead>
<tr>
<th>Stratum</th>
<th>Material Type</th>
<th>Approximate Layer Thickness (*) (Feet)</th>
<th>Soil Unit Weight (pcf)</th>
<th>Angle of Internal Friction (Degrees)</th>
<th>Wall Friction, (Degrees)</th>
<th>Earth Pressure Coefficients</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Saturated</td>
<td>Submerged</td>
<td></td>
<td>At-Rest (Ko)</td>
</tr>
<tr>
<td>1</td>
<td>FILL</td>
<td>1 - 6</td>
<td>110</td>
<td>48</td>
<td>31</td>
<td>23</td>
</tr>
<tr>
<td>2</td>
<td>SAND</td>
<td>2 – 7</td>
<td>107</td>
<td>45</td>
<td>28</td>
<td>21</td>
</tr>
<tr>
<td>3</td>
<td>Silty SAND</td>
<td>2 - 4</td>
<td>105</td>
<td>43</td>
<td>27</td>
<td>20</td>
</tr>
<tr>
<td>4a</td>
<td><strong>LIMESTONE</strong> (B-1, B-3 and B-4)</td>
<td>3 – 9</td>
<td>118</td>
<td>56</td>
<td>40</td>
<td>30</td>
</tr>
<tr>
<td>4b</td>
<td>*<strong>LIMESTONE</strong> (B-5 &amp; B-6)</td>
<td>7</td>
<td>115</td>
<td>53</td>
<td>32</td>
<td>24</td>
</tr>
</tbody>
</table>

**Notes:**
- *Measured from the existing ground surface
- **Limestone layers modeled as sandy gravel. Friction Angle, φ = N/4 + 33 to estimate Average Soil Parameters for Design
Limestone layers modeled as sand to estimate Average Soil Parameters for Design

Groundwater was encountered at depths between 8 feet and 9 feet below the ground surface. Groundwater shall be assumed at the ground surface for calculation design purposes.

Friction angle between shaft and soil should be taken as \(d = \frac{3}{4} \theta\) (NAVFAC DM-7.2)

The soil parameter values given in the above table are based on our borings, published values and past experience with similar soil types. These values should, therefore, be considered approximate.

Submerged unit weight values given are essentially material encountered below the water levels.

Asphalt/Topsoil was found at the surface at the boring locations. This top layer should be ignored for calculation purposes.

For a more detailed description of the subsurface profile encountered, please refer to the boring logs in the Appendix.

**Pipe Bearing Support Evaluation**

Based on the subsurface conditions disclosed by the borings and the anticipated pipe installation depth of within 8 feet below the existing ground surface, the proposed pipe would bear on loose sandy strata. The foundation subgrade soils should be prepared in accordance with the recommendations presented in the Construction Considerations section of this report. For pipes bearing on properly compacted sandy strata, an allowable bearing capacity of 3,000 pounds per square foot (psf) should be used for design. The allowable bearing pressure is a net pressure that will increase over and above that due to the overburdened soils. Settlement of the pipe is anticipated to be less than 0.5 inch.

**Excavation Support Evaluation**

We anticipate that the depth of the proposed excavation will not exceed 8 feet below the existing grades. We have evaluated the probable stability of the sidewalls for open excavation during the installation of the water main. A review of the boring logs indicates that the upper soil subsurface profile along the proposed pipe main alignment to depth of 8 feet is underlain by a surface layer of variable types of sandy materials, in a loose to medium dense conditions, at boring locations B-1, B-2, B-5 and B-6. At boring locations B-2 and B-4, loose to medium dense sandy materials were encountered to depths of 4 feet followed by the limestone formation to 8 feet below existing ground surface.
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Given the proposed construction and the existing soil subsurface conditions, an unsupported vertical cut to the proposed depth excavation of 8 feet on the existing subsurface profile is not considered stable or safe during construction. Therefore, in our opinion and following the current regulations established by OSHA for excavations, a temporary ground support system is required. Shoring and shielding procedures should conform to those presented in OSHA standards.

The installation of the proposed PVC water main pipe will require excavation into hard limestone formation for excavation beyond 4 to 6 feet below ground surface. (in the areas of Boring B-3 and B-4). Temporary excavation through the natural limestone formation can be expected to remain stable if excavated vertically. However, based on our experience, there is a potential for the possible occurrence of large solution holes or sand slots within the limestone formation. These large features are generally filled with loose sands, silty sands or silt and are expected to collapse during construction.

Solution holes are also suspected where low blows per foot were encountered at the boring locations and are likely encountered along the alignment in other areas. An unsupported excavation under this condition is not considered safe during construction and may cause the collapse of the sidewalls. Potential excavation collapse is an unsafe condition for workmen and can also damage the proposed pipe structures as it is being installed. Therefore, temporary ground support system should also be utilized for these conditions.

**Temporary Retaining System**

Ground support system for vertical cut consisting of a trench box along with proper groundwater control is anticipated. A temporary retaining system such as cantilever steel sheet pile walls may also be considered for the PVC water main pipe installation. GCES has provided the estimated geotechnical parameters (see Table 3) for the evaluation of temporary sheet pile system. The design of the sheet pile shall be performed by a licensed Specialty Engineering Contractor.

Hard zones may be encountered within the pipe excavation alignment. A local specialty contractor should be consulted for the installation of sheet piles due to the potential presence of hard zones.
After the temporary ground support is set in place, or sheet piles are installed to the required tip elevation, the excavation of the subsurface materials can be made. The following sections present construction considerations for installation of the water main pipe and excavation support.

**CONSTRUCTION CONSIDERATIONS**

We recommend that all excavation, trenching and backfilling operations be performed in accordance with the latest local code regulations (Broward County Minimum Design & Construction Standards) and Florida Department of Transportation (FDOT) Standard Specifications. The following are general construction recommendations for the pipe installation based on the anticipated construction and soil boring data.

**Trench Excavations**

As noted previously, a review of the boring logs and trench cuts located next to existing structures, utility or near existing curbs and sidewalks indicate that an unsupported vertical cut to the proposed depth excavation of 8 feet on the existing subsurface profile is not considered stable or safe during construction. Therefore, in our opinion and following the current regulations established by OSHA for excavations, a temporary ground support system is required. Shoring and shielding procedures should conform to those presented in OSHA standards.

All unsuitable materials encountered during the excavation (old pipes, drainage systems, etc.) should be removed along the pipe alignment. If the excavation of unsuitable materials extends below the planned pipe elevation, select backfill should be used to fill the excavation and should be compacted in 6-inch layers up to the bottom of the proposed six inches of pipe bedding.

Materials removed from any excavation should not be stockpiled immediately adjacent to the open excavation as this surcharge load may cause a sudden collapse of the sidewalls. We recommend material stockpiling at least 10 feet from the sides of the excavation based on a 10 foot deep excavation. If placed closer than this distance the shoring system should be designed for the additional surcharge loading. Suitable excavated material may be stockpiled and used for backfill as approved by the Geotechnical Engineer.
It has been our experience that the soil and limestone encountered in our borings can typically be excavated using conventional earthwork equipment (i.e. track-hoes, backhoes). Hard zones within the limestone formation may be encountered during the installation of the pipes along the pipe alignment. Some heavier equipment, such as a large track excavator equipped with a rock bucket may be required for excavation through hard limestone formation, if encountered.

We recommend that a contingency be included in the budget for excavation in hard limestone. If very hard limestone is encountered that cannot be excavated with heavy equipment, a local specialty contractor should be consulted. Blasting is not appropriate due to the presence of residences, utilities and other adjacent structures.

**Excavation with Lateral Support**

If temporary sheet piles are used for excavation support, the following are our suggestions for the installation of steel sheet piles:

- Predrilling may be required in order to prevent refusal conditions, damage of the structural section, and to minimize vibrations-induced settlements to nearby structures. Following predrilling, the sheet piles should be set in place and vibrated or driven to the required tip elevations.

- The sheet pile installation equipment will produce vibration and noise levels that may be considered disturbing to people and can produce vibrations noticeable in structures. The potential for damage to any adjacent structures during sheet pile installation will be dependent on the distance from the adjacent structures to the location of the sheet pile installation, the subsurface conditions, and the level of sensitivity of the structure to any type of vibration.

- We suggest that the recommendations provided in Section 108 of the FDOT Standard Specifications should be followed for the protection of the existing structures during sheet piling operations. All those structures and or utilities located adjacent to the proposed excavation shall be surveyed as well as monitored for vibrations and settlements in accordance with Section 108 of the FDOT Standard Specifications.
Foundation Bearing on Sandy Soils

The foundation bearing is the in place material beneath the pipe. If the foundation bearing is unsuitable, it must be removed and replaced with a suitable material. Should the soils at the bearing level become disturbed, the affected soil should be improved prior to placement of pipe bedding material. Trench bottom preparation should consist of compacting the foundation bearing material to provide a proper support for the pipe. The foundation bearing material should be compacted with vibratory tamper until densities equivalent to at least 95 percent of the maximum dry density as determined by the modified Proctor Test (ASTM D-1557 or AASHTO T-180).

Pipe Bedding Material

Pipe bedding thickness and backfill requirements to one (1foot) foot above the crown of the pipe should be specified by the Civil Engineer and in accordance with the project specifications. In general, pipes can be bedded on crushed rock or clean sand bedding material. The crushed rock should consist of hard, limestone with not less than 95 percent passing the ½ inch sieve and not less than 95 percent retained on the U.S. Standard Number 4 sieve. Where clean sand is used, the sand should have a fines content (percent passing the U.S. No. 200 sieve) of less than 5 percent.

Trench Backfill

Pipe backfill requirements to one foot above the pipe should be specified by the project designers. In most cases, backfill material required for placement around and to 1 foot above the top of the pipes should consist of clean, fine to medium sand or sand-gravel mixture with a maximum size of ¾ inch and not more than 10 percent passing the U.S. No. 200 sieve.

Unless otherwise specified, all fill materials above one foot above the pipe should consist of approved materials, free of organic matter and debris. The fill should be non-plastic with a fines content of less than 10 percent, (relatively clean sand with limerock or a crushed limerock with a two-inch maximum particle size) with a maximum particle size of 2 inch and Unified Soil Classification of GP, GW, SP, or SW.

The trench backfill shall be placed in maximum loose lifts of 6 inches and compacted to at least 95 percent of the maximum dry density as determined by the modified Proctor Test (ASTM D-1557 or AASHTO T-180). Note that excavated suitable granular soils and crushed limestone can be reused as backfill provided...
the excavated soils meet the particle size requirements specified by the project designers. If large pieces of rock are present they should be crushed to conform to the maximum allowable particle size. Some adjustments in the moisture content of on-site soils may be required to achieve adequate compaction. To most easily obtain the desired level of compaction, the water content of the soil at the time of compaction should be within +/-2 percent of the soil’s optimum moisture content as determined by the modified Proctor Test (ASTM D-1557 or AASHTO T-180).

Fill should be tested and approved prior to acquisition and placement. Density tests to confirm compaction should be performed in each fill lift before the next lift is placed. Any fill with less than minimum compaction requirements should be recompacted until the required density is obtained. We recommend that at least one density test be performed for every 200 linear feet per lift of compacted fill.

The fill material placed within the upper one foot of pavement subgrades should be compacted to at least 98 percent of the maximum dry density as determined by the modified Proctor Test (ASTM D-1557 or AASHTO T-180). LBR 40 material is commonly used in the upper 12 inches of pavement subgrade.

Prior to initiating compaction operations, we recommend that representative samples of the structural fill material to be used and acceptable in-place soils be collected and evaluated and, if necessary, tested by the contractor to determine their compaction and classification characteristics. The maximum dry density, optimum moisture content, gradation, and plasticity characteristics should be determined. These tests are needed for compaction quality control of the structural fill and existing soils and to determine if the fill material is acceptable. Any off-site materials used as fill should be approved by The Contractor prior to acquisition.

Groundwater Control
Groundwater control will depend upon the time of the year when the construction occurs, seasonal variations, tidal conditions, recent rainfall conditions, construction technique used, invert elevation and other site specific conditions. Assuming groundwater control will be required, the contractor shall dewater the excavated area so that the groundwater level is maintained at least 2 feet below the bottom of the excavations and surfaces subject to vibratory compaction.
operations. This may be accomplished through use of a well point system or submersible pump.

It is our opinion that the use of a wellpoint system may be necessary where the draw down exceeds approximately 2 feet. A wellpoint system may be capable of groundwater control, however, it is possible that the permeability of the limestone is such that cost-effective dewatering may not be practical. In this instance, performing these operations in the wet should be considered. A local specialty groundwater contractor should be consulted for operations in the wet and dewatering operations. Precautions should be taken by the contractor during pumping to so that fines are not withdrawn from the surrounding soils. Removal of sand and fine material could result in voids and undesirable settlement occurring in locations far from the actual dewatering area.

We suggest that all structures and/or utilities located adjacent to the proposed excavation be surveyed as well as monitored for settlements during the dewatering operations in accordance with Section 108 of the FDOT Standard Specifications. The water from on-site dewatering operations should be directed to a suitable discharge point and be adequate to satisfy any governmental regulatory agencies. We recommend that ground water control be performed in accordance with local code regulations (Broward County Minimum Design & Construction Standards) and Florida Department of Transportation (FDOT) Standard Specifications.

Excavation Requirements
In October of 1989, as published in the Federal Registrar, Volume 54, No. 209, the United States Department of Labor, Occupational Safety and Health Administration (OSHA) amended its; “Construction Standards for excavations, 29CRF part 1926, subpart P”. It is mandated by this federal regulation that all excavations, whether they be utility trenches, basement excavations, or footing excavations, be constructed in accordance with the new OSHA guidelines.

The contractor is solely responsible for designing and constructing stable, temporary excavations and should shore, slope, or bench the sides of the excavations as required to maintain stability of both the excavation sides and bottom. We recommend trench excavations in excess of 5 feet be supported with temporary shoring and bracing, such as trench boxes. The excavations should be
braced or sloped as required by OSHA regulations to provide stability and safe working conditions. A competent person should evaluate the excavations for stability prior to entry by personnel.

The excavations should strictly adhere to the most current local, state, and federal OSHA regulations. Construction site safety is the sole responsibility of the contractor who controls the means, methods and sequencing of construction operations. Under no circumstances shall the information provided herein be interpreted to mean that GCES is assuming any responsibility for construction site safety or the contractor's activities; such responsibility shall neither be implied or inferred.

**REPORT LIMITATIONS**

The evaluations presented in this Report of geotechnical exploration were prepared for exclusive use of STANTEC for the project title: Proposed 12-inch PVC Water Main Improvement along Foster Road in the City of Hallandale, Florida. These evaluations and recommendations were prepared using generally accepted standards of geotechnical engineering practices. No other warranty is expressed or implied. The scope of our services did not include an environmental assessment for the presence or absence of hazardous or toxic materials in the soil and groundwater. Any statements in this report regarding odors, staining of soils, or other unusual conditions observed are strictly for the information of our client.

Our geotechnical engineering evaluation of the site and subsurface conditions with respect to structures submittal and our recommendations are based upon the following: 1) site observations; 2) the field exploratory test data obtained during this phase of the study, and 3) our understanding of the project information as presented in this report.

Since this is an exploration, further consultation with GCES during the design process will be required so that these recommendations can be adjusted to the actual design. Furthermore, upon the discovery of any site or subsurface condition during construction which appears to deviate from the data presented and documented herein, please contact us immediately so that we may visit the site, observe the differing conditions, and thus evaluate this new information concerning these recommendations.
The recommendations presented represent design and construction techniques that GCES believes are both applicable and feasible for the planned construction and as noted above, it is based on the information provided to GCES Engineering Services, as summarized. Involvement of the geotechnical engineer during the design process and subsequently with the construction process is vitally important to ensure the project is constructed in accordance with the recommendations from the geotechnical report.

Should subsurface changes be encountered, early involvement of the geotechnical engineer can hasten subsequent recommendations. In addition, if varying subsurface conditions are encountered, resolutions can be obtained more quickly.

The assessment of site environmental conditions for the presence of contaminants in the soil, rock, surface, or groundwater of the site was beyond the scope of this exploration.
Geotechnical Engineering Services
Proposed 12-inch PVC Water Main Improvement along Foster Road
City of Hallandale, FL
BORING LOCATION PLAN
Proposed 12-inch PVC Water Main Improvement along Foster Road
City of Hallandale, FL

LEGEND

Approximate Boring Location

DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES
SOIL SURVEY MAP

From U.S. Department of Agriculture, Soil Conservation Service (later renamed the Natural Resource Conservation Service), dated 1967

LEGEND

SUBJECT SITE

Du - Dade-Urban land complex

Site Boundaries Are Approximate
SOUTH Beach
HOLLYWOOD
HALLANDALE

LEGEND

- SUBJECT SITE

Site Boundaries Are Approximate

CONTOUR INTERVAL 5 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929
DOTTED LINES REPRESENT 5’-FOOT CONTOURS

SOURCE: USGS
MIAMI, FL
1994
7.5 MINUTE SERIES (TOPOGRAPHIC)

FIG. No. 4

Geotechnical Engineering Services
Proposed 12-inch PVC Water Main Improvement along Foster Road
City of Hallandale, FL
CONSTRUCTION NOTES:

THE STRATA ENCOUNTERED WITHIN THE PROJECT SITE INCLUDE ROCK FORMATIONS THAT MAY PROVIDE HIGH RESISTANCE TO DRIVING AND EXCAVATION, SPECIAL EQUIPMENT AND BREAKING TOOLS ARE TYPICALLY REQUIRED TO EXCAVATE OR PENETRATE THESE LAYERS.

THESE LAYERS TYPICALLY REQUIRE PREFORMING HOLES TO MINIMIZE TIP ELEVATION TO PREVENT REFUSAL, STRUCTURAL DAMAGE OR TO MINIMIZE VIBRATION-INDUCED DAMAGE TO NEIGHBORING STRUCUTURES.

THE CONTRACTOR IS RESPONSIBLE FOR Dewatering AND SHALL ANTICIPATE THAT IT WILL BE REQUIRED TO FACILITATE PIPE INSTALLATION.

THE ROCK FORMATION ENCOUNTERED WITHIN THE PROJECT SITE MAY BE DIFFICULT TO Dewater DUE TO THEIR HIGH POROSITY AND PERMEABILITY.

REPORT OF CORE BORINGS

<table>
<thead>
<tr>
<th>ROAD NO.</th>
<th>COUNTY</th>
<th>FINANCIAL PROJECT ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>N/A</td>
<td>BROWARD</td>
<td>N/A</td>
</tr>
</tbody>
</table>

City of Hallandale, Broward County, FL

Proposed 12-inch PVC Water Main Improvement along Foster Road

REVISIONS

ENGINEER OF RECORD
GIES ENGINEERING SERVICES, LLC
ALJAREH R. MONTEMORO, P.E., LICENSE NO. 731046
TOBO NH 13TH ST UNIT 4
HIALEAH GARDENS, FL 33018
CERTIFICATE OF AUTHORIZATION 30039

LEGEND

<table>
<thead>
<tr>
<th>ASPHALT</th>
<th>TOPSOIL</th>
<th>SAND (FULL SP)</th>
<th>SAND (SP)</th>
<th>SILTY SAND (SW)</th>
<th>LIMESTONE</th>
</tr>
</thead>
</table>

NOTES:

- ASPHALT - Unified Soil Classification Group Symbol
- ENCOUNTERED WATER TABLE DURING DRILLING
- NUMBERS TO THE LEFT OF BORING INDICATE SP VALUE FOR SOIL PENETRATION (LESS THAN OTHERWISE NOTED)
- SPT BORINGS PERFORMED PER ASTM D 1586 WITH A HAMMER WEIGHT OF 62 LBS FALLING 30 INCHES
- STRATA BOUNDARIES ARE APPROXIMATE AND MAY VARY BETWEEN OR AWAY FROM BORING LOCATIONS
- 50% OF NUMBERS REQUIRED TO DRIVE SAMPLING SPOON (12.5 INCHES)

WITH WEIGHT OF HAMMER

WMC: NATURAL MOISTURE CONTENT (%) - SODIUM PERCENT PASSING 0.045 MESH (%)
OC: ORGANIC CONTENT (%) - LL: LIQUID LIMIT (%)
PI: PLASTICITY INDEX (%)
NP: INDICATES NON-PLASTIC

NOTES:

1. STANDARD PENETRATION TEST BORINGS WERE PERFORMED IN ACCORDANCE WITH ASTM D 1586. STANDARD PENETRATION RESISTANCE ARE SHOWN ON THE BORINGS AT THE TEST DEPTHS IN BLOWS PER FOOT UNLESS OTHERWISE NOTED.
2. SUBSURFACE CONDITIONS SHOWN ON THE BORING DO NOT REPRESENT CONDITIONS BETWEEN BORING LOCATIONS. ACTUAL CONDITIONS BETWEEN THE BORINGS MAY VARY FROM THOSE SHOWN.
3. UNIFIED SOIL CLASSIFICATIONS SHOWN ON THE BORING BASED ON VISUAL EXAMINATION AND UNOFFICIAL LABORATORY TESTING.

<table>
<thead>
<tr>
<th>RELATIVE DENSITY</th>
<th>SAFETY HAMMER SP V-VALUE (GRAIN/FOOT)</th>
<th>AUTOMATIC HAMMER SP V-VALUE (GRAIN/FOOT)</th>
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<tbody>
<tr>
<td>VERY LOOSE</td>
<td>LESS THAN 40</td>
<td>LESS THAN 30</td>
</tr>
<tr>
<td>LOOSE</td>
<td>40 - 50</td>
<td>30 - 40</td>
</tr>
<tr>
<td>MEDIUM DENSE</td>
<td>50 - 70</td>
<td>40 - 50</td>
</tr>
<tr>
<td>HARD</td>
<td>GREATER THAN 50</td>
<td>GREATER THAN 40</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SILTS AND CLAY</th>
<th>SAFETY HAMMER SP V-VALUE (GRAIN/FOOT)</th>
<th>AUTOMATIC HAMMER SP V-VALUE (GRAIN/FOOT)</th>
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<tbody>
<tr>
<td>VERY SOFT</td>
<td>LESS THAN 2</td>
<td>LESS THAN 3</td>
</tr>
<tr>
<td>SOFT</td>
<td>2 - 4</td>
<td>3 - 6</td>
</tr>
<tr>
<td>FIRM</td>
<td>4 - 8</td>
<td>6 - 10</td>
</tr>
<tr>
<td>HARD</td>
<td>GREATER THAN 10</td>
<td>GREATER THAN 24</td>
</tr>
</tbody>
</table>
CONSTRUCTION NOTES:

THE STRATA ENCOUNTERED WITHIN THE PROJECT SITE INCLUDE ROCK FORMATIONS THAT MAY PROVIDE HIGH RESISTANCE TO DRIVING AND EXCAVATION SPECIAL EQUIPMENT AND BREAKING TOOLS ARE TYPICALLY REQUIRED TO EXCAVATE OR PENETRATE THESE LAYERS.

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THE CONTRACTOR IS RESPONSIBLE FOR Dewatering AND shall ANTICIPATE THAT IT WILl REQUIRE TO FACILITATE PIPE INSTALLATION.

THE CONTRACTOR SHALL OBTAIN ALL NECESSARY PERMITS FOR PROPOSED METHOD OF DISPOSAL AND LOCATION OF DISPOSAL PRIOR TO DISCHARGING WATER FROM THE EXCAVATION.

THE ROCK FORMATION ENCOUNTERED WITHIN THE PROJECT SITE MAY BE DIFFICULT TO Dewater Due TO THEIR HIGH RESISTIVITY AND PENETRABILITY.

NOTES:

1. STANDARD PENETRATION TEST BORINGs WERE PERFORMED IN ACCORDANCE WITH ASTM D3515-01. STANDARD PENETRATION RESISTANCE ARE SHOWN ON THE BORINGS AT THE TEST DEPTHS IN BLOWS PER FOOT UNLESS OTHERWISE NOTED.

2. SUBSURFACE CONDITIONS SHOWN ON THE BORING do not REPRESENT CONDITIONS BETWEEN BORING LOCATIONS. ACTUAL CONDITIONS BETWEEN THE BORINGS may VARY FROM THOSE SHOWN.

3. UNIFIED SOIL CLASSIFICATIONS SHOWN ON THE BORING ARE BASED ON VISUAL EXAMINATION AND LIMITED LABORATORY TESTING.
<table>
<thead>
<tr>
<th>DEPTH</th>
<th>GRAPHIC LOG</th>
<th>MATERIAL DESCRIPTION</th>
<th>SAMPLE TYPE</th>
<th>BLOWS</th>
<th>N-VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td></td>
<td>Light Brown Fine SAND with Silt and Limestone Fragments, Medium Dense to Dense (Fill, SM)</td>
<td>SS</td>
<td>16</td>
<td>30</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>Light Brown Fine SAND, Loose (SP)</td>
<td>SS</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>Light Brown Silty Fine SAND with Limestone Fragments, Loose (SM)</td>
<td>SS</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>10</td>
<td></td>
<td>Light Brown LIMESTONE with Silty Fine SAND</td>
<td>SS</td>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td>15</td>
<td></td>
<td>Boring Terminated at 15 feet</td>
<td>SS</td>
<td>7</td>
<td>11</td>
</tr>
</tbody>
</table>

Disclaimer: GCES Consultants, accepts no Liability for the consequences of the independent interpretation of drilling logs by others
<table>
<thead>
<tr>
<th>DEPTH</th>
<th>GRAPHIC LOG</th>
<th>MATERIAL DESCRIPTION</th>
<th>SAMPLE TYPE NUMBER</th>
<th>BLOWS</th>
<th>N-VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td>1 inch - ASPHALT</td>
<td>SS</td>
<td>1</td>
<td>17 15 13 12</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>Light Brown to Dark Brown Fine SAND, Trace Limerock Fragments and Asphalt Fragments,</td>
<td>SS</td>
<td>2</td>
<td>10 8 8 7</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>Medium Dense (Fill, SP)</td>
<td>SS</td>
<td>3</td>
<td>6 4 4 4</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>Light Brown Fine SAND, Trace Asphalt Fragments, Loose (Fill, SP)</td>
<td>SS</td>
<td>4</td>
<td>4 3 3 4</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>Light Brown Silty Fine SAND with Limestone Fragments, Loose (SM)</td>
<td>SS</td>
<td>5</td>
<td>3 2 2 1</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>Brown Fine SAND, Loose (SP)</td>
<td>SS</td>
<td>7</td>
<td>1 2 2 3</td>
</tr>
</tbody>
</table>

Boring Terminated @ 15
**BORING NUMBER:** B-3  
**PROJECT NUMBER:** G10191010

**CLIENT:** STANTEC  
**PROJECT NAME:** Proposed 12-inch PVC Water Main Improvement along Foster Road

**PROJECT LOCATION:** Along Foster Road between NW 9th Avenue to NW 4th Avenue, City of Hallandale, Florida

**DATE STARTED:** 5/1/2019  
**COMPLETED:** 5/1/2019

**DRILLING METHOD:** Standard Penetration Boring

**LOGGED BY:** L.T.  
**CHECKED BY:** ARM

**APPROXIMATE LOCATION OF BORING:** See site plan

**GROUND WATER LEVELS AT TIME OF DRILLING:** 8.5 feet

**SURFACE ELEVATION REFERENCE:** Same Road Crown

---

**DEPTH** | **GRAPHIC LOG** | **MATERIAL DESCRIPTION** | **SAMPLE TYPE** | **BLOWS** | **N-VALUE**
---|---|---|---|---|---
10 | | | | | |
12 | | Brown Silty Fine SAND with Limestone Fragments, Medium Dense (SM) | SS | 4 6 6 7 | 12
15 | | Boring Terminated @ 15 | | | |

---

---

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### Boring Log

**Client:** STANTEC  
**Project:** Proposed 12-inch PVC Water Main Improvement along Foster Road  
**Project Location:** Along Foster Road between NW 9th Avenue to NW 4th Avenue, City of Hallandale, Florida  
**Date Started:** 5/1/2019  
**Completed:** 5/1/2019  
**Drilling Method:** Standard Penetration Boring  
**Logged By:** L.T.  
**Checked By:** ARM

**Approximate Location of Boring:** See site plan

**Surface Elevation Reference:** Same Road Crown  
**Ground Water Levels at Time of Drilling:** 8.6 feet

#### Graphical Log

<table>
<thead>
<tr>
<th>Depth</th>
<th>Material Description</th>
<th>Sample Type</th>
<th>Number</th>
<th>Blows</th>
<th>N-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>7 inch - TOPSOIL</td>
<td>SS</td>
<td>1</td>
<td>7 6 6 4</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>Brown Fine SAND with Limerock Fragments, Trace Roots, Trace Silt, Loose to Medium Dense (Fill, SP)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>SS</td>
<td>2</td>
<td>4 2 2 2</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>Brown Silty Fine SAND with Limestone Fragments, Loose (SM)</td>
<td>SS</td>
<td>3</td>
<td>2 2 3 4</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Tan Silty LIMESTONE with Fine Sand</td>
<td>SS</td>
<td>4</td>
<td>4 6 6 6</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SS</td>
<td>5</td>
<td>6 7 7 7</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SS</td>
<td>7</td>
<td>4 6 6 6</td>
<td>12</td>
</tr>
</tbody>
</table>

Boring Terminated @ 15

**Disclaimer:** GCES Consultants, accepts no Liability for the consequences of the independent interpretation of drilling logs by others
**Project Location:** Along Foster Road between NW 9th Avenue to NW 4th Avenue, City of Hallandale, Florida

**Date Started:** 5/1/2019  
**Completed:** 5/1/2019  
**Surface Elevation Reference:** Same Road Crown  
**Ground Water Levels at Time of Drilling:** 8.5 feet

<table>
<thead>
<tr>
<th>Depth</th>
<th>Graphic Log</th>
<th>Material Description</th>
<th>Sample Type Number</th>
<th>BLOWS</th>
<th>SPT N Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>SS</td>
<td>7 inch - TOPSOIL</td>
<td>1</td>
<td>6 6 7 6 13</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>SS</td>
<td>Dark Brown Fine SAND, Trace Limerock Fragments, Medium Dense [Fill, SP]</td>
<td>2</td>
<td>5 4 4 5 8</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>SS</td>
<td>Dark Brown Fine SAND, Loose (SP)</td>
<td>3</td>
<td>3 2 2 2 4</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>SS</td>
<td>Brown Silty Fine SAND with Limestone Fragments, Very Loose (SM)</td>
<td>4</td>
<td>2 1 1 3 2</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>SS</td>
<td>Tan Silty LIMESTONE with Fine Sand.</td>
<td>5</td>
<td>2 2 1 1 3</td>
<td></td>
</tr>
</tbody>
</table>

Boring Terminated @ 15 feet

**Disclaimer:** GCES Consultants accepts no Liability for the consequences of the independent interpretation of drilling logs by others.
## Boring Log

### Project Details
- **Client:** STANTEC
- **Project Name:** Proposed 12-inch PVC Water Main Improvement along Foster Road
- **Project Location:** Along Foster Road between NW 9th Avenue to NW 4th Avenue, City of Hallandale, Florida
- **Date Started:** 5/1/2019
- **Completed:** 5/1/2019
- **Logging Method:** Standard Penetration Boring
- **Checked By:** ARM
- **Surface Elevation Reference:** Same Road Crown
- **Ground Water Levels At Time of Drilling:** 9 feet

### Drill Site Information
- **Ground Water Levels At Time of Drilling:** 9 feet
- **Approximate Location of Boring:** See site plan

### Materials Log

<table>
<thead>
<tr>
<th>Depth</th>
<th>Material Description</th>
<th>Sample Type</th>
<th>Blows</th>
<th>N-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1 Inch - ASPHALT / Dark Brown Fine SAND with Limerock Fragments, Loose (Fill, SP)</td>
<td>SS</td>
<td>3 4 4 6</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>Gray to Dark Brown Fine SAND, Loose (SP)</td>
<td>SS</td>
<td>2</td>
<td>4 4 5 4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SS</td>
<td>3</td>
<td>3 3 4 6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SS</td>
<td>4</td>
<td>4 4 4 8</td>
</tr>
<tr>
<td></td>
<td>Light Brown Silty LIMESTONE with Fine Sand</td>
<td>SS</td>
<td>5</td>
<td>3 4 4 4 8</td>
</tr>
<tr>
<td>15</td>
<td></td>
<td>SS</td>
<td>7</td>
<td>3 4 6 6 10</td>
</tr>
</tbody>
</table>

### Additional Information
- **Disclaimer:** GCES Consultants accepts no liability for the consequences of the independent interpretation of drilling logs by others.

---

Boring Terminated @ 15 feet
## Summary of Laboratory Testing Results

**Client:** STANTEC  
**Project Name:** Proposed 12-Inch PVC Water Main Improvement along Foster Road  
**Project Location:** City of Hallendale, Broward County, FL  
**Project #:** G10191010

<table>
<thead>
<tr>
<th>BORING NUMBER</th>
<th>Sample Depth (Feet)</th>
<th>Stratum No.</th>
<th>USCS Group</th>
<th>Natural Moisture Content (%)</th>
<th>Organic Content (%)</th>
<th>Atterberg Limits</th>
<th>Sieve Analysis (Percent Passing)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>From</td>
<td>To</td>
<td></td>
<td></td>
<td></td>
<td>LL (%)</td>
<td>PL (%)</td>
</tr>
<tr>
<td>B-1</td>
<td>2</td>
<td>4</td>
<td>1</td>
<td>SM</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B-1</td>
<td>8</td>
<td>10</td>
<td>3</td>
<td>SM</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>B-2</td>
<td>6</td>
<td>8</td>
<td>3</td>
<td>SM</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B-2</td>
<td>13</td>
<td>15</td>
<td>3</td>
<td>SP</td>
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<td></td>
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<td>B-3</td>
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<td>3</td>
<td>SM</td>
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<td></td>
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<td>B-4</td>
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<td>2</td>
<td>SP</td>
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<tr>
<td>B-6</td>
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<td>4</td>
<td>2</td>
<td>SP</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>B-6</td>
<td>6</td>
<td>8</td>
<td>2</td>
<td>SP</td>
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<td>100</td>
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</tbody>
</table>
Client: STANTEC  
Project Name: Proposed 12-inch PVC Water Main Improvement along Foster Road  
Project Location: City of Hallandale, Broward County, FL  

Material Information/Sample Identification:  
Boring No: B-1  
Depth Interval: 2 to 4 (Feet)  

Laboratory Test Data:  

<table>
<thead>
<tr>
<th>US Standard</th>
<th>Sieve Size (mm)</th>
<th>Percent Retained (%)</th>
<th>Percent Passing Sieve (%)</th>
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<tbody>
<tr>
<td>Coarse</td>
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<td></td>
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</tr>
<tr>
<td></td>
<td>2 1/2&quot;</td>
<td>64.000</td>
<td>0%</td>
</tr>
<tr>
<td></td>
<td>1&quot;</td>
<td>25.400</td>
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<td></td>
<td>3/4&quot;</td>
<td>19.000</td>
<td>7.7%</td>
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<td></td>
<td>3/8&quot;</td>
<td>9.510</td>
<td>28.0%</td>
</tr>
<tr>
<td></td>
<td>No. 4</td>
<td>4.760</td>
<td>44.7%</td>
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<tr>
<td>Fine</td>
<td></td>
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<td></td>
</tr>
<tr>
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<td>&lt; #4</td>
<td>2.000</td>
<td>64.0%</td>
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<td>&gt; #200</td>
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<td>79.6%</td>
</tr>
<tr>
<td></td>
<td>&gt; #200</td>
<td>0.075</td>
<td>87.9%</td>
</tr>
<tr>
<td>PAN</td>
<td>N/A</td>
<td>100.0</td>
<td>100.0%</td>
</tr>
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</table>

Classification: Light Brown Silty Fine SAND with Limestone Fragments  

AASHTO: __________  USCS: __________

Coefficient of Uniformity: Cu (D60/D10): -  
Coefficient of Curvature: Cc  
(D30^2/(D10*D60)): -  

GRAIN SIZE DISTRIBUTION CURVE
Client: STANTEC  
Project Name: Proposed 12-inch PVC Water Main Improvement along Foster Road  
Project Location: City of Hallandale, Broward County, FL  
Report Date: 05/15/19  
Report #: 1A  
Project #: G10191010  
Report of Sieve Analysis

Material Information/Sample Identification:  
Boring No: B-1  
Depth Interval: 8 to 10 (Feet)  
Date Sampled: 05/01/19  
Date Tested: 05/10/19  

Laboratory Test Data:

<table>
<thead>
<tr>
<th>Material</th>
<th>Grain Size, mm</th>
<th>US Standard Sieve No.</th>
<th>Sieve Size (mm)</th>
<th>Percent Retained (%)</th>
<th>Percent Passing Sieve (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>GRAVEL</td>
<td>Coarse</td>
<td>&lt; 3/4&quot; to &gt; 3&quot;</td>
<td>2 1/2&quot;</td>
<td>64.000</td>
<td>0%</td>
</tr>
<tr>
<td></td>
<td></td>
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<td>1&quot;</td>
<td>25.400</td>
<td>6.4%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3/4&quot;</td>
<td>19.000</td>
<td>12.2%</td>
</tr>
<tr>
<td></td>
<td>Fine</td>
<td>&lt; 3/4&quot; to &gt; #10</td>
<td>3/8&quot;</td>
<td>9.510</td>
<td>37.9%</td>
</tr>
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<td></td>
<td>No. 4</td>
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<td>SAND</td>
<td>Coarse Medium</td>
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<td></td>
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<td>No 40</td>
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<td>&lt; #40 to &gt; #200</td>
<td>No. 60</td>
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<td>58.1%</td>
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<td></td>
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<td>No. 80</td>
<td>0.180</td>
<td>64.8%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>No. 200</td>
<td>0.075</td>
<td>82.7%</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>PAN</td>
<td>N/A</td>
<td>100.0</td>
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</tbody>
</table>

Percent Garvel: 46 %  
D10 (mm): -  
Percent Sand: 37 %  
D30 (mm): -  
Percent Fine: 17 %  
D60 (mm): -  
Coefficient of Uniformity: Cu (D60/D10): -  
Coefficient of Curvature: Cc (D30^2/(D10*D60)): -  

Classification: Light Brown Silty Fine SAND with Limestone Fragments  
AASHTO: SM  
USCS: SAND  

GRAIN SIZE DISTRIBUTION CURVE

Percent Passing vs. Grain Size, mm
**REPORT OF SIEVE ANALYSIS**

**Client:** STANTEC  
**Project Name:** Proposed 12-inch PVC Water Main Improvement along Foster Road  
**Project Location:** City of Hallandale, Broward County, FL  
**Report Date:** 05/15/19  
**Report #:** 2  
**Project #:** G10191010

### Material Information/Sample Identification:

- **Boring No:** B-2  
- **Date Sampled:** 05/01/19  
- **Date Tested:** 05/10/19  
- **Depth Interval:** 6 to 8 (Feet)

### Laboratory Test Data:

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<th>US Standard Sieve No.</th>
<th>Sieve Size (mm)</th>
<th>Percent Retained (%)</th>
<th>Percent Passing Sieve (%)</th>
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</thead>
<tbody>
<tr>
<td>Coarse</td>
<td>2 1/2&quot; &lt; 3&quot; to &gt; 3 1/4&quot;</td>
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<td>0%</td>
<td>100%</td>
</tr>
<tr>
<td>Fine</td>
<td>1&quot; &lt; 3/4&quot; to &gt; #4</td>
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<td>0.0%</td>
<td>100.0%</td>
</tr>
<tr>
<td></td>
<td>3/4&quot; &lt; 3/8&quot; to &gt; #4</td>
<td>19.000</td>
<td>3.2%</td>
<td>96.8%</td>
</tr>
<tr>
<td></td>
<td>No. 4 &lt; 1/4&quot; to &gt; #10</td>
<td>9.510</td>
<td>26.4%</td>
<td>73.6%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4.760</td>
<td>40.9%</td>
<td>59.1%</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>SAND</th>
<th>US Standard Sieve No.</th>
<th>Sieve Size (mm)</th>
<th>Percent Retained (%)</th>
<th>Percent Passing Sieve (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No 10 &lt; #4 to &gt; #40</td>
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<td>52.1%</td>
<td>47.9%</td>
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<tr>
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<td>No 40 &lt; #8 to &gt; #200</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>No. 60 &lt; #8 to &gt; #200</td>
<td>0.250</td>
<td>64.8%</td>
<td>35.2%</td>
</tr>
<tr>
<td></td>
<td>No. 80 &lt; #8 to &gt; #200</td>
<td>0.180</td>
<td>71.3%</td>
<td>28.7%</td>
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<tr>
<td></td>
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<td>PAN &lt; #8 to &gt; #200</td>
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<td>0%</td>
</tr>
</tbody>
</table>

**Classification:** Light Brown Silty Fine SAND with Limestone Fragments

**AASHTO:** _______  
**USCS:** _______

**Percent Garavel:** 41%  
**Percent Sand:** 37%  
**Percent Fine:** 22%

- **Coefficient of Uniformity: Cu (D60/D10):** -
- **Coefficient of Curvature: Cc (D30^2/(D10*D60)):** -

**GRAIN SIZE DISTRIBUTION CURVE**
## REPORT OF SIEVE ANALYSIS

**Client:** STANTEC  
**Report Date:** 05/15/19  
**Project Name:** Proposed 12-inch PVC Water Main Improvement along Foster Road  
**Project #:** 3  
**Project Location:** City of Hallandale, Broward County, FL  
**Date Sampled:** 05/01/19  
**Date Tested:** 05/10/19  
**Report #:** G10191010

### Laboratory Test Data:

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<th>Percent Retained (%)</th>
<th>Percent Passing Sieve (%)</th>
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</thead>
<tbody>
<tr>
<td>GRAVEL</td>
<td>2 1/2&quot; to &gt; 3&quot;</td>
<td>64.000</td>
<td>0%</td>
<td>100%</td>
</tr>
<tr>
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<td>1&quot;</td>
<td>25.400</td>
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<td>100.0%</td>
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<tr>
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<td>3/4&quot;</td>
<td>19.000</td>
<td>0.0%</td>
<td>100.0%</td>
</tr>
<tr>
<td></td>
<td>3/8&quot;</td>
<td>9.510</td>
<td>0.0%</td>
<td>100.0%</td>
</tr>
<tr>
<td></td>
<td>No. 4</td>
<td>4.760</td>
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<td>100.0%</td>
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<tr>
<td>SAND</td>
<td>No 10</td>
<td>2.000</td>
<td>0.0%</td>
<td>100.0%</td>
</tr>
<tr>
<td></td>
<td>No 60</td>
<td>0.250</td>
<td>7.2%</td>
<td>92.8%</td>
</tr>
<tr>
<td></td>
<td>No. 80</td>
<td>0.180</td>
<td>74.3%</td>
<td>25.7%</td>
</tr>
<tr>
<td></td>
<td>No. 200</td>
<td>0.075</td>
<td>98.7%</td>
<td>1.3%</td>
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<tr>
<td></td>
<td>PAN</td>
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<td>100.0%</td>
<td>0%</td>
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</table>

**Classification:** Brown Fine Poorly Graded SAND

### AASHTO: SP  
### USCS:

**Percent Garvel:** 0 %  
**Percent Sand:** 99 %  
**Percent Fine:** 1 %

**D10 (mm):** 0.12  
**D30 (mm):** 0.2  
**D60 (mm):** 0.25

**Coefficient of Uniformity:** Cu (D60/D10): 2.1  
**Coefficient of Curvature:** Cc (D30^2/(D10*D60)): 1.33

---

**GRAIN SIZE DISTRIBUTION CURVE**

---

**Percent Passing**

- 3"  
- 3/4"  
- #4  
- #10  
- #40  
- #200

**Grain Size, mm**
Client: STANTEC
Project Name: Proposed 12-inch PVC Water Main Improvement along Foster Road
Project Location: City of Hallandale, Broward County, FL

REPORT OF SIEVE ANALYSIS

Material Information/Sample Identification:

Boring No: B-3
Depth Interval: 13 to 15 (Feet)

Laboratory Test Data:

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<th>Percent Passing Sieve (%)</th>
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<td>GRAVEL</td>
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</tr>
<tr>
<td>Coarse</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 3/4&quot; to &gt; 3/4&quot;</td>
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<td>0%</td>
<td>100%</td>
</tr>
<tr>
<td>1&quot;</td>
<td>25.400</td>
<td>7.2%</td>
<td>92.8%</td>
</tr>
<tr>
<td>3/4&quot;</td>
<td>19.000</td>
<td>23.1%</td>
<td>76.9%</td>
</tr>
<tr>
<td>3/8&quot;</td>
<td>9.510</td>
<td>40.7%</td>
<td>59.3%</td>
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<td>No. 4</td>
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<td>Medium</td>
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<tr>
<td>&lt; #10 to &gt; #40</td>
<td>No 40</td>
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<tr>
<td>Coarse</td>
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<td></td>
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<td>72.1%</td>
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<tr>
<td>Fine</td>
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<tr>
<td>&lt; #40 to &gt; #200</td>
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<td>79.6%</td>
<td>20.4%</td>
</tr>
<tr>
<td>No. 200</td>
<td>0.075</td>
<td>88.0%</td>
<td>12.0%</td>
</tr>
<tr>
<td>PAN</td>
<td>N/A</td>
<td>100.0</td>
<td>0%</td>
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</table>

Classification: Brown Silty Fine SAND with Limestone Fragments

AASHTO: __________ USCS: SM

Coefficient of Uniformity: Cu (D60/D10): __________

Coefficient of Curvature: Cc (D30^2/(D10*D60)): __________

GRAIN SIZE DISTRIBUTION CURVE
Client: STANTEC
Project Name: Proposed 12-inch PVC Water Main Improvement along Foster Road
Project Location: City of Hallandale, Broward County, FL

Boring No: B-5
Depth Interval: 2 to 4 (Feet)

Material Information/Sample Identification:
Date Sampled: 05/01/19
Date Tested: 05/10/19

Laboratory Test Data:

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<tr>
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<td>3/4&quot;</td>
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</tr>
<tr>
<td></td>
<td>3/8&quot;</td>
<td>9.510</td>
<td>0.1%</td>
<td>99.9%</td>
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<td></td>
</tr>
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<td>No. 4</td>
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<td>99.7%</td>
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</tr>
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<td>No 10</td>
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<table>
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<th>#4 to #10</th>
<th>#10 to &gt; #40</th>
<th>#40 to &gt; #200</th>
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<td>No 60</td>
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<td>No. 80</td>
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PAN N/A 100.0 0%

Classification: Dark Brown Fine Poorly Graded SAND

AASHTO: SP
USCS: SP

Coefficient of Uniformity: Cu (D60/D10): 2.9
Coefficient of Curvature: Cc (D30^2/(D10*D60)): 1.70
Client: STANTEC
Project Name: Proposed 12-inch PVC Water Main Improvement along Foster Road
Project Location: City of Hallandale, Broward County, FL

Material Information/Sample Identification:
Boring No: B-5
Depth Interval: 6 to 8 (Feet)

Laboratory Test Data:

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<th>Percent Passing Sieve (%)</th>
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<td>3/4&quot;</td>
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<td>0.0%</td>
<td>100.0%</td>
</tr>
<tr>
<td>3/8&quot;</td>
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<td>84.8%</td>
</tr>
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<td>76.8%</td>
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<td>No. 80</td>
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<td>Coarse</td>
<td>&lt; 3/4&quot; to &gt; #200</td>
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</tr>
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<td>0.250</td>
<td>46.5%</td>
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Classification: Brown Silty Fine SAND with Limestone Fragments

AASHTO: __________ USCS: SM

Coefficient of Uniformity: Cu (D60/D10): ______
Coefficient of Curvature: Cc (D30^2/(D10*D60)): ______

GRAIN SIZE DISTRIBUTION CURVE
Client: STANTEC
Project Name: Proposed 12-inch PVC Water Main Improvement along Foster Road
Project Location: City of Hallandale, Broward County, FL

Material Information/Sample Identification:
Boring No: B-6
Depth Interval: 2 to 4 (Feet)

Laboratory Test Data:

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<th>Sieve Size (mm)</th>
<th>Percent Retained (%)</th>
<th>Percent Passing Sieve (%)</th>
</tr>
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<td></td>
</tr>
<tr>
<td>Coarse</td>
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<td></td>
<td></td>
</tr>
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<td></td>
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<td>100.0%</td>
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<td>3/4&quot;</td>
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<td>100.0%</td>
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<td>0.0%</td>
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<td>No. 4</td>
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<td>2.000</td>
<td></td>
<td>0.0%</td>
<td>100.0%</td>
</tr>
<tr>
<td>No. 10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; #10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3/8&quot; to #10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1/2&quot; to #10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. 40</td>
<td>0.420</td>
<td>4.9%</td>
<td></td>
</tr>
<tr>
<td>&lt; #40</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3/8&quot; to #40</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. 60</td>
<td>0.250</td>
<td>23.5%</td>
<td>76.5%</td>
</tr>
<tr>
<td>No. 80</td>
<td>0.180</td>
<td>54.5%</td>
<td>45.5%</td>
</tr>
<tr>
<td>No. 200</td>
<td>0.075</td>
<td>98.6%</td>
<td>1.4%</td>
</tr>
<tr>
<td>&gt; #200</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. 200</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PAN</td>
<td></td>
<td>100.0%</td>
<td>0%</td>
</tr>
</tbody>
</table>

Classification: Gray to Dark Brown Poorly Graded Fine SAND

AASHTO: SP
USCS: SP

Coefficient of Uniformity: Cu (D60/D10): 2.3
Coefficient of Curvature: Cc (D30^2/(D10*D60)): 1.19

GRAIN SIZE DISTRIBUTION CURVE
**REPORT OF SIEVE ANALYSIS**

**Client:** STANTEC  
**Project Name:** Proposed 12-inch PVC Water Main Improvement along Foster Road  
**Project Location:** City of Hallandale, Broward County, FL  
**Report Date:** 05/15/19  
**Report #:** 8  
**Project #:** G10191010

**Material Information/Sample Identification:**

- **Boring No:** B-6  
- **Depth Interval:** 6 to 8 (Feet)  
- **Date Sampled:** 05/01/19  
- **Date Tested:** 05/10/19

**Laboratory Test Data:**

<table>
<thead>
<tr>
<th>GRAVEL</th>
<th>US Standard Sieve No.</th>
<th>Sieve Size (mm)</th>
<th>Percent Retained (%)</th>
<th>Percent Passing Sieve (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coarse</td>
<td>2 1/2&quot;</td>
<td>64.000</td>
<td>0%</td>
<td>100%</td>
</tr>
<tr>
<td></td>
<td>1&quot;</td>
<td>25.400</td>
<td>0.0%</td>
<td>100.0%</td>
</tr>
<tr>
<td></td>
<td>3/4&quot;</td>
<td>19.000</td>
<td>0.0%</td>
<td>100.0%</td>
</tr>
<tr>
<td></td>
<td>3/8&quot;</td>
<td>9.510</td>
<td>0.0%</td>
<td>100.0%</td>
</tr>
<tr>
<td></td>
<td>No. 4</td>
<td>4.760</td>
<td>0.0%</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SAND</th>
<th>US Standard Sieve No.</th>
<th>Sieve Size (mm)</th>
<th>Percent Retained (%)</th>
<th>Percent Passing Sieve (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fine</td>
<td>No. 10</td>
<td>2.000</td>
<td>0.0%</td>
<td>100%</td>
</tr>
<tr>
<td>Coarse</td>
<td>&lt; #4</td>
<td>0.420</td>
<td>5.1%</td>
<td>94.9%</td>
</tr>
<tr>
<td></td>
<td>to &gt; #10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>&gt; #40</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>No. 60</td>
<td>0.250</td>
<td>25.4%</td>
<td>74.6%</td>
</tr>
<tr>
<td></td>
<td>No. 80</td>
<td>0.180</td>
<td>56.6%</td>
<td>43.4%</td>
</tr>
<tr>
<td></td>
<td>No. 200</td>
<td>0.075</td>
<td>97.6%</td>
<td>2.4%</td>
</tr>
<tr>
<td></td>
<td>PAN</td>
<td>N/A</td>
<td>100.0%</td>
<td>0%</td>
</tr>
</tbody>
</table>

**Classification:** Gray to Dark Brown Poorly Graded Fine SAND

**AASHTO:** Fine  
**USCS:** SP

**Laboratory Test Data:**

- **Percent Garvel:** 0%  
- **D10 (mm):** 0.09  
- **Percent Sand:** 98%  
- **D30 (mm):** 0.15  
- **Percent Fine:** 2%  
- **D60 (mm):** 0.22

**Coefficient of Uniformity:** Cu (D60/D10): 2.4  
**Coefficient of Curvature:** Cc (D30^2/(D10*D60)): 1.14

**GRAIN SIZE DISTRIBUTION CURVE**
Standard Penetration Test (SPT)

Soil samples were obtained by the split spoon sampling procedure in general accordance with the Standard Penetration Test (SPT) procedure ASTM Standard D-1586. The SPT procedure consists of driving a split-barrel sampler to obtain a soil sample and to measure the resistance (N-value) of the soil to penetration of the sampler. In the split barrel sampling procedure, the number of blows required to advance a standard 2 inch O.D. split barrel sampler the last 12 inches of an 18-inch penetration or the middle 12 inches of a 24-inch penetration by means of a 140 pound hammer with a free fall of 30 inches, is the standard penetration resistance value (N).

The N-values provide a measure of the relative density of cohesionless soils (sands) and the consistency of cohesive soils (clays) sampled during drilling. Engineering properties of the soils are inferred from SPT N-values and index property soil classification, based on published empirical correlations.

The N-values also provide a general indication of hardness for rock formations such as the limestone commonly encountered in the Southeast Florida area. Where limestone is encountered, the Standard Penetration Test is used as a general indication of hardness. Where low blows per foot are encountered, it is assumed that solution cavities filled with loose sands or soft silt soils are present within the limestone formation.
LABORATORY TESTING PROCEDURE

Percent Passing No. 200 Sieve
The grain size analysis were conducted in general accordance with FDOT test Designation (FM-1-T88 (ASTM Designation D-422, titled “Particle Side Analysis of Soils”). The grain-size analysis test measures the percentage passing the No. 200 Sieve. In this manner, the grain-size distribution of a soil is measured. The percentage by weight passing the No. 200 Sieve is the amount of silt and clay sized particles. Other samples were analyzed for fines content only by measuring the percentage by weight of dry soil sample passing a U.S. standard No. 200 sieve in general accordance with ASTM-D1140.

Moisture Content
In order to determine the moisture content of soil samples, test specimens were dried in an oven to constant mass in general accordance with ASTM-D2216. The water content is then calculated using the mass of the water and the mass of the dry specimen. The water content is used to express the phase relationship of air, water, and solid in a given volume of material. In fine grained soils, the consistency of a given soil type depends on its water content.

Organic Content
In order to determine the compressibility of soil over time, organic content tests were performed on soil sample collected from soil layers suspected of containing significant amounts of organic materials. Organic content is determined by methods similar to those employed to find water content. The dry test specimen is burnt in a hot oven until it reaches a constant mass. The loss of mass due to burning is considered to be organic materials in the soil. The organic soil content is then calculated using the mass of the organics and the mass of the burnt specimen.
GENERAL NOTES

DRILLING & SAMPLING SYMBOLS:
- SS: Split Spoon - 1-7/8" I.D., 2" O.D., unless otherwise noted
- ST: Thin-Walled Tube - 2" O.D., unless otherwise noted
- RS: Ring Sampler - 2.42" I.D., 3" O.D., unless otherwise noted
- DB: Diamond Bit Coring - 4", N, B
- BS: Bulk Sample or Auger Sample
- HS: Hollow Stem Auger
- PA: Power Auger
- HA: Hand Auger
- RB: Rock Bit
- WB: Wash Boring or Mud Rotary

The number of blows required to advance a standard 2-inch O.D. split-spoon sampler (SS) the last 12 inches of the total 18-inch penetration with a 140-pound hammer falling 30 inches is considered the “Standard Penetration” or “N-value”. For 3" O.D. ring samplers (RS) the penetration value is reported as the number of blows required to advance the sampler 12 inches using a 140-pound hammer falling 30 inches, reported as “blows per foot,” and is not considered equivalent to the “Standard Penetration” or “N-value”.

WATER LEVEL MEASUREMENT SYMBOLS:
- WL: Water Level
- WS: While Sampling
- N/E: Not Encountered
- WCI: Wet Cave in
- DCI: Dry Cave in
- BCR: Before Casing Removal
- AB: After Boring
- ACR: After Casing Removal

Water levels indicated on the boring logs are the levels measured in the borings at the times indicated. Groundwater levels at other times and other locations across the site could vary. In pervious soils, the indicated levels may reflect the location of groundwater. In low permeability soils, the accurate determination of groundwater levels may not be possible with only short-term observations.

DESCRIPTIVE SOIL CLASSIFICATION: Soil classification is based on the Unified Classification System. Coarse Grained Soils have more than 50% of their dry weight retained on a #200 sieve; their principal descriptors are: boulders, cobbles, gravel or sand. Fine Grained Soils have less than 50% of their dry weight retained on a #200 sieve; they are principally described as clays if they are plastic, and silts if they are slightly plastic or non-plastic. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size. In addition to gradation, coarse-grained soils are defined on the basis of their in-place relative density and fine-grained soils on the basis of their consistency.

CONSISTENCY OF FINE-GRAINED SOILS

<table>
<thead>
<tr>
<th>Unconfined Compressive</th>
<th>Standard Penetration or N-value (SS)</th>
<th>Consistency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strength, Qu, psf</td>
<td>Blows/Ft.</td>
<td></td>
</tr>
<tr>
<td>&lt; 500</td>
<td>&lt; 2</td>
<td>Very Soft</td>
</tr>
<tr>
<td>500 – 1,000</td>
<td>2 – 3</td>
<td>Soft</td>
</tr>
<tr>
<td>1,001 – 2,000</td>
<td>4 – 6</td>
<td>Medium Stiff</td>
</tr>
<tr>
<td>2,001 – 4,000</td>
<td>7 – 12</td>
<td>Stiff</td>
</tr>
<tr>
<td>4,001 – 8,000</td>
<td>13 – 26</td>
<td>Very Stiff</td>
</tr>
<tr>
<td>8,001+</td>
<td>&gt; 26</td>
<td>Hard</td>
</tr>
</tbody>
</table>

RELATIVE DENSITY OF COARSE-GRAINED SOILS

<table>
<thead>
<tr>
<th>Standard Penetration or N-value (SS)</th>
<th>Ring Sampler (RS)</th>
<th>Relative Density</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 – 3</td>
<td>0 – 6</td>
<td>Very Loose</td>
</tr>
<tr>
<td>4 – 9</td>
<td>7 – 18</td>
<td>Loose</td>
</tr>
<tr>
<td>10 – 29</td>
<td>19 – 58</td>
<td>Medium Dense</td>
</tr>
<tr>
<td>30 – 49</td>
<td>59 – 98</td>
<td>Dense</td>
</tr>
<tr>
<td>50+</td>
<td>99+</td>
<td>Very Dense</td>
</tr>
</tbody>
</table>

RELATIVE PROPORTIONS OF SAND AND GRAVEL

<table>
<thead>
<tr>
<th>Descriptive Term(s) of other constituents</th>
<th>Percent of Dry Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trace</td>
<td>&lt; 15</td>
</tr>
<tr>
<td>With</td>
<td>15 – 29</td>
</tr>
<tr>
<td>Modifier</td>
<td>&gt; 30</td>
</tr>
</tbody>
</table>

RELATIVE PROPORTIONS OF FINES

<table>
<thead>
<tr>
<th>Descriptive Term(s) of other constituents</th>
<th>Percent of Dry Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trace</td>
<td>&lt; 5</td>
</tr>
<tr>
<td>With</td>
<td>5 – 12</td>
</tr>
<tr>
<td>Modifiers</td>
<td>&gt; 12</td>
</tr>
</tbody>
</table>

GRAIN SIZE TERMINOLOGY

<table>
<thead>
<tr>
<th>Major Component of Sample</th>
<th>Particle Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boulders</td>
<td>Over 12 in. (300mm)</td>
</tr>
<tr>
<td>Cobbles</td>
<td>12 in. to 3 in. (300mm to 75 mm)</td>
</tr>
<tr>
<td>Gravel</td>
<td>3 in. to #4 sieve (75mm to 4.75 mm)</td>
</tr>
<tr>
<td>Sand</td>
<td>#4 to #200 sieve (4.75mm to 0.075mm)</td>
</tr>
<tr>
<td>Silt or Clay</td>
<td>Passing #200 Sieve (0.075mm)</td>
</tr>
</tbody>
</table>

PLASTICITY DESCRIPTION

<table>
<thead>
<tr>
<th>Term</th>
<th>Plasticity Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-plastic</td>
<td>0</td>
</tr>
<tr>
<td>Low</td>
<td>1-10</td>
</tr>
<tr>
<td>Medium</td>
<td>11-30</td>
</tr>
<tr>
<td>High</td>
<td>30+</td>
</tr>
</tbody>
</table>
### UNIFIED SOIL CLASSIFICATION SYSTEM

**Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests**

<table>
<thead>
<tr>
<th>Soil Classification</th>
<th>Group Symbol</th>
<th>Group Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clean Gravels Less than 5% fines</td>
<td>Cu ≥ 4 and 1 ≤ Cc ≤ 3(^d)</td>
<td>GW</td>
</tr>
<tr>
<td>Gravels with Fines More than 12% fines</td>
<td>Cu &lt; 4 and/or 1 &gt; Cc &gt; 3(^d)</td>
<td>GM</td>
</tr>
<tr>
<td>Clean Sands Less than 5% fines</td>
<td>Cu ≥ 6 and 1 ≤ Cc ≤ 3(^d)</td>
<td>CW</td>
</tr>
<tr>
<td>Sands with Fines More than 15% fines</td>
<td>Cu &lt; 6 and/or 1 &gt; Cc &gt; 3(^d)</td>
<td>SP</td>
</tr>
<tr>
<td>Clean Sands with Fines 5% to 12% fines</td>
<td>Fines classify as CL or CH</td>
<td>GC</td>
</tr>
<tr>
<td>Sands with Fines 1% to 4% fines</td>
<td>Fines classify as CL or CH</td>
<td>GM</td>
</tr>
<tr>
<td>Gravels with Fines 5% to 12% fines</td>
<td>Fines classify as CL or CH</td>
<td>GC</td>
</tr>
<tr>
<td>Sands with Fines 1% to 4% fines</td>
<td>Fines classify as CL or CH</td>
<td>GM</td>
</tr>
<tr>
<td>Gravels with Fines 5% to 12% fines</td>
<td>Fines classify as CL or CH</td>
<td>GC</td>
</tr>
<tr>
<td>Sands with Fines 1% to 4% fines</td>
<td>Fines classify as CL or CH</td>
<td>GM</td>
</tr>
<tr>
<td>Gravels with Fines 5% to 12% fines</td>
<td>Fines classify as CL or CH</td>
<td>GC</td>
</tr>
<tr>
<td>Sands with Fines 1% to 4% fines</td>
<td>Fines classify as CL or CH</td>
<td>GM</td>
</tr>
<tr>
<td>Gravels with Fines 5% to 12% fines</td>
<td>Fines classify as CL or CH</td>
<td>GC</td>
</tr>
<tr>
<td>Sands with Fines 1% to 4% fines</td>
<td>Fines classify as CL or CH</td>
<td>GM</td>
</tr>
</tbody>
</table>

**Fine-Grained Soils**

**Gravels**

<table>
<thead>
<tr>
<th>Soil Classification</th>
<th>PI &gt; 7 and plots on or above “A” line</th>
<th>PI ≤ 4 or plots below “A” line</th>
<th>Liquid limit - oven dried</th>
<th>Liquid limit - not dried</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gravels with 5 to 12% fines</td>
<td>CL</td>
<td>ML</td>
<td>Si classification</td>
<td></td>
</tr>
<tr>
<td>Gravels with 15% to 29%</td>
<td>CL</td>
<td>ML</td>
<td>Si classification</td>
<td></td>
</tr>
<tr>
<td>Gravels with 30% to 49%</td>
<td>CL</td>
<td>ML</td>
<td>Si classification</td>
<td></td>
</tr>
<tr>
<td>Gravels with 50% to 69%</td>
<td>CL</td>
<td>ML</td>
<td>Si classification</td>
<td></td>
</tr>
<tr>
<td>Gravels with 70% to 100%</td>
<td>CL</td>
<td>ML</td>
<td>Si classification</td>
<td></td>
</tr>
</tbody>
</table>

**Sands**

<table>
<thead>
<tr>
<th>Soil Classification</th>
<th>PI plots on or above “A” line</th>
<th>PI plots below “A” line</th>
<th>Liquid limit - oven dried</th>
<th>Liquid limit - not dried</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sands with 5 to 12% fines</td>
<td>CH</td>
<td>MH</td>
<td>Si classification</td>
<td></td>
</tr>
<tr>
<td>Sands with 15% to 29%</td>
<td>CH</td>
<td>MH</td>
<td>Si classification</td>
<td></td>
</tr>
<tr>
<td>Sands with 30% to 49%</td>
<td>CH</td>
<td>MH</td>
<td>Si classification</td>
<td></td>
</tr>
<tr>
<td>Sands with 50% to 69%</td>
<td>CH</td>
<td>MH</td>
<td>Si classification</td>
<td></td>
</tr>
<tr>
<td>Sands with 70% to 100%</td>
<td>CH</td>
<td>MH</td>
<td>Si classification</td>
<td></td>
</tr>
</tbody>
</table>

**Silts and Clays**

<table>
<thead>
<tr>
<th>Soil Classification</th>
<th>PI plots on or above “A” line</th>
<th>PI plots below “A” line</th>
<th>Liquid limit - oven dried</th>
<th>Liquid limit - not dried</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silts with 5 to 12% fines</td>
<td>OL</td>
<td>OH</td>
<td>Si classification</td>
<td></td>
</tr>
<tr>
<td>Silts with 15% to 29%</td>
<td>OL</td>
<td>OH</td>
<td>Si classification</td>
<td></td>
</tr>
<tr>
<td>Silts with 30% to 49%</td>
<td>OL</td>
<td>OH</td>
<td>Si classification</td>
<td></td>
</tr>
<tr>
<td>Silts with 50% to 69%</td>
<td>OL</td>
<td>OH</td>
<td>Si classification</td>
<td></td>
</tr>
<tr>
<td>Silts with 70% to 100%</td>
<td>OL</td>
<td>OH</td>
<td>Si classification</td>
<td></td>
</tr>
</tbody>
</table>

**Highly Organic Soils**

<table>
<thead>
<tr>
<th>Soil Classification</th>
<th>PI plots on or above “A” line</th>
<th>PI plots below “A” line</th>
<th>Liquid limit - oven dried</th>
<th>Liquid limit - not dried</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organic soil</td>
<td>CL</td>
<td>ML</td>
<td>Si classification</td>
<td></td>
</tr>
<tr>
<td>Organic soil</td>
<td>CL</td>
<td>ML</td>
<td>Si classification</td>
<td></td>
</tr>
<tr>
<td>Organic soil</td>
<td>CL</td>
<td>ML</td>
<td>Si classification</td>
<td></td>
</tr>
<tr>
<td>Organic soil</td>
<td>CL</td>
<td>ML</td>
<td>Si classification</td>
<td></td>
</tr>
<tr>
<td>Organic soil</td>
<td>CL</td>
<td>ML</td>
<td>Si classification</td>
<td></td>
</tr>
</tbody>
</table>

---

\( ^a \) Based on the material passing the 3-in. (75-mm) sieve

\( ^b \) If field sample contained cobbles or boulders, or both, add “with cobbles or boulders, or both” to group name.

\( ^c \) Gravels with 5 to 12% fines require dual symbols: GW-SM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.

\( ^d \) Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SC poorly graded sand with silt, SP-SC poorly graded sand with clay.

\( ^e \) If soil contains ≥ 15% sand, add “with sand” to group name.

\( ^f \) If fines classify as CL-ML, use dual symbol GC-GM, or SC-SC.

---

**For classification of fine-grained soils and fine-grained fraction of coarse-grained soils**

- **Equation of “A”** - line Horizontal at \( PL=\) 4 to \( LL=\) 25.5.
  
  \[ \text{then } PL=0.73 \times \text{LL} \]

- **Equation of “U”** - line Vertical at \( LL=\) 16 to \( PL=\) 7.
  
  \[ \text{then } PL=0.9 \times \text{LL} \]

---

**Plasticity Index (PI)**

- **Liquid limit - oven dried**
  
  \[ \leq 0.75 \]

- **Liquid limit - not dried**
  
  \[ > 0.75 \]

---

**Liquid Limit (LL)**

- **CL**
  
  - Lean clay
  
  - \( PI \leq 4 \)
  
  - Liquid limit - oven dried
  
  - Liquid limit - not dried

- **ML**
  
  - Silt
  
  - \( PI > 4 \)
  
  - Liquid limit - oven dried
  
  - Liquid limit - not dried

- **CH**
  
  - Elastic Silt
  
  - \( PI > 4 \)
  
  - Liquid limit - oven dried
  
  - Liquid limit - not dried

---

\( ^{11} \) If fines are organic, add “with organic fines” to group name.

\( ^{12} \) If soil contains ≥ 15% gravel, add “with gravel” to group name.

\( ^{13} \) If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.

\( ^{14} \) If soil contains 15 to 29% plus No. 200, add “with sand” or “with gravel,” whichever is predominant.

\( ^{15} \) If soil contains ≥ 30% plus No. 200 predominantly sand, add “sandy” to group name.

\( ^{16} \) If soil contains ≥ 30% plus No. 200, predominantly gravel, add “gravely” to group name.

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**Plasticity Index (PI)**

- ** liquid limit - oven dried**
  
  \[ \leq 0.75 \]

- ** liquid limit - not dried**
  
  \[ > 0.75 \]

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**PI plots on or above “A” line**

- \( PI \geq 4 \)
  
  - CL or ML
  
  - Liquid limit - oven dried
  
  - Liquid limit - not dried

**PI plots below “A” line**

- \( PI < 4 \)
  
  - CL or ML
  
  - Liquid limit - oven dried
  
  - Liquid limit - not dried

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**Highly Organic Soils**

- **PT**
  
  - Peat
NOTIFICATION OF ACCEPTANCE OF USE OF A GENERAL PERMIT

Dear Mr. Kunen:

On November 14, 2019, the Florida Department of Environmental Protection (Department) received a “Notice of Intent to Use the General Permit for Construction of Water Main Extensions for PWSs” [DEP Form No. 62-555.900(7)], under the provisions of Rule 62-4.530 and Chapter 62-555, Florida Administrative Code (F.A.C.).

The proposed project includes:

- Replacing 6 and 8-inch mains with approximately 5,100 LF 12-inch PVC water main
- Replacing Eleven (11) Fire Hydrants
- Thirteen (13) sample points
- All associated valves, fittings, and appurtenances

Located at approximately on NW 10th Ave along Foster Road and continues east to approximately NW 4th Ave, in Hallandale Beach, Broward County, Florida.

Based upon the submitted Notice and accompanying documentation, this correspondence is being sent to advise that the Department does not object to the use of such General Permit at this time. Please be advised that the permittee is required to abide by Rule 62-555.405, F.A.C., all applicable rules in Chapters 62-4, 62-550, 62-555, F.A.C., and the General Conditions for All General Drinking Water Permits (found in 62-4.540, F.A.C.).

The permittee shall comply with all sampling requirements specific to this project. These requirements are attached for review and implementation.

Permittee:  
City of Hallandale Beach  
Peter Kunen, P.E.,  
Asst. Director of PW/City Engineer  
630 NW 2nd St  
Hallandale Beach, FL 33009  
pkunen@hallandalebeachfl.gov

Permit Number: 0131028-080-DSGP  
Issue Date: November 14, 2019  
Expiration Date: November 13, 2024  
Project Name: City of Hallandale Beach  
12" WM Along Foster Rd  
Water Supplier: City of Hallandale Beach  
PWS ID: 4060573
Pursuant to Rule 62-555.345, F.A.C., the permittee shall submit a certification of construction completion [DEP Form No. 62-555.900(9)] to the Department and obtain approval, or clearance, from the Department before placing any water main extension constructed under this general permit into operation for any purpose other than disinfection or testing for leaks.

Within 30 days after the sale or legal transfer of ownership of the permitted project that has not been cleared for service in total by the Department, both the permittee and the proposed permittee shall sign and submit an application for transfer of the permit using Form 62-555.900(8), F.A.C., with the appropriate fee. The permitted construction is not authorized past the 30-day period unless the permit has been transferred.

When any existing asbestos cement (AC) pipes are replaced under this permit, the permittee shall do so in accordance with the applicable rules of the Federal Asbestos Regulation and Florida DEP requirements. For specific requirements applicable to AC pipes, the permittee should contact the Air and Waste Management Section Managers prior to commencing any such activities at (561) 681-6672. Please be aware that a notification is required to be submitted to the Department for a regulated project.

This permit will expire five years from the date of issuance. If the project has been started and not completed by that time, a new permit must be obtained before the expiration date in order to continue work on the project, per Rule 62-4.030, F.A.C.

Sincerely,

[Signature]

Chris Weller
Environmental Manager

November 14, 2019

Date

CW/MP

ec: Broward County Health Department — Robyn.James@flhealth.gov
FDEP/SED – Jocelyn.Labbe@dep.state.fl.us  Mark.Peters@dep.state.fl.us
Stantec – Dave Clarke, P.E. – dave.clarke@stantec.com
A Civil Penalty May Be Incurred if this project is placed into operation before obtaining a clearance from this office.

Requirements for clearance upon completion of projects are as follows:

1) **Clearance Form**
Submission of a fully completed Department of Environmental Protection (DEP) Form 62-555.900(9) Certification of Construction Completion and Request for Clearance to Place Permitted PWS Components into Operation.

2) **Record Drawings, if deviations were made**
Submission of the portion of record drawings showing deviations from the DEP construction permit, including preliminary design report or drawings and specifications, if there are any deviations from said permit (Note that it is necessary to submit a copy of only the portion of record drawings showing deviations and not a complete set of record drawings.).

3) **Bacteriological Results**
Copies of satisfactory bacteriological analysis (a.k.a. Main Clearance), taken within sixty (60) days of completion of construction, from locations within the distribution system or water main extension to be cleared, in accordance with Rules 62-555.315(6), 62-555.340, and 62-555.330, F.A.C. and American Water Works Association (AWWA) Standard C 651-92, as follows:

Connection to an existing system
The end point of the proposed addition
Any water lines branching off a main extension
Every 1,200 feet on straight runs of pipe

Each location shall be sampled on two consecutive days, with sample points and chlorine residual readings clearly indicated on the report. A sketch or description of all bacteriological sampling locations must also be provided.

For further clarification contact:
Mark Peters, Eng. Specialist III
Water Facilities Section
SED/DEP
3301 Gun Club Rd, MSC 7210-1
West Palm Beach, FL 33406
Tel: 561 681 6751
Mark.Peters@dep.state.fl.us