MIAMI-DADE COUNTY, FLORIDA

BOARD OF COUNTY COMMISSIONERS

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INSTALLATION OF 12-INCH D.I. WATER MAIN IN SW 71st AVENUE FROM SW 8th STREET TO SW 4th STREET

PCTS No. 14591
PROJECT ER No. W017004

CITY OF MIAMI J.P.A. PROJECT No. B-50405

BID SET

MIAMI-DADE WATER AND SEWER DEPARTMENT
LESTER SOLA, DIRECTOR

PREPARED BY:
A&P Consulting Transportation Engineers Corp.

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QUOTATION

INSTALLATION OF 12-INCH D.I. WATER MAIN
IN SW 71st AVENUE
FROM SW 8th STREET TO SW 4th STREET

PCTS No. 14591

PROJECT ER No. W017004

Dated _____

Board of County Commissioners
Miami-Dade County, Florida

Honorable Members:

The undersigned, as Contractor (herein used in the masculine singular, irrespective of actual gender and number) hereby declares that the only persons interested in this Quotation are named herein, that no other person has any interest in this Quotation or in the Contract to which this Quotation pertains, that this Quotation is made without connection or arrangement with any other person, and that this Quotation is in every respect fair, and is submitted in good faith and without collusion or fraud.

The Contractor further declares that he has satisfied himself fully relative to all matters and conditions with respect to the work to which this Quotation pertains.

The Contractor understands that the Quote for each and every item requiring a quote is the result of multiplying the Estimated Quantity times the Unit Price stated in words and figures. When the Estimated Quantity is an Aggregate Sum, the Aggregate Sum written in words shall be the same quantity as the Total.

The Contractor proposes and agrees, if this Quotation should be accepted, to execute all appropriate Contract Documents for the purpose of establishing a formal contractual relationship between him and Miami-Dade County, Florida.

All in full and complete accordance with all terms and conditions set forth in and covered by the Contract Documents including all addenda thereto through number _____*****.

***** Please fill in number of last addendum received. (If none, so state.)

The Contractor further proposes and agrees to begin the work with an adequate force and with sufficient equipment and facilities on the date stated in the written Notice to Proceed issued and served upon him by the Engineer and to complete the work in **One Hundred Twenty (120) Consecutive Calendar Days** including delivery time for materials and equipment.

For the purpose of reimbursing the County for additional costs incurred by the County and resulting from the failure of the Contractor to complete the work within the prescribed time limits, it is understood that the reductions for liquidated damages which are specified in the General Covenants and Conditions will apply in the event that the work is not completed within such time limits.

If Ordinance 90-143 applies to this project (Supplemental General Conditions and Wage and Benefit Schedules are included within these documents) the Contractor by submittal of this Quotation, acknowledges that he is aware of the applicability of Ordinance 90-143 and agrees to comply with the minimum wages and other provisions.

The list of parties interested in this Quotation, the list of equipment, references, and financial statement are to be furnished to assist the County in making the award of the Contract and they shall be true and correct.

WHEN THE CONTRACTOR IS A CORPORATION:

_____

_____

(Corporate Seal) *Name of Corporation*

ATTEST:

By: _____ By: _____

Signature of Secretary *Signature of Officer*

_____ _____

Print or type name *Print or type name*

_____

Official Title

_____

Corporation Address

_____

Corporation Telephone

Organized under the laws of the State of _____, and authorized by the law to make this quote and perform all work and furnish materials and equipment required under the Contract Documents.

In the event that the Contractor is a corporation, there shall be attached hereto a certified copy of a resolution of the Board of Directors of the Corporation authorizing the officer who signs the Quotation to do so in its behalf.

QUOTATION
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Item No.	Estimated Quantity	Description	Total
1.	Aggregate Sum (Divided into 2 or 4 payments. See Sect. 8.00 Measurement and Payment for Conditions)	For performing preparatory work and operations in mobilizing for beginning the work of the Project, including preparation and acceptance of MOT, but excluding materials and permit costs, both of which are paid under other payment items, the aggregate sum of _____ Dollars and _____ Cents	$ _____
2.	1,163 Linear Feet	For selling and delivering to the Department 12-inch ductile iron pipe and fittings for water main, the price per linear foot of _____ Dollars and _____ Cents ($_____/LF)	$ _____
3.	1,163 Linear Feet	For installing 12-inch ductile iron pipe and fittings for water main, the price per linear foot of _____ Dollars and _____ Cents ($_____/LF)	$ _____
4.	64 Linear Feet	For selling and delivering to the Department 8-inch ductile iron pipe, fittings and valves for water main, the price per linear foot of _____ Dollars and _____ Cents ($_____/LF)	$ _____
5.	64 Linear Feet	For installing 8-inch ductile iron pipe, fittings and valves for water main, the price per linear foot of _____ Dollars and _____ Cents ($_____/LF)	$ _____

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Item No.	Estimated Quantity	Description	Total
6.	114 Linear Feet	For selling and delivering to the Department 6-inch ductile iron pipe, fittings and valves for water main, the price per linear foot of _____ Dollars and _____ Cents ($_____/LF)	$ _____
7.	114 Linear Feet	For installing 6-inch ductile iron pipe, fittings and valves for water main, the price per linear foot of _____ Dollars and _____ Cents ($_____/LF)	$ _____
8.	2 Each	For selling and delivering to the Department 12-inch mechanical joint resilient seated gate valves for water main, complete, the price each of _____ Dollars and _____ Cents ($_____/EA)	$ _____
9.	2 Each	For installing 12-inch mechanical joint resilient seated gate valves for water main, complete, the price each of _____ Dollars and _____ Cents ($_____/EA)	$ _____
10.	1 Each	For removing existing plug and connecting to existing water main at: SW 71 Ave. and North of SW 8 St. (STA 11+62±) including furnishing and installing all fittings necessary for connection, and cutting and capping existing main, as shown on the Plans, complete, the price each of _____ Dollars and _____ Cents	$ _____

QUOTATION
INSTALLATION OF 12-INCH D.I. WATER MAIN IN SW 71st AVENUE
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Item No.	Estimated Quantity	Description	Total
11.	1 Each	For removing existing plug and connecting to existing water main at: SW 71 Ave. and South of SW 4 St. (STA 23+20±) including furnishing and installing all fittings necessary for connection, and cutting and capping existing main, as shown on the Plans, complete, the price each of _____ Dollars and _____ Cents	$ _____
12.	5 Each	For selling and delivering to the Department fire hydrant assemblies with guard posts, complete, the price each of _____ Dollars and _____ Cents ($_____/EA)	$ _____
13.	5 Each	For installing fire hydrant assemblies with guard posts, complete, the price each of _____ Dollars and _____ Cents ($_____/EA)	$ _____
14.	2 Each	For removing and salvaging existing fire hydrant assemblies with elbow/shoe and guard posts, complete, the price each of _____ Dollars and _____ Cents ($_____/EA)	$ _____
15.	8 Each	For furnishing and installing 1-inch single service <u>short</u>, <u>including reconnection of customer's service pipe and meter transfer</u>, complete, the price each of _____ Dollars and _____ Cents ($_____/EA)	$ _____

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Item No.	Estimated Quantity	Description	Total
16.	2 Each (Contingent Item)	For furnishing and installing 1-inch dual service short, including reconnection of customer's service pipe and meter transfer, complete, the price each of _____ Dollars and _____ Cents ($_____/EA)	$ _____
17.	1 Each	For constructing Flushing Valve Outlet Assemblies (FVOs) at the locations shown on the plans, complete, the price each of _____ Dollars and _____ Cents ($_____/EA)	$ _____
18.	4 Each (Contingent Item)	For constructing Air Release Valve Assemblies (ARVs) for water mains at the locations shown on the Plans, complete, the price each of _____ Dollars and _____ Cents ($_____/EA)	$ _____
19.	1,341 Linear Feet (Contingent Item)	For furnishing and installing polyethylene encasement for any size ductile iron pipe, fitting, or valve, if ordered by the Engineer, the price per linear foot of _____ Dollars and _____ Cents ($_____/LF)	$ _____
20.	100 Linear Feet (Contingent Item)	For trench overcut in 1-foot depth increments, for any size pipe, the price per linear foot of _____ Dollars and _____ Cents ($_____/LF)	$ _____

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Item No.	Estimated Quantity	Description	Total
21.	100 Square Feet (Contingent Item)	For sheeting and shoring ordered left in place by the Engineer, the price per square foot of _____ Dollars and _____ Cents ($_____/SF)	$ _____
22.	100 Cubic Yards (Contingent Item)	For removal, transport and legal disposal of unsuitable backfill materials, including tipping fees, as ordered by the Engineer, the price per cubic yard of _____ Dollars and _____ Cents ($_____/CY)	$ _____
23.	110 Cubic Yards (Contingent Item)	For furnishing and installing additional suitable backfill material, as directed by the Engineer, the price per cubic yard of _____ Dollars and _____ Cents ($_____/CY)	$ _____
24.	5 Square Yards	For constructing limerock base for **Type "M"** permanent pavement repairs, the price per square yard of _____ Dollars and _____ Cents ($_____/SY)	$ _____
25.	6 Square Yards	For constructing **Type "M"** asphaltic concrete surface course permanent pavement repairs, the price per square yard of _____ Dollars and _____ Cents ($_____/SY)	$ _____

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Item No.	Estimated Quantity	Description	Total
26.	23 Square Yards (Contingent Item)	For cold milling roadway surface course for permanent pavement repairs (nominal 1 inch thick) (area as shown on Plans), the price per square yard of _____ Dollars and _____ Cents ($_____/SY)	$ _____
27.	23 Square Yards (Contingent Item)	For constructing **Type "V"** permanent pavement repairs for roadway (nominal 1 inch thick machine-laid asphaltic concrete friction surface overlay), (area as shown on Plans), the price per square yard of _____ Dollars and _____ Cents ($_____/SY)	$ _____
28.	500 Square Feet (Contingent Item)	For constructing concrete sidewalk restoration to match existing, the price per square foot of _____ Dollars and _____ Cents ($_____/SF)	$ _____
29.	100 Linear Feet (Contingent Item)	For constructing concrete curb and gutter restoration to match existing, the price per linear foot of _____ Dollars and _____ Cents ($_____/LF)	$ _____
30.	Aggregate Sum	For furnishing traffic control, the aggregate sum of _____ Dollars and _____ Cents	$ _____
31.	**SUBTOTAL**	**The SUM of Item Nos. 1 through 30**	**$** _____

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Item No.	Estimated Quantity	Description	Total
32.	Dedicated Allowance	For cost of required permits, fees, inspections, impact fees, if authorized by the Engineer, **The sum of 3% of the Subtotal Item No. 31,** **(.03) x (Subtotal, Item No. 31)** _____ Dollars and _____ Cents	$ _____
33.	Contingency Allowance	For unforeseen conditions, for minor construction changes, and for quantity adjustments, if ordered by the Engineer, **The sum of 10% of the Subtotal Item No. 31,** **(.10) x (Subtotal, Item No. 31)** _____ Dollars and _____ Cents	$ _____
34.	**TOTAL BID**	**The SUM of Item Nos. 31, 32 and 33**	**$** _____

Note: For a detailed description of each Proposal Item, refer to Section 8.0, of the Specifications entitled "Measurement and Payment".

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"TRENCH SAFETY ACT"

Bidder acknowledges that included in the various items of the Quotation and in the Total Bid Price are costs for complying with the "Trench Safety Act", Florida Statute 553, Part 3. The bidder further identifies the costs to be summarized below:

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

SPECIFICATIONS

INSTALLATION OF 12-INCH D.I. WATER MAIN IN SW 71st AVENUE FROM SW 8th STREET TO SW 4th STREET

PCTS No. 14591

PROJECT ER No. W017004

1.00 SCOPE

The Project, including mobilization and demobilization, consists of furnishing and installing approximately 1,163 linear feet of 12-inch ductile iron pipe and fittings; 64 linear feet of 8-inch ductile iron pipe and fittings; 114 linear feet of 6-inch ductile iron pipe and fittings; three (3) resilient seated gate valves; five (5) fire hydrant assemblies with guard posts; removal of one (1) existing fire hydrant; ten (10) water services; making two (2) connections to existing water mains; furnishing and constructing flushing valve outlets; furnishing and constructing air release valve assemblies; polyethylene encasement for ductile iron pipe and fittings, if ordered by the Engineer; sheeting and shoring ordered left in place by the Engineer; additional suitable backfill, if needed; furnish all materials, equipment and supplies necessary for cleaning, testing and disinfecting the mains; removal of existing asphalt pavement; removal, transport and legal disposal of demolition material; placing existing water mains out of service upon completion of work; traffic control; temporary and permanent replacement of any sidewalk, sod, pavement markings, pavement and/or driveway damaged by construction and all other appurtenant and miscellaneous items and work for a complete and fully functional installation.

The Project is located in Section 02, Township 54, Range 40, City of Miami, Miami-Dade County, Florida.

It is the intent of the Department to obtain a complete functional, and satisfactory installation under this Contract, and any items of labor, equipment or materials which may reasonably be assumed as necessary to accomplish this end shall be supplied whether or not they are specifically shown on the Plans or stated herein.

The Contractor is also alerted that various "Standards" are used herein for reference and criteria, and that he should obtain copies for his general use and protection. Abbreviated titles are used throughout these Specifications and although most of them are widely known, their complete titles are given below in order to avoid any misunderstanding.

AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
AISI	American Iron and Steel Institute
ANSI	American National Standards Institute, Inc.
ASTM	American Society for Testing and Materials
AWWA	American Water Works Association
FBC	Florida Building Code
FDOH	Florida Department of Health in Miami-Dade County
FDOT	State of Florida Department of Transportation
MDCDTPW	Miami-Dade County Department of Transportation and Public Works
OSHA	Occupational Safety and Health Administration

The above list shall not be considered complete, as there are other "Standards" used; however, in most cases complete titles have been given.

Wherever "Standards" are indicated herein for reference, the referenced portion shall have the same force and effect as if it were included, herein, in its entirety, latest revision if the date of publication is not shown.

2.00 PLANS BY THE DEPARTMENT

Plans dated September 13, 2016 and any subsequent revision, thereto, introduced by Addenda prior to bid, showing this work, are hereby made a part of the Contract Documents, and listed as follows:

INSTALLATION OF 12-INCH D.I. WATER MAIN IN SW 71st AVENUE
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Sheet No.	Title
WM-1	Cover
WM-2	General Notes
WM-3	General Plan
WM-4	Topographic Survey
WM-5	Topographic Survey
WM-6	Topographic Survey
WM-7	Topographic Survey
WM-8	Topographic Survey
WM-9	Topographic Survey
WM-10	Topographic Survey
WM-11	Plan and Profile
WM-12	Plan and Profile
WM-13	Plan and Profile
WM-14	Plan and Profile
WM-15	Plan and Profile
WM-16	Side Street and Fire Hydrants Profile

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. All Departmental Standard Details are incorporated in these Contract Documents by reference and all work shall be performed in accordance with all applicable Departmental Standard Details.

3.00 SEQUENCE OF CONSTRUCTION AND GENERAL INFORMATION

A. General:

1. The Department has established a "Pre-Approved Product List" for products that are to be used in the construction of water and sewer facilities. See Section 5.00.1 "Shop Drawings" herein for requirements and instructions on the submittal process. Contractors and suppliers can submit the "Pre-Approved Product List(s)" for the products that they intend to use in the construction of the water and/or sewer facilities for the Project. Products listed in the "Pre-Approved Product List" do not require submittal of shop drawings to the Department. Shop drawing submittal is still required for products not found on the "Pre-Approved Product List."

2. Following receipt of Notice to Proceed with the work, the Contractor shall notify the Engineer at least 5 days before he is ready to start actual construction, to allow the Department time to make arrangements for inspection of the work.
3. Contractor's PSM shall reestablish the design baseline, vertical control points and reference points, and establish proposed pipeline location in accordance with Section 6.00 "Construction Methods."
4. The Contractor's equipment must be in first class operating condition, including safety features, proper mufflers and other silencing accessories. All equipment must be properly lubricated on a special maintenance type schedule to reduce noise, including tracks, rollers, idlers, sheaves and other noise producing components. Care must be taken to prevent oil spillage of any kind or oil dripping from equipment.
5. If the equipment used proves less than satisfactory and is unduly or needlessly disturbing the neighbors, in the opinion of the Engineer, he will have the right to order the Contractor to immediately modify the equipment to make it satisfactory, or to change to other equipment that is satisfactory at no additional cost to the Department.
6. During construction the Contractor shall, by sprinkling with water or by other means approved by the Engineer, eliminate dust annoyance to adjacent property owners. No additional compensation will be paid to the Contractor for any costs incurred in complying with the provisions herein.
7. Valves between the existing system and new work being installed hereunder shall only be operated by Department forces. The Contractor's personnel, under no circumstances, shall operate any such valve. This shall also apply to valves installed during the Project which are put into service prior to final acceptance (i.e. part of the Project is activated).
8. All items shall be performed by the Contractor with special emphasis on the fact that numerous standard and miscellaneous construction phases are not mentioned specifically, but shall be performed by the Contractor as required for a completed Project.
9. Water in the trench shall be kept below the level of the pipe to prevent the entry of debris and contaminants into the pipe.
    a. In instances where Section 6.06.1 "Alternate Method of Construction" is approved by the Engineer and used for the Project: During construction, the Contractor shall install a temporary plug, or other means approved by the Engineer, on the open end of the pipe in order to prevent debris and trench water backwash from entering the pipe during trench excavation ahead of the installed pipe. The plug shall remain in place until the following length of pipe is ready to be installed. No additional compensation will be paid to the Contractor for any costs incurred in complying with the provisions herein.
10. 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 work day. This requirement shall apply to installations both above and below the water table.
11. No separate payment shall be made for the cost of labor and materials required for the removal of nightcaps, plugs, bulkheads or external blocking and bracing of adjacent mains, for the supplying of water for cleaning and testing, nor for the interconnecting work to adjacent mains unless listed separately in the Quotation, and the cost of this work shall be included in other applicable items of work.

12. The Contractor shall hose down and clean the inside of the mains in intervals during its installation as specified in Section 6.08 "Installation of Pipe and Fittings." The Contractor shall utilize pigging to clean the main unless otherwise specified herein or instructed by the Engineer. A Bare Swab No. 5B, density 1 lb./ft.^{3} by Knapp Polly Pig, Inc., 1209 Hardy Street, Houston, Texas 77020, 1-800-231-7205, or approved equal, shall be utilized for this work. Any damage to the pipe lining caused by pigging shall be repaired or replaced to the satisfaction of the Engineer at the Contractor's sole expense. The Contractor shall furnish all materials and equipment necessary to clean the mains. Water removed from mains shall be disposed of by pumping out or ahead into the trench, or other approved location, and the Contractor shall exercise care to prevent any unauthorized discharge or drainage to the surrounding area and adjoining properties.
13. Mains shall be cleaned with a bare swab pig prior to the installation of the resilient seat gate valves.
14. Mains shall be cleaned at the intervals specified elsewhere herein and tested in sections as specified in the Sequence below unless otherwise permitted by the Engineer. Whenever the new main is being filled with water for testing, the air release valves on the main shall be left in the open position until the main is full.
15. The Contractor shall be responsible for positively anchoring the pipe, valves and fittings against movement from internal pressure by installing thrust blocks, restrained joints, bulkheads, ties, external blocking and bracing or other devices where required, or by installing sufficient pipe beyond the valve end to serve as the thrust anchor for the section under test.
16. Pipelines for potable water mains shall be pressure tested at 150 psi for a minimum of two (2) hours in accordance with FDOH requirements.
17. The Contractor is advised that he is required to furnish all labor, materials and equipment necessary to pressure test each valve furnished by either the Department or the Contractor bi-directionally, prior to installation, to the satisfaction of the Engineer. If the valves are available, the tests shall be performed prior to the start of Construction. Otherwise the tests shall be performed as soon as the valves are available to afford the maximum time for any corrective work required. The Contractor shall include all costs for this requirement under the appropriate Quotation Item(s), and no other compensation will be provided.
18. The installation of air release devices, flushing valve outlet and other appurtenances, cleanup, property restoration, paving repairs, cleaning and testing of the main shall follow as closely behind the installation of the main as possible, followed by a final cleanup and inspection. In performing the work in the above described sequence, all requirements of the Specifications shall be strictly followed, particularly those pertaining to leakage tests, prompt paving repairs and cleanup as the work progresses.
19. The Contractor shall show and include in his schedule for each section of water main to be tested and placed in service, thirty-five days for the activities (such as for example, flushing, pressure testing, chlorination, sampling and testing, etc.) required for testing and certification. For each such section of sewer main he shall include and show a period of fourteen days. All time for these activities shall be included in the total number of calendar days allowed for construction of the Project (or number of calendar days allowed for construction of the water and/or

sewer portions of joint projects such as JPAs) and no extra time will be allowed.

20. The Contractor is advised that, if the work of this project includes work in the public right of way, that work may be shut down by the roadway governing authority during the period from the beginning of the Thanksgiving holiday through the end of the New Year holiday or some portion(s) of that period. Unless otherwise specifically called out herein, or granted by the Engineer in writing, no extension of Project time will be allowed due to such a shutdown. If any extension of time is allowed, it will be of a non-compensable nature. All costs of such a shutdown including any demobilization/re-mobilization costs shall be the sole responsibility of the Contractor and no extra compensation will be allowed. Upon ending of any such shutdown, the Contractor shall immediately resume construction operations unless otherwise ordered by the Engineer in writing.
21. The Contractor shall fully comply with any special working hours, and with all other requirements of the Permits, at no additional cost to the Department. Working hours noted in permits or the specifications are subject to change. In the event that changed working hours effects the work of the Contractor, the Contractor's sole remedy shall be a non-compensable time extension. Said extension to be full compensation for all direct and indirect costs, including but not limited to loss of efficiency, loss of opportunity, increased bond or insurance premiums, or home office or extended overhead, incurred by the Contractor as a result of such change, and no additional compensation shall be considered. Night work may be required as a part of the construction.
22. New or altered water mains or force mains constructed of polyvinyl chloride pipe shall be pressure and leak tested in accordance with AWWA C605 and any Ductile Iron mains shall be pressure and leak tested in accordance with AWWA C600; both standards as incorporated in Florida Administrative Code (FAC) Rule 62-555.330.
23. New or altered potable water mains, including fire hydrant leads and services, that will be under Department control and have an inside diameter of three inches or larger shall be disinfected and bacteriologically evaluated in accordance with FAC Rule 62-555.340. Note that the above requirements are minimum and the Department may require more stringent procedures and routinely requires all services of whatever size be tested and disinfected along with the main. These more stringent or extensive requirements shall be performed by the Contractor and no extra compensation will be allowed.
24. All potable water pipe and fittings installed under this project shall be color coded as required by FAC Rule 62-555.320(21)(b)3, using blue as a predominant color to differentiate drinking water from reclaimed or other water. Underground plastic pipe shall be solid-wall blue pipe, shall have a co-extruded blue external skin, or shall be white or black pipe with blue stripes incorporated into, or applied to, the pipe wall; and underground metal or concrete pipe shall have blue stripes applied to the pipe wall. Pipe striped during manufacturing of the pipe shall have continuous stripes that run parallel to the axis of the pipe, that are located at no greater than 90-degree intervals around the pipe, and that will remain intact during and after installation of the pipe. If tape or paint is used to stripe pipe during installation of the pipe, the tape or paint shall be applied in a continuous line that runs parallel to the axis of the pipe and that is located along the top of the pipe; for pipes with an internal diameter of 24

inches or greater, tape or paint shall be applied in continuous lines along each side of the pipe as well as along the top of the pipe. Aboveground pipe shall be painted blue or shall be color coded or marked like underground pipe.

25. The Contractor shall take steps to provide accessibility for local traffic. The construction in this area shall proceed as quickly as possible and paving shall follow immediately to reduce inconvenience to residents in this area of the project.
26. The Contractor shall take pictures of the work site, in accordance with Section 3.04 "Construction Photographs," prior to the start of any construction.

B. Project Notes:

1. This is a JPA project. Accordingly, the Contractor shall coordinate his operations with the proposed City of Miami JPA Project No. B-50405.
2. The Contractor shall install new water service connections to existing residences/businesses from the proposed main. The meter boxes and vaults installed by the Contractor shall be located out of driveway areas and in front of the service property. Locations of the water services shall be approved by the Construction Manager prior to constructing the service (locations shall be adjacent to the existing meter when possible).
3. The Contractor, in coordination with the Department, shall determine the size and location of any and all existing firelines, domestic water services and irrigation water services that are connected to the existing mains that are to be replaced and abandoned. The Contractor shall install 1-inch water services for all existing water services of 1-inch diameter and smaller, 2-inch water services for all existing 2-inch services, and fireline piping shall be replaced with the same size pipe and valve.
4. The Contractor is advised that, during the construction of the Project, the Construction Manager may require the Contractor to adjust the location of the proposed gate valves, fire hydrants and meter boxes from the locations shown on the Plans. This relocation(s) shall be performed at no additional cost to the Department.
5. The existing mains shall remain in service until the new mains are placed in service. Connections and disconnections together with cut, plug and abandonment work shall be coordinated through the Department's Construction Manager with the Department's Water Distribution Division such that personnel from that Division will be able to supervise this work to the extent considered necessary by the Chief of that Division on a case by case basis. In all instances, the Department's Construction Manager shall, beginning with the Preconstruction Meeting, coordinate with the Water Distribution Division to pre-determine the notification lead times required for various operations.

C. Sequence of Construction

1. The Contractor shall be responsible for developing a detailed sequence of construction and schedule for review and approval by the Department before any work is started.
2. The detailed sequence of construction shall take into account the requirements and construction constraints detailed in these Specifications.
3. The Contractor shall coordinate the water main sequence of construction with the City of Miami JPA Project No. B-50405 progress schedule to

ensure timely performance of the work and project completion within the specified construction time.

4. The sequence of construction shall include but not be limited to:
   a. Contractor's field verification of all information provided in the Plans and to determine the type, location, elevation and extent of any utilities which may not have been shown on the Plans.
   b. Coordination with Department personnel to operate existing valves, activating newly installed and cleared water mains, cutting and plugging existing mains, connection to customer's plumbing and transfer of existing meters. Operation of existing valves and activation of newly installed and cleared water mains can only be performed by Department personnel.
   c. Beginning and end of water main installation.
   d. Phasing, if requested by the Contractor.
   e. Cleaning, pigging, pressure testing, disinfection and FDOH clearance points and schedule.
   f. Connections to existing mains.
   g. Cutting and plugging of existing mains.

5. The first items in the sequence of construction shall be as follows:
   a. Submit complete "Pre-Approved Product List(s)" and/or shop drawings package to the Engineer in accordance with Section 5.00.1 "Shop Drawings" herein. Obtain all pipe, valves, fittings and appurtenant items to begin the work.
   b. Notify "Sunshine State One-Call of Florida Inc., 811," forty-eight (48) hours prior to any excavation. Locate all utilities along the route of the Project.
   c. Contractor's PSM shall reestablish the design baseline, vertical control points and reference points, and establish proposed pipeline location in accordance with Section 6.00 "Construction Methods."
   d. After b. and c. above have been completed, the Contractor shall meet with the Department Inspector at the Project site and perform a pre-construction walk-through along the entire route of the Project to identify possible problems or conflicts with the proposed pipeline location.

6. The last items in the sequence of construction shall be as follows:
   a. Perform and complete all pavement restoration work to the satisfaction of the Engineer.
   b. Complete all remaining miscellaneous and appurtenant work, including restoration of damaged survey control points, final inspection and cleanup.

7. In performing the work in the approved sequence, all requirements of the specifications shall be strictly followed.
8. The Department's Construction Manager shall establish the point of 50% completion upon submittal and approval of the sequence of construction.
9. The Department reserves the right to make changes to the sequence as necessary to facilitate the work or minimize any conflict with operations.

3.01 PRECONSTRUCTION CONFERENCE

A. After the Award of Contract and prior to the issuance of the "Notice to Proceed," a preconstruction conference will be held with the Contractor, the Department, various utility companies and others who are interested in the Project for the purpose of coordinating the work. The time and place of meeting will be set by the Engineer.

B. In some cases the preconstruction conference may be held after the start work date stated in the written "Notice to Proceed." This may be due to difficulty with coordination of all parties concerned, or other similar reasons.

C. Such delays in holding the preconstruction meeting will not relieve the Contractor of any responsibilities hereunder, and will not be an acceptable reason for him to request additional work completion time beyond that provided since he can be obtaining permits, mobilizing his equipment and forces, ordering materials, performing minor work, or other work if approved by the Engineer, during the interim period.

D. Prior to the preconstruction conference, the Contractor shall prepare the construction schedule as described in Section 3.00 "Sequence of Construction and General Information," Section 5.00.3 "Project Scheduling" and provide copies of the same to others in attendance.

E. The construction schedule shall include the place of beginning, the proposed order of progression, together with the estimated times for beginning and completing the various items of work. In addition, the Contractor shall prepare on electronic media, a critical path method (CPM) with emphasis made to "construction time and completion."

F. The Engineer will discuss requirements of such matters as project supervision and inspections, progress schedules and reports, Contract Change Orders, insurance, safety, and other items pertinent to the Project.

G. All parties to this conference should be prepared to discuss any problems anticipated with the execution of the work under this Contract.

3.02 PROJECT SIGNS

A. The County will supply signs for this Project. These signs will be produced, installed, and at the end of construction, removed by County forces. During the construction period, the Contractor shall maintain the signs in good condition, satisfactory to the Engineer. Should the signs be defaced, damaged or destroyed, the Contractor shall be responsible for their repair or replacement to the satisfaction of the Engineer and no extra compensation will be allowed.

3.03 PROJECT PERMITS

A. Where the Department has obtained various permits for this Project, copies will be appended at the rear of the Specifications.

B. The Contractor shall familiarize himself with, and comply with, all requirements of these permits and their issuing authorities. All other necessary permits shall be obtained by the Contractor.

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, dewatering volume limits, and all other general and special conditions. In the event any of the conditions of the permits are in conflict with the requirements of these Specifications, the more stringent conditions of the permits shall take precedence.

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 the Department or other County departments as permitted of the aforementioned permits. All expenses necessary for compliance with the regulations and requirements of each permitting agency and its permit shall be paid by the Contractor, and shall be included in his overall bid price.

F. The cost of any fees such as impact fees, inspection fees, etc. and the cost paid of all required permits shall be borne by the Department. The Contractor shall pay the required fees, obtain the permit(s) and then upon submission of proof of cost to the Department, be reimbursed for said cost out of the Dedicated Allowance. 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 the paragraph above, all costs of compliance with the permit(s) shall be borne by the Contractor and included in his bid price.

G. All surveying required by the Project permits shall be done by the Contractor's Registered Professional Surveyor and Mapper (PSM) licensed to practice in the State of Florida.

H. Where the project or part of the project is located in the City of Miami, in accordance with the City of Miami Code, a special paving bond is required by the City of Miami Public Works Department. The Contractor shall obtain and execute this bond between the City of Miami and himself. The cost of this bond will **not** be reimbursed under the Dedicated Allowance item.

I. If the Contractor dewaters into a storm sewer in the City of Miami, a dewatering permit from the City of Miami is required.

3.04 CONSTRUCTION PHOTOGRAPHS

A. Photographs shall be clean, sharp and clearly show details. Out-of-focus photographs will not be acceptable.

B. Within fourteen (14) days of receiving Notice to Proceed and within the first ten (10) days of each month.

C. Enclose each print in a clear Mylar protector punched to fit a standard three-ring binder.

D. Number photographs in sequence beginning with the number one.

E. Size and Quality:
1. Standard commercial quality, color, 3-1/2" x 5", single weight glossy paper.

F. Identification:
1. Each print shall be stamped with the following information stamped or typed on the back of the print:

MIAMI-DADE WATER AND SEWER DEPARTMENT
PROJECT ER No. _____

Contractor: _____

Photograph No.: _____ Date: _____ Time: _____

Description: _____

G. Quantity:
1. A minimum of twelve (12) photographs shall be taken prior to construction and each month until completion of the Work.

H. Initial Photography:
1. Take pre-construction photographs of the entire site after receiving the Notice to Proceed and prior to disturbing the site in any matter. Coordinate with the Engineer as to the vantage points and number of photographs indicated above.

I. Photography During Construction:
1. Coordinate with the Engineer as to the actual number and location of views to be photographed and the day and time of photographing.

3.05 HURRICANE PREPAREDNESS

A. General:
1. During such periods of time as designated by the United States Weather Bureau as being a hurricane alert, the Contractor shall perform all precautions as necessary to safeguard the work and property, including the removal of all small equipment and materials from the site, lashing all other equipment and materials to each other and to rigid construction, and any other safety measures as may be directed by the Engineer.

B. Upon Notification of a Hurricane Watch:
1. Formal notification to all Contractors to prepare and submit for approval a Plan of Action for the specific actions to be taken on their particular projects.

C. Upon Notification of a Hurricane Warning:
1. Formal notification to the Contractors to implement their approved Plan of Action to protect the Project and the public.
2. For Construction contracts at a Water or Sewer Plant, a copy of the notifications will be provided to the Plant Superintendent. The Plant Superintendent is also requested to notify the Department's Construction Manager of any assistance he may need from the Contractor in order to secure Plant entities.

3. For pipeline construction projects within the public right-of-ways, the Contractor will be notified by the Department's Construction Manager to suspend his construction operations. The Contractor will backfill all open trenches, remove all construction equipment and materials from the right-of-way, remove unnecessary traffic barricades and signs, secure remaining barricades by "half burial" or "double sand bags."

3.06 SAFETY REQUIREMENTS

A. The Contractor shall be in compliance with all applicable provisions of the Occupational Safety and Health Act of 1970. The Contractor's Manual of Safety Practices, dealing with the firm's policies on field safety procedures for employees shall be submitted to the Engineer for his review before "Notice to Proceed" will be issued.

B. The Contractor shall familiarize himself with the Department's "Construction Safety and Health Policy" appended to these Specifications as Appendix "H." Failure to familiarize himself with the aforementioned safety and health provisions shall not relieve him from compliance with the obligations and penalties set forth therein.

C. The Contractor shall conduct his operations in such a manner (utilizing warning devices, such as traffic cones, barricades and warning lights, and personnel such as flagmen and uniformed police officers) that the public is given adequate warning of hazards of the work site as may be deemed necessary by the County and/or the Engineer. See Section 6.00.5 "Maintenance of Traffic Control."

D. The Contractor shall be in compliance with all applicable provisions of the OSHA Code of Federal Regulations (CFR), including, but not limited to, the following:
   1. Process Safety Management (29 CFR 1910.119)
   2. Personal Protective Equipment (29 CFR 1910.132)
   3. Respiratory Protection (29 CFR 1910.134)
   4. Confined Space Entry Procedures (29 CFR 1910.146)
   5. Lockout/Tagout (29 CFR 1910.147)
   6. Industrial Truck / Forklift (29 CFR 1910.178)
   7. Electrical Safety (29 CFR 1910.301)
   8. Commercial Diving (29 CFR 1910.401)
   9. Air Monitoring (29 CFR 1910.1000)
   10. Asbestos & Lead Abatement (29 CFR 1910.1001, 1025)
   11. Blood Borne Pathogens (29 CFR 1910.1030)
   12. Crane Operations (29 CFR 1926 & ANSI)
   13. Fall Prevention Protection (29 CFR 1926.104)
   14. Welding and Cutting (29 CFR 1926.350)
   15. Scaffolding (29 CFR 1926.451)
   16. Excavation Protection (29 CFR 1926.650)
   17. Movement of Traffic (FDOT Index)

E. In addition, the Contractor shall adhere to any other applicable Federal, State and Local Safety and Health Regulations involving General industry and/or Construction Standards not mentioned in the Specifications.

F. For trench excavations in excess of 5 feet in depth, the Contractor shall comply with the provisions of the "Trench Safety Act," Florida Statute 553, Part 3,

"Trench Safety Act," Florida Statute 553, Part 3 of the Quotation items, and Section 6.01 "Excavation."

G. The Contractor shall familiarize himself with the provisions of the "Underground Facility Damage Prevention and Safety Act," Florida Statute 556. The Contractor shall contact the Sunshine State One Call of Florida, at 811, forty-eight (48) hours prior to any excavation. Failure to familiarize himself with the aforementioned safety provisions shall not relieve him from compliance with the obligations and the penalties set forth herein.

H. All open excavations made in the earth shall be performed in compliance with OSHA 29 CFR 1926.650, Subpart P and "Trench Safety Act," Florida Statute 553, Part 3. The Contractor shall appoint a "competent person," in accordance with Subpart P, who shall be present at the job site. A "competent person" shall mean one who is capable of identifying existing and predictable hazards in the surroundings, or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them.

I. The Contractor shall not store any environmentally hazardous materials such as solvents, greases, lubricants or any such type of chemical substance at the site. The Contractor shall be allowed to keep only such materials at the site for immediate use.

3.07 SITE CONDITIONS

A. The Contractor acknowledges that by personal field observation or other means satisfactory to himself, performed prior to the Bid, he has included in the prices bid all costs for dealing with all construction problems created by observable above or on grade features on or adjacent to the site of the work whether or not these features are shown on the Plans or described in the Specifications. In instances where the observable features indicate subsurface conditions which may affect the Project work, as for example, a pavement patch or catch basin gratings indicating respectively a utility or storm sewer not shown on the Plans, the Contractor acknowledges that he has made timely, diligent, inquiry of the Engineer or by other means fully satisfied himself prior to the Bid as to the nature of, and costs created by, the subsurface condition and included all costs therefore in the prices bid.

B. The Contractor acknowledges that he has satisfied himself as to the nature and location of the work, the general and local conditions, particularly those bearing upon availability of transportation, disposal, handling and storage of materials, availability of labor, water, electric power, roads, and uncertainties of weather, the conformation and conditions at the ground, the type of equipment and facilities needed preliminary to and during the prosecution of the work and all other matters which can in any way affect the work or the cost thereof under this Contract.

C. The Contractor further acknowledges that he has satisfied himself as to the character, quality, and quantity of surface and subsurface materials to be encountered from inspecting the site, making whatever site investigations he deems diligent or prudent, and from evaluating information derived from exploratory work that may have been done by the Department or included with these Contract Documents. Any failure by the Contractor to acquaint himself

with all the available information will not relieve him from responsibility for properly estimating the difficulty or cost thereof under this Contract.

D. All information obtained by the Department regarding the site conditions, topography, subsurface information, ground water elevations, existing construction of site facilities as applicable, and similar data will be available for inspection at the office of the Engineer upon request. Such information is offered as advisory information only. Neither the Engineer nor the Department assumes any responsibility for the completeness of, or for the Contractor's interpretation of, such advisory information. Prior to bidding and after written approval from the Department, bidder shall make his own investigations to satisfy himself with site conditions at his own cost.

E. All information regarding subsurface conditions that the Department may have may be examined by all prospective bidders prior to the receipt of proposals. Appointment for the examination of such information shall be made with Department.

F. Prospective bidders are advised, at their own expense, to make such subsurface investigation, by boring or test hole excavation, as may be desirable. However, such work shall be scheduled by appointment with the Engineer if for a Department site or by notification to the Department and property permitted if in the public right of way.

G. In the event subsurface or latent physical conditions are found materially different from those indicated in these Documents, and differing materially from those ordinarily encountered and generally recognized as inherent in the character of work covered in these Project Documents, promptly, and before such conditions are disturbed, notify the Engineer in writing of such changed conditions.

H. The Engineer will investigate such conditions promptly and following this investigation, the Contractor shall proceed with the work, unless otherwise instructed by the Engineer. If the Engineer finds that such conditions do so materially differ and cause an increase or decrease in cost and time considered reasonable by the Engineer, the Department will make the final decision regarding any adjustment in cost or time for completion.

I. In the event that site conditions differ from those expected by the Contractor, the Contractor shall proceed to complete the work as contemplated by the Plans and Specifications at his own cost and expense. If in the discretion of the Engineer, the difference in site conditions renders completion of the work as described by the Plans and Specifications impossible, the Engineer may alter the work, whereupon the Contractor shall be compensated for any extra work in accordance with Section 13 "Extra Work and Payment Therefore" of the General Covenants and Conditions; the Engineer shall not alter the work where the site conditions render the work more difficult or costly to perform, if such work is otherwise still possible as described in the Contract Documents.

J. Known utilities and structures adjacent to or encountered in the work are shown on the Plans. The locations shown are taken from existing records and the best information available from existing plans; however, it is expected that there may be some discrepancies and omissions in the locations and quantities of utilities and structures shown. Those shown are for the convenience of the Contractor

only, and no responsibility is assumed by either the Department or the Engineer for their accuracy or completeness.

K. **No request for additional compensation or Contract time (except for a non-compensable time extension at the sole discretion of the Engineer, whose decision shall be final) resulting from encountering utilities or structures not shown, or differing in location or elevation from that shown, will be considered. The Contractor shall explore sufficiently ahead of the Work to allow time for any necessary adjustments without delay to the progress of the installation. Costs due to delays occasioned by encountering underground utilities or structures which could have or should have been discovered by timely exploration ahead of the Work shall rest solely with the Contractor.**

L. Where the Contractor's operation could cause damage or inconvenience to railway, telephone, fiber optic, television, electrical power, oil, gas, water, sewer, irrigation systems or any other utility, the Contractor shall make all arrangements necessary for the protection of these utilities and services.

M. Notify all utility companies that are affected by the construction operation at least 48 hours in advance. Under no circumstance expose any utility without first obtaining permission from the appropriate agency. Once permission has been granted, locate, expose, and provide temporary support for all existing underground utilities and utility poles where necessary. **Absolutely no extra compensation will be allowed for construction problems created by utility poles of whatever size, overhead electric, telephone or other lines whether shown on the Plans or not. The Contractor is solely responsible for discovering such items in the field prior to bidding and including all costs for such work in the prices bid.**

N. The Contractor and his Subcontractors shall be solely and directly responsible to the owner and operators of such properties for any damage, injury, expense, loss, inconvenience, delay, suits, actions, or claims of any character brought because of any injuries or damage which may result from the construction operations under this Contract.

O. Neither the Department nor its officers or agents shall be responsible to the Contractor for damages as a result of the Contractor's failure to protect utilities encountered in the work.

P. In the event of interruption to domestic water, sewer, storm drain, or other utility services as a result of accidental breakage due to construction operations, promptly notify the proper authority. Cooperate with said authority in restoration of service as promptly as possible and bear all costs of repair. In no event shall interruption of any utility service be allowed unless granted by the owner of the utility.

Q. In the event water service lines that interfere with construction are encountered, the Contractor may, by obtaining prior approval of the water utility, cut the service, dig through, and restore the service with similar and equal materials at the Contractor's expense and as approved by the Engineer.

R. Replace, with material approved by the Engineer, at Contractor's expense, any and all other laterals, existing utilities or structures removed or damaged during

construction, unless otherwise provided for in these Contract Documents and as approved by the Engineer.

S. Take necessary precautions to prevent damage to existing structures whether on the surface, above ground, or underground. An attempt has been made to show major structures on the Plans. While the information has been compiled from the best available sources, its completeness and accuracy cannot be guaranteed, and is presented as a guide. The Contractor is solely responsible for field verification of all information provided and to determine the type, location, elevation and extent of any utilities which may not have been shown on the Plans.

T. During the process of construction, it is expected that minor relocations of the work may be necessary. Such relocations shall be made only by the direction of the Engineer at the Contractor's expense. If existing structures are encountered that will prevent construction as shown, notify the Engineer before continuing with the work in order that the Engineer may make such field revisions as necessary to avoid conflict with the existing structures. If the Contractor fails to notify the Engineer when an existing structure is encountered, and proceeds with the work despite this interference, the Contractor does so at his own risk.

4.00 MATERIALS AND EQUIPMENT FURNISHED BY THE DEPARTMENT

A. No material or equipment will be furnished by the Department under this Contract. All material, labor and equipment necessary for completion of the work shall be furnished and installed by the Contractor, whether or not shown on the Plans or specifically mentioned in the Specifications.

4.01 WATER USED IN CONSTRUCTION

A. The Department will furnish water at a charge for all construction activities unless otherwise specifically made an exception in the Project Specifications or specifically made an exception by the Engineer in writing.

B. Consumption for the following activities shall be determined by Department personnel who shall be provided with a minimum of 72-hour advance notification. Failure of the Contractor to provide advance notification and/or have Department personnel on site to witness and verify consumption for the following activities could result in his being fined and/or a citation being issued against him in accordance with the Rules and Regulations of the Department's Tampering Section.

1. Pigging:
2. Flushing, only if and when approved by the Engineer:
3. Chlorination, if applicable:
4. To fill mains being pressure tested, excluding make-up water during test: and
5. When and where directed or approved by the Engineer.

Water for construction activities listed above will be furnished from adjacent Department-owned water mains or the most convenient water source. In instances where no Department-owned source of water is available, the Contractor shall make his own arrangements with the municipality or other controlling authority and include the cost of all water required during construction in his overall construction cost. No reimbursement will be made.

C. Water used in construction for purposes other than those listed above, including make-up water pumped into the pipe during hydrostatic testing, will be furnished by the Department at a charge. This water will be supplied from the most convenient source through the existing piping. However, all water used must be metered through a Department meter. The Contractor will be billed by the Department based on water usage recorded by the floating meter. Failure of the Contractor to meter the water could result in his being fined and/or a citation being issued against him in accordance with the rules and regulations of the Department's Tampering Section. The Contractor can obtain the meter through proper application and payment of deposit fee at the Department's New Customer Division, 3575 South LeJeune Road, Miami, Florida.

When the project is occurring in Unincorporated Miami-Dade County, the City of Miami or the City of Coral Gables, the Contractor shall present a Miami-Dade County, City of Miami or City of Coral Gables, respectively, Fire Department Permit during application with New Business Office. This requirement may also apply to some municipal areas of Miami Dade County.

The deposit fee will be refunded to the Contractor upon return of the meter in a sound satisfactory condition. The largest meter available is 3-inches NPS. Effective October 1, 2015, the required deposit for a 3-inch meter is $2,500.00 plus $140.00 service charge. For current fees contact the Department's New Customer Division at 786-268-5200. Additional fees may be required by other governmental agencies for utilizing existing sources of water.

D. All piping, fittings, valves and equipment, including pumps and power, required for handling the water shall be furnished by the Contractor. Care shall be exercised in the use of the water and provision shall be made to protect the water supply for contamination and indiscriminate use by unauthorized persons. The Contractor shall use only potable water unless otherwise specifically called out elsewhere herein and then only in the case of sewage force mains, reclaim water mains or raw water mains.

E. Under no circumstance shall the Contractor utilize a water source, including existing piping, until such source or piping has been approved for use by the Department.

5.00 MATERIALS AND EQUIPMENT FURNISHED BY CONTRACTOR

A. The general requirements specified herein shall apply to all items of materials and equipment in addition to the Specifications for individual items appearing in the following Sections in the 5.00 series.

1. All materials and equipment furnished by the Contractor for use in the work shall be new and of recent domestic manufacture, and shall be the products of reliable manufacturers who, unless otherwise specified, have been regularly engaged in the manufacture of such material and equipment for at least five years. All components shall, wherever possible, be standard stock articles of well-known domestic manufacturers. Where the Plans and Specifications designate the product of a particular manufacturer, the product specified has been found suitable for the intended use, but, unless otherwise provided, articles or products of similar characteristics may be offered for the approval of the Engineer. A minimum of six copies (more if so required

herein) of complete descriptive data shall be furnished regarding all articles furnished by the Contractor. The descriptive data shall consist of dimension drawings, catalog references and other information necessary to clearly identify each article. When substitutions are permitted, the Contractor shall make all necessary changes in adjacent or connected structures and equipment at his expense and shall be solely responsible for all cost and time required by any difference in construction methods, fabrication or assembly required and no additional time will be allowed. Any re-permitting together with all costs and work associated therewith shall be performed by the Contractor and no additional compensation will be allowed.

2. Where contemplated changes, substitutions or appurtenant work requires engineering design, in the opinion of the Engineer, the Contractor shall have such design services performed at his expense. Said engineering design services shall be of an extent satisfactory to the Engineer whose word shall be final and shall be performed by a Registered Professional Engineer licensed to practice in the State of Florida.
3. Unless otherwise specified or noted on the Plans, all steel bolts, nuts, washers and all other miscellaneous ferrous metal items (except cast iron and stainless steel) furnished by the Contractor, shall be hot-dip galvanized in accordance with ASTM A123 "Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products" or ASTM A153 "Zinc Coating (Hot Dip) on Iron and Steel Hardware." Where the word "galvanized" or its abbreviation is used on the Plans or in the Specifications, it shall mean hot-dip galvanized. Fabricated items shall be hot-dip galvanized after fabrication. Internal threads shall be tapped or re-tapped after galvanizing.
4. The Contractor shall have available sufficient tools and equipment to properly perform his work in all areas of the system, including easements or other areas with limited or restricted access or clearances. The Contractor is specifically advised that work in easements may require specialized equipment to satisfactorily perform the work and the capability to accomplish these installations is a requirement of these specifications.
5. The Contractor shall care for and protect against loss or damage all material to be incorporated in the construction, for the duration of the Contract, and shall repair or replace any damaged or lost materials. He shall be relieved of such responsibility only upon final acceptance of all of the work by the Engineer.
6. All pipe, valves, reinforcing steel and miscellaneous materials shall be stored on blocks or racks. Pipe fittings shall be stored on blocks, racks or platforms. As far as possible, no material shall be stored so that it is in direct contact with the ground. All metal shall be thoroughly cleaned before being placed in the work. Storage and protection measures shall be subject to approval of the Engineer whose decision shall be final. The Contractor shall immediately protect materials by different methods, materials or to a greater extent if so directed by the Engineer in the field.
7. Any salvable pipe, fitting, or other miscellaneous material or equipment, removed during construction and not reused in the work shall be cleaned, hauled to and stored by the Contractor at his expense, where directed by the Engineer, and shall remain the property of the Department. All other material and equipment shall be disposed of by the Contractor at his own expense.
8. To ensure satisfactory and successful final painting of materials and equipment to be furnished, it is essential that the paints applied in the

shop and in the field be mutually compatible. To this end, the Contractor shall require that the shop paints applied to materials and equipment be compatible with the paints he proposes to use in the field, or shall determine what shop paints have been used and select field paints compatible therewith, all as approved by the Engineer.

9. The Contractor shall also supply certification that all materials supplied that will come into contact with drinking water conform or will conform with American National Standards Institute (ANSI)/NSF International (NSF) Standard 61.
10. The Contractor shall furnish the Department, with one set of any special tools required for servicing for each type of equipment actually furnished. These tools shall be delivered to the office of the Department's Construction Manager, Miami-Dade Water and Sewer Department at 3575 S. LeJeune Road, Miami, Florida 33146 or by mail at P.O. Box 330316, Miami, Florida 33233-0316. A letter of transmittal shall be provided, containing a list of all items being provided.
11. All other material required to complete this Project shall be furnished and installed by the Contractor, whether or not shown on the Plans or specifically mentioned in the Specifications.

B. Extended Warrantees

1. The Contractor shall procure extended manufacturer's warrantees on equipment furnished by him. These warrantees shall be kept in force and extended such that the Department will be provided a manufacturer's warrantee with at least one year to run beyond the date of final acceptance of the Project. A copy of the warrantee with these provisions clearly stated or with an attached letter of certification from the manufacturer to this effect shall be delivered with the equipment and no payment or partial payment for said equipment will be made until such warrantee/certification is delivered to the Engineer.
    a. The warrantee shall specifically cover the case where the equipment warranted has been replaced by a newer model. In such instance the warrantee shall either provide spare parts and service to repair or replace in its entirety the original model, or in lieu of this; provide a complete new model unit to replace the warranted and failing equipment. Should the failing equipment be replaced by a new model, the Contractor shall be responsible for making all necessary changes to adjacent and/or connected equipment at no extra cost to the Department and to the satisfaction of the Engineer whose decision shall be final.
    b. As a part of final inspection, the Contractor shall deliver to the Department in a form satisfactory to the Engineer, either warrantees or certifications of warrantee extensions showing the warrantees to be in effect at least one year beyond the planned date of final acceptance.
    c. All costs for procuring, maintaining and extending these warrantees shall remain with the Contractor, even in cases where the Contract construction time for completion has been extended. These costs shall be included in the Contractor's bid price and no further compensation will be allowed.
    d. In instances where the Department puts an item of equipment into full productive service prior to final acceptance, the warrantee shall still be extended to at least one year past final acceptance. However, the Department will reimburse the Contractor for the

prorated cost of the extended warrantee from the time when the equipment was placed in full productive service to the date of final acceptance based upon the manufacturer's invoice to the Contractor for this cost. Only the warrantee cost will be reimbursed, no overhead or other costs will be allowed.

5.00.1 SHOP DRAWINGS

A. General

1. The Department has established a "Pre-Approved Product List" for products that are to be used in the construction of water and sewer facilities. The "Pre-Approved Product List" lists manufacturer's product models that are pre-approved by the Department to meet the minimum requirements established in the Department's design and construction standards and specifications.

   However, not all products that may be used in the construction of water and sewer facilities that meet the Department's design and construction standards and specifications are listed in the "Pre-Approved Product List." The "Pre-Approved Product List" is not an exclusive collection of all qualified and approved products.

   Contractors and suppliers can submit the "Pre-Approved Product List(s)" for the products that they intend to use in the construction of the water and sewer facilities for the Project. Products listed in the "Pre-Approved Product List" do not require the submittal of shop drawings to the Department.

   The "Pre-Approved Product List(s)" must be stamped, reviewed and initialed by the Contractor and by his engineer, if applicable, prior to submittal to the Department. A "Submittal Summary Sheet" must accompany all "Pre-Approved Product List" submittals.

   Both forms can be found in the Department website at www.miamidade.gov/water/pre-approved-product-list.asp.

2. For those products that are not on the "Pre-Approved Product List," the Contractor shall submit shop drawings as specified herein.
3. The Contractor shall use the "Miami-Dade Water and Sewer Department Document Control Services Transmittal Form," appended to these Specifications as Appendix "J," as a cover sheet for all submittals to the Department.

B. The Contractor shall submit "Pre-Approved Product List(s)" and/or shop drawings to the Engineer for approval in accordance with in accordance with Section 9 "Information and Drawings to be Furnished by the Contractor" of the General Covenants and Conditions, with the exception that no less than seven (7) copies shall be submitted.

C. It is the Contractor's sole responsibility upon the first occasion of submittal of a particular element of the work, to submit shop drawings of an element which match and fulfill the requirements and intent of the Plans and Specifications. 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. It is the intent of the Specifications that the Contractor shall, in the first instance, submit shop drawings of elements which meet or exceed the requirements of the Contract Documents and fit with the other elements of the work and the existing conditions. Activities such as those mentioned above, which are inimical to this intent will not be tolerated and may, at the sole discretion of the Engineer, subject the Contractor to costs for any delays, costs, damages or penalties suffered by County due to such activities to include but not be limited to; extra engineering and overhead costs together with any liquidated or actual damages.

D. 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 Project Number, the date and his signature and 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. Two copies 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 Department. When shop 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.

E. 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.

F. The approval of shop drawings and data will be general, and shall mean that upon examination of the shop 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.

G. Design calculations, drawings, and materials specifications shall be supplied. All Contractor's submittals requiring structural design shall be signed, dated and sealed by a Registered Professional Engineer licensed to practice in the State of Florida.

5.00.2 PROJECT RECORD DOCUMENTS

A. The Contractor shall maintain at the site one record copy of the following:
   1. Record Drawings as used herein shall mean a drawing that reflects construction or design changes.
   2. Record Specifications.
   3. Addenda.
   4. Change Orders and other modifications of the Contract.
   5. Engineer's written orders or instructions.

6. Approved "Pre-Approved Product List(s)" and/or Shop Drawings (including product data and samples).
7. Field test records.
8. Construction photographs.
9. Registered Professional Surveyor and Mapper (PSM) daily progress reports and/or field book notes.
10. As built dimensions and elevations as recorded by the Contractor's PSM licensed to practice in the State of Florida.

The records listed above are to be made available for the Engineer's review at all times for all projects.

B. Maintenance of Documents and Samples:
1. Maintain documents in a clean dry, legible, condition and in good order. Do not use record documents for construction purposes.

C. Records:
1. During the life of the Contract the Contractor shall retain the services of a PSM who shall maintain daily records of the installation, including all deviations from Plans and Specifications and for the purposes of preparing and submitting to the Department an as-built/record survey in compliance with:
   a. Florida Statutes Chapter 472.027.
   b. Florida Administrative Code Chapter 5J-17.050, 5J-17.051 and 5J-17.052.
   c. As further required by these Contract Documents.

2. Measure and Record all information required in Subsection A above for all projects concurrently with construction progress.
3. Submit redlines, partially completed as-built plan sheets and fully complete as-built Plan sheets, all as required by and satisfactory to, the Engineer as a prerequisite for the acceptance of monthly payment applications.
4. Label each document "PROJECT RECORD" in neat large printed letters.
5. Do not conceal any work until as-built information is recorded by the Contractor's PSM and, if so required, by the Department surveyor.
6. All locations for future connections or tie-ins shall be left unburied and uncovered until the Contractor's PSM measures and records the as-built information.
   a. All as-built and inspector information is to be made available to the Engineer on a daily basis for inclusion in the Department's records.

7. Restrained pipe, end line valves, thrust blocks shall be left uncovered for the last complete length. In line valves and tees shall be left exposed for one length on both sides plus the face end. Measure and record the elevation, horizontal and vertical alignment, and inclination for these items.
8. For all projects, the Contractor's PSM shall maintain exact and extensive records of any deviations from the Plans or Specifications. These records shall be satisfactory to the Engineer, whose decision shall be final, and sufficient to allow the production of accurate as-built Plans which correctly and completely portray the work as constructed.

9. For all projects, the Contractor's PSM shall record data as follows during the entirety of construction.
    a. For facility (e.g. a water or sewage plant, pump station, or similar site if so designated by the Department) projects, record as-built dimensions and elevations every 25 feet or portion thereof along the pipeline and at every abrupt change in direction of the new line.
    b. For pipeline projects, constructed in the public right-of-way dimensions and elevations every 100 feet or portion thereof along the pipeline and at every horizontal and vertical change in direction.
    c. In all cases record locations and elevations for each valve, fitting, service line, fire hydrant, water sampling point, utility poles adjacent to the proposed line, overhead wires crossing the ditch line (approximate height above grade) and other appurtenances along the pipeline.
    d. The identity, dimensions, location and elevation of any existing utility crossing the proposed line and immediately adjacent to the new line as to be exposed by the excavation shall also be recorded. Locate, excavate expose and record the same data for any utility shown in the plans whose proximity to the proposed pipeline could affect the certification requirements of the new installation. Note that in instances of a very wide ditch due to ground conditions the recording of data for adjacent, paralleling, utilities shall only be required for lines which come within 3' of the outside of the pipe being installed unless otherwise ordered by the Engineer whose decision shall be final.
    e. Without exception, for all thrust blocks, the top elevation, outer dimensions, thickness of the block, length and location of any sheet piling, if used, shall be recorded by the Contractor's PSM.
    f. Specific locations and elevation of equipment, the buildings and miscellaneous items installed inside them shall be recorded as applicable and as required by the Engineer.
    g. Without exception, where the substitution of another piece of equipment for that shown on the Plans has been allowed, the footprint, clearance and elevation dimensions shall be recorded by the Contractor's PSM and these changes shall be accurately and thoroughly portrayed on the as-built plans.
    h. The Contractor's PSM shall prepare from the field data, as-built record drawings showing correctly, completely and accurately the installation, embracing all changes and deviations made during construction, including all construction variances, to reflect the work as it was constructed.
    i. Record Drawings shall be prepared as specified herein.
    j. If the Engineer determines that the drawings are not acceptable, they will be returned to the Contractor with a cover letter noting the deficiencies and/or reasons for the disapproval. Contractor shall have ten calendar days to correct all exceptions taken by the Engineer and resubmit as-built record drawings to the Engineer for final acceptance.

D. Drawings:
1. During the life of the Contract, maintain records of all deviations from the Plans and Specifications and prepare therefrom As-Built Record

Drawings showing correctly and accurately all changes and deviations made during construction to reflect the work as it was actually constructed. It is the responsibility of the Contractor to check the As-Built Record Drawings for errors and omissions prior to submittal to the Department and certify in writing that the As-Built Record Drawings are correct and accurate, including the actual location of all piping including building exposed and internal piping, electrical/signal conduits in or below the concrete floor, Indicate the size, depth and voltage in each conduit.

2. Legibly Mark to Record Actual Construction: All data as previously specified for all installations by the Contractor's PSM. For on-site structures and facilities work the Contractor's PSM shall record:
   a. Depths of various elements of foundation in relation to finish first floor and datum plane.
   b. All exposed and underground piping and ductwork with elevations and dimensions and locations of valves, pull boxes, etc. Changes in location. Horizontal and vertical locations of underground utilities and appurtenances, measured from permanent reference points, plant survey grids, property lines and similar.
   c. Location of internal utilities and appurtenances concealed in the construction shall be referenced to visible and accessible features of the structure. Air conditioning ducts with locations of dampers, access doors, fans and other items needing periodic maintenance.
   d. Field changes in dimensions, locations and details.
   e. Changes made by Engineer's written instructions or by Change Order.
   f. Details not on original Plans.
   g. Equipment and piping relocations.
   h. Major architectural and structural changes in structures, including tanks.
   i. Architectural schedule changes according to Contractor's record and shop drawings.
   j. Record drawings shall be prepared as specified herein.

3. Specifications and Addenda: Legibly mark each section to record the following:
   a. Manufacturer, trade name, catalog number and supplier of each product and item of equipment actually installed.
   b. Changes made by Engineer's written instructions or by Change Order.

4. Approved Shop Drawings: Provide record copies for system diagrams and drawings together with each element of process equipment, piping, electrical system and instrumentation system.

E. Submittals:
   1. Accompany submittal with transmittal letter in duplicate, containing:
      a. Date
      b. Project title and number
      c. Contractor's name, address and phone number
      d. Title and number of each Record Document
      e. Signature of Contractor or his authorized representative.
      f. The Contractor shall use the "Miami-Dade Water and Sewer Department Document Control Services Transmittal Form,"

appended to these Specifications as Appendix "J," as a cover sheet for all submittals to the Department.

2. Record Drawings with five blue line copies, which have been signed, dated and sealed by a PSM, shall be submitted to the Department for the Engineer's review. Drawings shall conform to recognized standards of drafting and the minimum technical standards as set forth by the Board of Professional Surveyors and Mappers, shall be neat, legible and on 24" x 36" mylar. These materials shall be submitted to the Department for the Engineer's review as a prerequisite for payment during the course of construction as previously specified and final, complete sets of documents within ten calendar days following the completion date of successful testing of all mains, equipment and appurtenances under this Contract. Final payment will not be made until the set of as-built record drawings and five sets of blue-line prints have been approved and accepted by the Engineer.
   a. In cases where a portion of a pipeline system or parts of a process system are put into service, the above conditions shall apply for the in-service portion and monthly payments shall be withheld until the as-built drawings are accepted by the Engineer.
   b. As-Built Record Drawings, as prepared by the Contractor's PSM and submitted by the Contractor, shall comply with following criteria and standards:
      1) Title block must show the Contract or Project Title (as applicable); Contract number; Department ER number; Contractor's name; PSM's name and address; date; location; and where appropriate to the work, size and type (i.e. water main, sanitary gravity main, sanitary force main) of main.
      2) Baselines or centerlines must be tied to Section corners, monument line and right-of-way lines.
      3) Pipeline must be tied to baseline or centerline with stations and offsets.
      4) Baselines or centerlines must show bearings or deflection angles, or delta, radius, chord and arc length for curves.
      5) Show all horizontal curve data, including point of curvature (PC) and point of tangency (PT) stations or radial bearing.
      6) Stationing must be the same as shown on the Plans and must be tied to Section corners, centerline intersections and all other pertinent control points within the Project. All such pertinent points shall have their stationing shown and where there is dual stationing for a point, both stations shall be called out.
      7) Identify all streets by name or number and show stationing at all intersecting streets.
      8) Refer to vertical datum plane and identify the location, elevation and source supplying the bench mark used.
      9) Tie easement lines to survey baseline or platted centerline and right-of-ways.
      10) Show horizontal and vertical locations of all fittings, deflections, or at any significant change of direction, and at a maximum of 100 foot intervals along the pipeline for off-site (e.g. in the public right-of-way) and at maximum 25

foot intervals for on-site (e.g. on a facility such as a pump station or plant) work.

11) On all pipe fittings of 36-inch diameter or over, (i.e. tees, bends, crosses, wyes, increasers/decreasers, bevels) elevations must be taken at the end and center points to reflect the true elevation and attitude of the fitting.
12) Elevations of natural ground or pavement over the pipeline must be shown at each position where the pipe elevation is shown and at intervening high and low points.
13) Manhole rim and valve box rim elevations must be shown.
14) Show all invert and bottom elevations in manholes and valve vaults or boxes. Show all invert and bottom elevations together with pipe size, and where it can be determined, pipe material, for existing structures having pipes which cross the pipeline being constructed.
15) Locations and elevations together with diameter, thickness and material of all casings.
16) Location, top and bottom elevations of all sheeting left in place.
17) Coordinate values used inside plants shall be the local, Department established coordinate systems referenced to the property boundary.
18) State plane coordinate values for all new valves and manholes; on existing valves and manholes at points of connection or closest to the point of connection and the point of connection itself.

c. Certification: The Contractor shall certify on as-built record drawings all other actual constructed details and information as may be required by the Department including but not limited to:

1) Pipeline must be identified by type of pipe material, manufacturer, type of joint and type of joint restraint.
2) Valves must be identified by size, type, end condition; and on valves 16 inches or larger, the manufacturer's name and number of turns required to open or close the valve.
3) Show calculated pipeline percent of grade between manholes of gravity systems.
4) Types and sizes of sheeting and piling together with measured and complete; location, dimensional and elevation data on any pile caps, tie backs, anchors, whalers or other appurtenant structures left in place.

3. Drawings on Magnetic Media: The Department reserves the right to require submittal of as-built drawings in AutoCAD for Windows Release 14 format or later. Graphical information contained on magnetic media shall be the same as provided on plan sheets. Magnetic media shall be delivered to the Department's Construction Manager Document Control office, Miami-Dade Water and Sewer Department at 3575 S. LeJeune Road, Miami, Florida 33146 or by mail at P.O. Box 330316, Miami, Florida 33233-0316. A letter of transmittal shall be provided, containing a list of all files and data being provided.

5.00.3 PROJECT SCHEDULING

A. General:

1. Develop and submit for approval by the Department a construction progress schedule and phasing plan demonstrating complete fulfillment of all Contract requirements including all activities of Subcontractors, equipment vendors and suppliers. Unless otherwise directed by the Engineer, the construction progress schedule shall be computer developed and maintained using Microsoft Project software as manufactured by Microsoft Corporation, or equal. The Contractor shall prepare a network plan utilizing CPM (Critical Path Method). The Department reserves the right to request progress schedule on magnetic media.

B. Submittal:

1. The progress schedule shall be plotted on 11" x 17" paper and shall be revised and updated monthly, depicting progress through the last day of the current month and scheduled progress through completion. Six up to date copies of the schedule shall be submitted along with the application for monthly progress payments for the same period.
2. Immediately after award of contract, submit for review the progress schedule describing the activities to be accomplished and their dependency relationships, showing starting and completion dates for each activity in terms of the number of days after receipt of Notice to Proceed. All completion dates shown shall be within the period specified for Contract completion.
3. After receipt and initial review, the Engineer will meet with the Contractor for joint review, correction or adjustment of the proposed plan and schedule. Within five calendar days after the joint review, the Contractor shall revise the schedule in accordance with agreements reached during the joint review and shall submit two copies of the revised schedule. After the Contractor has received both the Notice to Proceed and the approved copy of the schedule, he shall immediately add calendar dates in lieu of the number of days from the date of Notice to Proceed and shall furnish two copies of the revised schedule to the Engineer.

C. Schedule Requirements:

1. Show the sequence and interdependence of activities required for complete performance. In preparing the schedule, break up the work into activities of a duration of no longer than fifteen working days each, except as to non-construction activities (such as procurement of materials, delivery of equipment and concrete curing) and any other activities for which the Engineer may approve the showing of longer duration. The schedule shall show the activities for actual construction work for each trade category of the Project. The Contractor is to include a schedule of submittals of shop drawings, equipment schedules, coordination drawings, templates, fabrication, delivery and the like, and review and approval of shop drawings. Activities related to a specific physical area of the Project shall be grouped on the schedule for ease of understanding and simplification. Activity duration (i.e. the single best estimate, considering the scope of the activity, and the resources planned for the activity) shall be shown on each activity on the diagram. To the extent that the schedule or any revised schedule shows anything not jointly agreed upon or fails to show anything jointly agreed upon, it shall not be deemed to have been approved by the Engineer. Failure to include any element of work required for the performance of this Contract shall not

excuse the Contractor from completing all work required within any applicable completion date, notwithstanding the Department's approval of the schedule.

2. Include a cost estimate for each activity which cumulatively equals the total Contract cost. Estimated overhead and profit shall be prorated throughout all activities. The partial payments as defined under the General Conditions will be based on these approved activity costs.
3. With each request for a partial payment, submit a copy of the schedule marked to show the activities completed and partially completed, for which payment is requested.
4. The Contractor is advised that, if the work of this project includes work in the public right of way, that work may be shut down by the roadway governing authority during the period from the beginning of the Thanksgiving holiday through the end of the New Year holiday or some portion(s) of that period. Unless otherwise specifically called out herein, or granted by the Engineer In writing, no extension of Project will be allowed due to such a shutdown. If any extension of time is allowed, it will be a non-compensable nature. All costs of such a shutdown including any demobilization/re-mobilization costs shall be the sole responsibility of the Contractor and no extra compensation will be allowed. Upon ending of any such shutdown, the Contractor shall immediately resume construction operations unless otherwise ordered by the Engineer in writing.
5. The Contractor shall fully comply with any special working hours, and with all other requirements of the Permits, at no additional cost to the Department. Working hours noted in permits or the specifications are subject to change. In the event that changed working hours effects the work of the Contractor, the Contractor's sole remedy shall be a non-compensable time extension. Said extension to be full compensation for all direct and indirect costs, including but not limited to loss of efficiency, loss of opportunity, increased bond or insurance premiums, or home office or extended overhead, incurred by the Contractor as a result of such change, and no additional compensation shall be considered. Night work may be required as a part of the construction.

D. Progress Meetings:

1. General progress meetings will be held once each week at which every entity then involved in the planning, coordination and performance of work shall be discussed. The progress of each element of current work shall be discussed as to whether it is ahead of schedule, on time or behind time in relation to the updated progress schedule. For each meeting, the Contractor shall prepare a detailed three week "look ahead" schedule in addition to, showing the progress schedule of the previous week. Methods to expedite behind-time work shall be determined and commitments secured for bringing back to the scheduled date for the entities involved. Everything of significance which could affect the progress of the work, including schedule revisions, shall be discussed to ensure that current and subsequent work will be completed within the Contract time. Within three days after each meeting, copies of the minutes of the meeting, including a brief summary of progress of the work since the previous meeting, shall be distributed to each present or who should have been present. Whenever revisions to the progress schedule have been made or recognized at the progress meeting, a copy of the revised schedule shall accompany the minutes distributed.

2. Each computer-generated construction progress schedule and report shall include the following minimum items:
   a. Activity Numbers
   b. Estimated Duration
   c. Activity Description
   d. Early Start Date (Calendar Dated)
   e. Early Finish Date (Calendar Dated)
   f. Latest Allowable Start Date (Calendar Dated)
   g. Latest Allowable Finish Date (Calendar Dated)
   h. Status (whether critical)
   i. Estimated Cost of the Activity
   j. Total Float and Free Float

3. In addition, each construction progress schedule, network analysis and report shall be prefaced with the following summary data:
   a. Contract Name and Number
   b. Contractor's Name
   c. Contract Duration
   d. Contract Schedule
   e. The Effective or Starting Date of The Schedule (the date indicated in the Notice-to-Proceed)

4. The work day to calendar date correlation shall be based on an 8-hour day and 40-hour week with adequate allowance for holidays, adverse weather and all other special requirements of the work. Normal work hours are Monday through Friday, 7:30 am to 4:30 pm.
5. If the Contractor desires to make changes in his method of operating which affect the construction progress schedule and related items, he shall notify the Engineer in writing stating what changes are proposed and the reason for the change. If the Engineer accepts these changes, in writing, the Contractor shall revise and submit, without additional cost to the Department, all of the affected portions of the construction progress schedule, and associated reports. The construction progress schedule and related items shall be adjusted by the Contractor only after prior acceptance, in writing by the Engineer. Adjustments may consist of changing portions of the activity sequence, activity durations, division of activities, or other adjustments as may be required. The addition of extraneous, non-work activities and activities which add restraints to the construction progress schedule shall not be accepted.
6. Except where earlier completions are specified, schedule dates which show completion of all work prior to the Contract completion date shall, in no event, be the basis for claim for delay against the Department by the Contractor.
7. Construction progress schedules and related items which contain activities showing negative float or which extend beyond the Contract completion date will not be accepted by the Engineer.
8. Whenever it becomes apparent from the current construction progress schedule and associated reports that delays to the critical path have resulted and the Contract completion date will not be met, or when so directed by the Engineer, the Contractor shall take some or all of the following actions at no additional cost to the Department. They shall submit to the Engineer for approval, a written statement of the steps they intend to take to remove or arrest the delay to the critical path in the current construction progress schedule.

a. Increase construction manpower in such quantities and crafts as will substantially eliminate the backlog of work.
b. Increase the number of working hours per shift, shifts per day, working days per week, the amount of construction equipment, or any combination of the foregoing, sufficiently to substantially eliminate the backlog of work.
c. Reschedule activities to achieve maximum practical concurrence of accomplishment of activities, and comply with the revised schedule.

9. If when so requested by the Engineer, the Contractor should fail to submit a written statement of the steps they intend to take or should fail to take such steps as reviewed and accepted in writing by the Engineer, the Engineer may direct the Contractor to increase the level of effort in manpower (trades), equipment and work schedule (overtime, weekend and holiday work, etc.) to be employed by the Contractor in order to remove or arrest the delay to the critical path in the current construction progress schedule, and the Contractor shall promptly provide such level of effort at no additional cost to the Department.
10. If the completion of any activity, whether or not critical, falls more than 100 percent behind its previously scheduled and accepted duration, the Contractor shall submit for approval a schedule adjustment showing each such activity divided into two activities reflecting completed versus uncompleted work.
11. Shop drawings which are not approved on the first submittal or within the time scheduled, and equipment which does not pass the specified tests and certifications shall be immediately rescheduled.
12. The Contract time will be adjusted only in accordance with the General Requirements and other portions of the Contract Documents as may be applicable. If the Engineer finds that the Contractor is entitled to any extension of the Contract completion date, the Engineer's determination as to the total number of days extension shall be based upon the current construction progress schedule and on all data relevant to the extension. Such data shall be included in the next updating of the schedule and related items. Actual delays in activities which, according to the construction progress schedule, do not affect any Contract completion date will not be the basis for a change therein.
13. From time to time it may be necessary for the Contract schedule of completion time to be adjusted by the Department in accordance with the General Requirements and other portions of the Contract Documents as may be applicable. Under such conditions, the Engineer will direct the Contractor to reschedule the work or Contract completion time to reflect the changed conditions, and the Contractor shall revise the construction progress schedule and related items accordingly, at no additional cost to the Department.
14. Available float time may be used by the Department through the Department's Engineer.
15. The Department controls the float time and, therefore, without obligation to extend either the overall completion date or any intermediate completion dates the Department may initiate changes that absorb float time only. Department initiated changes that affect the critical path on the network diagram shall be the sole grounds for extending the completion dates. Contractor-initiated changes that encroach on the float time may be accomplished only with the Department's concurrence. Such

changes, however, shall give way to Department-initiated changes competing for the same float time.

16. To the extent that the construction project schedule, or associated report or any revision thereof shows anything not jointly agreed upon or fails to shown anything jointly agreed upon, it shall not be deemed to have been accepted by the Engineer. Failure to include on a schedule any element of work required for the performance of this Contract shall not excuse the Contractor from completing all work required within any applicable completion date, notwithstanding the review of the schedule by the Engineer.
17. Review and acceptance of the construction progress schedule, and related reports, by the Engineer is advisory only and shall not relieve the Contractor of the responsibility for accomplishing the work within the Contract completion date. Omissions and errors in the construction progress schedule, and related reports shall not excuse performance less than that required by the Contract and in no way make the Engineer an insurer of the Contractor's success or liable for time or cost overruns flowing from any shortcomings in the construction progress schedule, and related reports.
18. The Contractor shall present and discuss the proposed schedule at the preconstruction conference.
19. The construction progress schedule shall be based upon the precedence diagramming method of scheduling and shall be prepared in the form of a horizontal bar chart showing in detail the proposed sequence of the work and identifying all construction activities included but not limited to yard piping, all structures and treatment units and all related work specified herein to be performed under the Contract. The schedule shall be time scaled, identifying the first day of each week, with the estimated date of starting and completion of each stage of the work in order to complete the Project within the Contract time. The Project critical path shall be clearly identified.

E. Daily Reports:

1. Prepare and submit to the Engineer at regular intervals not exceeding weekly intervals, a daily report recording information concerning events at the site. The daily reports shall contain the following and any other significant information:
    a. General weather conditions, rain, high/low temperatures.
    b. List of Subcontractors on site.
    c. List of separate contractors at the site, if any.
    d. Meetings and significant decisions.
    e. Stoppages, delays, shortages, losses.
    f. Emergency procedures, field orders.
    g. Orders/requests by governing authorities.
    h. Other events or activities.
    i. Partial completions.

5.01 CASTINGS

A. General:

1. Materials used in the manufacture of the castings shall conform to ASTM A48 "Gray Iron Castings," for Class 30 iron. Castings shall be non-rocking. Manhole and valve box covers shall have a roadway type surface and machined mating surface.

2. Shop drawings shall be furnished for all castings supplied and said drawings shall include certified dimensions and weights of all components. Dimensions shall conform with Department Standard Detail requirements.
3. Finish casting dimensions shall be held to the following tolerances: Up to 4", ±1/32"; 4" to 8", ±3/64"; 8" to 12", ±1/16"; 12" to 24" ±1/8"; above 24", add the appropriate (minimum) value from those given above to ±1/8". Note that this shall not affect the requirement that mating surfaces shall be machined and shall bear for their full length. Components shall be interchangeable with new and existing units without exceeding the tolerance add up specified above.
4. Weight of castings supplied shall not vary more than ±5 percent from the certified weight supplied by the Contractor as a part of his shop drawings.
5. The foundry's name (and if not domestically produced, foundry's name and country) shall be cast in the bottom of each lid. Body and lid or frame and cover shall be manufactured by the same foundry. Manufacture of the various components comprising one set, such as for example; a valve box and lid, by different manufacturers is expressly forbidden.
6. Note that name cast into the bottom of the lid shall be the name of the actual foundry doing the casting. Name of an importing, purchasing or fabricating (from components) firm will not be acceptable. Methods of attaching this information other than casting are not acceptable.
7. Each shipment of castings provided by the Contractor shall be accompanied by a certification specifically stating that the materials of that shipment comply with all requirements of this Specification, specifically including dimensions and tolerances, materials of manufacture, weights of components, marking and foundry of origin. This certification shall be signed, dated and sealed by a registered professional engineer licensed to practice in state where the materials are cast or if not of domestic manufacture in the state where the supplying firm is located.
8. Bidders should be aware that it is the intent of the Department to periodically check materials supplied for conformance to these specifications to include materials testing, dimensions and tolerances, component weights, marking, finish and fit, and such other matters as are necessary to assure supply of products meeting our requirements. Random testing of materials supplied will be at Department expense if passed. Any retesting due to material not passing tests will be at the supplier's expense.
9. Finish painting of castings is not required at this time and the required finish is shot blasting only.
10. Castings shall be as manufactured by U.S.F. Fabrication, Inc. (U.S.F.), Neenah Foundry Co., or approved equal.

B. Valve boxes and valve box covers:
1. For all water main line valves, air release devices and flushing valve outlets shall be Department No. 3 in accordance with Department Standard Details. For use with fire hydrants, service lines, by-pass valves and fire line valves shall be Department No. 2 in accordance with Department Standard Details. Valve box covers shall be cast labeled with the letter "W".

C. Meter Boxes and Covers:
1. Per Department Standard Details by U.S. Precast, or approved equal.

D. Manhole Frames and Covers

1. Manhole frames and covers shall be U.S. Foundry Model No. USF 679 with AZ Cover (Heavy Duty), or approved equal. Cover shall be a roadway cover and shall be cast labeled "WATER".

5.02 CONCRETE, MORTAR AND GROUT

A. General:

1. All concrete work shall be constructed in accordance with all of the applicable provisions of Section 03300 "Cast-in-Place Concrete, Reinforcing and Formwork" included herein as an Attachment to the Specifications, except as hereinafter specified.
2. All concrete exposed to potential sewage gas shall be Type II Portland Cement, and all other concrete shall have either Type I or Type II Portland Cement.
3. All reinforced concrete shall have a minimum design strength of 4,000 psi, a minimum content of 564 pounds of Portland cement per cubic yard, and a water-cement ratio which will produce a slump of 4 inches plus or minus 1 inch.
4. Non-reinforced concrete for sidewalk, concrete and curb and gutter repairs, if required, shall have a minimum design strength of 3,000 psi, a minimum content of 517 pounds of Type I Portland cement per cubic yard, and a water-cement ratio which will produce a slump of 4 to 6 inches.
5. Non-reinforced concrete for thrust blocks shall have a minimum design strength of 2,500 psi, a minimum content of 470 pounds of Type I Portland cement per cubic yard and a water-cement ratio which will produce a slump of 4 to 6 inches.

B. Concrete:

1. Cement:
   a. Shall be a standard brand of Portland cement manufactured within the continental limits of the United States. It shall meet the requirements of ASTM C150 "Portland Cement," Type I and Type II.
   b. The Contractor shall provide suitable means for storing and protecting the cement against dampness. Bags of cement which for any reason may become partially set, or which contain lumps of caked cement, shall be rejected. In no instance shall any portion of a bag of damaged cement, or a bag containing lumps of caked cement, be used. Cement salvaged from discarded or used sacks shall not be used. Different brands of cement, even if tested and approved, shall not be mixed during use, nor used alternately in any section of the work without written permission of the Engineer.

2. Fine Aggregate:
   a. Shall consist of sand or stone screenings, composed of hard durable grains, having not more than three percent (3%) by weight of foreign matter, such as loam clay, dirt or other impurities, and shall be free from injurious amounts of organic impurities.

b. When subjected to the calorimetric test for organic impurities and producing a color darker than the standard No. 2 color, it shall be rejected unless it passes the mortar strength test.

c. When subjected to the mortar strength test, shall have tensile and compressive strengths at the end of seven (7) and twenty-eight (28) days, not less than 100 percent of those developed by mortar of the same proportions and consistency, made of the same cement and standard Ottawa sand.

d. When tested by means of laboratory sieves shall conform to the following requirements:

Size Sieve	Percent Passing
3/8"	100
No. 4	90 to 100
No. 8	70 to 95
No. 16	50 to 85
No. 30	30 to 70
No. 50	10 to 45
No. 100	0 to 10

e. Subsequent samples of fine aggregate shall have a fineness modulus varying not more than 0.20 either way from that of the initial sample submitted by the Contractor, when determined by ASTM methods.

f. Fine aggregate from more than one source shall not be mixed nor used alternately in the construction without written permission from the Engineer.

3. Coarse Aggregate:

a. Shall consist of gravel, broken stone or local limerock.

b. It shall be free from adherent coatings, and the amount of contained deleterious substances shall not exceed the following:

Contained Deleterious Matter Percentage by Weight	
Removed by decantation	1.0
Shale	0.5
Coal	0.5
Soft fragments	3.0
Other local deleterious substances such as alkali, friable, thin elongated or laminated pieces	3.0
Total shale, coal, clay lumps and soft fragments	3.0

c. Tests for impurities shall be made in accordance with applicable methods of the American Society for Testing and Materials.

d. Shall have a loss of not greater than forty (40) percent when tested in accordance with ASTM C131 "Resistance to Degradation of Small Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine."

e. Unless otherwise specified, shall meet the following gradation requirements:

Size Sieve	Percent Passing
1-1/2"	100
1"	95 to 100

1/2"	25 to 60
No. 4	0 to 10
No. 8	0 to 6

f. Sieve sizes and tests for gradation of fine and coarse aggregate shall be in accordance with applicable specifications of the American Society for Testing and Materials.

g. Coarse aggregate from more than one source shall not be mixed or used alternately in the construction without written permission of the Engineer.

4. Mixing Water:

a. Water used in mixing the concrete that is not in the form of surface moisture on the aggregate shall be from the Department water supply or other approved source.

C. Ready-Mixed Concrete:

1. The Contractor will be permitted to use concrete from a ready-mix concrete plant provided he submits the name of the company to the Engineer for approval, and no concrete shall be placed in the work until such approval has been obtained.
2. Concrete obtained from a ready-mix plant shall conform to the requirements of these Specifications, and to all applicable portions of ASTM C94 "Ready-Mixed Concrete."

D. Mortar:

1. Mortar shall be composed of one part of Type II Portland cement to three parts of sand, with sufficient lime putty added to secure workability.
2. In no case shall the lime putty exceed 10% of the cement used.

E. Grout:

1. Cementitious grout shall be composed of one part of Type II Portland cement to three parts of sand.
2. Nonshrink, nonmetallic grout shall be Five Star Special Grout 150, Five Star Products, Inc.; Grout F-100, Sauereisen Cement; Masterflow 713, BASF Building Systems; NS Grout, Euclid Chemical Company, pre-mixed type, or approved equal.
3. Nonshrink metallic grout shall be Embeco 636 Plus Grout, BASF Building Systems, pre-mixed type, or approved equal.
4. Nonshrink hydraulic cement grout shall be Waterplug, Thoro Products, BASF Building Systems, or approved equal.
5. Nonshrink epoxy grout shall be Five Star HP Epoxy Grout, Five Star Products, Inc., available from Coastal Construction Products, Inc. or Wall-Nu Trowelable, Steelcote Manufacturing Co., available from Florida Wire and Rigging Works, or approved equal.

F. Specifications for cement and sand for mortar and grout shall be the same as those for concrete.

5.03 FIRE HYDRANTS

A. Fire hydrants shall conform with the requirements of ANSI/AWWA C502-85, "Dry Barrel Fire Hydrants," as modified herein; the Miami-Dade County Fire Flow Ordinance and the Miami-Dade County Fire Department. Hydrants installed

within the limits of the City of Miami shall conform to that fire department's standards.

B. The hydrants shall have the following features:

1. All hydrants shall meet the flow requirements of Section 2-103.21(B), Miami-Dade County Code. A certification for compliance with this standard must be available if requested.
2. Type of shutoff shall be compression type closing, with the line pressure, and a minimum 5-1/4-inch valve opening.
3. Barrels - Upper barrel with breakaway-from-lower-barrel feature shall be designed with a breakable safety connection of the flange and collar bolt-connected type joining the two barrels together. Lower barrel shall be of the same material as the hydrant shoe (inlet connection), and shall be designed so that the barrel can be removed from the hydrant shoe when the shoe (and valve) are under pressure. The drain outlets normally provided shall be omitted.
4. Main valve stem - Upper stem shall have breakaway-from-lower-stem feature. Top of the lower stem shall be below the top of the lower barrel to prevent a vehicle tire from depressing the stem and opening the valve, or damaging both lower stem and lower barrel. Stem and seat removal shall be easily accomplished from the upper part of the lower barrel or the upper barrel.
5. Main valve seat ring shall be bronze threaded into a fixed bronze bushing and shall be equipped with upper and lower O-ring seals, the lower of which shall seal against the hydrant elbow.
6. Sealed lubricant reservoir shall provide lubrication to all threaded and bearing surfaces automatically, and shall be located in the bonnet. All hydrants shall be supplied with factory pre-lubrication.
7. Inlet connection - Side inlet, 6-inch mechanical joint.
8. Delivery classification - Two (2) hose and one (1) pump nozzle 18 inches above ground (bury line).
9. Hose and pumper nozzles:
    a. Threaded, with O-ring seal, and the nozzle retained by stainless steel screws, or a left hand thread lug, slot and pipe plug lock system.
    b. Hose nozzle diameter shall be 2-1/2 inches, and threads shall be in accordance with American National Standard.
    c. Pumper nozzle:
        1) "Miami-Dade County Standard" shall have 4 and 1/2-inch diameter threads conforming to American National Standard.
        2) "City of Miami Standard" shall be 4-inch inside diameter, 4 and 47/64-inch outside diameter of threads, 7 threads per inch, 0.143 inch pitch, right hand, V-form threads.
10. Bury length shall be as shown on the Plans or specified elsewhere herein.
11. Operating and cap nuts:
    a. "Miami-Dade County Standard" shall be bronze to bronze, pentagonal, National Standard 1-1/2 inch point to flat, with operating nut weather cap.
    b. "City of Miami Standard" shall be bronze to bronze, pentagonal, National Standard 1-1/8-inch point to flat, with operating nut weather cap.

12. Stuffing box - O-ring pressure seal.
13. Direction to open shall be counterclockwise.
14. Markings - Hydrants shall be cast marked or outside design shall be such that visible identification can be made as to manufacturer model (type). In addition, all hydrants approved as a "special" or "modified" hydrant shall be cast marked "Miami-Dade County, Florida."
15. Color shall be chrome yellow.
16. Harnessing lugs and nozzle cap gaskets will not be required.
17. Nozzle cap chains will not be required on the "Miami-Dade County Standard" hydrants; however, they will be required on the "City of Miami Standard" hydrants.

B. The hydrants shall be the standard product of a manufacturing firm which has been engaged in the production of fire hydrants for a period of at least five years.

C. The hydrants shall be one (1) of the following models approved by the Miami-Dade County Fire Department:

	Model	Manufacturer
1.	A423 Centurion	Mueller Company
2.	K81-MD (per Kennedy Drawing No. 80783 MD, Rev. 05)	Kennedy Valve
3.	Medallion #F2545	Clow Valve
4.	5-1/4" B-84-B	American-Darling Co.

5.04.1 PIPE AND FITTINGS - DUCTILE IRON

A. General:

All pipe and fittings to be furnished hereunder shall conform to the referenced ANSI and/or AWWA Standard as modified herein, as appearing in the following sections.

All markings required on pipe and fittings, shall be clearly legible and located such that they will not be hidden or destroyed when assembled into the intended system. Plainly mark each length of straight pipe and each fitting at the bell end to identify the design pressure class, the wall thickness, and the date of manufacture, and the proper location of the pipe item by reference to the layout schedule. Mark the spigot end of restrained joint pipe to show clearly the required depth of insertion into the bell.

B. Pipe:

All pipe shall be ductile iron pipe conforming to ANSI/AWWA C151/A21.51-09, "Ductile-Iron Pipe, Centrifugally Cast, for Water." All pipe and fittings for water applications shall be in full compliance with ANSI/NSF 61, "Drinking Water System Components-Health Effects." Manufacturers shall maintain their NSF certification for the duration of the Contract and any extensions thereof.

The pipe thickness and outside diameter of pipe for sanitary sewer and water usage shall conform to Tables 1 and 2 (for push-on and mechanical joint pipe, respectively) of ANSI/AWWA C151/A21.51-09 for the following sizes (The pressure class specified is the minimum permitted):

Size	Pressure Class
4-inch through 12-inch	350
14-inch through 20-inch	250
24-inch	200
30-inch through 54-inch	150

For restrained joint pipe, the thickness of the pipe barrel remaining after grooves are cut, if required in the design of restrained end joints, shall not be less than the nominal wall thickness of equal sized non-restrained joint pipe as shown above.

Minimum pipe wall thickness required for corporation stops and tapped outlets shall be in accordance with Table A.1 of ANSI/AWWA C151/A21.51-09 for three full threads for design pressures up to 250 psi and four full threads for design pressures over 250 to 350 psi.

For flanged ductile-iron pipe with integrally cast flanges the nominal wall thickness of the pipe barrel shall be as specified in "Joints and Accessories" under "Flanged Joints," hereinbelow.

Minimum wall thickness for pipe having threaded flanges shall be Special Class 53 or Pressure Class 350.

Minimum wall thicknesses for pipe having grooved-end joints shall be as follows:

Size	Wall Thickness*
16-inch and smaller	Special Class 53
18-inch	Special Class 54
20-inch	Special Class 55
24-inch to 36-inch	Special Class 56
42-inch and larger	Special Class 53 or Pressure Class 350

*Special Class and Pressure Class per AWWA C151-09.

Each piece of pipe shall be marked as required in Subsection 4.7 of AWWA C151-09. Letters and numerals on pipe sizes 12-inch and smaller shall be not less than 3/8-inch.

The Department absolutely reserves the right to require the use of "thickness" class pipe or higher pressure class pipe in applications where, in the opinion of the Engineer, such use is in the best interest of the Department. The Engineer's decision in this regard shall be final.

A sufficient quantity of non-toxic vegetable soap lubricant shall be supplied with each shipment of pipe. The soap lubricant shall be suitable for use in subaqueous trench conditions.

The single gasket push-on pipe shall be shipped in standard 18-foot or 20-foot lengths, but not both. The restrained single-gasket push-on joint pipe shall be shipped in standard 18 or 20-foot lengths as specified above or fabricated lengths as noted in each order. At least two lengths of each size of single gasket push-on pipe furnished under each order shall be tested with circumferential gauges to insure that the pipe may be cut at any point along its length and have

an outside diameter which will be within the manufacturer's standard design dimensions and tolerances for plain pipe. These lengths shall be identified with an easily distinguished, painted marking, longitudinally along the full length of the pipe.

C. Fittings:

Fittings Conforming with ANSI/AWWA C110/A21.11-12 (Water & Sewer Use)
Restrained push-on joint fittings shall be cast ductile iron for use with ductile-iron pipe as specified above. Standard mechanical joint, push-on joint and flanged joint fittings shall also be ductile iron for use with ductile-iron pipe as specified above. Cast ductile-iron fittings in the 3-inch through 24-inch size range shall be pressure rated at 350 psi, minimum; (except flange-joint fittings shall be rated at 250 psi, minimum); and in the 30-inch through 48-inch size range shall be pressure rated at 250 psi, minimum. All fittings with mechanical joints, flange joints and push-on joints shall conform to ANSI/AWWA C110/A21.10-12, "Ductile-Iron and Gray-Iron Fittings, 3 in. Through 48 in., for Water and Other Liquids." In addition, fittings with mechanical joints and push-on joints shall conform to ANSI/AWWA C111/A21.11-12, "Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings."

The weight of fittings shall be as given in ANSI/AWWA C110/A21.11-12 for ductile-iron fittings. The weight of mechanical joint fittings shall be as established in Tables 4 through 13. The weight of flanged joint fittings shall as established in Tables 14 through 21.

Fittings Conforming with ANSI/AWWA C153/A21.53-11 (Water & Sewer Use)
All fittings shall be cast ductile-iron for use with ductile-iron pipe as specified above. Fittings in the 3-inch through 24-inch size range shall be pressure rated at 350 psi, minimum; 30-inch through 48-inch size range shall be pressure rated at 250 psi, minimum; and in the 54-inch through 64-inch size range shall be pressure rated at 150 psi, minimum (except for those fittings such as plugs, caps, and sleeves which are normally rated at a higher pressure). No flanged fittings or mixtures of flanged with other end type fittings will be allowed in the range of 3-inch through 48-inch. All fittings with mechanical joints, flange joints and push-on joints shall conform to ANSI/AWWA C153/A21.53-11, "Ductile-Iron Compact Fittings." In addition, fittings with mechanical joints and push-on joints shall conform to ANSI/AWWA C111/A21.11-12, "Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings" except as otherwise allowed in ANSI/AWWA C153. Mechanical joint glands shall be ductile-iron only. The weight of a fitting supplied under the contract shall not be less than ninety-five (95) percent of the tabulated nominal weight supplied by the manufacturer’s catalog literature for that fitting. Further, the weight of fittings supplied shall not be more than five (5) percent above the same tabulated nominal weight.

D. Joints and Accessories:

Joints in below-ground piping shall be flexible push-on or Mechanical joints, except where flanged joints are required to connect to valves, meters, and other equipment. Provide unrestrained buried joints except where restrained joints are specifically shown in the drawings. Joints in aboveground or submerged piping or piping located in vaults and structures shall be grooved end or flanged.

Restrained joints for piping 6 inches and larger shall be American Cast Iron Pipe "Lok-Ring" or "Flex-Ring," U.S. Pipe "TR-Flex," or approved equal. Weldments for restrained joints shall be tested by the liquid penetrant method per ASTM E165. Restrained joints for field closures shall be "Megalug" by EBAA Iron.

Push-On Type Joints (Single Gasket and Single Gasket with Gasket Restraint)
Push-on joints shall conform to ANSI/AWWA C111/A21.11-12, except that the gaskets for pipe and fittings shall be neoprene for sewer or vulcanized styrene butadiene rubber (SBR) for water.

The required number of gaskets for each push-on joint pipe plus one extra for every 50 joints or fraction thereof, shall be furnished with each order. The gaskets shall be shipped in suitable protective containers. All single gasket pipe shall be as manufactured by United States Pipe and Foundry Company (Tyton), by the American Cast Iron Pipe Company (Fastite), by McWane, Inc. (Mix of Tyton and Fastite), Tyler/Union (Tyton) or approved equal.

Push-on joints together with both their regular and gasket-restraint gaskets shall be of the design, dimensions and tolerances of either those provided by American Cast Iron Pipe Company (Fastite/Amarillo Fast-Grip) or those provided by United States Pipe and Foundry Company (Tyton/Field Lok). No other designs shall be acceptable.

The pressure rating shall be stamped on the restrained gasket. The restrained gasket and joint restraining system shall conform to ANSI/AWWA C111/A21.11-12 rated at the following (The pressure rating specified is the minimum permitted):

Size	Pressure Rating
4-inch through 12-inch	350
14-inch through 20-inch	250
24-inch	200
30-inch and above	150

The restrained gasket shall be manufactured a color other than black to allow for visual inspection of the pipeline. The restrained gasket color shall be consistent throughout the system and shall be inherent within the rubber, not painted.

Mechanical Joints
Mechanical joints for fittings shall conform to ANSI/AWWA C111/A21.11-12, except that the gaskets for each fitting shall be neoprene for sewer or SBR for water. Bolt holes for mechanical joints shall be equally spaced, and shall straddle the vertical centerline. Tee head bolts and hexagonal nuts for all mechanical joints in fittings shall be of high strength low-alloy steel with composition, dimensions and threading as specified in ANSI/AWWA C111/A21.11-12. Glands shall be of ductile-iron construction for ductile iron fittings, and cast gray iron or ductile iron for cast gray-iron fittings.

The proper number of gaskets, glands, bolts and nuts, all conforming to ANSI/AWWA C111/A21.11-12, plus one extra gasket for every 10 joints or fraction thereof, shall be furnished with each order. The gaskets and joint accessories shall be shipped in suitable protective containers. Follower glands

held in place with set screws will not be acceptable. Segmented glands will not be acceptable.

Mechanical Joint Megalug-Type Restraining Systems

In any mechanical joint or push on joint underground piping system of 30-inch nominal diameter and below this type of restraint may be utilized as design or field conditions dictate.

In sizes 36, 42 and 48-inch the prior written permission of the Engineer is required. In instances where written permission cannot be immediately obtained, verbal permission will be allowed but is to be confirmed in writing on the first business day following the substitution. If this type of restraint is used without permission or if permission is denied, the Contractor making the substitution shall be solely responsible for all costs, both direct and indirect, of immediately correcting the restraint system to the satisfaction of the Engineer.

Use of this type of restraint is restricted to underground mechanical joint or push-on joint applications and in general may not be used above grade or as a substitute for flanged joints. It is recognized that flange adapters of this type form a useful tool for adjusting lengths of flanged pipe runs in instances such as runs with a large number of deflections where it is almost impossible to predict all lengths correctly. Therefore, a very restricted number of these joints will be allowed in instances where it can be clearly demonstrated to the satisfaction of the Engineer that they are necessary. This application is restricted to 20-inch nominal diameter and below. Further, this use shall be designed in and shall not be made as a field substitution. In all instances flange adapters shall be rated for a minimum working pressure of 250 psi with a minimum safety factor of 2:1. In no case will these flange adapters be used as a general substitute for standard flanged joints.

The Department absolutely reserves the right to require other forms of restraint where in the opinion of the Engineer the use of this form of restraint is not in the best interest of the Department and his decision shall be final.

The Megalug restraint systems manufactured by EBAA Iron Sales, Eastland Texas, will be considered the standard of quality for comparison purposes and if the Department has any doubts as to the durability, quality or ability to restrain of a proffered substitute, the entity offering the substitute shall bear the entire burden of proving this equality to the complete satisfaction of the Engineer. Other manufacturers producing this type of restraint system shall submit data with their shop drawings showing that their restraint system has been in the marketplace for a minimum of three years in this country.

Each thrust-resistant mechanical joint or push on joint made up with this type of restraint and the pipe and fitting of which it is a part, shall be designed to withstand an axial thrust from an internal pipeline pressure of at least 150 psi at bulkhead conditions without reduction because of its position in the pipeline nor for support from external thrust blocks.

This type of joint restraint shall not be used above grade except as previously specified nor shall it be used as a carrier pipe within a casing. This type of restraint shall not be used with tape wrapped pipe or with too great a coating thickness on the exterior of the pipe.

Restrained Push-on Joints (Single Gasket Non-Gasket Restrained)

Restrained joints in pipe and fittings shall be of the single gasket push-on type, and shall conform to all applicable provisions of ANSI/AWWA C111/A21.11-12, except that gaskets for pipe and fittings shall be neoprene for sewer or SBR for water, and the following requirements:

Thickness of the pipe barrel remaining at grooves cut, if required in the design of restrained end joints, shall not be less than the nominal wall thickness of equal sized non-restrained pipe as specified hereinabove.

Restrained joints using field welding, set screws, or gaskets with expanding metal inserts will not be acceptable.

The restraining components, when not cast integrally with the pipe and fittings, shall be ductile iron or a high strength non-corrosive alloy steel.

Tee head bolts and hexagonal nuts for all restrained joints in pipe and fittings shall be of high strength low-alloy steel with composition, dimensions and threading as specified in ANSI/AWWA C111/A21.11-12, except that the length of the bolts shall meet the requirements for the restrained joint design.

The proper number of gaskets, bolts, nuts and all necessary joint material, plus one extra gasket for every 10 joints or fraction thereof, shall be furnished with each order. The gaskets and joint accessories shall be shipped in suitable protection containers.

Each thrust-resistant joint and the pipe and fitting of which it is a part, shall be designed to withstand the axial thrust from an internal pipeline pressure of at least 150 psi at bulkhead conditions without reduction because of its position in the pipeline nor for support from external thrust blocks.

Restrained push-on joint pipe and fittings shall be capable of being deflected after assembly. During deflection, all components in the restrained system shall be in contact to provide an equal force on all contact areas.

When restrained spigot ends are ordered for items of Group A, the corresponding bell ends of the pipe to be restrained (also within Group A), shall be furnished with the required matching restraining features at no additional cost other than the price bid per foot of pipe.

Restrained Push-on Joints (Single Gasket-Restrained by the Gasket)

The Department will permit the use of gasket-type restraining systems for ductile iron pipe and fittings in sizes 30-inch nominal diameter and below. This type of pipe, fitting and gasket system will be allowed to the maximum nominal diameter manufactured by a particular manufacturer and in no case greater than 30-inch nominal diameter. Restraining gaskets shall only be used in a push-on joint bell by the same manufacturer and only ductile iron pipe may be so restrained. The Department absolutely reserves the right to require other forms of restraint where in the opinion of the Engineer the use of this form of restraint is not in the best interest of the Department and his decision shall be final.

The Department is aware from catalogue data on file that U.S. Pipe produces this type of gasket restraint ("Field Lok") to size 24-inch and American Cast Iron Pipe produces this type of restraint ("Fast-Grip") to size 30-inch. Other manufacturers

producing this type of restraint system should submit data with their shop drawings showing that their pipe gasket restraint system has been in the marketplace for a minimum of three years in this country.

All pipe and fittings of this type shall meet all standards and specification requirements for push-on joint ductile iron pipe as normally required by the Department.

Each thrust-resistant joint and the pipe and fitting of which it is a part, shall be designed to withstand an axial thrust from an internal pipeline pressure of at least 150 psi at bulkhead conditions without reduction because of its position in the pipeline nor for support from external thrust blocks.

Joints between push-on joint pipe and/or fittings shall be made in accordance with ANSI/AWWA C600-93 "Installation of Ductile-Iron Water Mains and Their Appurtenances," except that deflection at joints shall not exceed one-half of the manufacturer's recommended allowable deflection, or one-half of the allowable deflection specified in Table 4 of AWWA C600-93, whichever is the lesser amount.

This type of joint restraint shall not be used above grade or as a carrier pipe within a casing. This type of restraint shall not be used with tape wrapped pipe or with too great a coating thickness on the exterior of the pipe. Pipe which will be field cut shall be measured at the location of the cut to check that the pipe diameter and circumference are within the particular manufacturer's tolerances for a spigot.

Flanged Joints

Connecting pieces with one end flanged and the other end either plain-end or mechanical joint, shall conform to ANSI/AWWA C110/A21.10-12. Joint material for both the flanged end and the mechanical joint accessories for connecting pieces with a mechanical joint end shall be furnished as specified.

Other types of flanged fittings, and flanged pipe, shall conform to the following requirements unless otherwise stated in the order:

Flanged fittings shall conform to ANSI/AWWA C110/A21.10-12, as specified hereinabove.

Flanged ductile-iron pipe with integrally cast flanges shall be manufactured in accordance with ANSI/AWWA C151/A21.51-09, and with provisions contained hereinabove for centrifugally cast ductile iron pipe, and shall be furnished with ANSI Class 125 flanges, plain faced and drilled, conforming to ANSI Standard B16.1, "Cast Iron Pipe Flanges and Flanged Fittings," latest revision. Hollow back flanges are not acceptable.

Flanged ductile-iron pipe with threaded flanges shall be manufactured in accordance with ANSI/AWWA C115/A21.15-11, "Flanged Ductile-Iron Pipe With Ductile-Iron or Grey-Iron Threaded Flanges," and shall be rated for a working pressure of 250 psi, minimum. The nominal thickness of flanged ductile-iron pipe, 6-inch and larger, shall not be less than those shown in Table 1 of ANSI/AWWA C115/A21.15-11. The nominal thickness of 4-inch flanged ductile-iron pipe shall be Class 54 (min.) conforming to Tables 3 and 4 of ANSI/AWWA C151/A21.51-09. Flanges shall be solid-back.

The pipe shall be furnished with ANSI Class 125 flanges, plain faced and drilled, conforming to ANSI B16.1, latest revision. Hollow back flanges and grey-iron flanges shall not be acceptable for use as threaded flanges. Threaded flanges shall be individually fitted and machine tightened on the threaded pipe by the manufacturer, and shall not be interchangeable in the field.

Flanges shall be back-faced parallel to the face of flange. Prior to assembly of the flange onto the pipe, apply a thread compound to the threads to provide a leak-free connection. There shall be zero leakage through the threads at a hydrostatic test pressure of 250 psi without the use of the gasket. Pipe lengths shall be as ordered. Removal of flanges, cutting and re-threading the pipe, and re-installing the flanges will not be permitted in any case. Where a raised face flange connects to a flat-faced flange, remove the raised face of the flange.

All flanges on ductile-iron pipe and fittings shall be of ductile iron, class 70-50-5 in accordance with ANSI/AWWA C110/A21.10. All joint materials for flanged pipe and fittings, shall be supplied with all pipe or fittings ordered. Bolts and nuts shall comply with all requirements of Appendix Section A.1 of ANSI/AWWA C115/A21.15-11 except that both shall be stainless steel. Bolts shall be of sufficient length to fully engage all threads in the nut. Unless ring gaskets are specified, gaskets shall be full-faced, and gaskets shall be of 1/8-inch thickness. Gaskets shall fully conform to the requirements of ANSI/AWWA C115/A21.15-11 Appendix Section A.2 except that gaskets shall be SBR for water and neoprene for sewer usages.

Grooved-end Fittings and Couplings

Grooved-end fittings shall conform to ANSI/AWWA C110/A21.10-12 with grooved ends conforming to ANSI/AWWA C606-11, radius cut rigid joints. Fitting material shall conform to ASTM A48, Class 30; ASTM A126, Class B; or ASTM A536, Grade 65-42-10. Wall thickness of ductile-iron (ASTM A536) fittings shall conform to AWWA C110 or C153; wall thickness of cast-iron fittings shall conform to AWWA C110. Fittings and couplings shall be furnished by the same manufacturer.

Grooved-end pipe couplings shall be ductile iron, ASTM A536 (Grade 65-45-12). Gaskets shall be Buna-N and shall conform to ASTM D2000. Bolts in exposed service shall conform to ASTM A183, 110,000-psi tensile strength. Bolts in buried or submerged service shall be ASTM A193, Grade B8, and Class 2.

Couplings for pipe 24 inches and smaller shall conform to AWWA C606 for flexible radius ductile-iron pipe, except where rigid radius couplings are required to connect to fittings. Couplings for pipe sizes 30 and 36 inches shall be in accordance with the coupling manufacturer's published literature for tolerances and dimensions for flexible and rigid radius cut joints. Couplings shall be Victaulic Style 31, Gustin-Bacon No. 500, or approved equal.

Couplings for pipe larger than 36 inches shall conform to AWWA C606 for shouldered end pipe. Couplings shall be Victaulic Style 44 or approved equal.

Grooved-end adapter flanges for piping 24 inches and smaller having an operating pressure of 150 psi and less shall be Victaulic Style 341 or 342 or approved equal. Flange dimensions shall conform to ASME B16.1, Class 125.

Grooved-end transition couplings for connecting ductile-iron pipe 12 inches and smaller to steel pipe shall be Victaulic Style 307 or approved equal.

Outlets and Nozzles

Provide outlets three quarters of an inch and smaller by direct tapping Ductile Iron Pipe in accordance with AWWA C600-10, Section 4.8. Provide outlets larger than three quarters of an inch up to 2 inches by tapping the pipe and attaching a service clamp. or use a threaded welded-on boss. Use stainless steel clamps for exposed piping. For outlets larger than 2 inches, use a tee with a flanged outlet. For outlets larger than 2 inches in buried piping, use a tee with a restrained joint outlet.

Ductile-Iron Pipe Weldments

All welding to ductile-iron pipe, such as for bosses, joint restraint, and joint bond cables, shall be done at the place of manufacture of the pipe. Perform welding by skilled welders experienced in the method and materials to be used. Welders shall be qualified under the standard qualification procedures of the ASME Boiler and Pressure Vessel Code, Section IX, Welding Qualifications.

Welds shall be of uniform composition, neat, smooth, full strength, and ductile. Completely grind out porosity and cracks, trapped welding flux, and other defects in the welds in such a manner that will permit proper and complete repair by welding.

Material for fittings with welded-on bosses shall have a Charpy notch impact value of minimum 10 ft-lbs under the conditions defined in ANSI/AWWA C151/A21.51-09. Test completed welds by the liquid penetrant method per ASTM E165.

Completed welds shall be inspected at the place of manufacture by the liquid penetrant method. Conform to the requirements specified in ASTM E165, Method A, Type I or Type II. The materials used shall be water washable and nonflammable.

Taps Into Ductile Iron Pipe

Maximum tap sizes for corporation stops (AWWA tapered thread only) in ductile iron shall be 1-1/4 inches for 4-inch diameter pipe and 1-1/2 inch for larger pipe sizes. Approved corporation stops shall be as listed in the Section 5.08 "Miscellaneous Materials."

Tapping saddles shall be installed when making taps for corporation stops into pressure class ductile iron mains 6-inches and smaller.

E. Linings and Coatings:

Asphaltic Coating

All pipe and fittings shall be outside-coated with an asphaltic material applied by means of the airless spray method. The exterior coating shall meet ANSI/AWWA C151/A21.51-09 for this type of coating, shall be smooth without pinholes, thin, bare or overly thick areas. Smoothness shall be such that when hand rubbed, no "sand paper" feeling will be experienced and such that the spigot area will readily slide through the gasket without pulling, tearing, rolling or otherwise disturbing the sealing capabilities of the gasket. Spigot ends shall be beveled prior to

painting and to an extent that will permit ready insertion of the spigot through the gasket area.

Cement-Mortar Lining

Pipe and fittings where so specified shall be cement-lined and seal-coated in accordance with ANSI/AWWA C104/A21.4-14, "Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water."

F. Tests and Certification:

The Contractor shall provide the Engineer with notarized Certifications of Compliance by the pipe and fitting manufacturers certifying that the pipe, fittings and lining comply with these Specifications and the referenced governing standards herein, and that all inspections and tests have been made and met.

No pipe or fitting will be accepted for use in the Project until the Certifications have been submitted to and approved by the Engineer.

G. Quality Assurance:

All pipe, fittings and other materials supplied under this contract shall be subject to inspection while still on the delivery truck. It is the sole responsibility of the Contractor to make prior contact with the Department's Construction Manager and provide a minimum of 48-hours prior notice of delivery. When so notified, the Department will make arrangements for inspection of the material upon arrival or within a reasonable time thereafter. Material will not be unloaded without inspection taking place either prior to or, if necessary for examination, during the unloading procedure. The Department will not be responsible for any delays or additional costs created by non-compliance with the requirement for prior notification or the requirement for thorough inspection.

Materials shall be delivered in complete compliance with the AWWA Standards as modified herein, without damage, and shall match or exceed the quality of any samples supplied. The Department absolutely reserves the right to require samples of any material supplied and to perform whatever tests considered by the Engineer, whose decision shall be final, to be in the Department's best interest on said samples. Where such tests are of a destructive nature, the sample, if it passes the test will be paid for (at cost as shown by invoice) by the Department. Samples failing will be immediately replaced with suitable material at the supplier's/contractor's expense. Samples required prior to order as a condition for purchase or as a materials submittal for approval will be at the supplier's/contractor's expense but, if approved and not used for destructive tests, may be used in the work with permission from the Engineer.

Materials found to be defective, not in strict compliance with the quality standards of samples supplied or these specifications shall be immediately returned to the vendor at his expense. If defects are discovered at a later time, the vendor shall be required to remove said items and shall bare all costs for so doing together with any replacement costs. Rejection of items may subject the vendor to liquidated and/or actual damages as specified elsewhere herein.

Foundries supplying materials shall maintain their metallurgical records for a minimum period of two years after fabrication and firms not doing so may be found in default.

Flaws which provide cause for rejection include but are not limited to; incorrect metallurgy or metallurgy which cannot be verified to the complete satisfaction of the Engineer; foundry identification/location, size, pressure and material identification information lost, removed, non-existent, or not visible when assembled; not in complete compliance with all applicable AWWA Standards as modified herein and/or these specifications; not in compliance with NSF; not in compliance with approved shop drawings; out of roundness in excess of AWWA requirements; dimensional differences in excess of AWWA requirements; rough exterior coating; chipped, cracked, scratched or otherwise damaged interior or exterior coatings or linings; interior or exterior coatings which are too thin; coatings too thick to allow proper assembly; coatings too thick to allow proper grip by restraining gaskets or other restraining elements; pin holes or honey combing of pipe; weld spatter or excess metal in gasket grooves or the whole of the bell area; bell areas which are distorted or otherwise improperly cast; spigots which are out of round, not of proper dimension, or not beveled to an extent that will allow easy assembly of the pipe joint; gaskets which are defective or of the wrong material; lack of joint materials; improper or defective joint materials; bolting of the wrong material or size; electro galvanizing or other exterior plating when hot-dip galvanizing is required; incorrect, flawed or damaged interior coating or lining; lack or non-submittal of all required certifications; non-timely submission of certifications; incorrect/incomplete certifications or certifications lacking the signature, date and seal of a professional engineer when so required; flanges which are too thin, not a right angles to the pipe centerline, or otherwise distorted; together with all other flaws or defects which in the opinion of the Engineer, whose decision shall be final, adversely affect the assembly and/or function of the piping system as intended.

5.04.2 PIPE AND FITTINGS - HIGH DENSITY POLYETHYLENE (HDPE) FOR USE IN POTABLE WATER SERVICES 2-INCH NOMINAL DIAMETER AND LESS

A. High density polyethylene (HDPE) pipe and tubing shall conform to ANSI/AWWA C901-96 "Polyethylene (PE) Pressure Pipe and Tubing, 1/2 In. (13 mm) Through 3 In. (76 mm), for Water Service" as modified herein. Pipe and tubing shall have a (natural) inner core with a blue colored outer shell. Pipe and 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 D3350-00 "Polyethylene Plastics Pipe and Fitting Materials" of 345444D for the core, which shall be 100% virgin material, and 345444E 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 and tubing shall conform to NSF 61 or 14. Manufacturer shall supply certification of compliance with all of the above requirements. Certification shall ship with the pipe and tubing on material sold to the Department and shall always be submitted with shop drawings and catalogue cuts. When required by the Engineer, 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. His decision in this regard shall be final.

1. All 1-inch HDPE tubing used for services shall be CTS-O.D. Controlled with Standard Outside Dimension Ratio (SODR) of 9, pressure rating of 200 psi, nominal outside diameter of 1.125-inches, minimum wall thickness of 0.125-inches, PE 3408, all in conformance with ASTM D2737-99 "Polyethylene (PE) Plastic Tubing."

2. All 2-inch HDPE pipe used for services shall be IPS-O.D. Controlled with Standard Outside Dimension Ratio (SODR) of 9, pressure rating of 200 psi, nominal outside diameter of 2.375-inches, minimum wall thickness of 0.264-inches, PE 3408, all in conformance with ASTM D3035-95 "Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter."

B. All mechanical fittings utilized with HDPE pipe and tubing services, shall conform with ANSI/AWWA C800-01 "Underground Service Line Valves and Fittings" as modified herein, shall utilize AWWA Standard (Mueller) threads on tapped pipe and tapping saddles; shall be; designed and manufactured to withstand a sustained working pressure of 150 psi and to restrain the pipe against pull out under loading beyond that causing tensile yield in the HDPE pipe or tubing connected. The manufacturer shall supply certification of these capabilities and fittings shall not be accepted or installed without said certification. If fittings are being supplied to the Department the certification shall ship with the fittings and payment will not be made without this certification. At the discretion of the Engineer, this certification may be required to be signed and sealed by a professional engineer licensed to practice in the state where the supplying firm is located or in the State of Florida. His decision in this regard shall be final.

In all cases, fittings shall be installed in strict accordance with the manufacturer's instructions.

5.04.3 PIPE AND FITTINGS - POLY (VINYL CHLORIDE) (PVC) FOR A.R.Vs. AND F.V.Os.

A. All poly (vinyl chloride) (PVC) pipe and fittings for air release valve and flushing valve assemblies shall be made from high impact, plasticized, rigid poly (vinyl chloride) compounds. Pipe and fittings shall be marked indicating size, type and schedule, ASTM Designation, manufacturer or trade mark, and shall bear the NSF (National Sanitation Foundation) seal of approval. Wherever the abbreviation on PVC is used in these Specifications in relation to pipe and fittings, it shall mean poly (vinyl chloride) plastic pipe and fittings as specified herein.

B. PVC pipe shall be Schedule 80, PVC 1120, 200 psi pressure rated, threaded, sized as shown in the Department Standard Details, and shall comply with ASTM D1785 "Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80 and 120." All pipe having threads shall be threaded with taper pipe threads as specified in ANSI B2.1.

C. Fittings for use with PVC pipe shall be PVC threaded pipe fittings, Schedule 80, PVC 1, and shall comply with ASTM D2464 "Threaded Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80."

5.05 ROCKBED AND BEDDING MATERIAL

A. Rockbed, also called bedding material herein, shall be washed and graded limerock obtained from local sources. Aggregate size shall be 3/8" to 7/8" in diameter. Select backfill material, 2" maximum size, or washed and graded limerock (3/8" - 7/8"), compacted to at least 90% of maximum density, 6 inch lifts per AASHTO Specification No. T-180.

B. Pea rock shall be used for small diameter (less than 24-inch) pipe bedding as shown on the Department Standard Details. Pea rock shall consist of hard, durable particles of proper size and gradation, and shall be free from organic material, wood, trash, sand, loam, clay, excess fines, and other deleterious materials. The Pea rock shall conform to the requirements of ASTM C33, Size Number 8, and be graded within the following limits:

U.S. Size Sieve	Percent Fines by Weight
1/2"	100
3/8"	85 to 100
No. 4	10 to 30
No. 8	0 to 10
No. 16	0 to 5

C. Crushed stone shall be used for bedding of 24-inch and larger diameter pipe and/or manholes as shown on the Department Standard Details. Crushed stone shall consist of hard, durable, sub-angular particles of proper size and gradation, and shall be free from organic material, wood, trash, sand, loam, clay, excess fines and other deleterious materials. The stone shall conform to the requirements of ASTM C33, Size No. 57 (3/4" rock) and be graded within the following limits:

U.S. Size Sieve	Percent Fines by Weight
1-1/2"	100
1"	95 to 100
1/2"	25 to 100
No. 4	0 to 10
No. 8	0 to 5

5.06.1 STEEL - REINFORCING

A. Bar reinforcement for concrete structures shall conform to the requirements of ASTM A615-90, "Deformed and Plain Billet-Steel Bars for Concrete Reinforcement," Grade 60, Deformed, except that Steel manufactured by the Bessemer Process will not be accepted. Wire mesh reinforcing for concrete structures shall be welded wire fabric meeting the requirements of ASTM A185-90a "Steel Welded Wire Fabric, Plain, for Concrete Reinforcement."

B. The Contractor shall furnish the Engineer with the manufacturer's test certificates showing the Steel to meet the above requirements, in addition to which the Engineer may take representative samples from the material on the job and have them tested by an independent testing laboratory.

C. Completely detailed shop drawings and bending schedules shall be submitted by the Contractor for the approval of the Engineer. Such approval shall be obtained before the bars are cut and bent.

5.06.2 STEEL - SHEET PILING

A. Steel sheet piling shall conform to the requirements of ASTM A572 "High-Strength Low-Alloy Columbium-Vanadium Steels of Structural Quality," (AASHTO No. M223) or ASTM A328 "Steel Sheet Piling."

B. The Contractor will be responsible for design and selection. Structural plans for the sheet steel piling installation and the calculations for the required Section Modulus and the Sheet Piling Designation shall be prepared by a Professional Engineer registered in the State of Florida. Sealed plans shall be submitted to the Engineer for approval prior to installation of the piling system.

C. Structural steel shall meet the requirements of ASTM A36 "Structural Steel."

D. Whenever shoring is required, locate the system to clear permanent construction and to permit forming and finishing of concrete surfaces. Provide shoring system adequately anchored and braced to resist earth and hydrostatic pressures. Shoring system adequately anchored and braced to resist earth on which the support or stability of existing structures is dependent must be left in place at completion of work. Maintain bracing until structural elements are supported by other bracing or until permanent construction is able to withstand lateral earth and hydrostatic pressures.

5.07 VALVES - GENERAL

A. The Contractor shall furnish all valves as specified herein. An affidavit is required from the manufacturer's certifying that the valves furnished for this Project comply with the most recent applicable provisions of the AWWA Standards as modified herein. The manufacturer shall have been engaged in the production of valves for at least 5 years.

B. Submittals:
1. AWWA Standard Leakage and Hydrostatic Test factory test with certified test report for each valve and an affidavit from the manufacturer(s) certifying that the valves furnished under this contract comply with all applicable provisions of the AWWA Specifications as revised and cited below.
2. Shop drawings, test and compliance certifications of all valves.

5.07.1 VALVES - AIR RELEASE VALVES (MANUAL) AND FLUSHING VALVE OUTLETS

A. The air release valve and flushing valve assemblies shall be installed in accordance with the details shown in the Department Standard Details. The following products shall be used to construct the assemblies:

1. Angle Valves (for air release valve and flushing valve outlet) ..... 2-inch screwed valve with handwheel, bronze body and composition disc, Nibco T311 or ITT Grinnell Fig. No. 3220

2. Corporation Stops (for air release valve) ..... 1-1/2 inch, Mueller No. H-10003

B. Taps into ductile iron pipe for air release and flushing valve assemblies shall be AWWA Tapered thread only, and the Contractor shall provide suitable equipment for this purpose as approved by the Engineer. After the tap has been made, and the corporation stop installed on a pipe conveying potable water, the inside of the pipe around the stop and the exposed exterior surfaces of the stop shall be heavily coated with Carboline Super Hi-Gard 891 White 1898, or approved equal.

C. The installation of air release valves shall include excavation, tapping the ductile iron pipe, corporation stop, angle valve, PVC pipe and fittings, complete with valve boxes and covers, set in concrete, backfilling and compaction, and all other appurtenant items and work in accordance with the Department Standard Detail WS 1.60.

D. The installation of the flushing valve outlets shall include excavation, tapping the ductile iron plug, angle valve, PVC pipe and fittings, concrete thrust block, complete with valve boxes and cover, set in concrete, backfilling and compaction, and all other appurtenant items and work in accordance with the Department Standard Detail WS 1.61.

5.07.2 VALVES - BUTTERFLY VALVES

A. Not Used

5.07.3 VALVES - RESILIENT SEATED GATE VALVES

A. General:

1. All valves specified herein, whether manufactured under the provisions of AWWA C509-94 "Resilient-Seated Gate Valves for Water Supply Service" or C515-01 "Reduced-Wall, Resilient-Seated Gate Valves for Water Supply Service" shall be furnished with an Affidavit of Compliance from the manufacturer as required by Section 6.3 of AWWA C515-01. This Affidavit of Compliance shall state that the valve and all materials used in its construction conform to the applicable requirements of the standard under which the valve is manufactured and the Department's specifications and that all tests specified in the applicable standard have been performed and all test requirements met. The manufacturer shall have been engaged in the production of valves for at least 5 years.
2. Submit to the Engineer for approval:
   a. Catalogue Data: Including illustrations and a parts list that identifies the materials used for various parts. The information shall be in sufficient detail to serve as a guide in the assembly and disassembly of the valve and for ordering repair parts.
   b. Weight information: Provide a statement of the net assembled weight for each size of valve exclusive of joint accessories.
   c. Assembly Drawings: one set of drawings showing the principal dimensions, construction details, and materials used for all parts of the valve.
3. Contractors shall, with their shop drawing submittals, submit the company name and location of the actual manufacturer of the valve which shall include Country, City, and street address of the manufacturer. Where valves are not domestically produced and tested, the Department reserves the right to require that the Affidavit of Compliance be signed and sealed by a Professional Engineer, licensed to practice in the state of where the importing firm is located or the State of Florida. When this is required, the Department's decision as to its necessity shall be final and no extra compensation will be allowed.
4. Grades B and C bronze as listed in Table 1 of AWWA C500-93 shall not be used in the fabrication of any of the various valve types listed in this specification. Aluminum bronzes, if used, shall not dealuminize and the method of preventing this shall be fully described in the submittal.

5. AWWA C515-01 lists a number of copper alloys for valve stems and gates. Of these the Department will accept alloys with the following Unified Numbering Series (UNS) numbers; C66100, C87600, C99400 and C99500. This same standard lists other copper alloys for Stem Nuts and Gates. Of these the Department will accept alloys with the following UNS numbers; C83600, C83450, C95200, C95500, C95800 C99400 and C99500.
6. Other copper alloys not listed in the standard may be used but must meet the performance requirements of the Standard, including but not limited to, minimum yield strength, chemical requirements and corrosion. The Department requires that alloys containing more than sixteen (16) percent zinc shall not be used.

B. Resilient Seated Gate Valves:
1. Resilient-seated gate valves shall be manufactured in conformance with the applicable provisions of ANSI/AWWA C509-94, "Resilient-Seated Gate Valves for Water Supply Service" (including the addendum material of AWWA C509a-95), as modified herein or in conformance with the applicable provisions of ANSI/AWWA C515-01 "Reduced-Wall Resilient-Seated Gate Valves for Water Supply Service" as modified herein.
2. Valves shall have nonrising stems (NRS) and are to be installed under buried and/or submerged conditions. For valves manufactured in conformance with the provisions of AWWA C509 as modified herein, the design working water pressure shall be a minimum of 200 psig valves of 3-inch through 12-inch size and 150 psig for 16 and 20-inch sizes. For valves manufactured in conformance with the provisions of AWWA C515 as modified herein, the design working water pressure shall be a minimum of 200 psig for all sizes. In addition to the pressure requirements, the valve assembly and mechanism shall be capable of withstanding an input torque of 200 ft. lbs. for valves 4-inch and smaller, and 300 ft. lbs. for valves 6-inch and larger. With the valve open the unobstructed waterway shall have a diameter not less than the full nominal diameter of the valve.

C. Valve Body:
1. All resilient-seated gate valves manufactured in conformance with AWWA C509-94 shall be iron-bodied and shall conform to ASTM A126-95, "Gray Iron Castings for Valves, Flanges, and Pipe Fittings," Class B; ASTM A395-99, "Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures"; or ASTM A536-84, "Ductile Iron Castings." Valve body and bonnet thickness shall conform with the requirements of AWWA C509-94.
2. Valves manufactured in conformance with AWWA C515-01 shall be iron-bodied and shall conform to ASTM A395-99, "Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures" or ASTM A536-84 "Ductile Iron Castings." Body and bonnet thickness shall conform with the requirements of AWWA C515-01.
3. All ferrous metal items in contact with the line fluids, except gray or ductile cast iron, shall be AISI Type 316 stainless steel. Valve body and bonnet gaskets shall be rubber or rubber composition, inorganic mineral fiber and paper are not acceptable. Rubber and rubber composition materials shall be suitable for use in water containing chlorine or chloramines and in sanitary sewage.

D. Stems:

1. Stems, stem nuts, glands and bushings shall be made of bronze as specified in ANSI/AWWA C509-94 with no Grades B or C bronze being utilized. The same items for valves made in conformance with C515-01 shall be made of the alloys specified hereinabove. The stem diameter shall conform to Table 4 of either C509 or C515 as appropriate. All valves shall be equipped with an ANSI/AWWA standard 2-inch square operating nut with skirt, or handwheel when required for above-ground service. Valve stems shall rotate counterclockwise to open. All valves 16-inch and larger shall be equipped with gearing conforming with their particular AWWA standard.

E. "O"-ring Stem Seals:

1. Shall be Buna-N, or approved equal. No natural rubber compounds will be acceptable. The stem seals shall be of design that permits the replacement of the "O"-ring seals while the valve is in service, without undue leakage.

F. External Ferrous Items:

1. All external ferrous items, except gray or ductile cast iron, shall be hot dipped galvanized in accordance with ASTM A123-00, "Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products," or ASTM A153-00, "Zinc Coating (Hot-Dip) on Iron and Steel Hardware," or stainless steel.

G. Resilient Seats:

1. Shall be applied to the gate only and shall seat against a corrosion-resistant surface. The surface shall be nonmetallic, applied in a manner to withstand the action of line fluids and the operation of the sealing gate under long-term service and shall coat all surfaces in contact with the liquid. The nonmetallic surface interior surface coating shall conform with ANSI/AWWA C550-01, "Protective Interior Coatings for Valves and Hydrants." Resilient seats shall be bonded or mechanically attached to the gate. No natural rubber products will be acceptable. Seat materials shall be EPDM, Nitrile or approved equal and shall have excellent resistance to sewage combined with good to excellent resistance to compression set. The method used for bonding or vulcanizing the resilient seat material to its substrate shall be proven by ASTM D429-81(1988), "Test Methods for Rubber Property-Adhesion to Rigid Substrates," Method A or B. For method A, the minimum strength shall not be less than 250 psi. When Method B is applicable, the peel strength shall not be less than 75 lb/in. All exposed mechanical attaching devices and hardware used to retain the resilient seat shall be of AISI Type 316 stainless steel.

H. Mechanical Joint Valves:

1. Shall have ends complying with ANSI/AWWA C111/A21.11-00, "Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings." Mechanical joint gaskets, glands, tee-head bolts and hex nuts shall be included with the valve. Segmented glands or follower glands held in place with set screws will not be acceptable. Bolt holes in the flanges of the mechanical joint shall be equally spaced and shall straddle the vertical centerline. Gaskets shall be shipped separately in suitable protective containers. Valves for use in sewage shall have neoprene gaskets.

I. Painting and Coatings:

1. The exterior valve surface shall be shop painted with two coats of asphalt varnish conforming to Federal Specifications TT-C-494B. Paintings and coatings shall conform to the requirements of AWWA C550 on exterior ferrous surfaces, and ANSI/AWWA C550-90 for the interior of the valve. Interior and exterior coatings shall conform with AWWA C515-01, Section 4.5.2 "Coating."

J. Testing:

1. All production tests shall be performed on all valves supplied without exception. Operation, shell and seat tests shall be performed as specified in Section 6.2 of AWWA C509-94 and Section 5.1.2 of AWWA C515-01 as appropriate to the standard which covers the valve in question.

K. The gate valves shall conform with the appropriate AWWA standard as modified herein and as manufactured by U.S. Pipe and Foundry Co., American Flow Control, Mueller or approved equal.

5.07.4 VALVES - TAPPING SLEEVE AND VALVE

A. Tapping Sleeve:

1. Tapping sleeves herein specified shall be manufactured from grey or ductile iron, designed to withstand a working pressure of at least 150 psi.
2. The sleeve shall be mechanical joint ended on the run and shall have a connecting flange outlet, with centering groove, for connection to the tapping valve. For tapping sleeves with flanged outlets 12 inches and smaller, the connecting flanged joint between the tapping sleeve and the tapping valve shall be in compliance with all applicable provisions of MSS Standard Practice SP60, latest revision, as developed and approved by the Manufacturers Standardization Society of the Valve and Fittings Industry, 1815 N. Fort Myers Drive, Arlington, Virginia 22209.
3. For tapping sleeves with flanged outlets larger than 12 inches, the connecting flange joint between the tapping sleeve and the tapping valve shall be industry standard. However, the tapping sleeve must provide a matching fit with tapping valves by other manufacturers.
4. All markings required on pipe and fittings, shall be clearly legible and located such that they will not be hidden or destroyed when assembled into the intended system.
5. Materials which are not domestically manufactured or which have components which are not domestically manufactured shall conform with the following additional requirements. Note that the term "manufactured" shall be construed to mean the actual casting of the component in question and the "manufacturer" is the foundry performing said casting operation. In this context, assembly of components shall not qualify as manufacture.
    a. With the shop drawing(s), submit the name, casting mark, address and country of the foundry producing each of the particular components. Further, this foundry shall not be changed without written previous notification of and written permission from the Department. If requested in writing, certified copies of foundry records shall be supplied to the Department within twenty-one (21) calendar days after request at no extra charge. These records shall be accompanied by a certified translation if not in English.

b. Each shipment of non-domestic manufactured materials provided by the Contractor shall be accompanied by a certification specifically stating that the materials of that shipment comply with all requirements of this Specification, specifically including dimensions and tolerances, passing all required tests and certifications, materials of manufacture, weights of components, marking and foundry of origin. This certification shall be signed, dated and sealed by a registered professional engineer licensed to practice in the state where the supplying firm is located. Shipments of non-domestic materials sent without the certification as required above may not be accepted.

6. Each mechanical joint on the tapping sleeve shall be furnished complete with tee-head bolts and nuts complying with ANSI/AWWA Standard C111/A21.11-00, "Rubber-Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings." Tee-head bolts and hex nuts shall be of high strength cast iron with composition, dimensions and threading as specified in ANSI/AWWA Standard C111/A21.11-00, or high-strength low-alloy steel as specified in the same standard. When steel bolting is supplied, bolts and nuts shall be hot-dip galvanized in accordance with ASTM A153 "Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware."
7. Side flange bolts and nuts joining the two halves of the sleeve shall be carbon steel complying with ASTM A307 "Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength," Grade B, hot-dip galvanized in conformance with ASTM A153 "Specification for Zinc Coating (Hot -Dip) on Iron and Steel Hardware" or Stainless Steel type 304 or 316 of the same size as the carbon steel fasteners and conforming with ASTM F593 Alloy Group 1 or 2, Condition CW.
8. All fasteners used in any part of the entire tapping sleeve assembly shall fully comply with Public Law 101-592, "Fastener Quality Act," as amended.
9. Each tapping sleeve shall be furnished complete with all necessary split end gaskets, longitudinal gaskets and two-piece (split) cast or ductile iron glands. Ductile iron glands shall be furnished with ductile iron sleeves and grey iron glands with grey iron sleeves. Follower glands held in place by set screws are not acceptable. Gaskets shall be shipped separately in suitable protective containers. Material for both longitudinal and split end gaskets shall be rubber conforming to ANSI/AWWA Standard C111/A21.11-00.
10. Tapping sleeve shall be U.S. Pipe model T-9, American Flow Control Series 2800 or Series 1004, or approved equal.

B. Resilient-Seated Tapping Valve:
1. Resilient-seated tapping valves shall have a mechanical joint outlet end conforming to ANSI/AWWA Standard C111/A21.11-00, "Rubber Gasket Joints of Ductile-iron and Gray-Iron Pressure Pipe and Fittings," for connection to new piping and a flange inlet with centering ring, for connecting to the tapping sleeve. For tapping valves 12 inches and smaller, the sleeve shall be in compliance with all applicable provisions of MSS Standard Practice SP 60, latest revision, as developed and approved by the Manufacturers Standardization Society of the Valve and Fittings Industry, 127 Park Street N.E. Vienna, VA. 22180. However, the

tapping valve must provide a matching fit with tapping sleeves by other manufacturer

2. The tapping valves shall conform to the requirements listed for gate valves, including bypass valve when applicable, shall be furnished complete with all joint materials. Joint materials for the flanged inlet shall be ANSI-sized and approved and shall include a 1/8-inch thick full-faced neoprene gasket, and hot dipped galvanized carbon steel bolts and nuts with internal threads tapped or retapped after galvanizing. The flange inlet gaskets shall conform to the gasket material and property requirements set forth in ANSI/AWWA Standard C111/A21.11-00. All gaskets and seals shall be neoprene, Buna-N, or approved equal, but not natural rubber. The mechanical joint outlets shall include the necessary joint materials conforming to the requirements of joint materials for mechanical joint ended gate vales as specified in Section 5.07.3 "Valves - Resilient Seated Gate Valves." Bolt holes in the flanges of the mechanical joint shall be equally spaced and shall straddle the vertical centerline. Gaskets shall be shipped separately in suitable protective containers. Resilient-seated tapping valves shall be as manufactured by U.S. Pipe and Foundry Co., American Flow Control, Mueller, or approved equal.

5.08 MISCELLANEOUS MATERIALS

A. Miscellaneous materials necessary for a complete installation, not specified herein, shall be equal in quality to the specified materials suitable for the intended use, and shall conform to the details and notes shown on the Plans. All minor items implied, usually included or required for the construction of a complete operating system, shall be installed whether specified or shown on the Plans, or not.

B. The Contractor shall furnish and install where shown on the Plans or stated herein, the following materials or approved equals:

1.	Anchor bolts, eyebolts, nuts, washers-steel, including anchor bolts and tie-rods carbon steel	ASTM A325-88a, hot-dip, galvanized.
2.	Brick - Clay brick for manhole construction	ASTM C62 "Building Brick (Solid Masonry Units Made from Clay or Shale)."
3.	Corporation stops (chlorination, testing, service)	1-inch Mueller No. H-15000
4.	Corporation stops (air release valve)	1-1/2 inch by 2-inch Mueller No. H10003
5.	Coupling adapters	Flanged cast iron. Type 912 by Rockwell International.
6.	Coupling for HDPE and PVC to brass ball valves	A.Y. McDonald PVC x MIP, 1" and 2", no substitution allowed
7.	Disinfectant	As specified in Section 6.15 "Cleaning, Testing and Disinfecting"

8.	Gasket lubricant	Vegetable soap lubricant, as recommended by the pipe and/or gasket manufacturer for installation of pipe in subaqueous trench.
9.	Guard posts for fire hydrants	Galvanized steel pipe, Schedule 40, filled with concrete
10.	Megalugs	Series 1100 and 1700 by EBAA Iron or approved equal. The restraint mechanism shall consist of multiple individually activated gripping surfaces to maximize the restraint capability. Rings and gripping surfaces to be ductile iron conforming to ASTM A536.
11.	Paint - bituminous	Carboline, Inc. Super Hi-Guard 891 White 1898
12.	Paint - for guard posts and fire hydrant repairs as necessary	Neutralizer - 1 coat Sherwin Williams galvanized iron primer, B50 A1. Finish paint - 2 coats Sherwin Williams Industrial Enamel OSHA yellow B54 Y17.
13.	Paint - zinc for galvanized items	Dry galvanized by Force Chemical Division, American Soldering and Flux Co.
14.	Pea Rock	Local washed rock, 100% passing 1-inch mesh and retained on 1/4-inch mesh.
15.	Polyethylene encasement material for pipe, fittings and valves.	Virgin polyethylene conforming to ANSI/AWWA C-105/A 21.5-82, Type I Class C, extruded tube form and approved polyethylene adhesive tape.
16.	Plastic sheet (for use with concrete anchors)	.006" (6-mil) polyethylene film, Vis-queen by Ethyl Corp.
17.	Service insulator assembly	Nylon dielectric bushing with bronze coupling-female I.P. thread by flared copper, Ford Meter Box Co., Inc.
18.	Service terminal fittings, single	One-inch lock wing style valve, drilled fittings, for wire sealing. Cat. No. KV23-444W, Ford Meter Box Co., Inc. or Cat. No. H-14255, Mueller Company
19.	Tie rods	Threaded each end, hot-dip galvanized steel, with hot-dip galvanized nuts, washers and eye bolts. The eyebolts shall be Star National Products, Figure No.7.
20.	90 degrees street elbows	150 psi brass or bronze, screwed ANSI B2.1 threads (NPT).

6.00 CONSTRUCTION METHODS

A. The Contractor acknowledges that by personal field observation or other means satisfactory to himself, performed prior to the bid, he has included in the price bids all costs for dealing with all construction problems created by observable above or on grade features on or adjacent to the site of the work whether or not

these features are shown on the Plans or described in the Specifications. In instances where the observable features indicate subsurface conditions which may affect the Project work, as for example, a pavement patch or catch basin gratings indicating respectively a utility or storm sewer not shown on the Plans, the Contractor acknowledges that he has made timely, diligent, inquiry of the Engineer or by other means fully satisfied himself prior to the bid as to the nature of, and costs created by, the subsurface condition and included all costs therefore in the prices bid.

B. The Engineer of Record shall furnish the Contractor, once only, at no cost, with horizontal and vertical control points established in the design documents which shall be utilized as specified elsewhere herein to layout the work. The Contractor through the services of his Registered Professional Surveyor and Mapper (PSM), licensed to practice in the State of Florida, shall verify all controls provided by the Engineer and it shall be the responsibility of the Contractor to preserve same for the life of the Project.

1. For pipeline Projects the Engineer of Record shall also furnish the Contractor with reference points at the beginning and end of each main and at intervals not more than 1,000 feet apart which shall be utilized as specified elsewhere herein to layout the work.

C. In accordance with the General Covenants and Conditions, the Contractor through the services of his PSM, shall establish the line and benchmarks and other reference points for the installation of the pipeline or structure. The Contractor's PSM shall furnish and set stakes, establishing line and grade and shall solely be responsible for the layout of the work as well as the recording of all as-built dimensions and elevations. He shall employ only competent personnel and utilize only suitable equipment in performing all survey work. The Contractor shall furnish all additional stakes, templates, and other materials for marking and maintaining survey points and lines given, and shall be responsible for their preservation. Should any of the horizontal and vertical control points, and reference points set by the Engineer be destroyed or disturbed, they shall be reset by the Contractor's PSM, at the Contractor's expense. All control points previously set by the Engineer shall be verified by the Contractor's PSM prior to the commencement of construction operations.

1. For pipeline Projects the Contractor's PSM shall also establish all points of bend (but not necessarily bevel pipe unless in close proximity to other facilities), valves, tees, crosses and other stations not more than 100 feet apart along the proposed centerline of the pipe for all pipe 4 inches in diameter or greater using white or pink temporary/non-permanent paint to mark the proposed pipeline and the stations.
2. For structures, this will consist of base lines, stakes at structure corners, centers and centerline, auxiliary lines and reference temporary bench marks no more than 500 feet apart from which to establish the elevations.

D. The Contractor will be charged by the Department for any survey work required due to his failure to properly maintain the control points previously furnished. The Contractor will be charged for any additional or extra survey work requested from the Department which is in addition to or beyond the scope of survey work stated above.

1. Charges for survey work will be based on the actual per hour cost of the Department's survey crew times the number of hours the crew works on the project, plus one additional hour travel time. These charges will be

deducted from the compensation otherwise to be paid to the Contractor, including monthly partial payments.

E. No payment shall be made for the cost to the Contractor of any work or loss or time occasioned by delay in the initial establishment of control points; reestablishment lost or destroyed control points, lines and grades; making other necessary measurements, or by inspection.

F. The Contractor's attention is directed to the subsurface soil conditions which may be encountered. Soil borings made within the limits of the proposed construction and included at the end of the Specifications are for the convenience of the Contractor. See Section 15 "Site Conditions" of the General Covenants and Conditions.

G. The Contractor's attention is called to the fact that connections to existing mains will probably involve the removal of concrete anchors and cast iron plug or cap; also that the existing mains may be cast iron with poured lead, sulfur compound, or rubber gasket type joints, concrete with flanged outlet connections, galvanized iron with threaded joints, or others. The Contractor should be equipped with the proper tools and equipment to make connections to any one or more of these types of existing mains. No additional compensation will be paid to the Contractor for any costs incurred in complying with this provision.

H. Keep adequate field notes and records as all survey work is accomplished. Copies of field notes, reports and records shall be provided to the Engineer and Inspector as the work progresses. Any inspection or review of the Contractor's field notes and records or layout work shall not relieve the Contractor of his responsibility to achieve the lines, grades, and dimensions shown on the Plans. Note that as specified above in this paragraph; the competency of personnel, suitability of equipment and adequacy of notes and records is defined as; to a level satisfactory to the Department.

I. In performing the work described in the Sequence of Construction, the Contractor shall limit the amount of ditch open at any one time to approximately 600 feet. The work, including excavation, pipe laying, backfilling and temporary paving, shall be completed before proceeding with the work in the next section.

1. The Contractor may employ more than one installation crew but not less than 1,200 feet shall separate any two trench sections as defined herein above.

J. Should any portion of the work lag, the Engineer will suspend other portions until the lagging portion is brought up to schedule. Such action by the Engineer shall be for the purpose of confining the construction work to as small an area as possible and shall not be used as justification to request an extension of completed time.

K. In addition to specific construction methods specified in the Section 6.00 series, the following general requirements shall apply to the work under this Project.

L. Costs for temporary connections required for maintaining service during construction shall be included in other parts of the job and no additional compensation will be allowed.

M. The ends of existing mains shall be temporarily capped or plugged and anchored to keep them clean and the joints from blowing apart from internal pressure until the new main can be reconnected to them.

N. Pipe and fittings shall at all times be handled with great care to avoid damage. In loading and unloading, they shall be lifted with cranes or hoists or slid or rolled on skidways in such manner as to avoid shock. Under no circumstances shall this material be dropped or allowed to roll or slide against obstructions. No cables, lifting arms, hooks or other devices shall be inserted into the pipe or fitting. All lifting, pulling or pushing mechanisms shall be applied to the exterior of the pipe or fitting. All of this material shall be unloaded so as not to interrupt automobile traffic in adjacent lanes. The Contractor shall make all the necessary arrangements for performing a smooth unloading operation.

O. Pipe and other material shall be distributed along the right-of-way in advance of installation only to the extent approved by the Engineer. Such materials shall be so placed as to keep obstruction to traffic at a minimum.

P. Any work within the pipe and fittings shall be performed with care to prevent damage to the lining. Damaged lining shall be repaired or the pipe section or fitting replaced as required by the Engineer.

Q. Pipelines shall be constructed by using surveying instruments to maintain alignment and grade. When a level is used to maintain grade at least one elevation shot shall be taken on each length of pipe and recorded. No abrupt changes in direction or grade will be allowed. Any error discovered shall be immediately reported to the Engineer.

R. All work when completed shall conform to the lines, elevations and grades shown on the Plans. Any variation in the completed work from the established lines, elevations and grades may be deemed sufficient cause for the work to be rejected and reconstructed to proper line and grade by the Contractor.

S. During the life of the Project, the Contractor shall retain the services of a PSM who shall maintain records of the installation, including all deviations from the plans and specifications by obtaining as-built dimensions and elevations.

T. The PSM shall prepare therefrom, record as-built drawings showing correctly and accurately all Work constructed together with all changes and deviations made during construction, including approved variances to record the Work as it was actually constructed.

U. As-built drawings and Record Documents shall be submitted to the Engineer and Inspector on a monthly basis. Refer to Section 5.00.2 "Project Record Documents" for the Department's criteria for developing record as-built drawings.

V. If, due to unforeseen conditions, the line or grade of the pipe has to be changed from the planned location, the Inspector shall note the actual location in a field book assigned to him for that purpose and the Contractor shall record the same for use in the preparation of Record Drawings.

W. During construction, the Contractor shall, by sprinkling with water or by other means approved by the Engineer, eliminate dust annoyance to adjacent property owners. The Contractor shall also furnish and maintain all barricades and/or

flashing warning lights necessary to warn motorists and pedestrians of the construction. This shall be done at the Contractor's expense and to the satisfaction of the Engineer. Every effort must be made to reduce inconveniences and nuisances to a minimum. No additional compensation will be paid to the Contractor for any costs incurred in complying with this provision.

X. The Contractor shall make his equipment and men available to the Inspector for checking the accuracy of the Work. The Inspector shall require the Work to be brought within the tolerances specified in Section 6.08 "Installation of Pipe and Fittings" before backfill is placed or the construction is otherwise hidden.

Y. Prior to final acceptance of the project, the Contractor shall be solely responsible for having his PSM reestablish and replace any permanent Monuments or Survey Control Points, Section Corners, City of Miami Monument Lines and/or Published Elevation Control that were disturbed during the construction of the Project. Marking shall be done in accordance with federal, state, county and municipal guidelines and requirements.

The Contractor's PSM shall coordinate with MDCDTPW for the reestablishment of any benchmarks that were disturbed during the construction of the Project. Contact Scott A. Riggs, PSM, MDCDTPW, Roadway Engineering and Right-of-Way Division, 305-375-2657, sriggs@miamidade.gov.

These shall be the responsibility of the Contractor and no additional compensation will be paid to the Contractor for any costs incurred in complying with the provisions herein.

Z. Temporary paving, where required, is specified in Section 6.17 "Pavement Removal and Replacement" herein, shall be placed the same day as the ditch backfill and it shall be replaced with permanent paving, where shown on the Plans, within thirty days.

6.00.1 USE OF PUBLIC STREETS

A. The use of public streets and alleys shall be such as to provide a minimum of inconvenience to the public and to other traffic. Any earth or other excavated material spilled from trucks shall immediately be removed by the Contractor and the streets cleaned to the satisfaction of the governing authority.

B. The Department has not made any attempt to define the equipment to be used in transporting the excavated material since this may vary, however, the Contractor shall abide by the following general requirements:
   1. Transport vehicles must be of the type(s) approved for this application by the political jurisdictions involved. General requirements are that the vehicles have watertight bodies that they be properly equipped and fitted with seals and covers to prohibit material spillage or draining, and that they be cleaned as often as is necessary to prevent deposit of material on roadways. Vehicles must be loaded within all legal weight limits and operated safely within all traffic and speed regulations.
   2. Access to businesses, schools and homes along the route of the work must be provided by the Contractor at all times.

6.00.2 CARE OF TREES, SHRUBS AND GRASS

A. In the course of the work, it may become necessary to remove trees if they interfere with construction. Miami-Dade County and various municipalities have ordinances regulating the removal, relocation and pruning of trees in the public right-of-way, and these ordinances shall be strictly adhered to. The Contractor shall obtain a permit from Miami-Dade County and/or other regulatory agencies having jurisdiction over the work area before removing, relocating and/or pruning any tree. The Contractor shall abide by all requirements and conditions of the permit, and shall include all costs under the various Quotation Items, and no other compensation will be provided.

B. The Contractor shall be fully responsible for maintaining in good condition all cultivated grass plots, trees and shrubs. Where maintained shrubbery, grass strips or area must be removed or destroyed incident to the construction operation, the Contractor shall, after completion of such work, or as directed by the Engineer, replace or restore to the original condition all destroyed or damaged shrubbery or grass areas. Tree limbs which interfere with equipment operation and are approved for pruning shall be neatly trimmed and the tree cut coated with a tree paint.

C. Grass replacement shall be solid sod sections laid with closely abutting joints with a tamped or rolled surface. Weeded areas need not be replaced with grass sod, but shall be restored to a "green" area by dressing the area with a 3-inch thick layer of top soil, and sowing a variety of permanent type grass seed, over the area as approved by the Engineer. The grassed or seeded area shall be watered and maintained until the Engineer is assured a good grass growth has developed, but not to exceed a maximum period of 60 days.

D. In order to protect himself from being held liable for any existing tree damage, the Contractor is advised to notify the Engineer in writing (with photographic documentation) before proceeding with any work.

6.00.3 PROTECTION OF EXISTING UTILITIES, STRUCTURES AND OTHER FACILITIES

A. The underground utilities, structures and other facilities shown on the Plans are located according to the best information available, but may vary by several feet from both the position and elevation shown. The Contractor shall explore far enough in advance of his main trench to determine the exact location and condition of such utilities, structures or facilities so that, before the pipe is installed, the Engineer may change the line or grade of the pipe, should that become necessary to avoid a conflict.

B. All costs for changing the grade of the proposed main downward 2'-6" or less in order to clear obstructions located differently than shown on the Plans, or to clear obstructions not shown on the Plans but the location of which could have become known or should have become known by proper observation of field conditions or the proper exploratory procedure, shall be included in the prices bid under the various items of the Quotation and no additional compensation will be allowed.

C. Additional cost, if any, for changing the grade of the proposed main downward more than 2'-6", for the same reasons, will be paid for as "Extra Work" in accordance with Section 13 "Extra Work and Payment Therefore" of the General Covenants and Conditions.

D. Where the Quotation contains Items for installing main in specific depth ranges, the main shall be paid for at the actual depth range installed. However, the provisions of paragraphs one and two of this Section shall apply and any depth increase caused by a lack of timely and sufficient exploration by the Contractor shall be at his expense. In such instance, the main shall be paid for as if installed at the invert elevations originally shown on the Plans.

E. Changing the grade of the proposed main by rising deflections, or the alignment by horizontal deflections, will not be considered as extra work, or extra cost, to the Contractor, and in some cases a credit to the Department may be warranted.

F. In all cases where the main is deflected either horizontally or vertically, and the Engineer requires additional work and items such as paving and similar items for which a pay item was established in the Quotation, then such additional work and items will be paid for at the prices bid.

G. The Contractor shall determine the locations of recent additions to the systems not shown on the Plans. Extreme caution shall be exercised to eliminate any possibility of any damage to utilities resulting from his activities. The location of all overhead utilities shall be verified and the Engineer notified of any conflict which might occur. The Contractor shall be responsible for determining which poles will need shoring during excavation and shall provide such shoring and support as is required.

H. Where it is necessary to temporarily interrupt house or building services, the Contractor shall notify the house or building owner or occupant, both before the interruption and again immediately before service is resumed. Before disconnecting any pipes or cables, the Contractor shall obtain permission from the Owner, or shall make suitable arrangements for their disconnection by the owner. The Contractor shall be responsible for any damage to any such pipes, conduits or cables, and shall restore them to service promptly as soon as the work has progressed past the point involved.

I. Various drainage culverts and drainage ditches may be encountered along the route of the work. Any culverts which are disturbed, damaged or removed shall be repaired, restored or reinstalled. Drainage ditches shall be restored to the original cross sections existing prior to construction of this work. Ditches shall be left clean and free of all excavated materials or other materials deposited in them as a result of this construction. All existing headwalls, removed or damaged as a result of this construction, shall be restored. This work shall be performed as directed by the Engineer, and the work shall be considered an incidental item and the cost included in the items listed in the Quotation.

J. All existing drainage structures and piping shall be considered clean at the start of construction. The Contractor shall check to verify that this is so. He should notify the governing agency of any damaged or dirty structures or piping to avoid repair or cleaning at his expense. Copies of such notices shall be sent to the Engineer.

6.00.4 RELOCATION OF EXISTING UTILITIES

A. The relocation of existing utilities, as noted on the Plans, or for the convenience of the Contractor shall be the responsibility of the Contractor. This work shall be completed by either the forces of the existing utility or the Contractor's forces at

the discretion of the responsible utility. If the work is to be performed by the Contractor, all work shall be done in accordance with the utility company's requirements. Under no circumstances shall the Contractor be authorized extra payment for this work, and all cost for the relocation shall be the responsibility of the Contractor.

B. The Contractor shall also be responsible for the coordination of all existing utility relocations with the appropriate utilities. Where temporary supports or protective encasements are required during the construction, the Contractor shall be responsible for this work at no additional cost.

C. Any conflicts between the field investigation and the information shown on the Plans shall be brought to the immediate attention of the Engineer. There shall be no additional payment for adjustments in grades or location resulting from locations of existing utilities.

D. Various storm sewer lines and inlets and slab-covered drainage ditches that conflict with the proposed construction may require adjustment, relocation or removal and reinstallation. This work shall be performed as directed by the Engineer, and the work shall be considered an incidental item and the cost included in the items listed in the Quotation.

E. Representatives of utility companies, the railroad companies, the traffic and transportation authorities, etc., shall be notified in accordance with the provisions set forth in the relevant sections of the Specifications and the permitting documents.

F. Notify all utility companies that are affected by the construction operation at least 48 hours in advance. Under no circumstance expose any utility without first obtaining permission from the appropriate agency. Once permission has been granted, locate, expose and provide temporary support for all existing underground utilities and utility poles where necessary.

G. Absolutely no extra compensation will be allowed for construction problems created by utility poles of whatever size, overhead electric, telephone or other lines, whether shown on the Plans or not. The Contractor is solely responsible for discovering such items in the field prior to bidding and including all costs for such work in the prices bid.

6.00.5 MAINTENANCE OF TRAFFIC CONTROL

A. As used herein, any reference to Miami-Dade County, its departments, or its published regulations, permits and data, shall be synonymous and interchangeable with other recognized governing bodies over particular areas or streets, or their departments, published regulations, permits or data. The Contractor shall abide by all applicable laws, regulations, and codes thereof pertaining to maintenance of public streets, detour of traffic, traffic control and other provisions as may be required for this Project.

B. The Contractor shall be responsible for providing the Engineer with Maintenance of Traffic (M.O.T.) plans for lane closures and/or detours for approval. These M.O.T. plans shall be produced by an individual employed by the Contractor and certified as "Work Zone Traffic Safety Supervisor" by the American Traffic Safety Service Association, ATSSA.

C. The Contractor shall be fully responsible for the maintenance of public streets, detour of traffic (including furnishing and maintaining regulatory and informative signs along the detour route), traffic control, and other provisions throughout the Project as required by the MDCDTPW, Traffic Engineering Division (Traffic Division), FDOT or other governing agency. Traffic shall be maintained according to corresponding typical traffic control details as outlined in the MDCDTPW Manual. No street shall be completely blocked, nor blocked more than one-half at any time, keeping the other one-half open for traffic, without specific approval.

D. If required by the Traffic Division, the Contractor shall make arrangements for the employment of uniformed off-duty policemen to maintain and regulate the flow of traffic through the construction area. The number of men required and the number of hours on duty necessary for the maintenance and regulation of the traffic flow shall be subject to their approval. The cost of such off-duty policemen shall be paid from the Quotation Item established for this purpose. If required by traffic control permits or agencies, the Contractor shall work, odd or night hours, as required for traffic control reasons, and the cost of such work shall be considered as incidental to construction and no extra compensation will be allowed.

E. The Contractor shall provide all barricades and/or flashing warning lights necessary to warn motorists of the construction throughout the Project.

F. Excavated or other material stored adjacent to or partially upon a roadway pavement shall be adequately marked for traffic safety at all times. The Contractor shall provide necessary access to all adjacent property during construction.

G. The Contractor shall be responsible for the provision, installation and maintenance of all traffic control and safety devices, in accordance with specifications outlined in the MDCDTPW Manual. In addition, the Contractor shall be responsible for the resetting of all traffic control and information signing removed during the construction period.

H. Where excavations are to be made in the vicinity of signalized intersections, the Contractor is alerted that vehicle loop detectors may have been embedded in the pavement. Every effort has been made to show the approximate locations on the Plans; however, the Contractor shall verify these locations by inspecting the site of the work and by contacting the Traffic Division. Any loop detector which is damaged by the Contractor, whether shown on the Plans or not, shall be repaired or replaced by the Contractor, at his expense, and to the satisfaction of the Traffic Division.

I. The Contractor shall notify the Traffic Division 24 hours in advance of the construction date, and 48 hours in advance of construction within any signalized intersection.

J. Temporary pavement will be required over all cuts in pavement areas, and also where traffic is to be routed over a swale or median areas. When the temporary pavement for routing traffic is no longer necessary, it shall be removed and the swale or median areas restored to their previous condition.

K. Pavement markings damaged during construction shall be remarked promptly by the Contractor, as required by the Traffic Division.

6.00.6 DEMOLITION AND MODIFICATION

A. The Contractor shall furnish all material, labor, tools, equipment, plant, appliances and services necessary to complete all demolition, modification, abandonment and relocation work required in the Drawings and specified herein. Examine the various Drawings, visit the site and determine the extent of work affected therein and all conditions under which he is required to perform the various operations.

B. Existing site structures and appurtenances affected herein are as indicated on the Drawings.

C. Demolition, modification, removal and relocation work shall be coordinated with the Department, shall conform to the requirements of Section 3.00 " Sequence of Construction and General Information" and shall be performed in an agreed upon sequence to minimize down time at the site.

D. Promptly remove all demolished materials and debris from the site.

E. Demolition shall result in the complete removal and disposal of existing structures and appurtenances from the site as indicated on Drawings and the cleanup after completion of the demolition work.

F. The cutting and removal of existing work necessary for modifications and installation of new work shall be made with a minimum of damage to the work that is to remain. Any damage done to existing facilities which are to remain shall be repaired at the Contractor's expense to the satisfaction of the Department.

G. Surfaces of seals visible in the completed work shall be made to match as nearly as possible the adjacent surfaces.

H. Follow other specific instructions for the modification work given in other sections of these specifications and/or as shown on the Drawings.

I. Verify exact location, material, alignment, joint, etc. of existing piping and structure prior to making the modifications and connections called out in the Drawings. The verifications shall be performed with adequate time to correct any potential alignment or other problems prior to the actual time of connection.

J. Dismantle and remove all existing equipment, piping and other appurtenances required for the completion of the work. Where called for or required, the Contractor shall cut existing pipeline for the purpose of making connections thereto. Anchor bolts for equipment and structural steel removal shall be cut off one inch below the concrete surface. Surface shall be properly repaired and finished.

K. Where necessary or required for the purpose of making connections, cut existing pipelines in a manner to provide an approved joint. Where required, the Contractor shall weld beads, flanges or provide the specified couplings, all as required.

L. Site shall be left in a clean condition satisfactory to the Engineer, free from demolished materials, rubbish or debris. Site shall be graded to meet adjacent contours and provide flow for surface drainage.

M. Restore items intended to remain that have been damaged by demolition work.

N. All interrupted utility services shall be returned to service, and temporary services disconnected, unless otherwise specified.

6.01 EXCAVATION

A. The Contractor shall remove and replace, where required, all existing shrubbery, trees, grass, sprinklers, fences, signs, mail boxes, guard rails, structures, roadways, sidewalks, curbs and similar items or structures in the way of the pipeline and shall make all excavation necessary for the construction of the main, connections, valves and appurtenances, to the lines and grades shown on the Plans. Weeded areas shall be restored as specified in Section 6.00.2 "Care of Trees, Shrubs and Grass." 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. Unless specific bid items are provided in the Quotation form, the cost of removing and replacing any plantings or existing structures shall be included in the price bid. In order to protect himself from being held liable for any existing damaged pavement, including detour routes, the Contractor is advised to notify in writing the authority having jurisdiction over 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.

B. All cleared materials shall be promptly removed from the work area and disposed of in an area provided by the Contractor, at no additional cost to the Department. Accumulation of debris or stockpiling along the route of the work will not be allowed.

C. The Contractor shall excavate pipe trenches to a minimum of 6 inches below the outside bottom of the proposed pipe barrel to provide for the installation of the bedding material.

D. Not more than 100-feet of trench shall be opened ahead of pipe laying operations at one time unless a greater length of open trench is approved by the Engineer. See General Notes in Section 3.00 "Sequence of Construction and General Information."

E. If, in the opinion of the Engineer, the soil at that depth is unsatisfactory as foundation material because it contains marl, muck, organic matter, or other unsuitable material, the excavation shall be continued 2 feet deeper, except if a suitable foundation material is exposed at a lesser depth, further excavation will not be required. The cost of this extra excavation, and backfilling with select backfill material, shall be included in the price for pipe laying and no additional payment will be made for this work.

F. If the soil is still unsuitable after the additional excavation as prescribed above, and the Engineer authorizes "Overcut," the trench bottom shall be excavated

further in one-foot increments and paid for as "Trench Overcut." See Section 6.05 "Trench Overcut."

G. 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 inch clearance on each side, between the outside of the pipe barrel and the face of the excavation, or sheeting if used.

H. For excavations 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 5 feet deep, the Contractor shall comply with the provisions of "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 1 foot above the top of the pipe.

I. The trench wall shall be kept at a stable angle of repose to maintain trench widths within the limits hereinafter specified or shown on the Plans.

J. The trench, when in rock, shall be excavated to a width within the limits of the top of the pipe and the trench bottom so as to provide a clearance on each side of the pipe barrel, measured to the face of the excavation, of 12 inches. Rock or removal in the excavation shall be considered a part of the excavation and as such no additional payment shall be made therefore. Where excavation is in silt, the width of trench bottom shall be pipe O.D. plus 2-feet with the trench walls being kept at a stable angle of repose. All pipe trenches shall be excavated to a level at least 12-inches below the outside bottom of the proposed pipe barrel.

K. Where wood sheeting or certain designs of steel sheeting are used, the Department may require that the sheeting be cut off at a level 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.

L. If interlocking steel sheeting is used, the Department 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.

M. A substantially and safely constructed moveable shield or box, as approved by the Engineer, may be used in place of sheeting when the trench is opened immediately behind the shield as pipe laying proceeds inside the shield. All construction in conjunction with using such a shield must be as approved by the Engineer, including excavation, installation of pipe and backfilling and compaction.

N. The Contractor shall perform all excavation of every description and of whatever substances encountered, to the dimensions and depth shown on the Plans, or as

directed by the Engineer. All excavations shall be made by open cut. Any existing utilities such as pipes, cables, etc., shall be carefully supported and protected from damage, and in case of damage, they shall be restored at no cost to the Department.

O. Excavation for thrust blocks shall be made in such a manner so that, when concrete is placed, it will bear against a firm, undisturbed, vertical trench wall with bearing area in accordance with the schedule shown on the Department Standard Details.

P. Excavation for other piping and appurtenances shall be sufficient to leave at least 12 inches clear between their outer surfaces and the embankment or sheeting that may be used to protect them.

Q. Materials removed from the trenches shall be stored and disposed of in such a manner that they will not interfere unduly with traffic on public streets and sidewalks and they shall not be placed on private property. In congested areas, such materials as cannot be stored adjacent to the trench or used immediately as backfill shall be removed to convenient places of storage. If any material is creating a public hazard or other unsafe condition, in the opinion of the Engineer, it shall be removed immediately by the Contractor to a storage area.

R. The Contractor shall temporarily store excavated material suitable for backfill in full compliance with the provisions of the permits. All mud, silt, debris and other material unsuitable for backfilling the trench shall be removed and legally disposed of offsite by the Contractor. The Contractor shall make his own arrangements regarding stock piling of excavated suitable material and storage and assembly space to properly and safely carry out the construction. Any agreements entered into by the Contractor and property owners shall hold the County and the Department harmless. Storage of excavated material shall not cause environmental problems and shall be performed at no additional cost to the Department.

6.02 TRENCH STABILIZATION

A. No claim for extras or additional payment will be considered for cost incurred in the stabilization of trench bottoms which are rendered soft or unstable as a result of construction methods, such as improper or inadequate sheeting, dewatering or other causes. In no event shall pipe be installed when such conditions exist and the Contractor shall correct such conditions so as to provide proper bedding or foundations for the proposed installation at no additional cost to the Department.

6.03 SHEETING AND SHORING

A. 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.

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 Department 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 Department may permit its complete removal in lie 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.

6.04 MOVABLE SHIELD (MULE)

A. A substantially and safely constructed moveable shield or box, as approved by the Engineer, may be used in place of sheeting except where it is specifically called out on the Plans or in the Specifications to install sheeting. When using a shield, the trench is opened immediately ahead of the shield as pipe laying proceeds inside the shield. All construction in conjunction with using such a shield must be as approved by the Engineer, including excavation, installation of pipe, and backfilling and compaction. When a moveable shield or box is used, the installed pipe shall be secured to prevent it from moving when the box is moved.

6.05 TRENCH OVERCUT

A. Trench overcut provisions herein shall be used only under direct authorization by the Engineer.

B. If, after excavating the trench to a depth of 2 feet 6 inches below the outside bottom elevation of the proposed pipe barrel, and the soil at that depth is still unsatisfactory as foundation material because it contains marl, muck, organic matter, or other unsuitable material, and the Engineer authorizes overcut, the pipe trench shall be excavated further in 1 foot increments until either a suitable foundation material is found, or the Contractor is directed by the Engineer to stop trench overcut operation and begin backfilling. In no case will trench overcut be

more than 6 feet in depth, i.e., to a point 8 feet 6 inches below the bottom of the pipe.

C. Selected backfill, as defined in Section 6.14 "Compacted Backfill," shall then be compacted in 6-inch layers up to the bottom of the proposed 6 inches of pipe bedding.

6.06 REMOVAL OF WATER

A. It is a basic requirement of these Specifications that excavation shall be free from water before pipe or structures are installed; however, it is realized that in certain sections of the work this cannot be accomplished economically and the Contractor may request permission to use Section 6.06.1 "Alternate Method of Construction."

B. The Contractor shall provide all necessary pumps, underdrains, well point systems, and other means for removing water from trenches and other parts of the work. The Contractor shall continue dewatering operations until the backfill has progressed to a sufficient depth over the pipe to prevent flotation or movement of the pipe in the trench and so that it is above the natural water table.

C. Water from the trenches and excavation shall be disposed of in such a manner as will not cause injury to public health, to public or private property, to the work completed or in progress, to the surface of the streets, or cause any interference with the use of the same by the public. The Contractor shall submit his proposed methods of handling trench water and locations at which the water will be disposed of to the Engineer for approval and shall receive approval before starting the excavation.

D. 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.

E. The Contractor shall be required to obtain all necessary permits approving the location and proposed method of disposal before discharging water from any excavation into any portion of the public right-of-way or into any existing drainage structure or facility.

6.06.1 ALTERNATE METHOD OF CONSTRUCTION

A. A combination of conditions in the substrata, water table, method of disposal or regulatory agency requirements may be encountered during the course of the work which makes dewatering impossible, or possible only through the use of unusual methods, the cost of which is excessive. When such conditions are encountered, but only after all reasonable means to dewater the excavation have been employed without success, the Contractor may request permission to employ the following Alternate Method of Construction. The concurrence of the Engineer shall be obtained in writing and shall limit the use of the Alternate Method of Construction to such specific portions of the work as the Engineer shall determine.

B. The requirements set forth in other Sections of these Specifications shall establish the required standards of construction quality for this work. Use of the

Alternate Method of Construction described hereinafter shall in no way be construed as relieving the Contractor of his basic responsibility for satisfactory completion of the work.

C. Under no conditions will any additional or increased payments be made to the Contractor for excavation, backfill, sheeting or any cost incurred for work or materials, or any other costs incurred as a result of the use of this alternate method of construction. The unit prices established in the Quotation shall be full payment for the various items of work.

D. Subject to all of the requirements stated herein, including written approval of the Engineer, construction will be permitted in accordance with the following specifications. All requirements of these Specifications shall apply to this construction unless otherwise specifically modified herein.

1. Removal of Water: The installation of pipe and appurtenances under water will be permitted and the dry-trench requirements of Section 6.06 "Removal of Water" will be waived.
2. Excavation: Excavation shall be performed in accordance with Section 6.01 "Excavation."
3. Pipe Bedding:
   a. Pipe bedding shall be placed from 6 inches below the outside bottom of the proposed pipe barrel up to the level of the lower one-third of the pipe barrel for pressure mains.
   b. The bedding material shall be pea rock, or drainfield limerock. Limerock screenings, sand or other fine organic material shall not be used.
   c. The bedding material shall be tamped and graded to provide a proper bedding for the pipe and shall then be shaped to receive the pipe. Bedding shall be provided under the branch of all fittings to furnish adequate support and bearing under the fittings.
4. Backfill:
   a. After the pipe is installed, backfilling shall proceed in accordance with the provisions of Section 6.14 "Compacted Backfill."
   b. Select backfill material shall be used to backfill around the pipe and to a level one foot above the crown of the pipe.
   c. Under no circumstances will material other than select backfill or specified pipe bedding material be considered satisfactory for this purpose.

E. If the Alternate Method of Construction is used, all backfill material, including specified pipe bedding material, shall be carefully lifted into the trench and not released to fall freely therein until the bucket or container is at or just above water level. Under no circumstances will backfill material be dumped or pushed into trenches containing water. Below existing water level, and to a point not more than 18 inches above the water level the backfill material shall be carefully placed in uniform layers, of equal depth on each side of the pipe. From a point not more than 18 inches above the water level, and below the pavement base or the surface of the ground, if out paving, backfill material shall be placed and compacted for normal backfilling as provided in Section 6.14 "Compacted Backfill."

F. During construction, the Contractor shall install a temporary plug, or other means approved by the Engineer, on the open end of the pipe in order to prevent debris

and trench water backwash from entering the pipe during trench excavation ahead of the installed pipe. The plug shall remain in place until the following length of pipe is ready to be installed. No additional compensation will be paid to the Contractor for any costs incurred in complying with the provisions herein.

6.07 PIPE BEDDING - PRESSURE PIPE

A. General:

1. Installation in Rock Bottom: Where rock is encountered at the bottom of a trench in which pipe is to be installed, the excavation shall be extended to a depth at least 6 inches below the bottom of the pipe and shall be backfilled with selected fine material in 6 inch layers, with each layer being firmly compacted, and with the final layer carefully graded and compacted at the proper elevation to provide continuous support for the pipe barrels. Where pipe bells will be located, depressions shall be excavated in the trench bottom to provide clearance under the bell or socket.
2. Installation in Soil Bottom: Where rock is not encountered at the bottom of a trench excavation, and the soil is satisfactory for pipe foundation, in the opinion of the Engineer, excavation shall be halted at an elevation slightly above that for bedding the pipe, and the pipe bed carefully excavated by hand in the undisturbed trench bottom to provide continuous bearing for the pipe barrels and clearance under the bells or sockets, or machine excavation may extend slightly below the elevation for bedding the pipe with the trench bottom carefully backfilled and compacted as specified in Section 6.14 "Compacted Backfill."

B. As described herein, all pipe trenches for the water and/or sewer force mains 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.

C. Bedding material shall be select backfill as defined under Section 6.14 "Compacted Backfill" or shall be drainfield limerock, or similar materials, as approved by the Engineer.

D. Select Backfill material may be utilized where the excavated trench bottom is above water.

E. 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.

F. Limerock screenings, sand, or other fine material shall not be used for bedding.

6.08 INSTALLATION OF PIPE AND FITTINGS

A. General:

1. The centerline of the pipe shall not vary by more than two inches from the plan view location shown on the Plans and the top of the pipe shall not vary by more than one inch from the established grade, except at points where this tolerance must be changed to clear obstructions or make connections. Deviation from this location will be permitted only upon written instructions from the Engineer.
2. Upon satisfactory excavation of the pipe trench and completion of the pipe bedding, a continuous trough for the pipe barrel and recesses for the pipe bells, or couplings, shall be excavated by hand digging. When the pipe is laid in the prepared trench, true to line and grade, the pipe barrel shall receive continuous, uniform support and no pressure will be exerted on the pipe joints from the trench bottom. Placing and compacting the bedding up to the level of the lower one-third of the pipe barrel shall immediately follow the installation of pipe.
3. The interior of the pipes shall be thoroughly cleaned of all foreign matter before being gently lowered into the trench and shall be kept clean during laying operations by means of plugs or other approved methods. During suspension of work for any reason at any time, a suitable stopper shall be placed in the end of the pipe last laid to prevent mud or other foreign material from entering the pipe.
4. Any pipe found defective shall be immediately removed and replaced with sound pipe.
5. Pipe and fittings shall at all times be handled with great care to avoid damage. In loading and unloading, they shall be lifted with cranes or hoists or slid or rolled on skidways in such manner as to avoid shock. Under no circumstances shall this material be dropped or allowed to roll or slide against obstructions. Pipe and other material shall be distributed along the right-of-way in advance of installation only to the extent approved by the Engineer. Such materials shall be so placed as to keep obstruction to traffic at a minimum.
6. No cables, lifting arms, hooks or other devices shall be inserted into the pipe or fitting. All lifting, pulling or pushing mechanisms shall be applied to the exterior of the pipe or fitting.
7. Lines shall be laid straight and depth of cover shall be maintained as shown on the Plans. Grades or pipe centerline elevations are shown on the Plans. The Contractor will be permitted to use surveying instruments to maintain alignment and grade. At least one elevation shot shall be taken on each length of pipe and recorded. No abrupt changes in direction or grade will be allowed.
8. All bends, tees and plugs shall be restrained as called for in the Department Standard Details or on the Plans. If concrete thrust blocks are required, the bearing area and/or volume of concrete in the anchors and blocks shall conform with that shown on the Plans or Department Standard Details.
9. All bolts, nuts, gaskets and other joint materials for use in the pipeline shall be stored under cover and properly protected.
10. Gaskets shall be stored in their original packing bags or containers, and care shall be exercised to keep them away from heat, light oil, gasoline or other petroleum products. Gaskets shall be kept clean at all times and not handled with greasy or dirty hands.
11. The joints of all pipelines shall be properly homed. The particular joint used shall be approved by the Engineer prior to installation. If assembly is underwater, lubricant recommended by the manufacturer for underwater use is required.

12. Unless otherwise directed, pipe shall be laid with the bell ends facing in the direction of laying and for lines of an appreciable slope, the bells shall, at the discretion of the Engineer, face upgrade.
13. Each individual length of pipe and each fitting shall be solidly and evenly bedded throughout its length on a prepared bed on the floor of the trench and not supported in position on blocks or wedges. Pipe shall only be laid when the two preceding lengths have been thoroughly embedded in place to prevent any movement or disturbance of the finished joint. Any pipe which is disturbed or found to be defective after laying shall be taken up and relaid or replaced.
14. The pipelines shall be cleaned. Cleaning methods shall meet the Engineer's approval, and must be sufficient to remove silt, rocks, or other debris which may have entered the pipeline during its installation.

B. **No request for additional compensation or Project time (except for a non-compensable time extension at the sole discretion of the Engineer, whose decision shall be final) resulting from encountering utilities or structures not shown, or differing in location or elevation from that shown, will be considered. The Contractor shall explore sufficiently ahead of the Work to allow time for any necessary adjustments without delay to the progress of the installation. Costs due to delays occasioned by encountering underground utilities or structures which could have or should have been discovered by timely exploration ahead of the Work shall rest solely with the Contractor.**

C. All underground pipe shall be color coded as required by the Florida Administrative Code as specified in Section 3.00 "Sequence of Construction and General Information."

6.08.1 INSTALLATION OF DUCTILE IRON PIPE

A. Push-on, restrained push-on and mechanical joints in ductile cast iron pipe and fittings shall be made in accordance with the manufacturer's standards except as otherwise specified herein. Joints between push-on and mechanical joint pipe and/or fittings shall be made in accordance with ANSI/AWWA C600-05, "Installation of Ductile Iron Water Mains and Their Appurtenances," except that deflection at joints shall not exceed one half of the manufacturer's recommended allowable deflection, or one-half of the allowable deflection specified in ANSI/AWWA C600-05, whichever is the lesser amount.

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

C. Flanged joints shall be used only where indicated on the Plans. Before making up flanged joints in the pipeline, the back of each flange under the bolt heads and

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

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

E. Cutting of ductile iron pipe for inserting valves, fittings, etc., shall be done by the Contractor in a neat and workmanlike manner without damage to the pipe, the lining, or the coating. Pipe, shall be cut with a mechanical pipe saw. After cutting the pipe, the plain end shall be filed to remove all sharp edges and burrs.

F. The pipe and fittings shall be restrained at reaction points and at any point shown on the Plans or as shown in Department Standard Detail GS 2.0 Sheets 1 through 5 or as specified herein.

1. All pipe 24-inch nominal diameter and above shall be restrained with both concrete thrust blocks to undisturbed solid and restrained joints.
2. In some situations the use of thrust blocks is impractical or for some reason undesirable. In such instances notes on the Plans at that location or covering a particular group of locations shall indicate only restrained joint pipe and fittings are required and that no thrust blocks are required. Under no circumstances shall the Contractor assume that thrust blocks are not required unless notations on the Plans specifically so state for that location or a particular group of locations which includes the location in question.
3. At times on the Plans, dimensional arrows between locator lines which are even with particular pipe joints are utilized to show the extent of restrained lengths of pipe and fittings. In these instances the joint(s) at the locator lines shall be considered as a restrained joint. Hence, the length of pipe beyond the locator line is restrained.

Thus, in the schematic above, four lengths of pipe are between the locator lines but all six lengths are restrained.

4. The pipe manufacturer shall instruct the Contractor on the making of restrained joints supplied as a part of the pipe and fitting purchase.
5. Encasement type thrust anchors and collars; tie rod restrained pipe and fittings; and proprietary joint restraints shall be installed where shown on the Plans or specified.

G. Taps into ductile iron pipe for corporation stops shall be AWWA tapered thread only, and the Contractor shall provide suitable equipment for this purpose as approved by the Engineer. After the tap has been made, and the corporation stop installed into the pipe, the inside of the pipe around the stop and the exposed exterior surfaces of the stop shall be heavily coated with Carboline Super Hi-Gard 891 White 1898, or approved equal.

H. Any work within the pipe shall be performed with care to prevent damage to the lining. Damaged lining shall be repaired as recommended by the pipe manufacturer or the pipe section replaced as required by the Engineer. No cables, lifting arms or other devices shall be inserted into the pipe. All lifting, pulling, or pushing mechanisms shall be applied to the exterior of the pipe barrel.

I. Sandbags may be used to support the pipe in the trench but no pipe shall be laid on blocks, except by the written permission of the Engineer.

J. Since some settling of the pipe may occur due to unfavorable ground conditions the Contractor shall exert every care in laying the pipe to the required grade. Prior to backfilling, the pipe grade and settlement shall be checked and the Contractor shall correct any excessive deflections or high points in the line to the satisfaction of the Engineer and at no additional cost to the Department.

K. Unless otherwise approved by the Engineer, the pipeline shall be cleaned at intervals not to exceed 30 lengths of pipe. Cleaning methods shall meet the Engineer's approval, and must be sufficient to remove silt, rocks, or other debris which may have entered the pipeline during its installation. The Contractor shall utilize pigging to clean the main unless otherwise specified herein or instructed by the Engineer.

L. Ductile iron pipe and fittings shall be encased in polyethylene encasement material, if required or as ordered by the Engineer whose decision shall be final. The polyethylene encasement shall be installed in accordance with ANSI/AWWA C105/A21.5-88, "Polyethylene Encasement for Ductile-Iron Piping for Water and Other Liquids" Method A or B. Polyethylene encasement is required where soil corrosion is present. Most common causes of corrosion include naturally corrosive soils or soil contaminants, such as muck organic matter, certain waste materials, salt water, brackish water, and potential stray direct currents.

M. Connections to existing mains shall be coordinated as required under Section 6.13 "Connections to Existing System."

6.09 INSTALLATION OF VALVES

A. General:
   1. The installation of all valves shall include a valve box and riser or manhole, as appropriate, in accordance with the Details shown on the Plans or in the Department Standard Details for the various sizes and types of valves to be installed.
   2. Riser pipes, valve boxes and manhole lids shall be carefully centered and set flush with the finished grade if in paving, or with the top of the ground if out of paved areas. All valve boxes shall be held in position with concrete as shown on the Plans or in the Department Standard Details.
   3. All valves shall be checked before installation to make sure they operate properly. All valves shall be thoroughly cleaned before installation, and during installation they shall be carefully aligned vertically and/or horizontally as indicated on the Plans.
   4. The Contractor is advised that he is required to furnish all labor, materials and equipment necessary to pressure test each valve furnished by the Department, bi-directionally, prior to installation, to the satisfaction of the Engineer.

5. All flanged and mechanical joint ended valves shall be connected to the abutting pipe or fittings in accordance with the requirements of Section 6.08 "Installation of Pipe and Fittings" for making such joints.
6. Upon completion of the Project, but prior to final acceptance, the Contractor in the presence of the Engineer, shall fully open each valve installed by him, except at connections to existing Department mains. For valves 16-inch and larger, the Contractor shall count the number of turns required to operate each valve from a completely closed to a fully opened position, and shall paint the number on the bottom of the valve's valve box lid or manhole cover. **VALVES AT CONNECTIONS TO EXISTING DEPARTMENT MAINS SHALL ONLY BE OPERATED BY DEPARTMENT FORCES.**
7. Valves which are a part of the section of pipe being installed encased with polyethylene, shall also be encased with polyethylene in accordance with ANSI/AWWA C105/A21.5 "Polyethylene Encasement for Ductile Iron Piping for Water and Other Liquids," Method A, B or C.

B. Air Release Valves (Manual) and Flushing Valve Outlets:
1. Air release and flushing valve assemblies shall be installed at the locations indicated on the Plans or as indicated by the Engineer in accordance with Section 5.07.1 "Valves - Air Release Valves (Manual) and Flushing Valve Outlets."

6.10 INSTALLATION OF TAPPING SLEEVE AND VALVE

A. Unless otherwise specified, all taps of tap diameter 20 inches and smaller made via a tapping sleeve and valve into non-concrete mains or taps of the same maximum diameter made into existing tapping flange outlets on main of any material will be made by Department forces.

B. The Contractor shall notify the Engineer at least seven days in advance of when he will be ready to make the connection and shall have the tapping valve installed on the existing main with the new equipment satisfactory pressure tested and sufficient excavated work areas prepared for the Department forces when they arrive to make the tap.

C. The Contractor shall furnish and install a mechanical joint plug on the free end of the tapping valve, and shall pressure test the tapping sleeve and valve after installation on the main, but prior to tapping operations. No leakage will be permitted at any joint in either the tapping sleeve or tapping valve. The tapping sleeve and valve shall be filled with water and then pressurized at 150 psi. Duration of the test shall be determined by the Department. The test shall be conducted in the presence of the Engineer, who will notify Department forces of the satisfactory conclusion of the test, and arrange a definite time and date for them to arrive at the site to make the tap.

D. A crane, or suitable equipment as approved by the Engineer, shall be furnished by the Contractor to unload the tapping machine from the Department vehicle, position it in the trench for bolting to the valve, and to reload it after the tapping operation has been completed.

E. Department forces will connect the tapping machine to the valve, and disconnect it after the tap is complete; however, the Contractor shall furnish suitable devices or material to support the machine in the trench for proper alignment, if required

by the Engineer. The Contractor shall aid the Department's forces whenever and to whatever extent necessary for the tapping operation to be performed efficiently and without undue time lost.

F. The tapping valve requires the installation of a cast iron riser pipe complete with valve box and cover, centered over the operator, and set in concrete. Where a tapping valve with by-pass gate valve will be installed, the Contractor shall install a No.3 valve box over the main valve and a No.2 valve box over the by-pass valve.

G. All necessary sheeting, shoring, dewatering, excavation, backfill and compaction, surface repairs, and other items and work appurtenant to or incidental to the work shall be performed by the Contractor. The Contractor shall include all costs for items and work provided by him for this type of connection in his price or prices bid under the various Quotation Items. No other compensation will be provided.

6.11 INSTALLATION OF FIRE HYDRANTS

A. General:

1. Six-inch branch runs to the fire hydrants shall be constructed in accordance with all applicable portions of Section 6.08 "Installation of Pipe and Fittings," including making thrust resistant joints, installing 6-inch gate valve, tie-rods, riser pipe and valve boxes.
2. New fire hydrants and branch runs shall be installed by the Contractor where shown on the Plans and in accordance with the Department Standard Details herein. Bid item(s) for the installation of a new fire hydrant shall include excavation, installation of hydrant on the branch run, the concrete anchor at the hydrant elbow (mechanical restrainment of the hydrant elbow/shoe is not allowed), protective concrete slab in non-sidewalk areas, replacing concrete sidewalk when in sidewalk area; steel posts in concrete bases and filled with concrete where required, and backfilling and compaction. Fire hydrants shall be touched up or repainted with yellow paint, as specified, where necessary, and the same type of paint shall be used to paint the guard posts after treating the galvanized surface with a neutralizer. Payment will be made for each new fire hydrant installed at the price bid in the Quotation. The installation of the branch main and its appurtenances will be paid for under the appropriate bid item in the Quotation. Payment will be made for the permanent pavement restoration under the appropriate bid item in the Quotation.
3. Some fire hydrants are factory lubricated, while others require lubrication after installation. The Contractor shall verify which type of hydrant has been furnished, and if required, shall lubricate and touch-up paint each hydrant after its installation and prior to its operation.
4. Lubricating and touch-up painting hydrants will be considered, as incidental to the hydrant installation, and no extra compensation will be provided for this work.

B. Removal of Fire Hydrants:

1. Any fire hydrants being removed, as shown on the Plans, shall be salvaged by excavating the entire hydrant assembly including the bottom shoe. The Contractor shall use caution so as not to damage any component of the hydrant assembly, remove the entire hydrant assembly including the shoe, carefully clean off any thrust block concrete, clean,

load, transport, unload and store in a Department storage yard as directed by the Engineer. Fire hydrant feed mains shall be cut, plugged and thrust blocked if they are to remain connected to an active main line. Lines which are deactivated (i.e. not connected to an active main) shall be abandoned or removed as called for on the Plans. All cost for this work shall be included in the prices bid and no extra compensation will be allowed.

6.12 INSTALLATION OF WATER SERVICES

A. General:

1. High Density Polyethylene (HDPE) shall be used for 1-inch services and 2-inch services.
2. Services shall be a single piece of pipe with no couplings or fittings between those shown adjacent to the water main and those shown adjacent to the meter box or vault.
3. Services from the new water mains shall consist of corporation stops, 1-inch HDPE or 2-inch HDPE pipe, and terminal fittings as shown in Department Standard Details. The services shall be installed where designated in the field by the Engineer, and will be determined as soon as possible in order that the Contractor may tap the mains as they are installed.
4. All HDPE services require the use of a 10-gauge stranded copper blue tracer wire.
5. When installing services the Contractor shall temporarily plug the ends of the tailpieces for protection against dirt.
6. The Contractor shall perform the final cleanup and restore all site conditions to original or better conditions.
7. Locations of the water services shall be approved by the Engineer prior to constructing the service (locations shall be adjacent to the existing meter when possible).
8. Field conditions may make it necessary for the Engineer to require deletions to the water service installation, including but not limited to, the meter boxes, vaults, lids, covers, branch assemblies, valves, tailpieces, perforated spacers and accessories. In order for the Department to receive appropriate credit(s) the Contractor shall provide a "Schedule of Values" for furnishing and installing all individual materials and activities that are a part of this work with prices satisfactory to the Engineer. Material/activity prices will be used should deletions be required by field conditions and as directed by the Engineer.

B. Meter Boxes and Vaults:

1. All meter boxes and vaults shall be installed in non-traffic and non-parking areas.
2. Meter boxes and vaults shall be installed with their long axis perpendicular to the longitudinal axis of the adjacent street. Under no circumstances shall they be set askew. Boxes and/or vaults in close proximity to one another shall have their sides parallel with ends the same distance from the sidewalk or slab edge.
3. Where meter boxes and vaults 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 and vaults shall be eliminated when they are installed in an existing sidewalk.

4. Where meter boxes and vaults are located out of sidewalk areas, a concrete support is required. Concrete supports shall be to the established line and grade.
   a. For 1-inch services construct a 3'x3'x6" reinforced concrete slab.
   b. For 2-inch services construct a 5'x5'x4" reinforced concrete slab.

5. Meter boxes and vaults shall be set flush with the finished grade if in sidewalks, or with the top of the ground if out of sidewalk areas.

C. Each 1-inch service connection to be installed as part of this Project will be one of the following:

1. 1-inch Single or Dual Service Short: Consists of a short run of 1-inch HDPE from the main on the same side of the street as the proposed meter, to the meter installation approximately 2-1/2 feet from property line.

2. 1-inch Single or Dual Service Long: Same as above but from a main on the opposite side of the street from the proposed meter, requiring additional HDPE to cross the street to the meter installation, and requiring a 2-inch PVC casing pipe, installed by use of a torpedo under the street pavement.

   The purpose of installing casing pipe is to make it unnecessary to repair paving over 1-inch service cuts. Should the Contractor elect to open-trench any 1-inch service line with casing pipe across pavement, he will be required to repair the paving at his own expense.

3. The Contractor shall supply and install the single or dual meter box with cover and lid, 1-inch branch assembly and angle stop, 30-inch tailpieces, perforated spacers and accessories as per Department Standard Details.

4. 1-inch Single Service installations shall be in accordance with Department Standard Details WS 2.10 and WS 2.16.

5. 1-inch Dual Service installations shall be in accordance with Department Standard Details WS 2.12 and WS 2.16.

6.12.1 CONNECTION TO CUSTOMER'S EXISTING WATER SERVICE PIPE

A. General:

1. The work specified in Section 6.12.1 "Connection to Customer's Existing Water Service Pipe" is only for conditions where a new water service and meter box will be installed adjacent to the existing meter box that presently serves the property. It is not intended to be used for the relocation of water services from the rear to the front of properties.
2. Upon completion of the installation of the water main and water services and clearance by the FDOH the Contractor shall disconnect the customer's existing water service pipe from the existing water service and connect to the new water service installed as part of this Project.
3. All work taking place within the right-of-way or easement shall be in accordance with these Specifications.

4. All work taking place within private property shall be in accordance with the FBC, as modified herein. The Contractor shall be responsible for obtaining all necessary permits from the respective permitting agencies and for coordinating all permit acquisition procedures and requirements with the property owners. Furthermore, the Contractor shall be responsible for requesting final inspections and clearances and make any necessary modifications required until the final inspection is approved.
5. Whenever the customer's use of the water services must be interrupted the Contractor shall notify the residents well in advance of the interruption. This notification shall be accomplished with door hanger "Notice" cards to be placed at the addresses of affected customers. Property owners shall be informed when service interruption will take place and the approximate duration. This notice shall be provided a minimum of 24 hours in advance of commencement of service interruption. The Contractor shall make every effort to minimize inconvenience to the customers and avoid long water service interruption. Should the Engineer find it necessary to order efforts above those instituted by the Contractor's in this regard, the Engineer's order shall be final, and no extra compensation will be made to the Contractor.
6. The "Notice" cards to be attached to customer's front door shall state that the disconnection of the existing water service and the connection of the new water services will be performed at this day and during this time frame. The Contractor shall use the "Notice" Door Hanger appended to these Specifications as Appendix "K."
7. Upon approval by the Engineer, and under the direction of Department personnel, the Contractor shall relocate the existing water meter to the new meter box or vault.
8. Field conditions may make it necessary for the Engineer to require deletions to the customer's water service pipe connections, including but not limited to, the service pipe, fittings, testing and disinfection, removal of meter boxes, vaults, lids and covers, accessories and restoration. In order for the Department to receive appropriate credit(s) the Contractor shall provide a "Schedule of Values" for furnishing and installing all individual materials and activities; including removal, transport and disposal; that are a part of this work with prices satisfactory to the Engineer. Material/activity prices will be used should deletions be required by field conditions and as directed by the Engineer.

B. Pipe Size:
1. The size of the water service pipe between the tailpiece and the customer's pipe shall be the same size as the new water service installed as part of this Project.

C. Pipe Material Between Water Meter and Customer's Existing Water Service Pipe:
1. 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.
2. All copper pipe, brass pipe, fittings, meter accessories, washers, tailpieces, couplings and other appurtenant items used for water services shall be “NL” no lead type for installation in the Department’s system. Solders and flux shall contain no more than 0.2% lead.
3. 1-inch services shall be copper.

a. The water service pipe or tubing shall be Copper Soft Temper Type L or Hard Drawn Type L and shall conform to NSF 61 and ASTM B88 standards. All water service pipe or tubing installed underground and outside of the structure, shall have a minimum working pressure rating 160 psi at 73.4 degree; piping material shall have a minimum rated working pressure equal to the highest available pressure.

4. 2-inch services shall be brass.
5. Pipe fittings shall be approved for installation with the piping material install and shall conform to NSF 61 and ASTM B16.18. The fitting shall not have ledges, shoulders or reductions capable of retarding or obstructing flow in the pipe.
6. Connections of pipe or fittings of dissimilar metals shall be made with dielectric fittings.

D. Installation:
1. Shall comply with all applicable provisions of Section 6.12 "Installation of Water Services."

E. Testing and Inspection:
1. Upon completion of a section of or the entire water supply system, the system, or portion completed, shall be tested and proved tight under a water pressure not less than the working pressure of the system; or, for piping system other than plastic, by an air test of not less than 50 psi. The water utilized for test shall be obtained from a potable source of supply.

F. Disinfection of Potable Water System:
1. New or repaired potable water system shall be purged of deleterious matter and, disinfected prior to utilization. The method to be followed shall be:
   a. The pipe system shall be flushed through the hose bibb on the customer's plumbing lines with clean, potable water until dirty water does not appear at the points of outlet.
   b. The system or part thereof shall be filled with a water/chlorine solution containing at least 200 parts per million (200 mg/L) of chlorine and allowed to stand 3 hours.
   c. Following the required standing time, the system shall be flushed with clean potable water until the chlorine is purged from the system.
   d. The procedure shall be repeated where shown by a bacteriological examination that contamination remains present in the system.

G. Removal of Existing Meter Box and Lid and/or Meter Vault and Vault Cover:
1. The existing meter box and/or vault shall be removed and legally disposed of offsite by the Contractor.
2. Cast iron meter box lids and vault covers shall be cleaned, hauled to and stored by the Contractor at his expense, where directed by the Engineer, and shall remain the property of the Department.
3. Contractor shall backfill and compact the area where existing water meter box and/or vault has been removed.

4. The Contractor shall perform the final cleanup and restore all site conditions to original or better conditions.

6.13 CONNECTIONS TO EXISTING SYSTEM

A. **All connections to existing mains of the Miami-Dade Water and Sewer Department shall be made under the direct supervision of Department personnel. Valves separating the main being installed from existing mains shall be operated by Department personnel upon request by the Contractor. Under no circumstances shall any of these valves be operated by the Contractor's personnel.**

B. The Contractor's attention is called to the fact that connections to existing mains may involve the removal of a concrete anchor and cast iron plug; also that the existing mains may be cast iron with poured lead, sulphur compound, or rubber gasket type joints, concrete with flanged outlet connections, galvanized iron with threaded joints, or others. The Contractor should be equipped with the proper tools and equipment to make connections to any one or more of these types of existing mains. New gaskets shall always be installed, regardless of the condition of the existing one. Other joint accessories, such as nuts, bolts and glands, shall be reused only if judged to be in good condition by the Engineer, unless otherwise specified in Section 3.00 "Sequence of Construction and General Information."

C. Any proposed length of pipe, fitting, or valve to be installed as an integral part to an active main, shall be swabbed on the inside with calcium hypochlorite, HTH, Perchloron, or approved equal, mixed in solution with water. The quality of hypochlorite shall in all cases be subject to the approval of the Engineer whose representative shall be present at all times while this phase of the work is in progress. The installation shall be made as swiftly as possible after service has been halted in the pipeline and any water in the ditch shall be kept below the level of the length of pipe, fitting, or valve. The pipeline shall then be placed in service by Department personnel.

D. In the event any existing customers will be without water while a connection is being made, the Contractor shall notify them when the water will be turned off and when he estimates service will be resumed. In some instances these connections may have to be made at night.

E. All necessary sheeting, shoring, dewatering, excavation, backfill and compaction, surface repairs, and other items and work appurtenant to or incidental to the work shall be performed by the Contractor. The Contractor shall include all costs for items and work provided by him for this type of connection in his price or prices bid under the various Quotation Items. No other compensation will be provided.

6.14 COMPACTED BACKFILL

A. When mains are to be installed within existing street areas, the Contractor shall limit the amount of ditch open at any one time to one block (approximately 600 feet). The work in each block including excavation, pipe laying, backfilling, compaction and temporary paving, shall be completed before proceeding with the work in the next block. The Contractor may employ more than one installation crew on the Project, but not less than 1,200 feet shall separate any two open trench sections as defined above.

B. Trenches remaining open to facilitate the repair of existing underground utilities damaged by the Contractor during excavation shall not be deemed a portion of the allowable 600 feet of open trench, unless otherwise decided by the Engineer, at his discretion.

C. **Backfilling and compaction shall in be kept up with the rate of pipe laying. Backfill consisting of the specified material shall be placed and properly compacted, to the degree specified hereinafter. Unless otherwise ordered or approved by the Engineer, in writing, no temporary fill, refill, or uncompacted fill shall be installed. Under no circumstances shall backfill material other than that specified or an approved equal be installed. Backfill shall be placed and compacted immediately after installation of piping.**

D. Where existing paving is damaged or removed, temporary paving, as specified hereinafter shall be placed the same day as the ditch backfill and compaction and it shall be replaced with permanent paving within thirty (30) days, to the limits shown in the Department Standard Details or directed by the Engineer.

E. Backfill Material: Shall be clean and free from all organic material, clay, marl or unstable materials, debris, lumps or broken paving. No rocks or stones larger than 6 inches in diameter shall be allowed in any backfill. Material for backfill may be material resulting from trench excavation, if suitable in the opinion of the Engineer.

F. Select Backfill Material: Specified in these Specifications or required by the Plans shall meet all of the general requirements for backfill material set forth above, and, in addition, shall be free of any rocks or stones larger than 2 inches in diameter. Select backfill material may be material resulting from trench excavation, if suitable in the opinion of the Engineer, carefully selected to comply with these requirements.

G. Backfilling and compaction of trenches will not be allowed until the work has been inspected by the Engineer, and the Engineer indicates that backfilling and compaction may proceed. Any work covered up or concealed without the knowledge or consent of the Engineer may be required to be uncovered or exposed at no cost to the Department.

H. The Contractor shall backfill and compact all trenches and other excavations made in the process of installing the pipe. The cost of all backfilling and compaction shall be included in the price bid under the various Items. The Contractor shall maintain the surface of the backfill free from major irregularities and potholes. Backfill to a point at least one foot above the pipe shall be select backfill material not exceeding 2 inches in diameter. Above this point, backfill shall be of material not exceeding 6 inches in diameter.

I. Backfilling and compacting of material under and around the pipe and to one foot above the crown shall be in layers not exceeding 6 inches in thickness. Each layer shall be thoroughly compacted to at least 90 percent of maximum density as determined by AASHTO Standard No T-180-74, "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 Engineer.

J. Backfilling and compacting of material lying above a point one foot 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 98 percent of maximum density as determined by AASHTO Specification T-180-74 or such greater density as may be required by the governing authority over the area in which the work is performed.

K. A testing laboratory, designated by the Department, will make periodic field tests to determine the density being obtained in each lift, or layer, of the backfill. The Department will pay the cost for each test that indicates that the density obtained in the backfill meets or exceeds the specified percentage. Contractor shall pay the cost for each test that indicates that the density obtained in the backfill is insufficient and does not meet the specified percentage. When compacted backfill fails to meet the specified percentage of maximum density as shown by test results, it shall be reworked and recompacted in a manner approved by the Engineer, and then retested. The reworking, recompacting 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. The Contractor shall exercise proper care to insure 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. See Section 6.06.1.

L. Backfill and compaction shall be kept up with the rate of pipe laying. The backfill up to the springline of the pipe shall be placed and compacted as soon as practical after the laying of the pipe.

M. On parts of the line where ground water level may be high enough to float the pipe, the placing of the backfill and the rate of pumping the trench shall be so controlled as to prevent the pipe from floating or moving from the line and grade shown on the Plans.

N. 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 at no additional cost to the Department.

O. Suitable material in excess of all backfill requirements shall be removed from the work and disposed of by the Contractor. The cost for removal shall be included in the overall Project cost bid.

P. 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 3 inches of gravel or graded and washed rock with a maximum diameter of 1/2-inch except as otherwise directed by the Engineer. 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. The cost for replacement of gravel or rock stabilized driveways and roadways shall be included in the overall Project cost bid unless a specific Bid Item is established in the Quotation.

Q. Backfill material shall consist of the suitable excavated material being stored for this purpose. Backfill material placed within 1-foot of piping and appurtenances shall not contain any stones or rocks larger than 2 inches in diameter, and no stones or rocks larger than 6 inches in diameter will be permitted in any backfill. Backfill material containing mangrove muck or other unsuitable materials shall not be used.

R. During the backfilling operation, care shall be taken to preserve the alignment and gradient of the installed pipe.

6.15 CLEANING, TESTING AND DISINFECTING

A. Cleaning

1. Volume flushing will not be required, however, the inside of the main shall be hosed down with water and swept clean as the work progresses.
2. The Contractor shall furnish all materials and equipment as necessary to clean the mains. The dirty water removed from the mains shall be disposed of by pumping out or ahead into the trench, or other approved location, and the Contractor shall exercise care to prevent any damage to the surrounding area and adjacent properties.
3. 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.
4. Unless otherwise ordered by the Engineer, cleaning shall be by pigging for lines of 36-inch nominal diameter and below. Lines of larger size are anticipated as being cleaned directly by construction personnel as the installation progresses. For all lines of nominal diameter greater than 24-inches the Contractor shall furnish for approval by the Department a written shop drawing and procedure submittal detailing materials and methods to be used in the cleaning operation. This submittal shall be made in timely fashion so as not to delay construction and to permit sufficient time for review. If said submission is not approved, the Contractor shall immediately make such changes as are directed by the Department and resubmit.
5. 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 Department, any damaged pipe or lining.
6. The pig for cleaning shall be a Bare Swab No. 5B; density, 1 lb./ft.^{3} by Knapp Polly Pig, Inc. 1209 Hardy Street, Houston, Texas 77020, 1-800-231-7205, or approved equal.
7. Prior to cleaning operations, the Contractor shall in writing, notify the Department of the make, model and characteristics of the pig to be used. This description shall be sufficient to fully identify and describe the pig to be used. If the pig has not been previously approved for this use by the

Department, the submittal shall be a formal shop drawing and be accompanied by a letter from the manufacturer stating that the pig is designed to be used with lined pipe and will not, if properly applied, abrade or damage the lining.

8. As soon as the installation of each run of pipe is completed, and prior to installation of valves on the main in positions which would interfere with or be damaged by 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.
9. 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 Department, pigging operations shall be scheduled to allow observation by the Department and no extra compensation will be allowed for such scheduling.
10. The Contractor shall furnish, install and remove 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 Department reserves the right to reject the pig and require provision by the Contractor of a new replacement at no extra charge to the Department.
11. After the main has been cleaned to the satisfaction of the Engineer, any valves which could not be placed prior to pigging operations shall be installed using care to prevent entrance of deleterious materials into the cleaned main or valve body. Thereafter, the main shall be tested as specified below unless otherwise ordered or permitted by the Engineer.

B. Testing

1. Pipelines for potable water mains shall be pressure tested at 150 psi for a minimum of two (2) hours in accordance with FDOH requirements.
2. The main shall be tested as specified in the Sequence of Construction or permitted by the Engineer. Corporation stops shall be installed prior to testing, and shall be included in the test with no leakage permitted.
3. Water for cleaning and/or testing shall be furnished as specified in Section 4.01 "Water Used in Construction." Water from a fire hydrant shall be measured with a floating meter.
4. The Contractor shall furnish and install all necessary pumps, piping and fittings, including the corporation stops, to connect the section under test to the source of water. The test pump shall be centrifugal or gear pump producing a steady pressure free of pulsation. The test pressure shall be maintained throughout the duration of the test. Unless otherwise permitted by the Engineer, no static testing will be allowed.
5. All fire hydrants, corporation stops, air release valves, flushing valves, and meter valves in the section being tested shall be opened and left open until water comes out of them, in order to remove as much air as possible from the line.
6. Water shall be pumped into the line through the meter up to the required pressure, and pumping shall be continued to maintain that pressure for a period of 2 hours, or such longer period as the Inspector requires to inspect the line for leaks. Leakage shall be defined as the quantity of water that must be supplied into the newly laid pipe, or any valved section

thereof, to maintain the specified leakage test pressure after the air in the pipeline has been expelled and the pipe has been filled with water.

7. Testing shall continue for additional 1 hour periods if the leakage increases during a previous to a subsequent test period, even if the leakage is within the allowable amount, until the leakage stabilizes or decreases.
8. The maximum allowable leakage for ductile iron mains shall be determined by the following formula from the ANSI/AWWA C600, "Installation of Ductile-Iron Water Mains and Their Appurtenances":

$$L = \frac{SD \text{ times the square root of } P}{148{,}000}$$

where: L = allowable leakage in gallons per hour
S = length of pipeline tested in feet
D = nominal diameter of the pipe in inches
P = average test pressure during the leakage test, in pounds per square inch gage.

9. No pipe installation will be accepted if the leakage is greater than that determined by the above requirements.
10. The Contractor shall locate and repair all leaks until the leakage is reduced to the limits specified. The Contractor may use the leak detector belonging to the Department but shall reimburse the Department for the actual cost of the operation of the instrument by Department personnel. Any observed leaks or any obviously defective joints or pipes shall be repaired or replaced as directed by the Engineer, even though the total leakage is below that specified above.
11. The tests and repairs shall be continued or repeated until the Engineer is assured that the leakage from the section of line under test is less than the amount specified.

C. Disinfecting

1. As part of the work to be paid for under this Project, the Contractor shall furnish all the necessary labor, equipment, and material and shall disinfect the pipe in accordance with AWWA C651-86, "Disinfection of Water Mains," with Addendum C651a-90, both as modified herein.
2. Liquid chlorine is available locally and shall be purchased by the Contractor. A suitable chlorinator shall be used to inject the chlorine into the lines.
3. The pipelines shall be disinfected after they have been pressure tested and while still full of water. All connections required for the introduction of chlorine into the water lines shall be made by the Contractor. Chlorine and water shall be introduced at one end and shall be allowed to flow slowly through the lines to the other end where it shall be removed and disposed of at the Contractor's expense. Several points of introduction and removal of chlorine solution may have to be employed to get an even distribution through the entire section being disinfected. The quantity of chlorine introduced shall be such as to insure a concentration of at least 50 parts per million in the water flowing from the line. The chlorine solution shall be allowed to stand in the line for at least 24 hours or longer, if required, to destroy all bacteria. At the end of the required time, the concentration of chlorine in all parts of the section shall be at least 25 ppm. All valves and appurtenances in the section shall be operated at

least once during the above period. After the required period, the treated water shall be thoroughly flushed from the section and the system filled with potable water. At least one bacteriological sample of the potable water in the main will be taken by the Engineer with the assistance of the Contractor on each of two successive days. The Engineer will submit the samples to the FDOH for testing. The samples shall be taken from each main or section of main to be placed in service where designated by the Engineer. The samples must be approved by the FDOH before the main is placed in service. The Contractor shall be responsible for any rechlorination and retesting that may be required until the FDOH's approval is obtained. The Contractor shall be responsible for the disposal of all water flushed from the system and shall safeguard all adjoining properties from damage from flooding.

4. All of the connections shall be disinfected by the Contractor. The inside of each pipe and fitting laid by the Contractor in connecting to existing mains which are isolated from the main line by valves shall be swabbed with calcium hypochlorite, HTH, Perchloron, or approved equal, mixed in solution with water. The quantity of hypochlorite shall in all cases be subject to the approval of the Engineer, whose representative shall be present at all times while this phase of the work is in progress.
5. Wherever practicable, water from the existing mains flowing through the disinfected connections shall be used in disinfecting the main line in order that the hypochlorite may be removed to the greatest extent possible. In other cases, the water from the disinfected connections shall be removed by allowing it to flow into the main line as it is being drained.

6.16 STRUCTURAL WORK

A. All concrete work shall be constructed in accordance with all of the applicable provisions of Section 03300 "Cast-in-Place Concrete, Reinforcing and Formwork."

B. If in performing the concrete work hereunder, the forms holding the concrete should fail, sag, or get out of line in any way whatever, the Contractor shall repair such damage to the complete satisfaction of the Engineer. All completed members shall be straight and true and present a uniform appearance. The use of excavated walls as forms will not be approved.

C. All reinforcement shall be delivered without rust. It shall at times be fully protected from grease, dirt or mortar. Before being placed in position, it shall be thoroughly cleaned of all foreign matter, loose mill scale and rust. Reinforcing bars shall be securely wired together at all intersections and held clear of forms by concrete blocks or other approved devices. Steel wire chairs with or without plastic tips will not be accepted. Stirrups and hoops shall pass around the outside of the main reinforcement in beams and columns. The bars shall be bent cold, to the shapes indicated on the Plans. Bending shall be done in the shop before shipment and not in the field unless otherwise noted on the Plans or directed by the Engineer. Unless otherwise noted on the Plans, splice lengths shall not be less than 40 bar diameters.

6.17 PAVEMENT REMOVAL AND REPLACEMENT

A. General:

1. Work included under this Section covers the furnishing of all labor, equipment and material required for cutting, removing, protecting, replacing or stabilizing all existing roadways, driveways and pavements of the various types encountered, removed or damaged under this Contract.
2. In addition, all existing utility castings, including valve boxes, junction boxes, manholes, hand-holes, pull boxes, inlets and similar structures in the areas of trench restoration, pavement replacement and pavement overlay shall be adjusted by the Contractor to bring them flush with the surface of the finished work.
3. The Contractor shall be responsible for the protection from damage from his construction operations, all pavements, including all base courses and surface courses, within the work area.
4. Payment for pavement restoration will be made only where such base courses or surface courses are encountered within the limits defined in the pavement repair details shown on the Plans and/or in the Department Standard Details at the rear of the Specifications.
5. Any base course or surface course beyond those limits, damaged as a result of the Contractor's operation, shall be restored in accordance with the applicable requirements of these Specifications, to the satisfaction of the Engineer, and to the satisfaction of the governing authority having jurisdiction over the work area at no additional cost to the Department.
6. Any damage to adjacent lanes of pavement which amounts to 25 percent or more in any one block (approximately 600 feet) will require that the Contractor resurface the entire width of the lane in which the damage occurred for the entire block, at no cost to the Department.
7. In order to protect himself from being held liable for any existing damaged pavement, including detour routes, the Contractor is advised to notify in writing the authority having jurisdiction over 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.
8. No payment shall be made for pavement restoration which falls outside the above described limits and is required for thrust blocks and other appurtenant items. The cost for such work shall be included in the price bid for the applicable item.
9. It is brought to the Contractor's attention that wherever the line of the nominal repaving for trenches extend to within two feet of the edge of the existing paving, he shall repave to this edge.
10. Permanent pavement repair shall be in accordance with the details shown on the Plans and/or in the Department Standard Details herein, 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. Where trenches are located out of the existing pavement and damage occurs to the pavement, it shall also be replaced by the Contractor at his expense.
11. Pavement markings removed or obliterated by the Contractor's operations shall be promptly replaced in kind by him at his expense, to the satisfaction of the MDCDTPW, Traffic Engineering Division, or other authority having jurisdiction over the work area.
12. The percentages of maximum density for subgrade and limerock base specified herein are minimum. Greater percentages of maximum density shall be obtained, if so required by the governing authority having jurisdiction over the work location.

13. Asphaltic concrete mixtures shall be obtained only from plants which comply with the requirements of FDOT Specifications, 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 FDOT Specifications, Section 330, as applicable.
14. All equipment necessary for construction shall be on the job site in first class working condition.
15. Asphaltic concrete shall be laid only where the surface to be covered is intact, firm, cured and dry, and only when weather conditions are suitable. The temperature of the mixture at the time of spreading shall be within 25 degrees F. of the temperature set by the Engineer. No mixture shall be spread when the air temperature is less than 40 degrees F nor when the spreading cannot be finished and compacted during daylight hours.
16. 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.

B. Temporary Paving:
1. Prior to commencing excavation, the asphalt surface shall be sawcut within the limits of the construction area. Temporary paving shall be placed the same day the trench is backfilled. The trench shall be backfilled as required in Section 6.14 "Compacted Backfill," up to a level one inch below the existing pavement surface and a temporary, cold mixed sand/asphalt pavement shall be constructed up to the level of the existing pavement surface. The liquid asphalt shall be Grade RC-70 conforming to the requirements of FDOT Specifications, Section 916-2. The sand shall conform to the requirements of FDOT Specifications, Section 902, for fine aggregate.
2. The cold mix is to be installed one block at a time, not crossing any intersections, to a maximum of 1,200 feet. Work in this 1,200 (max.) feet shall be completed before the Contractor may move forward with his excavation work. Backfill, compaction and temporary paving is to keep pace with the pipe installation. Written permission must be obtained from the Department and the municipal agency permitting the work to allow greater lengths than 1,200 feet. Permitting agencies may reduce the allowable limits in their permit, or for other unforeseen right-of-way conditions.
3. Prior to completion of the work, the Contractor shall remove the one inch of cold mix and surplus backfill. He shall replace it with the specified compacted limerock base course and asphalt within the approved working limits. Municipal agencies permitting this work may accelerate the 30-day time limit specified below for replacement of temporary with permanent pavement at their discretion. No additional compensation will be allowed due to such acceleration.
4. The temporary pavement shall be maintained by the Contractor in a condition satisfactory to the Engineer until its removal. Removal shall include any surplus backfill material. Replacement shall be made within 30 days with the permanent pavement. In replacing the temporary paving with permanent pavement, all work shall be completed in sections compatible with specified traffic maintenance procedures.

5. No payment shall be made for temporary paving work and the cost for such work shall be included in the prices bid for other applicable items of work.
6. Should the Contractor elect to install temporary hot mix asphalt, to be left in place, in lieu of cold mix asphalt, a suitable credit for cold mix will be provided to the Department when the hot mix temporary asphalt is left in place and installed over properly compacted limerock base course and shall be incorporated into the specified permanent pavement restoration as part of Type I paving replacement.
7. Sand seal on the limerock base course will not be permitted in lieu of temporary paving.

C. Type M Paving Repairs (Limerock Base and Asphaltic Concrete Surface)

1. Type M repairs, as detailed in Department Standard Detail A 4.0, shall be used for this Project for the portions of right-of-way that fall within the jurisdiction of the City of Miami Public Works Department.
2. The limerock base shall be 12 inches thick with a minimum width equal to the trench width plus one foot.
3. The asphaltic concrete wearing surface shall be a minimum 1 1/2-inch thick.
4. Limerock for pavement base shall be Miami limerock obtained from local sources where the overburden was removed from the pits prior to mining operations. The limerock shall comply with the requirements of FDOT Specifications, Section 911.
5. The backfill previously placed and compacted shall be excavated to the required depth below the existing road surface and the existing paving shall be cut back beyond all excavations, using an abrasive disc saw to trim the edges to straight and true lines. Eight inches of limerock base shall be placed in two layers, each layer compacted to not less than 98 percent density as specified in Section 6.14 "Compacted Backfill." During rolling, it shall be wet down as necessary to secure the greatest possible compaction. After rolling, the entire surface shall be thoroughly scarified to a depth of not less than 3 inches and shaped to conform to the existing surface, then watered and rolled again. Rolling and watering shall continue until the entire depth of the base is bonded and compacted into an unyielding mass.
6. If at any time the subgrade material becomes churned up and mixed with the limerock base course materials, the Contractor shall, without additional compensation, dig out and remove the mixture, reshape and compact the subgrade and replace the materials removed with clean rock which shall be watered and rolled until satisfactorily compacted.
7. After the limerock base course has been properly prepared and is dry and ready to receive the wearing surface, a tack coat of emulsified asphalt (Grade RS 2) shall be applied at a rate of 0.10 gallon per square yard, immediately followed by the asphaltic concrete. The tack coat shall be applied to the entire limerock base course uniformly, and shall thoroughly coat all surfaces. Care shall be taken to tack coat and bond the edges of surrounding pavement. 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.
8. The asphaltic concrete shall be plant mixed, using the best grade of local aggregates of approved size and gradation and mixed with an approved binder and conforming to either FDOT Specifications, Type S-1 Asphaltic Concrete, Section 331-1 through 331-5, or, MDCDTPW Type I, as

ordered by the Engineer. Where the width of the repair permits the material shall be placed by means of an approved mechanical spreader and finisher. The mixture shall be compacted to true grade and cross section by means of a tandem roller weighing not less than eight tons. The compacted asphaltic concrete mixture shall not be, in any case, less than one inch in thickness. Rolling shall proceed as closely behind the spreader as possible and all material shall be completely compacted the same day it is placed.

D. Type V Paving Repairs (Asphaltic Concrete Wearing Surface Overlay)

1. Type V paving repairs shall be made where noted on the Plans and/or as ordered by the Engineer. Type V paving repair is usually in addition to required Type I or State Road paving repairs. Since the quantity of Type V repairs that may be required is usually unknown until Contract pavement restoration work begins, Type V repairs may be established in the Quotation on a contingent basis. A Contingent Item may or may not be used at the option of the Department, and any provisions contained within the Contract Documents for quantity overruns will not be applicable.
2. Type V paving repairs shall consist of a machine-laid asphaltic concrete wearing surface overlay which shall be nominal one-inch thick asphaltic concrete meeting the requirements of Type I repairs as specified hereinabove. As used herein, "overlay" shall mean Type V paving repairs.
3. In general, the overlay will be applied in a full lane width or widths, after the permanent paving repairs over the trench have been made.
4. Where the overlay will abut existing pavement which is not to be overlaid, such as at extreme ends, the marked centerline of the pavement, or other lane markings, the existing asphaltic concrete surface shall be saw cut for its full depth or 1-inch minimum, and then stripped back for at least 2 feet into the area to be overlaid to a second cut which shall also be in clean straight lines. The second, or interior, cut edge shall be rolled with a tandem roller weighing not less than 8 tons before the overlay is applied. The stripped area shall be used to provide a transition or "feather" area between the overlay and the existing pavement. Before placing the overlay, all cut edges and the stripped area shall be tack coated with emulsified asphalt as specified herein below.
5. Before the overlay is applied, existing surfaces shall be swept clean of all dirt and debris, using a power driven broom if warranted by the size of the location to be overlaid and/or as ordered by the Engineer. Pavement edges shall be cleared of all encroaching vegetation, loose sand, rock and all other foreign matter. When the existing surface is thoroughly clean, a tack coat of Emulsified Asphalt, Grade RS-2 (anionic) shall be applied at the rate of approximately 0.10 gallon per square yard, immediately followed by the asphaltic concrete overlay. 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.
6. Machine-laid overlay shall be placed by means of an approved mechanical spreader and finisher, and the mixture shall be compacted to true grade and cross section by means of a tandem roller weighing not less than 8 tons.
7. The compacted overlay mixture shall be thicker as required to produce a smooth uniform surface free of any irregularities, but shall not be less than one inch in thickness. Rolling shall proceed as close behind the

spreading of the mixture as possible, and all materials shall be completely compacted the same day it is placed.

E. Asphalt Cold Milling

1. Cold milling of the existing pavement for a 1-inch depth shall be done by using an automated pavement planer capable of maintaining an accurate depth. Cold milling equipment shall meet the approval of the Engineer and the governing agency having jurisdiction at the location of the pavement milling operation. The Engineer's word as to the acceptability of the equipment shall be final.
2. After the pavement has been milled and the existing pavement removed, a tack coat shall be applied as specified above.
3. The required width of 1-inch thick asphaltic concrete wearing surface of the specified wearing course shall be applied in accordance with the above specifications.

6.18 PAVEMENT MARKINGS

A. Pavement markings for this Project shall conform to the FDOT Standard Specifications for Road and Bridge Construction.

B. Traffic Paint:

1. Traffic paint shall conform with FDOT Specifications, Section 971-12, or, at the Contractor's option, fast dry traffic paint as specified in FDOT Specifications Section 971-13 may be used.
2. The colors of the paint shall be yellow or white as existed before the repair.
3. All equipment shall be of a type and design which will readily obtain the required uniformity of application of the stripes, both as to thickness of coating and alignment. The paint machine shall be of the spray type and shall be capable of spraying the paint to the required spread without thinning of the paint. The paint tank shall be equipped with a mechanical agitator. The nozzle shall have cut-off valves which will apply broken or skip lines automatically. Each nozzle shall also be provided with suitable line guides, either metallic shrouds or air blasts.
4. Painting shall be done only during daylight hours and, as far as practicable, shall be terminated in time to permit sufficient drying by sunset. No paint shall be applied when any moisture is present on the surface to be painted or when the air temperature is below 40 degrees F. Painting shall not be done when winds are sufficient to cause spray dust.
5. 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 of soil shall be removed from the pavement before edge striping is begun.
6. The paint shall be thoroughly mixed before it is poured into the painting machine and no thinning of the paint will be allowed at any time. Before the start of each day's work, the paint container, the connections, and the spray nozzles on the machine shall be thoroughly cleaned with paint thinner or other suitable cleaner.
7. 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.

8. 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.
9. Any portions of the stripes damaged by passing traffic or from other cause shall be repainted at the Contractor's expense.
10. Thermoplastic and reflective markers obliterated or removed by the Contractor's operation, within the construction limits shown in the details, shall be replaced with Traffic paint as specified hereinabove.
11. Paint for temporary pavement markings shall also be used where the thermoplastic markings are to be applied after the asphaltic concrete has "cured." The cure time shall be based on the thermoplastic manufacturer's recommendation. This traffic paint shall be completely compatible with the thermoplastic paint to be installed after cure.

C. Thermoplastic Traffic Stripes and Markings:
1. Thermoplastic pavement markings, including stripes, pavement messages, stop bars, directional arrows, reflective pavement markers and other miscellaneous items, will be replaced as existed before the repair was made. The thermoplastic compound shall be as specified in Section 711 of the FDOT Specifications. 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.
2. The colors of the compound shall be white or yellow as existed before the repair.
3. Reflective Pavement Markers and their installation shall conform to the FDOT Specifications, Section 706.
4. Where thermoplastic is to be applied to cement concrete pavement, a sealing primer as specified in FDOT Specifications Section 711-2.2, shall be applied in advance of the placing of the stripes.
5. The thermoplastic shall be applied to the pavement utilizing either extrusion or spray application equipment. The application equipment shall be so constructed as to provide continuous mixing and agitation of the material. Conveying parts of the equipment between the main material reservoir and the shaping die or gun shall be so constructed as to prevent accumulation and clogging. The equipment shall be constructed so that all mixing and conveying parts up to and including the shaping die or gun, maintain the material at the plastic temperature with heat transfer oil or electrical element controlled heat. Direct fire heat transfer will not be allowed.
6. The application equipment shall be so constructed as to insure continuous uniformity in the dimensions of the stripe. The applicator shall provide a means for cleanly cutting off square stripe ends and shall provide a method of applying "skip" lines. The use of pans, aprons, or similar appliances resulting in die overruns will not be permitted.
7. Glass spheres applied to the surface of the completed stripe shall be applied by an automatic bead dispenser attached to the striping machine in such a manner that the beads are dispensed almost instantaneously upon the installed line.

8. Special kettle(s) shall be provided for melting and heating the thermoplastic material. The kettle(s) shall be equipped with automatic thermostatic control devises in order to provide uniform temperature control and prevent overheating of the material. The applicator and kettle(s) must be so equipped and arranged as to satisfy the requirements of the National Fire Underwriters, the State of Florida, Miami-Dade County and any municipal authority applicable to where the work is being done.
9. Applicators shall be mobile and maneuverable to the extent that straight lines can be followed and normal curves can be made in a true arc. The applicator equipment to be used on roadway installations shall consist of either hand equipment or truck mounted units depending on the type of marking required.
10. The hand applicator equipment shall insulated and shall have sufficient capacity to hold 150 pounds of molten material and shall be sufficiently maneuverable to install crosswalks; lane, edge and center lines; arrows and legends. The truck mounted unit for lane, edge and center lines shall consist of a mobile self-contained unit carrying its own material capable of operating at a minimum speed of five miles per hour while installing striping.
11. Application time, weather limitations and surface preparation shall be in accordance with FDOT Specifications Sections 710-4, 710-5 and 710-8.
12. The material, when formed into traffic stripes or other markings must be readily renewable by placing an overlay of new material directly over an old line of compatible material in such a manner that no splitting or separation takes place.
13. The application temperature shall be within the range specified by the manufacturer of the thermoplastic compound being used.
14. All pavement edge lines, gore, island and diagonal strip markings, bike lane symbols and messages, wherever located, shall have a minimum thickness of 0.060 inch at the edges and a maximum thickness of 0.120 inch at the center. A minimum average film thickness of 0.060 inch shall be maintained. All lane lines, center lines, transverse markings (except shoulder markings) and pavement markings within traffic wearing area (such as dotted turning guide lines) shall have a minimum thickness of 0.090 inch at the edges and a maximum thickness of 0.188 inch at the center. A minimum average film thickness of 0.090 shall be maintained. All thickness measurements shall be an average in any three foot length.
15. The glass sphere top coating shall be applied by a type of glass sphere dispenser or gun which will embed the spheres into the line surface to at least one-half their diameter. The glass sphere top coating shall no incur more than a 10 percent loss during the first 30 days of traffic exposure.
16. Reflective pavement markers shall be installed as they existed before the repair. They shall be replaced with the appropriate color or colors and oriented in the correct direction as specified in Section 706 of the FDOT Specifications.

6.19 CONCRETE DRIVEWAY, SIDEWALK, AND CURB AND GUTTER REMOVAL AND REPLACEMENT

A. General:
1. 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.

2. 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 Department. 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.
3. 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.
4. 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.
5. No form shall be set higher than the elevation of the adjacent concrete surface.
6. As used herein, "driveway" shall mean concrete driveway, and "curb and gutter" shall mean free standing curb, gutter, or combination curb and gutter.
7. 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.
8. 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.
9. All concrete and concrete work for driveway, sidewalk and curb and gutter replacement shall conform to Section 5.02 "Concrete, Mortar and Grout" and Section 03300 "Cast-in-Place Concrete, Reinforcing and Formwork."

B. Concrete Driveways:

1. 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.

2. 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.
3. 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.
4. 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.
5. Replacement driveways (and sidewalks) shall match the elevation and alignment of existing driveways (and sidewalk) wherever a connection is made.

C. Sidewalks:

1. Sidewalks shall be restored in full section rather than trench width plus 2 feet (shoulder).
2. 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.

D. Curb and Gutter:

1. 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.

6.20 LANDSCAPING

A. General:

1. Existing plants, trees and grassed areas damaged or destroyed by the Contractor's operations shall be restored or replaced by the Contractor, at his expense to equal or better than original condition, and to the satisfaction of the Engineer.

B. Solid Sod:

1. Solid sod shall be planted in the unpaved areas abutting the structures and extending to the limits shown on the Plans.
2. When solid sod is to be placed adjacent to or in close proximity to existing sod or grass, the Contractor is to use similar sod or grass and obtain approval from the Engineer prior to installation. In public areas and right-of-ways the Contractor is also required to comply with Governmental

Agency requirements and provide the Department with written approval of said agency prior to installation of grass and sod.

3. All areas to be grass sodded shall first be leveled, and debris, rocks, and other undesirable matter removed. Topsoil shall then be placed to a minimum depth of 3 inches, with all larger lumps broken up. The mixture shall be well worked and raked to a uniform surface and then hand tamped, or lightly rolled. The topsoil shall be moistened with water prior to placing sod.
4. The sod shall be placed with closely abutting joints, and shall completely cover the disturbed areas. The top of the new sod shall coincide with the top of the existing grass. The sod shall be covered with a light top dressing of topsoil and shall then be thoroughly watered.
5. The Contractor shall weed and water the grassed areas until the Project is accepted by the Department; however, the minimum period of this maintenance shall not be less than 60 days even if it extends beyond said acceptance. Any portions of the grassed areas which die, or appear to have succumbed to the shock of transplanting, before the acceptance by the Department, or expiration of the minimum 60-day maintenance period, shall be replaced by the Contractor at his expense.
6. Solid sod shall be certified bitter blue St. Augustine Floratam. The sod shall be firm touch texture having a compact growth of grass with good root development. It shall contain no weeds or other objectionable vegetation.
7. Where sodding is used in drainage ditches, the setting of the pieces shall be staggered so as to avoid a continuous seam along the line of flow. Along the edges of such staggered areas, the offsets of individual strips shall not exceed 6-inches. In order to prevent erosion caused by vertical edges at the outer limits, the outer pieces of sod shall be tamped so as to produce a featheredge effect.
8. Sodding shall not be performed when weather and soil conditions are, in the Engineer's opinion, unsuitable for proper results.

C. Watering:

1. The areas on which the sod is to be placed shall contain sufficient moisture, as determined by the Engineer, for optimum results. After being placed, the sod shall be kept in a moist condition to the full depth of the rooting zone for at least 2 weeks. Thereafter, the Contractor shall apply water as needed until the sod roots and starts to grow for a minimum of 60 days (or until final acceptance whichever is latest).

7.00 CLEANING UP SITE

A. The Contractor shall at all times during the execution of this Contract keep the work site free and clear of all rubbish and debris. As soon as the work is completed, the accumulated rubbish or surplus materials shall be promptly removed. The Contractor shall also restore in an acceptable manner all property, both public and private, which has been displaced or damaged during the prosecution of the work, and shall leave the site and vicinity unobstructed and in a neat and presentable condition.

B. In the event of delay exceeding two days after written notice is given to the Contractor by the Engineer to remove such rubbish or materials or to restore displaced or damaged property, the Engineer may employ such labor and equipment as he may deem necessary for the purpose, and the cost of such

work, together with the cost of supervision, shall be charged to the Contractor and shall be deducted from any monies due him. The Project shall not be considered as having been completed until all rubbish and surplus materials have been removed and disposed of properly.

8.00 MEASUREMENT AND PAYMENT

A. General:

1. Payment for all the work completed under this Project shall be made in accordance with the provisions of the General Covenants and Conditions on the basis of the specific provisions of this section of the Specifications.
2. The Contractor will be paid each month the value of the work completed during the preceding month (less retainage) and the invoiced cost including applicable sales taxes and shipping value (less retainage) of materials not already used, but which have been furnished by the Contractor under the Specifications, provided that such materials have been delivered, properly stored and inspected by the Engineer and that payment therefore has been satisfactorily certified by the Contractor to the Engineer. Remaining cost for materials (less retainage) will be paid at the same time as installation. Any payment for materials which are not used will be withheld from the final pavement.
3. The Contractor shall receive and accept the compensation as provided in the Quotation, the RPQ and Section 27 "Scope of Payment" of the General Covenants and Conditions as full payment for furnishing all labor, materials, tools and equipment, for performing all operations necessary to complete the work under this Contract, and also in full payment for all loss or damages arising from the nature of the Work, or from the action of the elements or from unforeseen difficulties which may be encountered during the prosecution of the work until the final acceptance by the Department.
4. The cost breakdown (or schedule of values) referred to herein is defined in Section 9 "Information and Drawings to be Furnished by the Contractor" of the General Covenants and Conditions. The cost breakdown (schedule of values) approved by the Engineer will be used as the basis for making progress payments and for determining the cost of extra work which is the same or similar (as determined by the Engineer) to that defined in the schedule of values.
5. The prices stated in the Quotation includes full compensation for overhead and profit, all costs and expenses for taxes, labor, equipment, furnishing and repairing small tools and ordinary equipment, mobilization, home office expenses and general supervision, materials, commissions, transportation charges and expenses, patent fees and royalties, bond, insurance, labor for handling materials during inspection, together with any and all other costs and expenses for performing and completing the work as shown on the Plans and specified herein. In addition, the Contractor shall include the actual cost of social security taxes, unemployment insurance, worker's compensation, fringe benefits, inclusive of life and health insurance, union dues, pension, pension plans, vacations, and insurance and contractor's public liability and property damage insurance involved in the work based on the actual wages paid to such labor and all other general costs and profits, prorated to each item.
6. Unless otherwise specifically stated elsewhere herein, the Contractor shall include in the prices bid all materials, electrical supply, fuel,

lubricants, temporary equipment, temporary wiring, temporary piping and fittings, pumps, gages, and all other items of whatever nature required to completely test, balance, disinfect if required, and put into fully operational condition all equipment and/or systems supplied by either the Department or the Contractor and installed as a part of this Project. Further, any test materials supplied by the Contractor shall be completely satisfactory to the Department. Any decision as to whether a particular material is suitable for test purposes shall be at the sole discretion of the Engineer whose decision shall be final. Any material considered not suitable shall be immediately replaced by the Contractor with suitable material and no extra compensation will be allowed."

7. It is the intent of the Department to obtain a complete and working installation under this Contract, and any items of labor, equipment or materials which may reasonably be assumed as necessary to accomplish this end shall be supplied whether or not they are specifically shown on the Plans or stated herein.
8. The Contractor will be paid each month the value of the work completed during the preceding month (less retainage) and the invoiced cost including applicable sales taxes and shipping value (less retainage) of materials not already used, but which have been furnished by the Contractor under the Specifications, provided that such materials have been delivered, properly stored and inspected by the Engineer and that payment therefor has been satisfactorily certified by the Contractor to the Engineer. Remaining cost for materials (less retainage) will be paid at the same time as installation. Any payment for materials which are not used will be withheld from the final payment.
9. For purposes of determining the monthly payments to be made to the Contractor for work accomplished, the value of the work completed shall be determined in the following manner:
    a. Excavation, installation of pipe, valves and fittings, water services, fire hydrants, completed backfill, plugging existing mains and temporary paving repairs shall constitute seventy-five percent **(75%)** of the price bid for these Quotation Items.
    b. Submittal of the PSM's daily progress reports and/or field book notes and monthly as-builts of the work that has been performed to date (all documents subject to approval and acceptance by the Department) shall constitute ten percent **(10%)** of the price bid for these Quotation Items.
    c. Completion of all interior work in the pipeline including cleaning, hydrostatic testing and disinfection of water main shall constitute five percent **(5%)** of the price bid for these Quotation Items.
    d. Submittal of the final as-builts to the satisfaction of the Engineer, completion of all surface repairs, restoration of public or private facilities, appurtenances, and all other work not provided for under other Quotation Items shall constitute the remaining ten percent **(10%)** of the price bid for these Quotation Items.

B. Prices Bid:

1. The price bid for each item shall be stated in both words and figures in the appropriate places in the Quotation form. All blank spaces for bid prices must be filled in with ink, or with a typewriter. The Bidder is further directed that any and all alterations, changes, corrections and modifications, made to the Quotation forms prior to submission of bids,

must be initialed by the Bidder. Non-compliance by the Bidder of this directive may be grounds for rejection of his bid.

2. In the event that there is a discrepancy between the price written in words and the price written in numbers, the price written in words shall govern except where the number of units multiplied by the unit price shown in numbers equals the total price for that bid item. In such case the unit price shown in numbers shall govern over the unit price shown in words.
3. Where an error is made in the calculation of the total bid price of an item, the unit price shall govern.
4. If the bidder makes an error in his addition of the total bid prices of the applicable items in the Quotation, the correct sum of its applicable bid item totals shall be the Total Bid.
5. It has been determined that the County is not exempt from the payment of Florida State Sales Tax under this Contract. All items of materials, equipment and supplies furnished by the Contractor and remaining a part of the completed Project are subject to this Tax. The Bidder shall include a sufficient amount of money to pay for this Tax in his bid price. Sufficient money to pay the Tax for all miscellaneous materials and minor items shown on the Plans, specified herein, or necessary for the work, and which will remain a part of the completed Project, shall also be included in the price or prices bid, and no other compensation will be provided.

C. Quotation Items:

It is intended that all work required to complete this Project will be included in the various bid items as follows:

Item No. 1

For performing preparatory work and operations in mobilizing for beginning the work of the Project, including preparation and acceptance of Maintenance of Traffic Plan (MOT), but excluding materials and permit costs, both of which are paid under other payment items, shall include, but not be limited to; preparation, submission and acceptance of the MOT, first by the Department and if acceptable to the Department, submission to and acceptance by all other governing authorities; supply, submission and correction of all "Pre-Approved Product Lists" and/or shop drawings; ordering the said equipment and materials in a timely fashion; those operations necessary for the movement of personnel, equipment, supplies and incidentals to the Project site and for the establishment of temporary offices, buildings, safety equipment and first aid supplies, sanitary and other facilities; the cost of reestablishing the design baseline, vertical control points and reference points, and establishing proposed pipeline location; the cost of MOT and permit preparation/submission/acceptance; the costs of bonds, required insurance and other preconstruction expense but excluding the actual cost of permits, which are paid under a separate dedicated allowance account and excluding the cost of materials which are paid under another bid item(s).

Not inclusive of the costs incurred in the provision of traffic control and the costs incurred in the provision of off-duty police officers that are to be paid for under separate Bid Items.

The mobilization item will be paid in the following manner:

Contracts with construction duration of up to 120 calendar days will be paid in two (2) separate payments, each equal to fifty (50) percent of the amount bid for this item.

Contracts with construction duration of over 120 calendar days will be paid in four (4) separate payments, each equal to twenty-five (25) percent of the amount bid for this item.

The two or four payments will be made with the first two or four payment draws and is conditioned upon progress satisfactory to the Engineer being made pursuant to the accepted Project.

The total amount of the partial payments may not exceed ten (10) percent of the original Subtotal of the bid items. Any remaining amount will be paid upon completion of all work on the Contract. Retainage, as specified in the General Covenants and Conditions and any Special Provisions will apply to these payments.

Since this item is bid as an aggregate sum, payment will be in accordance with the cost breakdown as approved by the Engineer and measured as required by and satisfactory to the Engineer.

Item No. 2

For selling and delivering to the Department 12-inch ductile iron pipe and pipe fittings for water mains will be paid at the unit price bid times the number of linear feet accepted by the Engineer, which payment shall be full compensation for furnishing ductile iron pipe, pipe fittings, solid sleeves and specials; joint materials; joint thrust restraints; tie rods and eyebolts; corporation stops for testing and chlorination; vegetable soap lubricant; pipe bedding; backfill materials; temporary pavement materials; transportation and handling costs delivered ditchside; all shop drawing preparation and correction cost for material furnished under this item; all material and equipment required to clean, disinfect and test the main and fittings; and all other appurtenant and miscellaneous items (not included in another bid item) required for a complete and satisfactory installation.

The quantity for payment shall be the horizontal projection of the center line of the permanently installed and accepted pipe (of the particular bid item), including the length of fittings along the run, measured to the nearest one-tenth of a foot from P.I. to P.I. of bends and to the seat of the bell at the end of any particular line. The laying length of reducers, wyes, tees and crosses will be measured as pipe of the size of the largest diameter, and measured only once, only along run of wyes, tees and crosses so that the length of the outlets, even if of equal size to the run, will not be included in the measured length of lines connected to said outlets.

Item No. 3

For installing 12-inch ductile iron pipe and pipe fittings for water mains will be paid for at the unit price bid times the number of linear feet installed and accepted by the Engineer. The price per foot for installing pipe and pipe fittings shall be full compensation for the completed pipeline, ready for service, and shall include, but not be limited to; exploratory excavation; excavation; sheeting and shoring if necessary; complying with the Florida "Trench Safety Act"; dewatering the excavation; transporting and unloading the pipe, fittings and all other

materials not specified in other bid items from delivery trucks at the job site (trench side) and placing them into position in the trench; installing ductile iron pipe, pipe fittings, solid sleeves and specials; installing joint materials installing joint thrust restraints; making thrust resistant joints; installing tie rods and eyebolts; cutting and installing nipples; making all connections within the lines themselves; tapping the main for corporation stops for testing and chlorination; cleaning, testing and disinfecting the pipe and fittings; placing and compacting backfill; removal and disposal of excess or unsuitable fill material, where required; maintaining access to residences and businesses along the route of the main; protecting existing utilities along the route of the main; making temporary paving repairs; complying with work hour restrictions; satisfying all requirements of the Project permits; preparation and submittal of PSM's daily progress reports and/or field notes and monthly as-builts of the work that has been performed to date; moving and replacing utilities, trees, shrubs, mail boxes, sprinkler systems, shoulders, asphalt paths and all other similar items, to original locations and to equal or better than original conditions; and all other appurtenant and miscellaneous items and work (not included in another bid item) including final cleanup for a complete, satisfactory and functional installation.

The quantity for payment shall be the horizontal projection of the center line of the permanently installed and accepted pipe (of the particular bid item), including the length of fittings along the run, measured to the nearest one-tenth of a foot from P.I. to P.I. of bends and to the seat of the bell at the end of any particular line. The laying length of reducers, wyes, tees and crosses will be measured as pipe of the size of the largest diameter, and measured only once, only along run of wyes, tees and crosses so that the length of the outlets, even if of equal size to the run, will not be included in the measured length of lines connected to said outlets.

Complete monthly redline as-builts shall be condition for approval of monthly progress payment requests.

Item Nos. 4 and 6

For selling and delivering to the Department ductile iron pipe, pipe fittings and valves for water mains of the nominal sizes specified in these bid items will be paid at the unit price bid times the number of linear feet accepted by the Engineer, which payment shall be full compensation for furnishing ductile iron pipe, pipe fittings, solid sleeves and specials; resilient seat gate valves, valve boxes & lids and riser pipe, complete; joint materials; joint thrust restraints; tie rods and eyebolts; corporation stops for testing and chlorination; vegetable soap lubricant; pipe bedding; backfill materials; temporary pavement materials; transportation and handling costs delivered ditchside; all shop drawing preparation and correction cost for material furnished under this item; all material and equipment required to clean, disinfect and test the main, valves and fittings; and all other appurtenant and miscellaneous items (not included in another bid item) required for a complete and satisfactory installation.

The quantity for payment shall be the horizontal projection of the center line of the permanently installed and accepted pipe (of the particular bid item), including the length of fittings along the run, measured to the nearest one-tenth of a foot from P.I. to P.I. of bends and to the seat of the bell at the end of any particular line. The laying length of reducers, wyes, tees and crosses will be measured as pipe of the size of the largest diameter, and measured only once, only along run of wyes, tees and crosses so that the length of the outlets, even if of equal size to

the run, will not be included in the measured length of lines connected to said outlets.

Item No. 5 and 7

For installing ductile iron pipe, pipe fittings and valves for water mains of the nominal sizes specified in these bid items will be paid for at the unit price bid times the number of linear feet installed and accepted by the Engineer. The price per foot for installing pipe, pipe fittings and valves shall be full compensation for the completed pipeline, ready for service, and shall include, but not be limited to; exploratory excavation; excavation; sheeting and shoring if necessary; complying with the Florida "Trench Safety Act"; dewatering the excavation; transporting and unloading the pipe, valves, fittings and all other materials not specified in other bid items from delivery trucks at the job site (trench side) and placing them into position in the trench; installing ductile iron pipe, pipe fittings, solid sleeves and specials; installing resilient seat gate valves, valve boxes & lids and riser pipe, complete; installing joint materials installing joint thrust restraints; making thrust resistant joints; installing tie rods and eyebolts; cutting and installing nipples; making all connections within the lines themselves; tapping the main for corporation stops for testing and chlorination; cleaning, testing and disinfecting the pipe, fittings and valves; placing and compacting backfill; removal and disposal of excess or unsuitable fill material, where required; maintaining access to residences and businesses along the route of the main; protecting existing utilities along the route of the main; making temporary paving repairs; complying with work hour restrictions; satisfying all requirements of the Project permits; preparation and submittal of PSM's daily progress reports and/or field notes and monthly as-builts of the work that has been performed to date; moving and replacing utilities, trees, shrubs, mail boxes, sprinkler systems, shoulders, asphalt paths, driveways, traffic separators, pavement markings and all other similar items, to original locations and to equal or better than original conditions; and all other appurtenant and miscellaneous items and work (not included in another bid item) including final cleanup for a complete, satisfactory and functional installation.

The quantity for payment shall be the horizontal projection of the center line of the permanently installed and accepted pipe (of the particular bid item), including the length of fittings along the run, measured to the nearest one-tenth of a foot from P.I. to P.I. of bends and to the seat of the bell at the end of any particular line. The laying length of reducers, wyes, tees and crosses will be measured as pipe of the size of the largest diameter, and measured only once, only along run of wyes, tees and crosses so that the length of the outlets, even if of equal size to the run, will not be included in the measured length of lines connected to said outlets.

Complete monthly redline as-builts shall be condition for approval of monthly progress payment requests.

Item No. 8

For selling and delivering to the Department 12-inch mechanical joint resilient seat gate valves for water main, valve box & lid and riser pipe, complete, will be paid at the unit price bid times the number of valves accepted by the Engineer. The price bid shall be full compensation for furnishing all materials and supplies required for each complete and satisfactory installation, ready for service and shall include, but not be limited to; furnishing 12-inch mechanical joint resilient seat gate valves; furnishing valve box & lid and riser pipe; furnishing joint

materials; transportation and handling costs; and all other appurtenant and miscellaneous items and work required for a complete installation.

Item No. 9

For installing 12-inch mechanical joint resilient seat gate valves for water main, valve boxes & lids and riser pipe, complete, will be paid at the unit price bid price times the number of valves installed by the Contractor and accepted by the Engineer. The price per valve shall be full compensation for complete installation, ready for service, and shall include, but not be limited to, complying with the Florida "Trench Safety Act"; exploratory excavation; excavation; dewatering the excavation; transporting and unloading the valve at the installation location; installing gate valves complete with valve box & lids and riser pipe; placing and compacting backfill; furnishing additional suitable backfill material, if required; installing joint materials as required; cleaning, testing and disinfecting; and all other appurtenant and miscellaneous items (not included in another bid item) required for a complete, functional and acceptable installation.

Item No. 10 and 11

For removing existing plugs and connecting to existing water mains at:

Item No. 10 - SW 71 Ave. and North of SW 8 St. (STA 11+62±)
Item No. 11 - SW 71 Ave. and South of SW 4 St. (STA 23+20±)

complete, will be paid for at the unit price bid times the number of connections for each respective bid item, installed and accepted by the Engineer. The price bid shall be full compensation for each complete installation, ready for service, and shall include, but not be limited to, exploratory excavation to verify the main size; excavation; sheeting and shoring if necessary; complying with the Florida "Trench Safety Act"; dewatering the excavation; cutting the existing main, removing section of existing pipe and connecting the proposed water main to the existing main; installing solid sleeves; making thrust restrained joints; taking salvageable materials to the storage yard or to a location determined by the Engineer; installing plugs and caps on the existing main and placing it out of service; legal disposal of removed pipe and debris; furnishing all materials and equipment required to clean, test and disinfect the connection; cleaning, disinfecting and testing the connection; placing and compacting backfill; furnishing additional suitable backfill material, if required; temporary and permanent paving repairs around the connection outside the trench line, if required; transportation and handling costs; coordination with Department forces; and all other appurtenant and miscellaneous items and work (not included in another bid item) for a complete, satisfactory, and functional installation.

Item No. 12

For selling and delivering to the Department fire hydrant assemblies with guard posts, complete, will be paid for at the unit price bid times the number of hydrants installed by the Contractor and accepted by the Engineer. The price per hydrant shall be full compensation for furnishing all materials and supplies required for a complete installation.

Item No. 13

For installing fire hydrant assemblies with guard posts, complete, will be paid for at the unit price bid times the number of hydrants installed by the Contractor and accepted by the Engineer. The price per hydrant shall be full compensation for a complete installation and shall include, but not be limited to, excavation; sheeting

and shoring if necessary; complying with the Florida "Trench Safety Act"; dewatering the excavation; transporting and unloading the hydrant assembly from delivery trucks at the job site (trench side) and placing them into position in the installation location; placing the hydrant in the trench and connecting it to the 6-inch hydrant branch run; furnishing and installing joint materials; furnishing and installing joint thrust restraints making thrust resistant joints; furnishing and installing tie-rod and eyebolts; installing a concrete anchor at the hydrant elbow; cleaning, testing and disinfecting the entire assembly; placing and compacting backfill; removal and disposal of excess fill material, where required; saw-cutting, demolition and legal disposal of one flag of sidewalk, if required; constructing concrete protective slab around the fire hydrants in non-sidewalk areas; furnishing, installing and painting two guard posts, if required, including the concrete bases and filling posts with concrete; lubricating the hydrant, if required; touch-up painting of the hydrant, if required; making all surface repairs, including temporary and permanent pavement repairs around the hydrant, if any, and all other similar items; out-of-the-ditch-line permanent pavement repairs around the hydrant, if any, dirt and rock roadways, and all similar items; and all other appurtenant and miscellaneous items and work (not included in another bid item) for a complete, functional and acceptable installation.

Sidewalk restoration repairs for the installation of fire hydrants are to be paid for under a separate Quotation Item.

Item No. 14

For removing and salvaging fire hydrant assembly with guard posts, complete, will be paid for at the unit price bid times the number of hydrants removed by the Contractor and accepted by the Engineer. The price per hydrant shall be full compensation for a complete removal and shall include, but not be limited to salvaging the fire hydrant assembly by excavating and removing the entire assembly including the bottom shoe; carefully cleaning the fire hydrant assembly of any thrust block concrete; cleaning, loading, transporting, unloading and storing the fire hydrant assembly in a Department storage yard as directed by the Engineer. The Contractor shall remove the existing guard posts and sidewalk shall be restored, if required. Fire hydrant feed mains shall be cut, plugged and thrust blocked if they are to remain connected to an active main line. Lines which are deactivated (i.e. not connected to an active main) shall be abandoned or removed as called for on the Plans. The price per hydrant assembly removal shall be full compensation for furnishing all labor, materials and supplies required for a complete removal per the aforementioned, and no extra compensation will be allowed.

Item No. 15

For furnishing and installing 1-inch single services short, including reconnection of customer's service pipe and meter transfer, will be paid for at the unit price bid for each type of service times the number of that type of service installed. The price bid per service shall be full compensation for its complete construction, ready for connection or reconnection as appropriate, and shall include, but not be limited to, furnishing and installing all materials in accordance with Department Standard Details WS 2.10 and WS 2.16 as applicable to each type of service; excavation; complying with the Florida "Trench Safety Act"; dewatering the excavation; furnishing and installing corporation stops; furnishing and installing HDPE pipe or tubing, couplings, unions, service terminal fittings, valves and other miscellaneous fittings; furnishing and installing meter boxes with lids for services; furnishing and installing perforated spacers and tail pieces; transporting

and unloading pipe, tubing, meter boxes, lids, fittings, valves, and all other materials not specified in other bid items from delivery trucks at the job site and placing them into position; tapping the main; placing and compacting backfill; temporary paving repairs or driving casing pipe under the pavement; saw-cutting, demolition and legal disposal of two flags of sidewalk together with the meter box where there is an existing meter box and service or one flag of sidewalk if no service exists; constructing a three-foot square reinforced concrete meter box support slab where no sidewalk exists; furnishing all materials and equipment necessary to clean, test and disinfect the service connections; testing and disinfecting the service connections; disconnection of existing water service at existing meter box and re-connection to new meter box as directed by the Engineer, if required; furnishing and installing copper service pipe of size to match existing and all other materials necessary to reconnect customer's existing water service to new single service downstream of the meter, if required; for backfilling and compacting area where existing water meter box has been removed, if required; salvage, cleaning, transport, unloading and storage of existing cast iron meter box lids to a Department storage yard as directed by the Engineer; coordination with Department forces; complying with work hour restrictions; moving and replacing utilities, trees, shrubs, fences, walls, mail boxes, sprinkler systems, shoulders, asphalt paths and all other similar, appurtenant and miscellaneous items and work (not included in another bid item) disturbed by construction, or as directed by the Engineer, to original or immediately adjacent locations and to equal or better than original conditions, together with all other required items and work to provide a complete, satisfactory, and functional installations.

Sidewalk restoration repairs for the installation of water services are to be paid for under a separate Quotation Item.

The Contractor shall provide a "Schedule of Values" for furnishing and installing all individual materials and activities; including removal, transport and disposal; that are a part of this work with prices satisfactory to the Engineer. Material/activity prices will be used should deletions be required by field conditions and as directed by the Engineer.

Item No. 16 - Contingent Item

For furnishing and installing 1-inch dual services short, including reconnection of customer's service pipe and meter transfer, will be paid for at the unit price bid for each type of service times the number of that type of service installed. The price bid per service shall be full compensation for its complete construction, ready for connection or reconnection as appropriate, and shall include, but not be limited to, furnishing and installing all materials in accordance with Department Standard Details WS 2.12 and WS 2.16 as applicable to each type of service; excavation; complying with the Florida "Trench Safety Act"; dewatering the excavation; furnishing and installing corporation stops; furnishing and installing HDPE pipe or tubing, couplings, unions, service terminal fittings, valves and other miscellaneous fittings; furnishing and installing meter boxes with lids for services; furnishing and installing perforated spacers and tail pieces; transporting and unloading pipe, tubing, meter boxes, lids, fittings, valves, and all other materials not specified in other bid items from delivery trucks at the job site and placing them into position; tapping the main; placing and compacting backfill; temporary paving repairs or driving casing pipe under the pavement; saw-cutting, demolition and legal disposal of two flags of sidewalk together with the meter box where there is an existing meter box and service or one flag of sidewalk if no service

exists; constructing a three-foot square reinforced concrete meter box support slab where no sidewalk exists; furnishing all materials and equipment necessary to clean, test and disinfect the service connections; testing and disinfecting the service connections; disconnection of existing water service at existing meter box and re-connection to new meter box as directed by the Engineer, if required; furnishing and installing copper service pipe of size to match existing and all other materials necessary to reconnect customer's existing water service to new single service downstream of the meter, if required; for backfilling and compacting area where existing water meter box has been removed, if required; salvage, cleaning, transport, unloading and storage of existing cast iron meter box lids to a Department storage yard as directed by the Engineer; coordination with Department forces; complying with work hour restrictions; moving and replacing utilities, trees, shrubs, fences, walls, mail boxes, sprinkler systems, shoulders, asphalt paths and all other similar, appurtenant and miscellaneous items and work (not included in another bid item) disturbed by construction, or as directed by the Engineer, to original or immediately adjacent locations and to equal or better than original conditions, together with all other required items and work to provide a complete, satisfactory, and functional installations.

Sidewalk restoration repairs for the installation of water services are to be paid for under a separate Quotation Item.

The Contractor shall provide a "Schedule of Values" for furnishing and installing all individual materials and activities; including removal, transport and disposal; that are a part of this work with prices satisfactory to the Engineer. Material/activity prices will be used should deletions be required by field conditions and as directed by the Engineer.

Item No. 17

For constructing Flushing Valve Outlet Assemblies (FVOs), at the locations shown on the Plans, complete as shown in Standard Detail WS 1.61, will be paid for at the unit price bid times the number of assemblies installed and accepted by the Engineer. The price bid shall be full compensation for each complete installation, ready for service, and shall include, but not be limited to, excavation; sheeting and shoring if necessary; complying with the Florida "Trench Safety Act"; furnishing and installing PVC pipe, including cutting and threading as required; brass nipples, bends and couplings, bronze angle valves and street elbows, No. 3 valve box and lid, including concrete support ring; tapping the ductile iron cap or plug; furnishing and installing 6-mil polyethylene sheet; placing concrete for concrete anchor; placing and compacting backfill; constructing concrete support slabs, if necessary; temporary paving; permanent paving outside of the main trench line, if necessary; and all other appurtenant and miscellaneous items and work for a complete, satisfactory and functional installation.

Item No. 18 - Contingent Item

For constructing Air Release Valve Assemblies (ARV's), at the locations shown on the plans, or where directed by the Engineer in the field, complete as shown in Department Standard Detail WS 1.60, will be paid for at the unit price bid times the number of assemblies installed and accepted by the Engineer. The price bid shall be full compensation for each complete installation, ready for service, and shall include, but not be limited to, excavation; sheeting and shoring if necessary; complying with the Florida "Trench Safety Act"; furnishing and installing PVC pipe, including cutting and threading as required, corporation stops, bronze

couplings, bronze angle valves and street elbows, No. 3 valve box and lid, including concrete support ring; tapping the main; constructing concrete support slabs, if necessary; placing and compacting backfill; temporary paving; permanent paving outside of the main trench line, if necessary; and all other appurtenant and miscellaneous items and work for a complete, satisfactory, and functional installation.

Item No. 19 - Contingent Item

For furnishing and installing polyethylene encasement for any size ductile iron pipe, fitting or valve, if ordered by the Engineer, will be paid for at the unit price bid times the number of feet installed and accepted, as measured to the nearest foot along the horizontal projection of the pipe. The price bid shall be full compensation for furnishing all materials, labor and equipment required for a complete polyethylene encasement for any size ductile iron pipe, fitting or valve.

Item No. 20 - Contingent Item

For trench overcut in one-foot depth increments, will be paid for at the unit price bid per linear foot, for any size pipe to be installed in the trench times the number of linear feet of overcut excavated, times the number of one-foot increments of depth as ordered by the Engineer. There shall be no more than six (6) one-foot increments of depth in any one location. The number of linear feet excavated shall be the length in feet of the horizontal projection of the centerline of the trench, measured to the nearest foot, between the limits established by the Engineer in the field. The price per linear foot for trench overcut shall be full compensation for the completed work and shall include, but not be limited to, excavating to the specified depth as directed by the Engineer, placing, leveling and compacting suitable select backfill material to the level specified. Suitable select backfill shall be obtained from material excavated from the site. If sufficient material is not available from the site, additional material shall be furnished by the Contractor at no additional cost to the Department.

Item No. 21 - Contingent Item

For sheeting and shoring ordered left in place by the Engineer, will be paid for at the unit price bid per square yard, measured from tip to cut-off times the horizontal length, regardless of thickness, times the number of linear feet of sheeting and shoring left in place as accepted by the Engineer. Payment shall be full compensation for cutting off and for all salvage and potential reuse value of the material. Sheeting and shoring left in place without the Engineer's approval will be at the Contractor's expense.

Item No. 22 - Contingent Item

For removal, transport and legal disposal of unsuitable backfill materials, including tipping fees, as ordered by the Engineer, will be paid for at the unit price bid times the number of cubic yards removed and legally disposed of, as measured by the truckload to the satisfaction of the Engineer.

Item No. 23 - Contingent Item

For furnishing and installing additional suitable backfill material, will be paid for at the unit price bid times the number of tons of additional trench backfill furnished and installed as directed by the Engineer in the field and includes removal of unsuitable material, loading, hauling, legal disposal off-site and tipping fees. The additional trench backfill shall be measured along the main within the limits of the trench as defined by the Department Standard Details appended hereto. The

use of additional trench backfill shall be paid for only when and where approved by the Engineer prior to installation.

Item No. 24

For constructing limerock base for **Type " M"** permanent pavement repairs, will be paid for at the unit price bid times the number of square yards of such base required, installed and accepted as measured along the main within the limits defined by details on the Plans and/or the Standard Details appended hereto. Greater widths are at the Contractor's option and expense. The price bid shall be full compensation for furnishing all materials, labor and equipment required for a complete limerock base installation ready to receive the tack coat and surface course. Limerock base for permanent pavement repairs installed outside the main trench line limits as shown in the Standard Details under other bid items will be paid for under those items; it will not be separately measured and paid for under this item.

Limerock base for permanent paved driveway repairs, if necessary, will be paid for under this item.

Item No. 25

For constructing **Type "M"** asphaltic concrete surface course permanent pavement repairs (1-1/2 inch minimum thickness), will be paid for at the unit price bid times the number of square yards of such surface course installed and accepted as measured along the main within the limits defined by details on the Plans and/or the Standard Details appended hereto. Greater widths are at the Contractor's option and expense. The price bid shall be full compensation for furnishing all materials, labor and equipment required for a complete machine-laid asphaltic concrete surface course installation. Asphaltic surface course for permanent pavement repairs installed outside the main trench line limits as shown in the Standard Details under other bid items will be paid for under those items; it will not be separately measured and paid for under this item.

Item No. 26 - Contingent Item

For cold milling roadway surface course for permanent pavement repairs (nominal 1 inch thick), will be paid for at the unit price bid times the number of square yards of such surface course milled and required as measured along the curb within the limits defined by details on the Plans and/or the Department Standard Details appended hereto and as approved by the Engineer. Greater widths are at the Contractor's option and expense. The price bid shall be full compensation for furnishing all materials, labor and equipment required for milling of surfaces indicated. Asphalt cold milling shall be performed using an automated pavement planer capable of maintaining an accurate depth. Cold milling equipment shall meet the approval of the Engineer and the governing agency having jurisdiction at the location of the pavement milling operation. The Engineer's word as to the acceptability of the equipment shall be final.

Cold milling of asphalt pavement driveways in roadways, as required and directed by the Engineer, will be paid for under this item.

Item No. 27 - Contingent Item

For constructing **Type "V"** permanent pavement repairs for roadway (nominal 1 inch thick machine-laid asphaltic concrete friction surface overlay) will be paid for at the unit price bid times the number of square yards of overlay, installed where directed by and to the satisfaction of the Engineer, which price shall be full

compensation for furnishing all labor, material, and equipment for a complete installation; and shall include asphalt pavement driveways in roadways, as required and directed by the Engineer. After the pavement has been milled and the existing pavement removed, a tack coat shall be applied as specified above. Type "V" pavement repairs, if required, will usually be in addition to the required Type "I" pavement repairs. The latest applicable standard for the friction course from the governing authority shall be used. Temporary pavement markings for roadways shall be included in this bid item.

Item No. 28 - Contingent Item

For constructing concrete sidewalk restoration to match existing, will be paid for at the unit price bid times the number of square feet of such sidewalk required, installed and accepted by the Engineer, and the price bid shall be full compensation for furnishing all labor, materials and equipment for a complete installation.

Item No. 29 - Contingent Item

For constructing concrete curb and gutter restoration to match existing, will be paid for at the unit price bid times the number of linear feet of such curb and gutter required and placed as measured along the curb, installed where directed by the Engineer, and the price bid shall be full compensation for furnishing all labor and equipment for a complete installation.

Item No. 30

For furnishing traffic control, will be paid for from the aggregate sum amount established by the Contractor for this purpose. Such amount represents the amount the Contractor feels is necessary to provide sufficient flagmen, signs, barricades, and similar items and work for directing traffic and maintaining safety during all times of work and other times as directed by the Engineer, FDOT, the municipalities' Public Works Department and any other governing authority. Any portion of this fund remaining after all authorized payments have been made will remain with the Contractor. Conversely, no requests for additional payments will be approved.

Payment to the Contractor under this item will be by monthly percentage corresponding to the percentage of the Project's work items completed and paid for each month, as approved by the Engineer.

Item No. 31- SUBTOTAL

Sum of Item Nos. 1 through 30.

Item No. 32 - Dedicated Allowance

This item establishes a fund for reimbursement of the cost of all required construction permits and fees, if authorized by the Engineer. Payment shall reimburse the Contractor for only the cost of the construction permit and fee. Any question or whether a construction permit or fee is required shall be decided by the Engineer whose word shall be final. Any portion of this fund remaining after all authorized payments have been made will be withheld from Project payments and will remain with the County.

Item No. 33 - Contingency Allowance

For unforeseen conditions, minor construction changes and Quantity Adjustments, additional work not covered by other items, if ordered by the Engineer.

This account is for all labor, materials, equipment and services necessary for modification or extra work required to complete the Project due to unforeseen conditions, unforeseen conflicts between existing elements of work and the proposed work; for minor changes required to resolve any unforeseen conditions, Revised Regulations, Technological and Products Development, Operational Changes, Schedule Requirements, Program Interface, Emergencies and other Miscellaneous Costs; and for adjustments to estimated quantities shown on the unit prices of the Quotation to conform to actual quantities installed; and associated time related to this work only if ordered by the Engineer.

Payment to the Contractor under the Contingency Allowance will only be made for work ordered in writing by the Engineer, in accordance with Section 13 "Extra Work and Payment Therefore" of the General Covenants and Conditions. Any portion of these accounts remaining after all authorized payments have been made will be withheld from Contract payments, and will remain with the County.

A non-compensable time extension shall be included in the Contingency Allowance work when approved by the Engineer.

Item No. 34 - TOTAL BID
Sum of Item Nos. 31, 32 and 33.

Note:
Since Item Nos. 16, 18, 19, 20, 21, 22, 23, 26, 27, 28 and 29 are Contingent Items, and because of the nature of the Dedicated Allowance, Item No. 32, and the Contingency Allowance, Item No. 33, they may or may not be used at the option of the Department. Any overrun or under run provisions contained within the Project Documents shall not be applicable to these items.

END OF SECTION

SECTION 03300

CAST-IN-PLACE CONCRETE, REINFORCING AND FORMWORK

PART 1 GENERAL

1.01 DESCRIPTION

A. Work included: Provide all labor, materials, equipment, fabrication, incidentals, transportation, placing and supervision necessary to complete all cast-in-place concrete work, its finishing, and all related work called for by the Plans and/or Specifications, or reasonably inferable from either or both, as needed for a complete and proper installation.

B. Related work: Work affecting this Section includes, but is not limited to:
1. Shop Drawings - Per General Conditions and as specified herein.
2. Materials and storage thereof.
3. Reinforcing-Bar and fabric.
4. Accessories of every nature, including form tie system.
5. Formwork and removal thereof, including shoring and reshoring.
6. Concrete proportions and mixes.
7. Placing of concrete.
8. Admixtures.
9. Joints, metal joint screeds and joint fillers.
10. Finishes of all types.
11. Protection and curing.
12. Patching.
13. Laboratory Testing.

1.02 QUALITY ASSURANCE

A. Unless otherwise indicated, all materials, workmanship and practices shall conform to the requirements of ACI 301-96 "Specifications for Structural Concrete for Buildings", except as modified by supplemental requirements hereinafter.

1.03 STANDARDS

A. ACI 301-10 Specifications for Structural Concrete.

B. ACI 318-11 Building Code Requirements for Reinforced Concrete.

C. Florida Building Code, latest edition.

D. ACI 117-10 Standard Specifications for Tolerances for Concrete Construction and Materials.

PART 2 PRODUCTS

2.01 MATERIALS

A. Materials for Concrete:

1. Cement shall conform to the following: Portland Cement ASTM C150, normal, type I or type II. Provide domestic cement of one type and from same source for entire project.
2. Mineral Admixtures:
   a. Fly Ash: Shall conform to ASTM C618. 20% maximum of total cementitious weight.
   b. Ground Blast Furnace Slag: Shall conform to ASTM C989-93. 30% maximum of total cementitious weight.

3. Chemical Admixtures: The following admixtures are permitted, but require written approval from the Engineer:
   a. Air Entraining Admixture: Comply with ASTM C260. "Specifications for Air-Entraining Admixtures for Concrete."
   b. Water Reducing Admixture: Comply with ASTM C494 "Specifications for Chemical Admixtures for Concrete", Type A and compatible with air entraining admixture.
   c. Water Reducing and Retarding Admixture: Comply with ASTM C494, "Specifications for Chemical Admixtures for Concrete", Type D, and compatible with air entraining admixture.
   d. High Range Water Reducing Admixture: Comply with ASTM C494, "Specifications for Chemical Admixtures for Concrete", Type F or G, and compatible with air entraining admixture. (Including superplasticizer to reduce water content.)
   e. Admixtures containing added calcium chloride are not permitted.

4. Aggregates: Shall conform to ASTM C33 and shall be quarried/mined in fresh water. Aggregates from salt water or brackish water are not permitted.
   a. Fine aggregate shall be silica (quartz) sand. Manufactured sand and screenings are not permitted.
   b. Coarse aggregate size shall not exceed:

Concrete Member		Size	
1)	Walls	3/4"	67#
2)	Beams or structural slabs not on ground	3/4"	67#
3)	Columns and all other concrete	1"	57#
4)	Drilling concrete pad or slabs on ground	1"	57#

5. In sanitary sewage applications, where called for in the Plans and/or specifications an antimicrobial admixture as specified below shall be utilized:
   a. An antimicrobial agent, Con^{MIC}Shield®, or approved equal, shall be used to render the concrete uninhabitable for bacteria growth.
   b. Contractor shall mix the liquid antimicrobial additive with the

total water content of the concrete mix design in a proportion of 1 gallon per cubic yard. In the case of repairs to damaged concrete a proportion of 2 gallons per cubic yard shall be utilized.

c. In some instances all of the concrete in the structure in will receive the additive and in other instances only a portion of the concrete will receive the additive. Hence, the Contractor shall apply the additive only as directed in the specific instance.

d. Contractor shall submit a letter of certification to the Department, stating that the correct amount and correct mixing procedure was followed for all antimicrobial concrete.

e. Con^{MIC}Shield® antimicrobial additive shall be as manufactured by Con^{MIC}Shield® Technologies, Inc.; 541 Tenth Street NW #233, Atlanta, GA 30318; Phone: 877-543-2094.

B. Portland cement and reinforcing steel: Comply with ACI 301-10 and, with all modifications and supplements thereto listed in Part 3 of these Specifications.

C. Burlap mats: Conform to AASHTO Specification M182. (Burleen non-staining mats.)

D. Epoxy bonding agent: A two (2) component, solvent free, moisture insensitive structural epoxy adhesive conforming to ASTM C881-13 Type II, Sikadur 32 Hi-Mod, as manufactured by Sika Corp., Concresive 1090 Liquid by Master Builders or approved equal.

E. Anchor bolts, nuts and washers: Conform to ASTM A449-10, hot-dip galvanized.

F. Dovetail slots: Galvanized steel, 22 gauge, 1 x 1 inch, with 5/8-inch throat, fiber filled.

G. Forms:

1. Plywood Forms: PS-1, B-B Concrete Form, Class I, exterior type, mill oiled and edge sealed. Thickness shall be as required to support concrete at the rate placed, but not less than 3/4-inch.
2. Steel Forms: Uncoated steel, 3/16-inch minimum thickness, fabricated to close tolerances, protected only by the specified release agent, braced so as not to dent, bend or dimple under wet concrete loads, vibrator impact and tool impact. Maintain steel forms in rust free condition by use of steel wool and light grinding, followed by coats of the specified release agent. Forms should be adjustable to be brought into true alignment without steps or ridges.

H. Form release agent:

1. For plywood forms use a natural non-petroleum base, non-staining and non-retarding release agent that will effectively prevent absorption of moisture and prevent bond with concrete, and leaves the concrete with a

paintable surface.

2. For steel forms, use an approved material that will not stain, color or otherwise affect the finish of the concrete. Form coating shall not be detectable on finished surfaces.
3. Round column forms: Provide seamless fiber forms with the three plies nearest to the interior surface of the form deckled or scarfed and overlapped to minimize spiral gaps or seams on the column surface.

I. Form Ties: Steel rod type with integral waterstops and cones, and with ends or end fasteners that can be removed without spalling the concrete and which leave a hole equal in depth to the required reinforcement clearance, but not less than 2 inches from the formed face of the concrete. Wire tie, banding wire and wood spreaders will not be permitted.

J. Form Inserts:
1. Bevel or chamfer strips: Wood or non-staining plastic, 3/4-inch wide on each leg at exposed edges of concrete members, unless otherwise noted on plans.
2. Tongue and Groove Joint Forms: Minimum 24 gauge with steel stakes and splice plates. Forms shall be designed for joints not to receive a poured seal.
3. Pipe hangers and other utility supports: AISI Type 316 stainless steel.

K. Non-Shrink Grout: Non-shrink, non-metallic grout conforming to ASTM C1107-13 Grade B or Grade C only. Grout must meet ASTM C1107-13 at a temperature range of 50ºF to 90ºF at a flowable consistency.

L. Grout for Surface Repair and Bond Coat:
1. For repair, one part Portland cement to two parts fine sand, and a 50% of water and 50% Acryl 60 or equal (Thoroseal or Acryl Set Bonding Agent by Master Builders) to produce a stiff mortar.
2. For bond coat, one part Portland cement to one part sand, and a 50% of water and 50% Acryl 60 or equal (Thoroseal or Acryl Set Bonding Agent) to produce a slurry mix.

M. Moisture Barrier: Kraft paper and glass reinforcing fibers sandwiched between 2 layers of polyethylene film with a permeance rating of maximum 0.1 as per ASTM E96-00, Procedure A.

N. Preformed Expansion Joint Filler: Non-extruding type, self expanding cork, 3/4-inch, 1-inch, and 1-1/2-inch cork (not to be used for sidewalks), conforming to plans or as otherwise noted on drawings, conforming to the requirements of ASTM D1752-04a (2013), Type II, and compatible with joint sealant compound.

O. Joint Sealant Compound: Non-sag, 2 component, solvent free, moisture insensitive, flexible, epoxy resin conforming to the requirements ASTM C920-14 Type M, Grade NS. Additionally, the sealant must be recommended by the manufacturer to perform under continuous immersion in water.

P. Polyurethane Elastomeric Sealant: Sikaflex-2c, NS/SL or approved equal. Provide a 2-component, premium-grade, polyurethane-based, elastomeric

sealant. It is principally a chemical cure in a non-sag and self-leveling consistency. Sealant shall meet ASTM C920-14 and Federal Specifications TT-S-00227E.

1. Joint Movement: +50%.

Q. Waterstops:

1. Volclay Waterstop-RX or approved equal. Flexible strip of bentonite waterproofing compound in coiled form.
   a. Chemical Composition:
      1) Butyl Rubber-Hydrocarbon: 24.9% by weight; ASTM D297.
      2) Bentonite: 75% by weight; SS-S-210-A.
      3) Volatile Matter: Below 1%; ASTM D6.
      4) Waterstop shall not contain any asbestos fibers or asphaltics.

   b. Physical Properties:
      1) Specific Gravity: 1.57; ASTM D71.
      2) Application Temperature Range: 5-125ºF.
      3) Flash Point: 365; ASTM D93-97.
      4) Accelerated Aging: Maintained 99% solids.
      5) Dimensions: 1" x 3/4" x 16'-6"

2. Polyvinyl chloride (PVC): Conforming to the requirements of U.S. Army Corps of Engineers Specification CRD-C-572 and of the following type:
   a. Expansion Joints: 9-inches by 3/8-inch, ribbed center bulb.
   b. Construction Joint: 9-inches by 3/8-inch, flat ribbed.
   c. Only where specified on Plans at construction and expansion joints: 9-inches by 3/8-inch, split ribbed.
   d. Install waterstops as shown as manufactured structures.

R. Fiber Reinforcement: Fiber reinforcement shall not be used in the concrete unless ordered by the Engineer in writing. It shall consist of 100% virgin polypropylene fibrillated fiber-dosage of 2 lbs. per cubic foot.

1. Compressive Strength: 1 psi (.006895 M Pa), ASTM C39.
2. Flexural Strength: 288 psi (2.0 M Pa) after 7 days, 390 psi (2.7 M Pa) after 28 days; ASTM C78.
3. Splitting Tensile Strength: 194 psi (1.3 M Pa) after 7 days, and 290 psi (2.0 M Pa) after 28 days; ASTM C496.
4. Source: Fibermesh Micro-Reinforcement System by Fibermesh Company, Division of Synthetic Industries, Inc., or approved equal.

S. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Engineer.

T. A shrinkage reducing admixture (Teraguard) or equivalent at the rate of 2.2% by weight of cement may be used in the concrete to meet the shrinkage limitations.

U. To protect the concrete slab against the elements, the Engineer may direct the Contractor to spray an evaporation retarder on the finished concrete slab

immediately behind the cement finishing process at no additional cost to the Department. This is not a curing compound.

PART 3 EXECUTION

3.01 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work.

3.02 SUPPLEMENTAL REQUIREMENTS

A. All phases of concrete construction, including materials formwork, and all other related procedures shall comply with the most stringent allowed tolerances of ACI-301 and ACI-117 Standards (Latest Edition) - Non compliance with these standards will cause full rejection of any work done.

B. Comply with ACI 301-10 and with all modifications and supplements thereto listed herein. In addition to the ACI Standards on finished concrete, the Engineer will only approve quality finished concrete which in his opinion is ready to receive a grout finish, paint or liquid membrane.

C. The following modifications and supplements to ACI 301-10 shall also apply to the work.

1. General
   a. These specifications cover cast-in-place structural concrete for use in buildings and appurtenances, including foundations, curbs, sidewalks, concrete pavements and utility structures, water containment tanks, and piles.
   b. Keep minimum two (2) copies of ACI 301-10 "Specifications for Structural Concrete" in field office at all times.

2. Proportioning and Design of Mixes:
   a. General: Proportion concrete to meet properties as specified. Prepare mix designs for each type and strength of concrete. Submit with mix design the chemical admixture manufacturer's statement that the admixture proposed complies with the requirements of this specification. Where concrete of different strengths are specified for the same location, the higher strength concrete shall be used. Concrete proportions shall be established on the basis of previous field experience, or laboratory trial batches as specified in ACI 301-10 Sections 4.2.2 & 4.2.3.
   b. Classes of Concrete:
      1) Structural concrete of normal weight for portions of the structure that are required to be watertight containments or tremie concrete, the water/cementitious ratio shall not exceed 0.45 if exposure is to be to fresh water.
      2) If the concrete is exposed to salt or brackish water, or if exposed to injurious concentrations of sulfate-containing

solutions (1,500 ppm or more of Sulfate in water) or other chemically aggressive solutions, use Type II cement with Rheobuild 1000 admixture by Master Builders, or approved equal; water/cementitious ratio shall not exceed 0.34.

3) Other Concrete: (This would be slabs-on-grade, concrete thrust blocks, and miscellaneous concrete). The water cementitious ratio shall not exceed 0.50 to 0.55.

4) Minimum f'c @ 28 days shall be 3,000 psi.

5) Minimum f'c @ 28 days shall be 4,000 psi with a Water/Cement ratio of 0.45. (see 1) above)

6) Minimum f'c @ 28 days shall be 7,000 psi with a Water/Cement ratio of 0.34. (see 2) above)

c. Slumps:

1) All structural concrete, pumped concrete and tremie concrete shall contain a High Range Water Reducing Admixture and be designed with a maximum water content of 270 pounds per cubic yard (32.36 gallons). The initial water slump prior to addition of the High Range Water Reducing Admixture shall be 2 inches maximum. Concrete at point of placement shall not exceed 10 inches. Concrete shall be non-segregating.

2) Slabs including slabs-on-grade, and all other concrete shall have a maximum water content of 287 pounds per cubic yard (34.4 gallons) and have a 5-inch maximum slump with a water reducer, or water reducer and retarder admixture added.

3. Formwork

a. Earth cuts are not permitted for forms for vertical surfaces. Footings, grade beams and slab edges shall be formed. Provide moisture barrier under all slabs on grade. Lap 6 inches and tape punctures.

b. The contractor is responsible for the adequacy of forms and shoring including placing, fill and equipment on roof, and for safe practice in their use and removal. Submit formwork calculations, and shop drawings including shoring and reshoring. In addition, the calculations and shop drawings for formwork, shoring, and reshoring, if required by the Engineer or Building Department, shall be signed and sealed by a Professional Engineer registered in the State of Florida.

c. Design forms for the loads and lateral pressures resulting from the placement and vibration of concrete and for design considerations, wind loads, allowable stresses, and other applicable requirements of the Florida Building Code.

d. Provide form facing materials as required by the specified finish of the formed surface. Do not use facing material with raised grain, torn surfaces, worn edges, patches, dents or other defects. No form may be reused more than three times without the Department's approval. The maximum deflection permitted of facing materials reflected in concrete surfaces exposed to view is

1/240 of the span between structural members.

1) Forms shall be free from surface defects, tight to prevent leakage and braced to keep its position and shape when filled with concrete. Adjacent edges and end panels and sections shall be held together to provide accurate alignment and prevent forming ridges, fins, offsets or similar type defects in finished concrete. It shall be tight to prevent loss of water, cement or fines during placing and vibrating concrete. The bottom of the forms placed in continuous straight even footings or slabs shall be watertight to prevent loss of water, cement and fines during placement and vibration of concrete, a gasket may be required by the Engineer under the forms to provide water tightness at the Contractor expense. The Contractor shall not proceed to place forms for concrete work adjacent to or on top of previous placed concrete without the Engineer's approval, if the stripped forms reveals columns, walls or beams are out of level or plumb or there are cold joints or other objectionable work in the opinion of the Engineer. Contractor shall submit to the Engineer for approval, how he intends to correct or remove the defective work promptly at his expense. Contractor shall perform such corrections prior to proceeding to place concrete in the next Section.

e. Provide positive means of adjustment (wedges or jacks) of shores and struts, and all settlement shall be taken up during concrete placing operation. Brace forms securely against lateral deflection. Do not anchor form bracing to poured concrete floors, or make holes in floor.

f. Provide temporary openings in columns and wall forms to limit the free fall of concrete to five (5) feet. Place such openings at no more than eight (8) feet apart to facilitate placing and consolidation of concrete. Elephant trunks may be used to vertical heights of fifteen (15) feet for tremie and other purposes, if approved by the Engineer. Provide temporary openings at the bottom of wall and column forms and elsewhere as necessary to facilitate cleaning and observation immediately before concrete is placed. Blow formwork entirely clean of all saw dust, dirt, or other items not specifically intended to be a part of the final concrete. Any evidence of non-intended items in the forms is considered sufficient cause to stop concreting operation and/or require removal of concrete placed in such contaminated forms.

g. Provide inserts, conduits, boxes, sleeves, anchors, ties, bolts, hangers, dowels, thimbles, nailers, grounds and other devices in coordination with other trades.

h. Set anchor bolts and other embedded items accurately and hold securely until concrete is placed and set. Anchor bolts shall be galvanized and of size and length as indicated on the Plans. Bolts not sized shall be 3/4-inch diameter.

i. Insert galvanized dovetail anchor slot in forms, in columns, beams

and slabs completely around in-fill masonry panels. Coordinate with Section 04220 Unit Masonry for spacing of dovetails.

j. Install wall spools, wall flanges and wall anchors before placing concrete. Do not weld, tie or otherwise connect the wall spools to the reinforcing steel.

k. Do not use pinch bars, wrecking bars or other metal tools against as-cast concrete to wedge forms loose; use only wooden wedges carefully and gradually. Driving shall be accomplished by light tapping.

l. The Contractor is responsible for the removal of forms and shores. Concrete shall be cured in accordance with ACI 308r-01 (also see section 10 below). Do not remove forms or shores before the member has attained sufficient strength to support its weight and the loads imposed, nor sooner than listed below:
   1) Wall forms: 24 hours.
   2) Column forms: 24 hours.
   3) Beam and girder side forms only (not bottom form): 24 hours.
   4) Beam and Girder bottom forms: 7 days minimum unless otherwise approved by the Engineer.
   5) Slab forms: 14 days.
   6) Arch centers: 7 days.
   7) Pan joist forms: 4 days.

4. Reinforcement

   a. Prior to fabrication, submit for review shop drawings showing all fabrication dimensions, bar lists and location for placing of the reinforcing steel and accessories, including spacing of reinforcing, splices (lap, welded, Cadweld and/or mechanically threaded), grade of reinforcing and name of manufacturer. Note all deviations from the Plans and use the same designation mark as shown on the Plans where possible.

   b. Reinforcing bars: ASTM A615, Grade 60, deformed bars of USA manufacturer.

   c. Welded wire fabric: ASTM A185, galvanized.

   d. Metal bar supports: CRSI MSP-1, Chapter 3, Class 2, Type B stainless steel protected bar supports.

   e. Coupler Splice Devices: Cadweld, tension couplers capable of developing the ultimate strength of the bar.

   f. Reinforcing steel upon which unauthorized welding has been done, shall be removed and replaced at no additional cost to the Department.

   g. Place reinforcing bars to the most stringent tolerances indicated in ACI 301 and ACI 117 (Latest Edition). Tolerances specified in those standards shall govern over any other reference code or standard.

   h. All reinforcement at time concrete is placed shall be free of mud, oil or other materials that may affect or reduce the bond. Reinforcing with rust or mill scale will not be accepted without cleaning and/or brushing to remove scale and rust.

   i. Support rebar and mesh reinforcing for slabs on grade 1-1/2

inches from top of slab on masonry blocks not less than 4 sq. in., having a compressive strength equal to or greater than the specified strength of the concrete being placed. Space blocks at no more than 4 feet apart each way for rebars, and no more than 3 feet apart for mesh reinforcement.

j. Support reinforcing off from formwork for columns, walls and beams with stainless steel protected bar supports. Support slab reinforcing on #5 bars, or larger, spaced at no more than 48 inches on center. Space individual high chairs no more than 48 inches apart and support bars shall not exceed 24 inches past outermost chairs.

k. Overlap welded wire fabric in such a manner that the overlap measured between outermost cross wires of each fabric sheet is not less than the spacing of the cross wires plus 2 inches or 6 inches, whichever is greater. Do not extend fabric through expansion and/or contraction joints, unless otherwise noted on the Plans.

l. The minimum clear distance between parallel bars, both vertical and horizontally, shall not be less than the nominal diameter of the bars, or less than 1-1/2 times the maximum size of the aggregate, or 1 inch in beams, or 1-1/2 inches in columns, whichever is greater. Where reinforcement in beams is placed in two or more layers, the upper layer shall be placed directly above the bars in the bottom layer. Misplacement, misalignment or improper length of dowels shall be sufficient cause to require removal and reconstruction of affected work.

m. Unless allowed by the Engineer, bending of reinforcing partially embedded in concrete is not permitted. When permitted, bending shall be in accordance with CRSI Manual of Standard Practice.

5. Joints and Embedded Items.

a. Provide premolded expansion joint filler strips of proper width and length as specified in the Plans. Place 1/2-inch expansion joint fillers every 20 feet in straight runs of walkways or sidewalks, at right angle turns and wherever concrete butts into vertical surfaces, unless otherwise noted on the Plans.

b. Provide waterstops in all construction joints, unless otherwise indicated on the Plans.

c. Join all waterstops at all intersections so that a continuous seal is provided. Center the waterstop in the joint. Hold water stop positively in correct position. In the event of damage to the waterstop, repair the water stop in an acceptable manner. Vibrate concrete to obtain impervious concrete in the vicinity of all joints.

d. Install waterstop in accordance with instructions of the manufacturer. Prior to use of the waterstop material in the field, submit to the Engineer for approval a sample of each size and shape to be used. Fabricate sample so that the material and workmanship represent in all respects the fittings to be furnished under this Specification.

e. Place all sleeves, inserts, anchors, and other embedded items prior to placing concrete. Anchors and bolts cast in concrete shall

be hot dip galvanized or stainless steel. Where permitted by the Engineer, concrete expansion bolts shall be stainless steel and of the wedge anchor type. Take all necessary precautions to prevent embedded items from being displaced, broken or deformed during concreting operation. Protect drains from intrusion of concrete.

6. Placing:
   a. Equipment for mixing and transporting concrete must be clean. Forms shall be thoroughly clean and damp, and reinforcing shall be secured in place. Runaways for transporting concrete shall not rest on reinforcing. When concrete is placed against earth, sprinkle sufficiently before placing.
   b. Deposit of concrete in forms no longer than ninety (90) minutes after the initial design water has been added to the cement and aggregates. Concrete which can not be so placed shall not be used and shall be wasted. **No additional water shall be added**. No retempering with water is permitted.
   c. In addition to the requirements of ASTM C94, the concrete delivery tickets shall indicate the cement content and water/cement ratio.
   d. During hot weather, proper attention shall be given to ingredients, production methods, handling, placing, protection and curing. Comply with ACI 305R "Hot Weather Concreting" recommendations.
   e. Do not place concrete in forms unless the water level is below the concrete to be placed, even if it is necessary to maintain the dewatering, or under rain.
   f. Do not place concrete under water except for tremie concrete as called for on the Plans. Submit for approval plan and details of means and methods for installation of seal tremie concrete prior to commencement of work. Seal concrete which subsequently fails to perform, shall be repaired or replaced at no additional cost to the Department.
   g. Place seal concrete under water in the space in which it is to remain, by means of a tremie, a closed-bottom dump bucket of not less than one cubic yard capacity, or other approved method, and do not disturb after it is deposited. Deposit all seal concrete in one continuous pour. Do not place concrete in running water. Design all formwork, to retain concrete under water, to be watertight. Submit shop drawings for the design of formwork and excavation sheeting signed and sealed by a Florida Registered Professional Engineer.
   h. The tremie shall consist of a tube having a minimum inside diameter of ten (10) inches, and shall be constructed of sections having tight joints. No aluminum parts which have contact with the concrete will be permitted. The discharge end shall be entirely seated at all times and the tremie tube kept full to the bottom of the hopper. When a batch is dumped into the hopper, the tremie shall be slightly raised (but not out of the concrete at the bottom) until the batch discharges to the bottom of the hopper, after which

the flow shall be stopped by lowering the tremie. The means of supporting the tremie shall be such as to permit the free movement of the discharge end over the entire top surface of the work, and shall permit it being lowered rapidly when necessary to choke off or retard the flow. The flow shall preferably be continuous and in no case shall be interrupted until the work is completed. Exercise special care to maintain still water at the point of deposit.

i. When the concrete is placed by means of a bottom dump bucket, the bucket shall be lowered gradually and carefully until it rests upon the concrete already placed. The bucket shall then be raised very slowly during the discharge travel; the intent being to maintain, as nearly as possible, still water at the point of discharge and to avoid agitating the mixture. Aluminum buckets will not be permitted.

j. Do not commence pumping, to dewater a sealed cofferdam, until the seal has set sufficiently to withstand the hydrostatic pressure, and in no case earlier than 72 hours after placement of concrete.

k. Notify Engineer a minimum of 24 hours prior to concreting and request a specific time for observation of reinforcing and formwork for portions of concrete work to be placed. No observation will made by the Engineer until rebar installation for all work to be done and all formwork has been completed and approved by the Contractor's field superintendent. Do not order concrete until all correction and additions indicated by the Engineer have been made. Should the Engineer's observation reveal that work is improperly prepared and an additional observation will be required, he will so inform the Contractor and all above requirements shall also govern.

7. Repair of Surface Defects:

a. Repair all concrete surface defects, which includes, but not limited to cracks, tie holes (no plastic cones), uneven holes, honey combs, rough frame work and other objectionable conditions deemed unacceptable to the Engineer immediately after form removal. This repair work is to be done for all concrete expose surfaces, liquid applied surface or painted surfaces in or out of the water. Repair all cracks and defects in the concrete floors, beams, joists, columns, and other structural members, roof and walls, to the satisfaction of the Engineer, that may occur up to one year after acceptance of work regardless of the cause. Test unformed, surfaces such as monolithic slabs, for smoothness and verify placement tolerances specified for each surface and finish. Test unformed surfaces sloped to drain for trueness of slope, in addition to smoothness. Repair unformed surfaces that contain surface defects which affect durability of concrete. Surface defects, as such, include cracking, cracks which penetrate to reinforcement or completely through non-reinforced sections regardless of width, spalling, pop-outs, honeycomb, rock pockets and other objectionable and rough conditions.

b. Proprietary compounds for adhesion or as patching ingredients may be used, if approved by the Engineer. All structural repair of surface defects to be made require the approval of the Engineer, as to the method and procedure. Approval of the completed work must be obtained from the Engineer.

8. Finishing of Formed Surfaces.
   a. Apply rough form finish to exterior walls below grade not exposed to water.
   b. Apply smooth form finish to exterior and interior walls and columns exposed to water.
   c. Apply smooth form finish to interior walls and underside of floors, stairs and slabs.
   d. In addition to the smooth form finish, apply a grout cleaned finish to concrete walls and surfaces exposed to public view and underside of formed floors, stairs or slabs.
   e. Apply a rubber float grout mix to properly prepared concrete surface, only when approved by the Engineer. Mix shall have one part Portland cement to two parts fine sand in a 50% water and 50% Acryl #60 (Thoroseal or Acryl Set) mix or Acryl Set by Master Builders. Make a 10 x 10-foot sample on the concrete wall for the approval of the Engineer. Finished surface shall be a non dusting hard finish, when scratched with a 1/4-inch metal edge.
   f. Finish concrete surface, interior or exterior, below or above water shall include all:
      1) Exposed concrete.
      2) Grout finished concrete.
      3) Painted surface concrete.
      4) Liquid membrane finished concrete shall comply with manufacturer's requirements.
      5) The entire surface of finished concrete shall have a smooth uniform surface, there shall be no offsets, visually bulges, or wavering in the finished surfaces. The joints must be accurately aligned, they can not be uneven or in or out, a higher and lower, there shall be no fins, projection or unevenness between forms.
      6) If after stripping the forms the Engineer determines that the finished concrete does not comply with any or all of the above requirements, the Contractor shall submit his proposal in writing to the Engineer as to his methods of correcting the work at no added cost to the Department, which shall include, but not limited to all grinding of fins, projections, unevenness between joints, form high spots and uneven spots.
      7) In addition to all other requirements, concrete surfaces exposed to public view, irrespective of size, area or location shall be completely clean and free of: (1) Stains of any nature, (2) Parts of forms or other wood of any nature, (3) laitance, (4) "Run-downs" of leaked water from secondary pours, (5) Nails, (6) Strips, (7) Ties and (8) all other extraneous, deleterious materials and/or substances

which may affect the finished appearance and condition of exposed concrete. Surfaces not meeting the above requirements are to be repaired and treated at no additional cost to the Department.

9. Slabs
   a. Unless otherwise noted on the Plans, place strips alternately at maximum 20 feet center-to-center and to align with column centerline. Do not place adjacent strips until elapse of twenty four hours after first strip is placed. Place slabs on grade by the "strip-cast" method. Method to be reviewed by the Engineer. Provide saw-cut joints at maximum 20 feet center-to-center and to align with column center lines within four hours of final finishing.
   b. Provide doweled construction joints where shown on the Plans.
   c. Provide a hard steel troweled finish, free from trowel marks and irregularities, to slabs and floors.
   d. Provide a light hair-broom finish to exterior slabs and floors exposed to public view. Leave hair-broom lines parallel to direction of the slab drainage.
   e. Provide a stiff bristle broom finish to slabs and floors with slopes greater than 10 percent. Leave broom lines parallel to slope drainage.
   f. Finish exposed edges of slabs, floors and tops of walls with a 1/4-inch radius edge unless a chamfer is called for on the Plans.

10. Curing and Protection
   a. Comply with ACI 305 "Hot Weather Concreting", Chapter 4, with the supplements and modifications to ACI 301 listed herein.
   b. Only concrete water curing for not less than 7 days (24 hours/day continuously) will be accepted; Burlene mats shall be used in curing. Water cure by ponding or continuous sprinkling covering complete surface with minimum runoff. The application of water to wall may be interrupted for grout cleaning only over the areas being cleaned at the time, and the concrete surfaces shall not be permitted to become dry during such interruption.
   c. Begin all water curing as soon as concrete is set and concrete will not be damaged. Keep concrete and wall forms wet the first 24 hours. Remove forms as indicated in Formwork, Section 3.02-C.4, and continue with 7 day water curing. Recoat damaged surfaces subject to heavy or surfaces damaged by construction procedures within 3 hours of damage. Method of repair shall be approved by the Engineer.

11. Testing
   a. Testing laboratory will be selected and paid for by the Department. Send results of all test to the Department and to the Contractor. The Contractor shall notify the Testing laboratory at least 24 hours before each concrete placing.
   b. Obtain and mold 3 specimens for each fifty (50) cu. yds., or fraction thereof, of each class of concrete placed each day or as directed by the Engineer.

c. Cure specimens from each sample in accordance with ASTM C31. Record in test report any deviations from this Standard.

d. Test specimens in accordance with ASTM C39. Test one specimen at twenty eight (28) days for acceptance and, one specimen at three (3) days and seven (7) days respectively, for information. If one specimen in a test manifests evidence of improper sampling, molding or testing, it shall be discarded and the strength of the remaining cylinders shall be considered the test result.

e. Contractors Superintendent shall color code on a set of structural drawings the extent of days work and date to conform to cylinders test.

f. Perform slump test at discharge of mixer, one for each strength test in accordance with ASTM C143. In the event slump is excessive, testing laboratory will immediately notify the Contractor's superintendent and the Engineer's representative on site. The Contractor shall then reject all concrete with excessive slump and/or deposit time.

g. Drying Shrinkage Test: A drying shrinkage test shall be conducted on the preliminary trial batch with the maximum water-cementitious materials ratio used to qualify each proposed concrete mix design using the concrete materials, including admixtures, that are proposed for the project. Three test specimens shall be prepared for each test. Drying shrinkage specimens shall be 4 x 4 x 11 inch prisms with an effective gauge length of 10 inches fabricated, cured, dried, and measured in accordance with ASTM C157 except with the following modifications:

   1) Specimens shall be removed from the molds at an age of 23 hours ± 1 hour after trial batching, shall be placed immediately in water at 73°F ± 3°F for at least 30 minutes, and shall be measured within 30 minutes thereafter to determine original length and then submerged in lime-saturated water as specified in ASTM C157. Measurement to determine expansion expressed as a percentage of original length shall be taken at age 7 days. The length at 7 days shall be the base length for drying shrinkage calculations ("0" days drying age). Specimens then shall be stored immediately in a humidity controlled room maintained at 73°F ± 3°F and 50% ± 4% relative humidity for the remainder of the test. Measurements to determine shrinkage expressed as percentage of base length shall be reported separately for 7, 14, and 21 days ±4 hours of drying from "0" day after 7 days of moist curing.

   2) Drying shrinkage deformation for each specimen shall be computed as the difference between the base length (at "0" days drying age) and the length after drying at each test age. Results of the shrinkage test shall be reported to the nearest 0.001 percent. If drying shrinkage of any specimen deviates from the average for that test age more than 0.004 percent, the results for that specimen shall be

disregarded.

3) The average drying shrinkage of each set of test specimens cast in the laboratory from a trial batch as measured at the 21 days drying age shall not exceed 0.036 percent and 0.042 percent at the 28-day drying stage for all concrete.

a) The maximum concrete shrinkage for specimens cast in the field shall not exceed the trial batch maximum shrinkage requirement by more than 25 percent.

b) If the required shrinkage limitation is not met during construction, the Contractor shall take any or all of the following actions at no additional cost to the Owner, for securing the specified shrinkage requirements. These actions may include changing the source or aggregates, cement and/or admixtures, including Tetra Guard AS 20 or approved equal; reducing water content; washing of aggregate to reduce fines; increasing the number of construction joints; modifying the curing requirements; or other actions designed to minimize shrinkage or the effects of shrinkage.

4) Alkali-aggregate reactivity potential shall be determined in accordance with Appendix XI of ASTM C33. Aggregates shall be tested in accordance with ASTM C289 and C295 to determine potential reactivity. Aggregates which do not indicate a potential for alkali reactivity or reactive constituents may be used without further testing. Aggregates which indicate a potential for alkali reactivity shall be further tested in accordance with ASTM C227 or C1105, as appropriate, using a cement containing less than 0.6 percent alkalies. At the discretion of the Engineer, testing in addition to that indicated in Appendix XI of ASTM C33 may be performed on potentially reactive aggregates. Nonreactive aggregates shall be imported if, in the opinion of the Engineer, local aggregates exhibit unacceptable potential reactivity.

12. Evaluation and Acceptance of Concrete.

a. If tests are insufficient or inadequate, test and evaluate by core tests. Failure of any concrete cylinder to meet specified requirements shall be deemed as non-complying and costs of additional tests to determine the adequacy or inadequacy shall be borne by the Contractor. Concrete rejected for any reason is to be removed and replaced, including labor, forms and reinforcing, to meet specifications at no additional cost to the Department and no additional time extension.

13. Additional Requirements.

a. Submit shop drawings as required per General Conditions and

elsewhere in these specifications. Prime Contractor shall check and approve all shop drawings prior to submission. Do not fabricate any item requiring shop drawings until approval of shop drawings has been granted by the Department. Partial shop drawings are not accepted, submit drawings for complete submittal.

b. Provide precast or cast-in-place reinforced concrete lintels at all masonry openings and sills at all windows. Reinforce to suit loads and span. Provide minimum 8-inch bearing at each end and, pour integral with columns where opening abuts columns.

c. Sidewalks in R.O.W.: Provide poured-in-place 4-inch thick concrete slab, 3,000 psi concrete, with continuous 8-inch deep thickened slab edges. Isolate walks from vertical surfaces with 1/2-inch expansion joint material. Provide 1/2-inch expansion bituminous joint material flush with top of concrete slabs at 20 feet on center and tooled joints at 5 feet on center. Tool all open edges to a smooth radius and all edges adjacent to the forms.

END OF SECTION