



North Bay Village

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Addendum 3 Issued on November 22, 2016

BID NO. 2016-003 FOR WATER METER REPLACEMENT PROGRAM

Issued by: North Bay Village

Notice to all Bidders:

Attached is Appendix B referenced in the Bid Package.

PROOF OF RECEIPT

Recipient

Signature:

Print Name:

Company:

Date:

SUBMIT WITH BID RESPONSE

Mayor
Connie Leon-Kreps

Vice Mayor
Jorge Gonzalez

Commissioner
Dr. Richard Chervony

Commissioner
Andreana Jackson

Commissioner
Eddie Lim

SECTION UC-075
WATER SERVICE INSTALLATIONS

PART 1 - GENERAL

1.01 SCOPE

This Contractor shall furnish all labor, material and equipment required to construct water service installations, as specified herein.

1.02 RELATED SECTION

Section UC-080 - Meter Boxes, Sectional Plates and Vaults for Water Service
Section UC-085 - Water Meter Valves

1.03 LEAD FREE REQUIREMENT

- A. It is a requirement that all components of water service installations be certified lead free. All brass components for water service installations shall comply with the S3874 amendment (Reduction of Lead in Drinking Water Act) to Section 1417 of the Federal Safe Drinking Water Act.
- B. All meters, meter accessories, copper pipe, brass pipe, fittings, corporation stops, saddles, washers, tailpieces, couplings and other appurtenant items used for water services shall be "NL" no lead Type for installation in the WASD system. Solders and flux shall contain no more than 0.2% lead.
- C. All brass components shall be marked "NL" to indicate no lead.
- D. All valves 2-inch and smaller shall conform to the No Lead, NL, requirement. Valves larger than 2-inches are exempt.

PART 2 - PRODUCTS

2.01 HDPE Pipe for Services

- A. All 2-inch high density polyethylene pipe used for services shall be IPS-O.D. Controlled with Standard Outside Dimension Ratio (SODR) of 9, pressure rating of 250 psi, nominal outside diameter of 2.375-inches, minimum wall thickness of 0.264-inches, in conformance with Materials Standard PE 4710 "Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter". Pipe shall conform with ANSI/AWWA C901 "Polyethylene (PE) Pressure Pipe and Tubing, ½ In. (13 mm) Through 3 In. (76 mm), for Water Service" as modified herein. Pipe shall have a (natural) inner core with a blue colored outer shell. Pipe shall have footage marks at a maximum interval of every two feet. Polyethylene material shall have a minimum cell classification in accordance with ASTM D3350 "Polyethylene Plastics Pipe and Fitting Materials" of 445576D for

the core, which shall be 100% virgin material, and 445576E for the outer shell. Note that both of these materials are UV stabilized as signified by the "D" for natural colored and "E" for the colored shell. Pipe shall conform with NSF 61 or 14. Manufacturer shall supply certification of compliance with all of the above requirements. Certification shall ship with the pipe on material sold to the Department and shall always be submitted with shop drawings and catalogue cuts. When required by the Chief, Engineering Division, Miami-Dade Water and Sewer Department or his designee, certification shall be signed and sealed by a professional engineer licensed to practice in the state in which the manufacturer is located or in the State of Florida.

- B. All 1-inch high density polyethylene tubing used for services shall be CTS-O.D. Controlled with Standard Outside Dimension Ratio (SODR) of 9, pressure rating of 250 psi, nominal outside diameter of 1.315-inches, minimum wall thickness of 0.125-inches, PE 3408, all in conformance with Materials Standard PE 4710 "Polyethylene (PE) Plastic Tubing". Tubing shall conform with ANSI/AWWA C901 "Polyethylene (PE) Pressure Pipe and Tubing, ½ In. (13 mm) Through 3 In. (76 mm), for Water Service" as modified herein. Tubing shall have a (natural) inner core with a blue colored outer shell. Tubing shall have footage marks at a maximum interval of every two feet. Polyethylene material shall have a minimum cell classification in accordance with ASTM D3350 "Polyethylene Plastics Pipe and Fitting Materials" of 445576D for the core, which shall be 100% virgin material, and 445576E for the outer shell. Note that both of these materials are UV stabilized as signified by the "D" for natural colored and "E" for the colored shell. Tubing shall conform with NSF 61 or 14. Manufacturer shall supply certification of compliance with all of the above requirements. Certification shall ship with the tubing on material sold to the Department and shall always be submitted with shop drawings and catalogue cuts. When required by the Chief, Engineering Division, Miami-Dade Water and Sewer Department or his designee, certification shall be signed and sealed by a professional engineer licensed to practice in the state in which the manufacturer is located or in the State of Florida.
- C. All HDPE services require the use of a 10 gauge direct bury stranded copper blue tracer wire tapped every four feet with poly or duct tape for location purposes. The tracer wire shall be accessible at the meter box and connected to the corporation stop for continuity of the signal. The 10 AWG standard tracer wire shall have 0.030" HDPE insulation and measure 0.162" min O.D.

2.02 COPPER

- A. Copper tubing shall conform to the requirements of NSF 61 and ASTM Standard B88. "Seamless Copper Water Tube", Type "K". All tubing shall be furnished in straight lengths. Fittings and valves shall be of the solder-joint type except where specified otherwise. Type L copper shall only be used on the customer side of the property and is not allowed on public right-of-ways.
- B. Fittings for use with copper tubing shall be one of the following:
 - 1. Cast bronze solder-joint fitting shall be in accordance with ANSI Standard B-16.18, "Cast Brass Solder-Joint Fittings", and ASTM Standard B62-90, "Composition Bronze or Ounce Metal Castings". Cast bronze solder-joint fittings shall be as manufactured by Chase Brass and Copper Co., Stanley G. Flagg & Co., Inc. Or approved equal.
 - 2. Wrought copper solder-joint fittings shall be in accordance with ANSI Standard B16.22, "Wrought Copper and Bronze Solder-Joint Pressure Fittings".

Connection of copper pipe or fittings with galvanized pipe or fittings shall be made with dielectric fittings. Solder shall be lead free type.

2.03 SERVICE TERMINAL FITTINGS

A. Single Meter Box Installation

- a. One inch or 2-in copper or High Density Polyethylene (HDPE) tubing and terminal fittings.
- b. 1" lock wing style valve, drilled for wire sealing, Cat. No. KV23-444W Ford Meter Box Co. or Cat. No. 14255, Mueller Co.
- c. C.I. cover and lid as per MDWASD Standard Details

B. Duel Meter Box Installation

- a. One inch or 2-in copper or High Density Polyethylene (HDPE) tubing and terminal fittings.
- b. 1" branch valve assembly, with Standard 7 ½ -in spacing between outlet centers, drilled for wire sealing, Cat. No. UV23-42W Ford Meter Box Co. or 1-in branch connection with Standard 7 ½ in spacing between outlet centers Cat. No. H-15362, fitted with angle stops for 5/8 inch meters, drilled for wire sealing, Cat. No. H-14265, (3/4' Inlet) Mueller Co.
- c. C.I. cover and lid as per MDWASD Standard Details

2.04 CASINGS FOR TORPEDO INSTALLATIONS

- A. Provide a PVC Schedule 40 casing or black steel pipe casing one inch in diameter larger than the service pipe when the service is installed with the use of a torpedo. When the service is installed by the direct bury method, no casing is required.

2.05 BRASS FITTINGS AND VALVES

- A. All brass components shall be marked "NL" to indicate no lead.
- B. Angle Key Meter Valves – Ford Meter Box Company KV-444W, Mueller or approved equal.
- C. Brass Fittings – Merrit Brass or approved equal
- D. Pack Joint, Swivel Nut – A.Y. McDonald Model 4761-22
- E. Ball Corporation Stop – Ford Meter Box Company FB800, Mueller H-10003 or approved equal.

PART 3 - EXECUTION

3.01 INSTALLATION OF SERVICES

- A. Services from the new water mains shall consist of corporation stops, HDPE or copper tubing and terminal fittings as shown in the Standard Details. All service installations from the new

main shall be installed by the Contractor. Service installations from existing mains, if required, will be installed by Department forces, and the cost for materials and labor furnished by the Department shall be borne by the Contractor.

- B. Where possible, all meter boxes shall be installed in non-traffic and non-parking areas.
- C. Where meter boxes are located in existing sidewalks, the whole flag of sidewalk shall be removed and replaced with new concrete. The concrete walk shall be 4 inches thick and finished with the proper tools and techniques to resemble the existing walk. The concrete support for meter boxes shall be eliminated when the box is installed in an existing sidewalk. Where meter boxes are located out of sidewalk areas, a concrete support is required. Concrete supports shall be to the established line and grade.
- D. Meter boxes shall be set flush with the finished grade if in sidewalks, or flush with the top of the ground if out of sidewalk areas.
- E. All bends in copper tubing shall be made with an approved type tube bender to the satisfaction of the Department. Flattened, out of round or kinked tubing will not be permitted.
- E. One inch service connections shall be one of the following:
 - 1. Short Single - Consisting of a short run of HDPE or copper tubing from the main on the same side of the street as the proposed meter, to the meter installation approximately 2 ½ feet from property line. Single meter box installation included.
 - 2. Long Single - Same as above but from a main on the opposite side of the street from the proposed meter.
 - 3. Short Dual - Consisting of a short run of HDPE or copper tubing from the main on the same side of the street as the proposed meter to the meter installation, approximately 2 ½ feet from the property line and branched off to serve an additional customer. Dual meter box installation included.
 - 4. Long Dual - Same as above but from a main on the opposite side of the street from the proposed.
- F. If PVC or black steel casing pipe for services crossing existing pavement is required, the pipe may be driven from the side of the street which affords the most room for the driving trench, thus resulting in the least number of couplings in the casing. Extra care shall be used in leveling and heading the first length of casing in the proper direction. One method of driving casing, known to work in this area and offered here as a suggestion, is to use an ordinary coupling screwed on the leading end of the casing as a cutting edge, and driving against a coupling screwed on the trailing end with a special tool in a pneumatic hammer, while maintaining a steady pull forward on the hammer with a small winch. Each length of casing as driven shall be cleaned out with compressed air introduced through a one-half-inch pipe at least as long as the casing. The purpose of driving casing pipe is to make it unnecessary to repair paving over one-inch service cuts. Should the Contractor elect to open-trench any one-inch service line across pavement, he will be required to repair the paving.

- G. The Contractor shall install the meter box, 1-inch branch assembly, 30 inch tailpieces and perforated spacers.
- H. When installing services the Contractor shall temporarily plug the ends of the tail pieces for protection against dirt.
- I. Pipe bedding and the backfill material to at least 6 inches above the crown of the copper tubing shall be clean white masonry sand. Backfilling and compaction of material lying above a point 6 inches above the crown of the tubing and below the surface of the ground shall be as specified in Section 02315, "Trenching and Backfilling for Piping Systems".
- J. Department forces will install the meters into the boxes installed by the Contractor.

END OF SECTION

SECTION UC-080

METER BOXES, SECTIONAL PLATES AND VAULTS FOR WATER SERVICE

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. The Contractor shall furnish and install all concrete meter boxes, lids, sectional plates and precast vaults required for a complete installation.
- B. All concrete meter boxes, sectional plates and vaults shall be in accordance with the Department's Standard Details and as specified herein.

PART 2 - PRODUCTS

2.01 GENERAL

All materials used in the production of the concrete meter boxes, lids sectional plates and vaults shall be new and or recent manufacture. Aggregates shall not originate in salt or brackish water areas and no calcium chloride containing admixtures shall be used.

2.02 FINE AGGREGATE

Fine aggregate for concrete mixes shall consist of sand or stone screening, composed of hard durable grains, free of foreign matter such as loam, clay, dirt, organic matter or other impurities. Fine aggregate shall conform to the following gradation requirements:

<u>Size Sieve</u>	<u>Percent Passing</u>
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

2.03 COARSE AGGREGATE

- A. Coarse aggregate for concrete mixes shall consist of gravel, broken stone or local limerock.
- B. Coarse aggregate shall be hard, durable and free of foreign matter such as loam, clay, dirt, organic matter or other impurities. It shall be free of adherent coatings. Coarse aggregate shall conform to the following gradation requirements:

1. Meter Boxes, Lids and Sectional Plates

<u>Size Sieve</u>	<u>Percent Passing</u>
3/4"	100
1/2"	90 to 100
3/8"	40 to 70
No. 4	0 to 15
No. 8	0 to 5

2. Vaults

<u>Size Sieve</u>	<u>Percent Passing</u>
1-1/2"	100
1"	95 to 100
1/2"	25 to 60
No. 4	0 to 10
No. 8	0 to 6

2.04 CEMENT

- A. Cement shall be a standard brand of Portland cement meeting the requirements of ASTM C150-86, "Portland Cement", Type I.
- B. Different brands of cement, even if tested and approved, shall not be mixed during use.

2.05 REINFORCING STEEL

- A. General: All reinforcing steel shall be free of rust, grease, dirt or mortar and shall be thoroughly cleaned of any such foreign matter or loose mill scale before being placed in position.
- B. Wire reinforcement shall conform to ASTM A82, "Steel Wire, Plain, for Concrete Reinforcement".
- C. Wire mesh reinforcement shall conform to ASTM A185, "Steel Welded Wire, Fabric, Plain for Concrete Reinforcement".
- D. Bar reinforcement shall conform to ASTM A615-7a, "Deformed and Plain Billet-Steel Bars for Concrete Reinforcement", Grade 60, deformed, except that steel manufactured by the Bessemer process will not be accepted.

2.06 WATER

Water used in mixing concrete that is not in the form of surface moisture on the aggregate shall be from the Department's water supply or other approved source. (See "Water Used in Construction" of Section 01100)

PART 3 - EXECUTION

3.01 MANUFACTURE

A. General

All concrete meter boxes, lids, sectional plates and vaults shall be manufactured in accordance with the applicable provisions of ASTM C858, "Underground Precast Concrete Utility Structures", as modified herein.

B. Forms

1. The Forms shall be made from of a non-porous material with smooth surfaces and shall be accurate and strong enough to maintain the structure's dimensions within one half of the allowable tolerances given in Section 3.4 of ASTM C858
2. The precast sections for 4' x 4' vaults shall be constructed with a threaded metal insert in accordance with Standard Detail No. WS 2.20, Sheet 1 of 2, contained herein. Also, each section shall be furnished with a corner bolt.

C. Cleaning and Oiling: Forms shall be cleaned before each use, and shall be free of paint or other protective coatings that might cling to the surface of the concrete. Releasing agents applied to the form to aid in breaking the bond shall not be injurious to the concrete.D. Reinforcement: Steel reinforcing shall be securely positioned in the form to maintain the concrete cover shown on the Standard Details.E. Mixture

1. The aggregates shall be sized, graded, proportioned and thoroughly mixed in a batch mixer with proportions of cement and water that will produce a homogeneous concrete having a compressive strength of 3500 psi at 28 days of age for the boxes and plates and 3000 psi for the vaults after the same curing period.
2. Batched concrete shall be made in standard concrete mixers only, and not in mortar boxes, wheelbarrows or similar equipment.
3. Mixers shall be standard mechanical (power-driven) rotary type for concrete. Mixers normally used for mortar or plaster mixing will not be permitted.

F. Concrete Placement

1. Concrete shall be placed either by gravity into the form at a rate such that the concrete is plastic at all times and flows readily into all parts of the form and around all reinforcement steel without segregation of materials, or by highspeed pneumatic rammer resulting in dense, evenly compacted concrete without disturbing the reinforcement. The surfaces from top to bottom shall show uniform compaction.

2. The top surface of the molded items shall be flat and finished smooth while in the mold. Capping will not be permitted. Where required by the Department, corners shall be rounded.
- G. Curing: Curing shall be by any method or combination of methods that will develop the required compressive strength within 28 days or less.
- H. Repairs: The precast units may not be repaired without specific approval by the Department.
- I. Inspection: The quality of materials, manufacturing process, and the finished units shall be subject to inspection at any time by the Department, and the supplier shall afford access for this purpose, if so required.

3.02 CERTIFICATION

Prior to installation of any of the above mentioned units, the Contractor shall furnished the Engineer, upon his required, with a statement giving the following information:

- A. Name of manufacturer.
- B. The source and type of cement.
- C. The source and specific gravities of the aggregates.
- D. The concrete mix proportions, and strength at 28 days.
- E. Name of admixtures, if any.
- F. Mill certificates for the reinforcement steel.
- G. Source of water.

3.03 REJECTION

The Precast units shall be subject to reject, either at the manufacturing plant or at delivery, upon failure to conform to any of the specified requirements herein. The following imperfections shall also be cause for rejection:

- A. Defects that indicate any imperfect concrete mixing and molding.
- B. Surface defects such as honey-combed or open textured and damaged area which would affect the structural adequacy.
- C. Repaired areas or capping.
- D. Improper radius at corners or improper tolerances.

END OF SECTION

SECTION UC-085**WATER METER VALVES****PART 1 - GENERAL**

1.01 SCOPE

This Contractor shall furnish meter valve and accessories for cold water displacement meters (to be furnished and installed by the Department) and shall supply all labor, material and equipment necessary for a satisfactory installation.

1.02 RELATED SECTION

Section UC-080 - Meter Boxes, Sectional Plates and Vaults for Water Service

PART 2 - PRODUCTS

2.01 METER VALVE ASSEMBLY

- A. Meter valves (inlet side of meter) for single meter box installations, including single meter boxes for multi-story buildings, shall be the lock wing type with coupling nut drilled for wire seal. The inlet end of the valve shall be for 1-inch copper tubing as specified herein, and the outlet end (coupling nut) shall connect to a 1-inch meter. The valves shall be as manufactured by the following or an approved equal:

Ford Meter Box. - Angle Inverted Key Meter Valves, No. KV23-444W

or

Mueller Co. - Angle Meter Stop, No. H-14255

- B. Meter valves (outlet side of meter) for single meter boxes (multi-story building) shall be the plain type with coupling nut drilled for wire seal. The inlet end of the valves (coupling nut) shall be for 1-inch copper tubing as specified herein, and the outlet end shall connect to a 1-inch meter. The valves shall be as manufactured by the following or approved equal:

Ford Meter Box. - Straight Inverted Key Meter Valves, No. KV23-444W

or

Mueller Co. - Straight Inverted Key Meter Valves, No. H-14348

- C. Meter branch valve assemblies (inlet side of meter) with standard 7-1/2 inch spacing for dual meter boxes (two 5/8-inch water meters) shall be lock-wing types with coupling nuts drilled for wire seal. The inlet side of the branch valve assembly shall be for 1-inch copper tubing as specified herein, and the outlet side (coupling nut) shall connect to a 5/8-inch by 3/4-inch meter. The branch valve assembly shall be as manufactured by the following or an approved equal:

Ford Meter Box. - Branch Valve Assemblies, No. UV23-42WW

or

Mueller Co. - "U" branch connection No. H-15362 with 7-1/2 inch spacing, 3/4 I.P. male thread (outlet) and inlet for 1-inch copper tubing

and

Angle meter stops No. H-14265 with 3/4-inch I.P. female thread (inlet), and coupling nut (outlet) for 5/8-inch by 3/4-inch meter and drilled for wire seal.

PART 3 - EXECUTION

(Not Used)

END OF SECTION

SECTION UC-170**CLEANING AND TESTING OF MAIN****PART 1 - GENERAL**

1.01 SCOPE OF WORK

- A. The Contractor shall furnish all material, labor and equipment necessary to clean and test force main and/or water main.
- B. The material herein specifies cleaning and testing of mains 24-inches in diameter and less unless otherwise allowed by the MD-WASD.

1.02 RELATED SECTION

Section UC-175 - Disinfection of Main
Section UC-370 - Cleaning and Testing Gravity Sewers

1.03 QUALITY ASSURANCE

- A. Testing shall be in accordance with ANSI/AWWA Standard C-600, latest edition, as modified herein.
- B. Cleaning and testing shall be performed in strict accordance with these specifications.
- C. The Contractor is cautioned that Miami-Dade County or other governing body having jurisdiction over the work location may have regulatory rules and ordinances prohibiting or limiting the discharge of water from any excavation into sanitary and storm sewer systems, or to canals and drainage ditches. The Contractor shall comply with all regulations of all governing agencies.

PART 2 - PRODUCTS

(Not Used)

PART 3 - EXECUTION

3.01 GENERAL

- A. As soon as the installation of each run of main is completed, including valves sufficient for control and anchored sufficiently to withstand any test pressure, the run shall be thoroughly cleaned by pigging (or, if required by the MD-WASD, flushing), discharging the water through a riser into the pipe trench, unless some other method of disposal is approved by the MD-WASD. Note that in some circumstances it may be necessary to install valves after the line segment has been pigged. In such an instance, permission to use this sequence of operations must be approved in writing by the MD-WASD.

- B. THE Contractor shall clean the inside of the main in intervals during its installation. The Contractor shall utilize pigging to clean the main unless otherwise specified herein or instructed by the MD-WASD. A Bare Swab No. 5, 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 MD-WASD at the Contractor's sole expense. The Contractor shall furnish all materials and equipment necessary to clean the mains.
- C. Volume flushing, if required, shall be of sufficient velocity to produce a scouring action in the main meeting the approval the MD-WASD.
- D. The Contractor shall furnish and install all piping necessary to dispose of the flushing water and shall exercise care to prevent any damage to the surrounding area and adjoining and adjacent properties.
- E. Water Main: Mains shall be tested as a whole or in sections between line valves, unless otherwise specified or approved by the MDWASD. Unless otherwise approved by the MDWASD, the total length of pipe for any single test shall not exceed 2,000 feet. Where a segment is being tested which includes more than one line valve to line valve section the maximum allowable leakage, defined below, shall be based on the length of the small segment being tested. All offset connections, fire hydrants, fire hydrant branch mains, and services between line valves shall be tested with the water main.
- F. Force Main: The force main shall be tested in a manner identical to the water main test specified above. Offset connections and blow offs will be tested along with the main. Corporation stops shall be installed prior to testing and shall be included in the test with no leak permitted.

3.02 WATER FOR CLEANING AND TESTING

- A. Water for cleaning and testing shall be furnished as specified in "Water Used in Construction" of Section 01100. The Contractor shall furnish and install all necessary pumps, piping and fittings, including the corporation stop(s), to connect the section under test to the source of water. The test pump shall be a centrifugal or gear pump producing a steady pressure free of pulsation. The MD-WASD may furnish a suitable meter or container for measuring the flow of water into the line, if available and requested by the Contractor in a timely manner, but will not be considered as obliged to do so. If the meter is not furnished by the MD-WASD, a meter or container, calibrated to the satisfaction of the MD-WASD shall be provided by the Contractor. A Contractor-supplied meter or container must be approved in writing by the MD-WASD. The test pressure shall be 100 psi and, as specified in AWWA C600, Section 5.2 "Hydrostatic Testing", shall not vary more than ± 5 psi for the duration of the testing.

3.03 LEAKAGE TESTING

- A. Force Main: All corporation stops and blow offs in the section being tested shall be opened and left open until water comes out of them, in order that as much air as possible may be removed from the line.

- B. Water Main: All fire hydrants, corporation stops, air release valves and meter valves in the section being tested shall be opened and left open until water comes out of them, in order that as much air as possible may be removed from the line.
- C. Water shall be pumped into the line from a MD-WASD approved calibrated container or through a MD-WASD approved meter up to the required pressure, and pumping shall be continued to maintain that pressure for a minimum 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 isolated 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.
- D. The inspector will record the amount of water supplied to the pipeline at the end of the first hour of the test and at each hour thereafter for the full duration of the test. Should the amount of leakage (ie water supplied to the pipe) recorded for any hour exceed the amount recorded for any previous hour, even if the amount of leakage is less than the allowable amount, the test shall continue for additional one-hour periods until the leakage stabilizes or decreases.
- E. The maximum allowable leakage for ductile iron mains shall be determined by the following formula from the ANSI/AWWA Standard C600-05 "Installation of Ductile-Iron Water Mains and Their Appurtenances", latest edition:

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

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

Note: For force mains, also see "Tightness Standards" in Section UC-370, as applicable.

- E. No pipe installation will be accepted if the leakage is greater than that determined by the above requirements.
- F. 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 MD-WASD but shall reimburse the MD-WASD for the actual cost of the operation of the instrument by MD-WASD personnel. Any observed leaks or any obviously defective joints or pipes shall be repaired or replaced as directed by the MD-WASD, even though the total leakage is below that specified above. 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.

END OF SECTION

SECTION UC-175
DISINFECTION OF WATER MAIN

PART 1 - GENERAL

1.01 SCOPE OF WORK

The Contractor shall furnish the necessary labor, equipment, and material to disinfect sections of water main and fittings as applicable to this project.

1.02 RELATED SECTION

Section UC-170 - Cleaning and Testing of Main

1.03 QUALITY ASSURANCE

- A. Disinfection shall be performed in strict accordance with these specifications and with AWWA Standard C651, "Disinfection of Water Mains", latest edition, except as otherwise modified herein.

PART 2 - PRODUCTS

2.01 Liquid Chlorine, available from local sources.

2.02 Calcium hypochlorite, HTH, Perchloron, or approved equal.

PART 3 - EXECUTION

3.01 GENERAL

- A. The Contractor shall clean, flush and disinfect every piece of pipe, fitting and valve in accordance with these specifications and to the satisfaction of the Department.
- B. Liquid chlorine is available locally and shall be purchased by the Contractor.

3.02 DISINFECTION

- A. The pipelines shall be disinfected after they have been pressure tested and while still full of water, as specified in Section UC-170.
- B. A suitable chlorinator shall be used to inject chlorine into the lines. 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.

- C. 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.
- D. The chlorine solution shall be allowed to stand in the line for at least 24 hours or longer, if required, to destroy all harmful bacteria. At the end of the required time, the concentration of chlorine in all parts of the section shall be at least 25 ppm.
- E. 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.
- F. The Contractor shall be responsible for coordination with Dade County Department of Health, who shall collect and test samples from main. The Contractor shall provide assistance to the Dept. of Health for the collection of samples. The samples shall be taken from each main or section of main to be placed in service where designated by the Dept. of Health. The samples must be approved by the Department of Health before the main is placed in service.
- G. The Contractor shall be responsible for any rechlorination and retesting that may be required until the Department of Health'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. The Contractor shall exercise due care in the protection of private property from water damage due to his operations. In addition, the Contractor shall assume complete liability for any damage which was directly or in-directly caused by his operations.
- H. All of the connections shall be disinfected by the Contractor.
- I. 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 Department, whose representative shall be present at all times while this phase of the work is in progress.
- J. 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.

END OF SECTION

SECTION 15060**PIPING AND FITTINGS****PART 1 - GENERAL**

1.01 SCOPE:

- A. This section describes materials, testing, and installation of ductile-iron pipe and fittings for water mains, Cast Iron Soil Pipe, and Vitrified Clay Pipe for sanitary Sewer Service, and small diameter Poly Vinyl Chloride Pipe (PVC) with threaded, flanged and solvent cemented joints; Copper Pipe and Fittings, and High Density Polyethylene Pipe for water services. The work included in this section consists of furnishing all material, equipment, craft labor and performing all operations necessary for the supply, installation, and commissioning of all piping, fittings and accessories within the limits of work, as shown on the drawings and specified herein.
- B. Where references are made to other standards or codes, unless specific date references are indicated the latest edition of said standard or code shall govern.

1.02 WORK NOT INCLUDED UNDER THIS SECTION:

Piping installation for various types of piping systems is specified other sections herein that constitute MDWASD's Design Standards and Construction Details. Installations specified in this section are supplementary to those sections and in the case of conflict the more stringent condition shall prevail. For type PSM SDR-35 PVC and AWWA C900 PVC sewer pipe and fittings see Section UC-250, "Gravity Sewer Systems".

1.03 RELATED SECTIONS:

- A. Section 15010 - Basic Mechanical Requirements
- B. Section 15065 - Miscellaneous Materials
- C. Section 15070 - Jacking and Boring
- D. Section 15075 - Aerial Crossings
- E. Section UC-250 - Gravity Sewer Systems
- F. All sections specifying various types of valves.

1.04 PIPING LAYOUT AND DESIGN CRITERIA:

- A. Field verify dimensions prior to preparation of layout and shop drawings. Obtain the following information from the drawings and specifications:
 - 1. Elevation of the pipe centerline and of the completed ground.
 - 2. Alignment of the pipeline.
 - 3. Field test hydraulic gradient elevation (HGL).
 - 4. Nominal internal diameter, ID.
 - 5. Design internal pressure class or HGL

6. Joint types.

- B. Obtain shop drawing approval prior to fabrication of piping. All items not specifically mentioned in the Specifications or noted on the approved Plans, but which are reasonably necessary to for a complete, functional, and satisfactory installation shall be included.

1.05 SUBMITTALS

- A. Submit shop drawings in accordance with the General Provisions.
- B. Provide an affidavit of compliance with standards referenced in this specification, e.g., AWWA C151, AWWA C153, etc.
- C. Submit copy of report of pressure tests for qualifying the designs of all sizes and types of pipe and fittings that are being used in the project. The pressure test shall demonstrate that the minimum safety factor described in relevant standard is met.
- D. Submit piping layout profile drawings showing location and dimensions of pipe and fittings; submit after equipment and valve submittals have been reviewed and marked "**Resubmittal not required.**" Include laying lengths of valves, meters, in-line pumps, and other equipment determining piping dimensions. Label or number each fitting or piece of pipe. Piping having identical design pressure class, laying lengths, and bell-and-spigot dimensions that is to be placed in long straight reaches of alignment may have the same identifying label or number.
- E. Provide the following information:
1. Mortar lining thickness.
 2. Wall thickness.
 3. Material test data for this project.
 4. Show deflections at push-on and mechanical joints.
 5. Submit joint and fitting details and manufacturer's data sheets.
- F. Fully detailed drawings of all fittings proposed shall be supplied by the manufacturer with his bid. The tabulated nominal weight of each size and type of fitting shall also be supplied by the manufacturer for all items proposed. This weight shall be that of the bare casting prior to application of any lining or coating.
- G. Submit calculations and test data proving that the proposed restrained joint arrangement for restrained joint pipe can transmit the required forces with a minimum safety factor of 1.5.
- H. Submit copy of manufacturer's quality control check of pipe material and production. Include hydrostatic test records and acceptance test records. For each acceptance test, submit a stress-strain diagram showing yield strength, yield point, tensile strength, elongation, and reduction in area. Provide specimen test section dimensions and speed and method used to determine speed of testing, method used for rounding of test results, and reasons for replacement specimens, if any. Submit ring-bending test of pipe of the same diameter and pressure class as the pipe required for this project to prove ring-bending stress at 48 ksi results in a factor of safety of 2.0.

- I. For Ductile Iron Pipe and fittings, submit certificate that cement for mortar lining complies with ASTM C150, designating type.
- J. Submit test report on physical properties of rubber compound used in the gaskets.
- K. Submit test reports and certifications for ceramic epoxy lining as specified herein. Submit applicators qualifications. Submit manufacturer's written recommendations for application and repair of coating.
- L. Submit drawing or manufacturer's data sheet showing flange facing, including design of facing serrations.
- M. Submit weld procedure specification, procedure qualification record, and welder's qualifications prior to any welding to ductile-iron pipe or fittings.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. During shipping, delivery and installation of pipe and accessories, handle in a manner that is in compliance with the manufacturer's recommendations, and employ procedures that ensure delivery of an undamaged operable product
- B. Exercise particular care not to damage coatings by limiting exposure or physical contact with other materials, objects, or the environment.

1.07 INSPECTION

The Owner's Representative will inspect materials, production, and testing of pipes, fittings, and special pieces at manufacturer's plant.

1.08 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 vendor and supplier to make prior contact with the Storekeeper or the Construction Management section 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 shall not be unloaded without inspections 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;

1. Incorrect metallurgy or metallurgy which cannot be verified to the complete satisfaction of the Engineer;
2. Foundry identification/location, size, pressure and material identification information lost, removed, non-existent, or not visible when assembled;
3. Not in complete compliance with all applicable AWWA Standards as modified herein and/or these specifications;
4. Not in compliance with NSF;
5. Not in compliance with approved shop drawings;
6. Out of roundness in excess of AWWA requirements;
7. Dimensional differences in excess of AWWA requirements;
8. Rough exterior coating;
9. Chipped, cracked, scratched or otherwise damaged interior or exterior coatings or linings;
10. Interior or exterior coatings which are too thin;
11. Coatings too thick to allow proper assembly; coatings too thick to allow proper grip by restraining gaskets or other restraining elements;
12. Pin holes or honey combing of pipe;
13. Weld spatter or excess metal in gasket grooves or the whole of the bell area;
14. Bell areas which are distorted or otherwise improperly cast;
15. 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;
16. Gaskets which are defective or of the wrong material;
17. Lack of joint materials;

18. Improper or defective joint materials;
19. Bolting of the wrong material or size;
20. Electro galvanizing or other exterior plating when hot-dip galvanizing is required;
21. Incorrect, flawed or damaged interior coating or lining;
22. Lack or non-submittal of all required certifications;
23. Non-timely submission of certifications; incorrect/incomplete certifications or certifications lacking the signature, date and seal of a professional engineer when so required;
24. Flanges which are too thin, not a right angles to the pipe centerline, or otherwise distorted;
25. The above listed items 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.

PART 2 - PRODUCTS

2.01 PIPE AND FITTINGS: DUCTILE IRON

A. GENERAL

As used herein, "ANSI" denotes the American National Standards Institute, "AWWA" denotes the American Water Works Association, and "ASTM" denotes the American Society for Testing and Materials.

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 permanent and 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. DUCTILE IRON PIPE

All pipes shall be ductile iron pipe conforming to ANSI/AWWA Standard 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 Standard 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 wall thickness for pipe having threaded flanges shall be Special Class 53 or Pressure Class 350.

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 or threaded flanges, the nominal wall thickness of the pipe barrel shall be as specified in Section 3.3, "Joints and Accessories" under "Flanged Joints", herein below.

Minimum wall thicknesses for pipe having grooved-end joints shall be as shown in the following table:

DI Pipe and Fitting Sizes (inches)	Grooved End Joint Wall Thickness*
16 and smaller	Special Class 53
18	Special Class 54
20	Special Class 55
24 to 36	Special Class 56
42 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 Water and Sewer 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 (i.e. the Chief, Engineering Division, M-D WASD or his representative) 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.

Single gasket push-on pipe shall be shipped in standard 18-foot or 20-foot lengths, but not both. 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 ensure 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 to 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 54-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 Standard C110/A21.10-12, "Ductile-Iron and Gray-Iron Fittings ". In addition, fittings with mechanical joints and push-on joints shall conform to ANSI/AWWA Standard 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 to 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 Standard C153/A21.53-11, "Ductile-Iron Compact Fittings ". In addition, fittings with mechanical joints and push-on joints shall conform to ANSI/AWWA Standard C111/A21.11-12, "Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings" except as otherwise allowed in 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 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 Standard C111/A21.11-12, except that the gaskets for pipe and fittings shall be neoprene unless otherwise specified.

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 (Amarillo 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 (Amarillo Fastite/Fast-Grip) or those provided by United States Pipe and Foundry Company (Tyton/Field Lok). No other designs will be acceptable.

The pressure rating shall be stamped on the restrained gasket. The restrained gasket and joint restraining system shall conform to ANSI/AWWA Standard C111/A21.11-12 (with neoprene required for sewer) rated at the following:

Size	Pressure Rating (Min.)
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 Standard C111/A21.11-12, except that the gaskets for each fitting under Groups D and D1 shall be neoprene. 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 Standard 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 Standard 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 restrained glands may be utilized for underground pipeline. The ASTM A536 ductile iron casting of the restrained gland shall be bonded powder coated. The wedge and wedge assembly shall have a bonded liquid polymer coating applied for corrosion protection. The gland shall utilize torque limiting twist off wedge actuation screws.

Foreign and domestic manufactured restrained glands are allowed for pipelines 24-inches and below unless otherwise required by the Department due to Federal or State funded projects which require domestic manufacture. In sizes 30, 36, 42 and 48-inch the prior written permission of the Engineer is required to use non-domestic manufactured restraining glands. The country of origin shall be clearly identified on the restraining gland and shop drawing.

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. 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.

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 Standard C111/A21.11-12, except that gaskets for pipe and fittings shall be neoprene, where so specified, 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 in Section 3.1 above.

Restrained joints using field welding, set screws, or gaskets with expanding metal inserts are not 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 Standard 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.

Flanged Joints

Connecting pieces with one end flanged and the other end either plain-end or mechanical joint, shall conform to ANSI/AWWA Standard 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 Standard C110/A21.10-12, as specified hereinabove.

Flanged ductile-iron pipe with integrally cast flanges shall be manufactured in accordance with ANSI/AWWA Standard C151/A21.51-09, and with provisions contained hereinabove for centrifugally cast ductile iron pipe, and shall be furnished with ANSI Standard 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 Standard 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 Standard 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/Standard C151/A21.51-09. Flanges shall be solid-back.

The pipe shall be furnished with ANSI Standard Class 125 flanges, plain faced and drilled, conforming to ANSI Standard 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 Standard 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 Standard 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 equal.

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

E. LININGS AND COATINGS

Polyethylene Encasement

For non-submerged applications, all Ductile Iron Pipe and fittings shall be wrapped with V-Bio Polyethylene Enhanced Encasement in accordance with AWWA C600 and ANSI/AWWA C105/A21.5-, Standard for Polyethylene Encasement of Ductile-Iron Pipe Systems. . Film low-density, polyethylene film and shall be 8 mils thick. Color shall be Blue for Potable Water, Purple for Recycled water, and green for sanitary sewage service. Alternatively, or if specified, polyethylene encasement for use with ductile iron pipe systems shall consist of three layers of co-extruded linear low density polyethylene (LLDPE), fused into a single thickness of not less than eight mils. The inside surface of the polyethylene wrap to be in contact with the pipe exterior shall be infused with a blend of antimicrobial biocide to mitigate microbiologically influenced corrosion and a volatile corrosion inhibitor to control galvanic corrosion. Product: V-

Bio or equal.

Polyethylene encasement for ductile-iron pipe shall be supplied as a flat tube meeting the dimensions of Table 1 in AWWA C105 and shall be supplied by the ductile-iron pipe manufacturer.

Plastic adhesive tape shall consist of polyolefin backing and adhesive which bonds to common pipeline coatings including polyethylene. Products: Canusa Wrapid Tape; Tapecoat 35; Polyken 934; AA Thread Seal Tape, Inc.; or equal.

Install the polyethylene to completely encase the pipe and fittings to provide a watertight corrosion barrier. Continuously secure overlaps and ends of sheet and tube with polyethylene tape. Make circumferential seams with two or more complete wraps, with no exposed edges. Tape longitudinal seams and longitudinal overlaps, extending tape beyond and beneath circumferential seams. Wrap bell-spigot interfaces, restrained joint components, and other irregular surfaces with wax tape or moldable sealant prior to placing polyethylene encasement. Minimize voids beneath polyethylene.

Place circumferential or spiral wraps of polyethylene tape at 2-foot intervals along the barrel of the pipe to minimize the space between the pipe and the polyethylene. Overlap adjoining polyethylene tube coatings a minimum of 1 foot and wrap prior to placing concrete anchors, collars, supports, or thrust blocks. Hand-wrap the polyethylene sheet, apply two complete wraps with no exposed edges to provide a watertight corrosion barrier, and secure in place with 2-inch-wide plastic adhesive tape. Repair polyethylene material that is damaged during installation. Use polyethylene sheet, place over damaged or torn area, and secure in place with 2-inch-wide plastic adhesive tape.

Repair polyethylene encasement at all service connections in accordance with AWWA C600-10, Section 4.8.

Asphaltic Coating

All Ductile Iron pipe and fittings shall be outside-coated with an asphaltic material applied by means of the airless spray method. The exterior coating shall comply with 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 coating to an extent that will permit ready insertion of the spigot through the gasket area.

Cement-Mortar Lining

Ductile Iron Pipe and fittings unless otherwise specified shall be double-thickness cement-lined and seal-coated in accordance with ANSI/AWWA Standard C104/A21.4-14, "Cement-Mortar Lining for Ductile-Iron Pipe and Fittings".

Ceramic Epoxy Lining

Ductile Iron Pipe and fittings where so specified shall be lined with ceramic epoxy

Ceramic epoxy shall contain pigmentation to resist ultraviolet exposure under the same

conditions.

All ductile iron pipe and fittings for which ceramic epoxy lining is to be applied shall be delivered to the application facility without asphalt, cement lining or other lining on the interior surface or the first 6 inches on the spigot end of the pipe exterior.

Ceramic epoxy material shall be a high-build multi-component Amine cured Novalac epoxy, Protecto 401, by Vulcan Painters, Inc. of Bessemer, AL 35021 or Department-approved equal.

Ceramic epoxy material shall meet the following criteria and shall be accompanied by certification of the following test results:

- A. A permeability rating of 0.00 when tested according to Method A of ASTM E96-00 "Test Method for Water Vapor Transmission of Materials", Procedure A with a test duration of 30 days.
- B. The following test must be run on coupons from factory lined ductile iron pipe:
 1. ASTM B117 Salt Spray (scribed panel) - Results to equal no more than 0.5mm undercutting after one year.
 2. ASTM G95 Cathodic Disbondment 1.5 volts @ 77 degrees F. Results to equal no more than 0.5mm undercutting after 30 days.
 3. Immersion Testing rating using ASTM D714-87 (1994).
 - a. 20% Sulfuric Acid - No effect after one year.
 - b. 25% Sodium Hydroxide - No effect after one year.
 - c. 160° F. Distilled Water - No effect after one year.
 - d. 120° F. Tap Water (scribed panel) - 0.0 undercutting after one year with no effect.
- C. A statement from the manufacturer attesting to the fact that at least 20% of the volume of the lining contains ceramic quartz pigment.
- D. A statement concerning recoat ability and repair to the lining.

Ceramic Epoxy Application

- a. The lining shall be applied by a competent firm with a successful history of applying linings to the interior of ductile iron pipe and fittings.
- b. **Surface Preparation**

Prior to abrasive blasting, the entire area which will receive the protective compound shall be inspected for oil, grease, etc. Any areas where oil, grease or any substance is present which can be removed by solvent shall be solvent cleaned using the guidelines outlined in SSPC-1 Solvent Cleaning. After the surface has been made free of grease, oil or other substances, all areas to receive the protective compounds shall be abrasive blasted using compressed air nozzles with sand or grit abrasive media. The entire surface to be lined shall be struck with the blast media so that all rust, loose oxides, etc., are removed from the surface. Only slight stains and tightly adhering annealing oxide may be left on the surface. Any area where rust reappears before coating must be re-blasted to remove all rust.
- c. **Lining Application**

After the surface preparation and within 8 hours of surface preparation, apply to the interior of pipe and fittings a minimum forty (40) mils dry film thickness of the protective lining. No lining shall take place when the substrate or ambient temperature is below 40 degrees Fahrenheit. The surface also shall be dry and dust free. If flange ends are included in the Project, the linings shall not be used on the face of the flange; however, full face gaskets must be used to protect the ends of the pipe. The 40-mil system shall not be applied in the gasket grooves.

d. Coating of Gasket and Spigot Ends

Coat the gasket area and exterior of the spigot end for 6 inches back from the end of the spigot with six (6) mils minimum, ten (10) mils maximum of Protecto Joint Compound. This coating shall be applied by brush to ensure complete coverage. Care shall be taken that the coating is smooth without excess buildup in the gasket groove or on the spigot end. All material for the gasket groove and spigot end shall be applied after the application of the lining as specified in the preceding paragraph.

e. Number of Coats

The number of coats of lining material applied shall be as recommended by the lining manufacturer. However, in no case shall this material be applied above the dry thickness per coat recommended by the lining manufacturer in printed literature. The time between coats shall never exceed that time recommended by the lining material manufacturer. No material shall be used for lining which is not indefinitely recoated able with itself without roughening the surface.

f. Touch-Up and Repair

Protecto Joint Compound shall be used for touch-up or repair. Procedures shall be in accordance with manufacturer's recommendations.

F. INSPECTION AND CERTIFICATION

a. Inspection

1. All ceramic epoxy lined ductile iron pipe and fitting linings shall be checked for thickness using a magnetic film thickness gauge. The thickness testing shall be done using the method outlined in SSPC-PC-2 Film Thickness Rating. Re-line any pipe whose lining is below the specified minimum thickness.
2. The interior lining of all pipe and fittings shall be tested for pinholes with a nondestructive 2,500 volt test. Re-line any pipe not passing the test.
3. Each pipe joint and fitting shall be marked with the date of application of the lining system and with its numerical sequence of application on the date.

Procedures for Sealing Cut Ends and Repairing Field Damaged Areas

1. Remove burrs caused by field cutting of ends or handling damage and smooth out the edge of the lining if rough.
2. Remove all traces of oil, grease, asphalt, dust, dirt, etc.
3. Areas of loose or damaged lining associated with field cutting the pipe shall be repaired, if approved by the Engineer, as recommended by the pipe manufacturer. The damaged area shall be stripped back by chiseling or scraping about 1 to 2 inches into the well-adhered

lining before patching.

The exposed metal and the 1 to 2-inch lining overlap shall be roughened with a coarse grade of emery cloth (#40 grit), rasp or small chisel. Avoid wire brushing or similar buffing which would make the surface too smooth for good adhesion.

4. With the area to be sealed or repaired absolutely, clean and suitably roughened, apply a coat of Protecto Joint Compound by brush in accordance with the manufacturer's recommendations.

2.02 PIPE AND FITTINGS: CAST IRON SOIL

- A. Cast iron soil pipe and fittings shall be cast gray iron, extra heavy, conforming to the requirements of ASTM Standard A74 "Cast Iron Soil, Pipe and Fittings".
- B. Joints in soil pipe and fittings shall be made with neoprene rubber, compression type gaskets conforming to ASTM Standard C564, "Rubber Gaskets for Cast Iron Soil Pipe and Fittings".
- C. Hubless EHCI with stainless steel and neoprene "Band-Aid" connections is only approved for use in size 2-inches. All EHCI of larger diameter shall be hub pipe.

2.03 PIPE AND FITTINGS: POLY VINYL CHLORIDE (PVC)

- A. Poly (vinyl chloride (PVC) pipe and fittings specified herein are small diameter PVC with threaded, flanged and solvent cemented joints.
- B. All poly (vinyl chloride) (PVC) pipe and fittings shall be made from high impact, 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 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.
- C. PVC pipe shall be Schedule 80 unless Schedule 120 pipe is called for on the Plans or by the Engineer, Type I, Grade I, or Class 12454B with socket ends, and shall comply with ASTM Standard D1785, "Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80 and 120". Products intended for contact with potable water shall be evaluated, tested, and certified for conformance with ANSI/NSF Standard No. 61 or the health effects portion of NSF Standard No. 14 by an acceptable certifying organization when required by the regulatory authority having jurisdiction.
- D. Schedule 80 Socket-type fittings shall comply with ASTM Standard D2467, "Socket-Type Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80" and D2464 "Specification for Threaded Poly Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80, for threaded fittings.
- E. Joining cement for PVC pipe and fittings shall comply with ASTM Standard D2564, "Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings". Cemented joints shall be made in accordance with ASTM Standard D-2855, "Recommended Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings".
- F. Flanges: One piece molded hub type flat face flanges, 125 pound standard as specified under fittings hereinbefore.
- G. Gaskets: Full faced, 1/8-inch thick, neoprene (for sewer) or SBR (for water).

- H. AISI Type 316 stainless steel, ASTM A193, Grade B8M hex bolts and ASTM A 194 Grade E8 hex head nuts. Bolts shall be fabricated in accordance with ANSI B 1812 and provided with washers of the same materials as the bolts.

2.04 PIPE AND FITTINGS: COPPER

- A. Pipe: Copper pipe shall be Type K for interior piping and Type K Soft Temper for exterior piping, both conforming to ASTM B88, seamless, round, drawn tubing.
- B. Fittings: Solder joint fittings shall be wrought copper and bronze fittings conforming to ANSI B16.22 or cast brass fittings conforming to ANSI Standard B16.18. Fittings for use with copper tubing shall be one of the following:
 - 1. Cast Bronze Solder-Joint Fittings: Solder joint fittings of this type shall be cast bronze fittings conforming to ANSI B16.18, "Cast Brass Solder-Joint Fittings", and ASTM Standard B62, "Composition Bronze or Ounce Metal Castings", as manufactured by Chase Brass and Copper Co., Stanley G. Flagg & Co., Inc., or Department-approved equal.
 - 2. Wrought Copper Solder-Joint Fittings: Solder joint fittings of this type shall be wrought copper fittings in accordance with ANSI B16.22, "Wrought Copper and Bronze Solder-Joint Pressure Fittings".
- C. Solder: Solder shall consist of 95 percent tin and 5 percent antimony. Soldering shall be in conformance with Section 3 of the Copper and Brass Research Association Copper Tube Handbook.
- D. Connection of copper pipe or fittings with galvanized pipe or fittings shall be made with dielectric fittings. Connect copper pipe to direct-taps to Ductile Iron Pipe with an insulating union. Wrap the copper pipe with polyethylene tape at least two feet in length beyond the point of connection.

2.05 PIPE AND FITTINGS: VITRIFIED CLAY

Vitrified clay pipe and fittings for gravity sewers shall be extra-strength, non-perforated. Pipe and fittings shall conform to the latest edition of ASTM Standard C700, "Vitrified Clay Pipe, Extra Strength, Standard Strength, and Perforated", and the following requirements.

- A. Any fracture or crack passing through the socket of the pipe bell and exceeding a length of one-half ($\frac{1}{2}$) inch in any direction shall be cause for rejection of the pipe. This requirement supersedes the portion of the ASTM Specifications cited above in conflict herewith.
- B. Only factory bonded joints will be permitted for all vitrified clay pipe. The joints shall have rubber "O" ring type compression seals conforming to "Standard Specification for Compression Joints for Vitrified Clay Pipe and Fittings", ASTM C425, latest edition. Department approved pipe joints are Polyester Ring-Type joints as manufactured by Logan Clay Products Company under the trade name of "Logan-O-Ring", Can-Tex Industries under the trade name of "Can-O-Lock," or approved equal.
- C. Where cast iron soil pipe or ductile iron pipe laterals are used with vitrified clay mains, the wye or tee shall be vitrified clay. For the joint between the vitrified clay wye or tee and the lateral

pipe use FERNCO "Donut" No. 6-10-601 with E.H.C.I. soil pipe and "Donut" No. 6-08-607 with ductile iron laterals, or approved equals. When using E.H.C.I. soil pipe with ductile iron tees or wyes, use transition gasket by Romac or approved equal.

2.06 HIGH DENSITY POLYETHYLENE (HDPE) PIPE FOR USE IN POTABLE WATER SERVICES

- A. Smooth wall high density polyethylene pipe for use in potable water services 3.5-inch nominal outside diameter and less shall meet ASTM D3350, and shall be PE 335434C. Pipe shall meet the standards of ASTM F714, as modified herein, including the "Government/Military Procurement" sections. Minimum hydrostatic design basis shall be 1600 psi. In all cases, hydrostatic design basis and pressure rating shall be as determined using the methods of ASTM F714. Pipe of this type shall be butt-fusion welded at joints. All welding of joints shall be in strict conformity with the recommendations of the pipe manufacturer and by a firm or individual recommended to the Engineer of Record in writing by the manufacturer.
- B. As a part of the shop drawing submittals, submit the following signed by a Florida Registered Engineer, all calculations to determine, the pipe thickness, SDR rating, allowable stresses, in accordance with ASME B31.8 -1992, Table A842.22 as required by the pipe manufacturer.
- C. 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.
- D. In all cases, fittings shall be installed in strict accordance with the manufacturer's instructions.
 1. HDPE PIPE FOR WATER SERVICES:

All 2-inch high density polyethylene pipe used for services shall be IPS-O.D. controlled with Standard Outside Dimension Ratio (SODR) of 9, pressure rating of 200 psi at a Factor of Safety of 2.5 or greater, 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". Pipe shall comply with ANSI/AWWA C901-96 "Polyethylene (PE) Pressure Pipe and Tubing, ½ In. (13 mm) Through 3 In. (76 mm), for Water Service" as modified herein. Pipe shall have a (natural) inner core with a blue colored outer shell.

Pipe shall have footage marks at a maximum interval of every two feet. Polyethylene material shall have a minimum cell classification in accordance with ASTM D3350-14 "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 shall comply with NSF 61 or 14.

Submit manufacturer's certification of compliance with all of the above requirements. Certification shall ship with the pipe on material sold to the Department and shall always be

submitted with shop drawings and catalogue cuts. Certification shall be signed and sealed by a professional engineer licensed to practice in the State of Florida.

2. HDPE TUBING FOR WATER SERVICES:

All 1-inch high density polyethylene tubing used for services shall be CTS-O.D. Controlled with Standard Outside Dimension Ratio (SODR) of 9, pressure rating of 200 psi, nominal outside diameter of 1.125-inches, minimum wall thickness of 0.125-inches, PE 3608, all in conformance with ASTM D2737-12 "Polyethylene (PE) Plastic Tubing". Tubing shall comply with ANSI/AWWA C901-08 "Polyethylene (PE) Pressure Pipe and Tubing, ½ In. (13 mm) Through 3 In. (76 mm), for Water Service" as modified herein. Tubing shall have a (natural) inner core with a blue colored outer shell.

Tubing shall have footage marks at a maximum interval of every two feet. Polyethylene material shall have a minimum cell classification in accordance with ASTM D3350-14 "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.

Tubing shall comply with NSF 61 or 14. Submit Manufacturer' shall supply certification of compliance with all of the above requirements. Certification shall ship with the tubing on material sold to the Department and shall always be submitted with shop drawings and catalogue cuts. When required by the Chief, Engineering Division, Miami-Dade Water and Sewer Department or his designee, certification shall be signed and sealed by a professional engineer licensed to practice in the State of Florida.

2.07 WALL SLEEVES, PIPES AND CASTINGS

- A. Wall Sleeves: Wall sleeves shall be of cast iron, ductile iron or carbon steel with steel galvanized after fabrication as specified in Section 15065, Miscellaneous Materials, under wall pipe. Sleeves shall be provided with seals and shall be oversized as required for the installation of seals. Sleeves shall terminate flush with finished surfaces of walls and ceilings, and shall extend 2-inches above the finished floor. Escutcheons shall be provided at walls and floor to completely conceal the sleeves smaller than 3-inches. Escutcheons shall be brass or cast iron, nickel plated split-type.
- B. Interior: Wall sleeves shall be installed for all piping passing through interior walls and floors, except where noted on the Drawings. Sleeves shall be of sufficient size to pass the pipe without binding.
- C. Wall Sleeve Seals: Wall sleeve seals shall be modular mechanical type consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the pipe and wall sleeve. Links shall be loosely assembled with bolts to form a continuous rubber belt around the pipe with a pressure plate under each bolt head and nut. After the seal assembly is positioned in the sleeve, tightening of the bolts shall cause the rubber sealing elements to expand and provide an absolutely water-tight seal between the pipe and wall sleeve. The synthetic rubber shall be suitable for exposure to treated sewage effluent and groundwater. Bolts, nuts and hardware shall be 18-8 stainless steel. The seals shall be Link Seal as manufactured by Thunderline Corporation or Department-approved equal, and the wall sleeve and seal shall be sized as recommended by the seal manufacturer.
- D. All piping passing through exterior walls and base slabs shall be provided with wall pipes. All

wall pipes shall be of ductile iron and shall have an intermediate flange or waterstop located in the center of the wall. Each wall pipe shall be of the same grade, thickness and interior coating as the piping to which it is joined. Those portions of the wall pipes that are buried shall have a coal tar outside coating.

2.08 STEEL CASING (JACKING AND BORING)

See Section 15070, "Jacking and Boring"

2.09 STEEL PIPE (AERIAL CROSSING)

See Section 15075, "Aerial Crossings"

PART 3 - EXECUTION

3.01 General:

- A. Furnish and maintain all barricades and flashing warning lights necessary to warn of the construction throughout the Project.
- B. Pipe and fittings shall at all times be handled with great care to avoid damage. Exercise particular care not to injure pipe coatings. 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.
- C. All work shall be performed by skilled workmen experienced in pipeline construction.
- D. All pipe and fittings shall be adequately supported by clamps, brackets, straps, concrete supports, rollers or other devices as shown and/or specified. Supports or hangers shall be spaced so that maximum deflection between supports or hangers shall not exceed 0.050 inch for pipe filled with liquid, but shall not be further than 6 feet apart, whichever is closer, unless otherwise shown. All pipe supports shall be secured to structures by approved inserts or expansion shields and bolts.
- E. All pipe shall be thoroughly cleaned internally before being installed. All pipes, except oxygen service, air and gas, shall be flushed with water and swabbed to assure removal of all foreign matter before installation. Air and gas piping shall be tapped with a hammer to loosen scale or other foreign matter that might be within the pipe, and then thoroughly blown with a high pressure air hose. Furnish and maintain suitable air compressor.
- F. Whenever possible, the pipe shall be installed with minimum 48-inches of cover. Deviations shall not be installed without written approval by the Owner.
- G. At all horizontal or vertical pipe deviation, install both restrained pipe and thrust blocks. Joints may only be opened to adjust alignment by half of the AWWA or manufacturer's recommended opening (which is smaller).
- H. Pipe Sleeves and Wall Casings: Pipe sleeves and wall casings shall be provided at the locations called for on the Drawings and specified herein. These units shall be as detailed and of the material as noted on the Drawings and specified herein. They shall be accurately set in the concrete or masonry to the elevations shown. All wall sleeves and castings required in the walls shall be in place when the walls are poured. Ends of all wall casings and wall sleeves

shall be of a type consistent with the piping to be connected to them.

- I. Tie Rods: Unless otherwise indicated on the Drawings, the size and number of tie rods for a joint or installation shall be as recommended by the manufacturer's design chart for a working pressure of 150 psi. Tie rods shall be installed as recommended by the manufacturer.

3.02 EXCAVATION FOR PIPING

- A. Make all excavation necessary for the construction of the pipelines, connections, valves and appurtenances, to the lines and grades shown on the Plans.
- B. Excavate the trench at least 6 inches below pipe laying grade as shown on the Plans. Install sheeting and shoring for the protection of workers in trenches, and where it is necessary for pipe installation and property protection or required by the Trench Safety Act. The cost of dewatering any excavation shall be at the Contractor's expense. The disposal of water removed from an excavation shall be in a manner which will not create a hazard, or be detrimental to the public health or to public or private property.
- C. 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. Furnish and maintain all construction signs required.

3.03 INSTALLATION OF PIPE, FITTINGS AND VALVES

A. General:

1. The design Drawings are in some cases diagrammatic. They may not show every bend, off-set, elbow or other fitting which may be required in the piping for installation in the space allotted. . Install gravity lines at uniform grade to low point after field verification of low point invert.
2. The centerline of the pipe shall not vary by more than 2 inches from the location shown on the Plans and the top of the pipe shall not vary by more than 2 inches from the established grade, except at points where this tolerance must be changed to clear obstructions, or make connections.
3. Limit onsite pipe storage to a maximum of one week. Use unloading and installation procedures that avoid cracking of the lining. If necessary, use plastic sheet bulkheads to close pipe ends and keep cement-mortar lining moist. Deliver the pipe alongside the pipe laying access road over which the pipe trailer-tractors can travel under their own power. Place the pipe in the order in which it is to be installed and secure it from rolling. Sandbags may be used to support the pipe in the ditch but no pipe shall be laid on blocks, except by the written permission of the Engineer of Record. Do not move pipe by inserting any devices or pieces of equipment into the pipe barrel. Field repair linings damaged by unloading or installation procedures. Flanged joints, mechanical joints and push-on joints in cast iron pipe and fittings may be made under water.

B. Installation of Ductile Iron Pipe

1. Install Ductile Iron Pipe in accordance with ANSI/AWWA C600-10 "Installation of Ductile-iron Mains and Their Appurtenances", and the following. For potable water pipelines, comply with NSF/ANSI 61 "Drinking Water System Components – Health Effects. All bends,

tees, and plugs, unless otherwise specified, shall be backed with concrete to undisturbed ground. Provision shall be made to prevent concrete from adhering to plugs or bolts by wrapping in polyethylene sheet complying with ANSI/AWWA C105/A21.5-05.

2. Bolts, nuts and rubber gaskets for use in flanged and mechanical joints shall be stored under cover. During laying operations, do not place tools, clothing, or other materials in the pipe. Gaskets shall not be exposed to heat, light or any petroleum products, shall be kept clean and shall not be handled with greasy or dirty hands. When pipe laying is not in progress, close the ends of the installed pipe by a child- and vermin-proof plug.
3. Assemble Flanged joints in accordance with the written recommendations of the pipe manufacturer. Before making up flanged joints in cast iron pipe and fittings, the back of each flange under the bolt heads, and the face of each flange shall have all lumps, blisters and excess bituminous coating removed and shall be wire brushed and wiped clean and dry. Cut the bore of the gaskets such that the gaskets do not protrude into the pipe when the flange bolts are tightened.
4. Before laying the ductile iron pipe, all lumps, blisters and excess asphaltic coating shall be removed from the bell and spigot ends of each pipe and the outside of the spigot and the inside of the bell 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. 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.
5. Cutting of ductile iron pipe for inserting valves, fittings, etc., shall be done with a mechanical pipe saw in a neat and workmanlike manner without damage to the pipe, the lining, or the coating.
6. Unless otherwise directed, ductile iron pipe shall be laid with the bell ends facing in the direction of laying; and for lines on an appreciable slope, the bells shall, at the discretion of the Engineer, face upgrade. Small angular changes (less than 2.5 degrees) in horizontal alignment defined in the drawings by a point of inflection (PI) with no accompanying curve data shall be approximated as a curve by deflecting an equal amount of equal length pipe segments to create a curve equally distributed on both sides of the given PI. Accomplish a larger (greater than or equal to 2.5 degrees) change in horizontal alignment where a curve is not called for in the drawings through the use of an elbow placed at the station of the PI shown in the drawings. Small angular changes (less than 2.5 degrees) in vertical alignment may be accomplished by the use of pulled joints. For larger vertical deflections, place an elbow at the station and elevation of the vertical PI shown in the drawings.
7. Push-on and mechanical joints in ductile iron pipe and fittings shall be made in accordance with the manufacturer's written recommendations except as otherwise specified herein. Joints between push-on and mechanical joint pipe and/or fittings shall be made in accordance with AWWA Standard Specifications, "Installation of Ductile Iron Water Mains and Appurtenances," C600-10, 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 AWWA C600-10, whichever is the lesser amount.
8. 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 insure that bolt stresses are evenly distributed.

9. Bolts and nuts in flanged and mechanical joints shall be tightened in accordance with the written recommendations of the pipe manufacturer for a leak-free joint. 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.

C. Installation of PVC Pipe:

1. In the installation of glue joint PVC pipe, the pipe shall first be cut square and smooth. Wipe all surfaces to be connected with a cloth moistened with an appropriate solvent and remove any foreign matter from socket of fitting. Using an ordinary paint brush of width about equal to the nominal pipe size, apply a generous coat of cement to inside and shoulder of socket, flowing on but not brushing out. A similar coat shall then be applied to the end of the pipe for at least the same distance on the pipe as the depth of socket, and to the cut end. Pipe and fittings shall then be pressed firmly together and the pipe turned a quarter to a half turn to evenly distribute the cement. The cementing and joining operation must not exceed one minute. Allow 24 hours set-up time before applying pressure. Sand shall be used as backfill material around pipe installed underground.
2. Thread Sealant: Teflon tape.
3. All rigid PVC pipe shall be cut, made up, and installed in accordance with the pipe manufacturer's recommendations. Plastic pipe shall be laid by snaking the pipe from one side of the trench to the other. Offset shall be as recommended by the manufacturer for the maximum temperature variation between time of solvent welding and during operation.
4. Schedule 80 pipe shall not be threaded. Use Schedule 80 threaded nipple where necessary to connect to threaded valve or fitting.
5. Only strap wrenches shall be used for tightening threaded plastic joints, and care shall be taken not to over tighten these fittings.
6. Provide adequate ventilation when working with pipe joint solvent cement.
7. Testing: All lines shall be hydrostatically tested at the pressures specified elsewhere herein or at the design pressures.
8. Supports And Hangers: In accordance with the manufacturer's recommendations.

D. Installation of Copper Pipe:

1. Tubing above ground shall, whenever possible, be run in full lengths between fittings, valves and connections and joints shall be kept to a minimum. All connections shall be made without sharp bends or kinks in the tubing. Above ground tubing shall be supported at short intervals to prevent sagging and vibration.

2. All copper pipe shall be reamed to full diameter before joining. The ends of pipe and the inside of fittings shall be cleaned and flux applied to the entire area of pipe to be soldered.
- E. Joint Pipe:
1. Threaded Pipe: Ream all pipe after cutting and before threading. Use non-hardening pipe compound "Tite-Seal" or approved equal, on male threads only.
 2. Provide nipples of same material and weight as pipe used. Provide extra strong nipples when length of unthreaded part of nipple is less than 1-1/2".
 3. Provide reducing fittings rather than bushings where changes in pipe sizes occur.
 4. Provide dielectric unions or flanges between copper and steel piping and between brass-ware and steel. Do not use steel and copper piping in the same system without such isolation.
- F. Unions: Provide unions or flanges in all domestic water service lines at each piece of equipment, specialty valves or at other locations required for ready disconnect.
- G. Pipe Protection:
1. Paint all un-insulated metal (ductile iron or steel) piping underground with two coats of asphaltic paint.
 2. Wrap soil pipe that touches metal or is exposed to masonry with a layer of 6 mil polyethylene.
 3. Spirally wrap all pipe lines embedded in concrete with two layers of 30 lb. felt prior to placing the concrete.
 4. Coat all exposed threads on galvanized steel pipe after assembly with two coats of zinc chromate.
- H. Cleaning and Testing: All of the piping installed under this project shall be tested as follows and as directed by the Engineer.
1. With exceptions as noted below, all ductile iron piping installed under this Contract shall be cleaned and tested according to Paragraph I hereinbelow in this Section:
 - a) Only potable water piping shall be disinfected.
 - b) No leakage shall be permitted for flanged piping.
 - c) No leakage shall be permitted for any type of above ground piping.
 2. Unless otherwise specified elsewhere herein, all PVC pressure system bushings and galvanized steel piping shall be tested at 100 psig. No leakage will be permitted.
- I. Installation of Aboveground and Exposed Piping
1. Aboveground and exposed pipe fittings, valves and accessories shall be installed as shown or indicated on the Drawings.

2. Piping shall be cut accurately to measurements established at the job site and shall be worked into place without springing or forcing, properly clearing all equipment access areas and openings. Changes in sizes shall be made with appropriate reducing fittings rather than bushings. Pipe connections shall be made in accordance with the details shown and manufacturer's recommendations. Open ends of pipe lines shall be properly capped or plugged during installation to keep dirt and other foreign material out of the system. Pipe supports and hangers shall be provided where indicated and as required to insure adequate support of the piping.
3. Welded connections shall be made in conformity with the requirements of AWWA Standard C 206 and shall be done only by qualified welders. The Engineer may, at his option, require certificates that welders employed on the work are qualified in conformity with the requirements of this standard and/or sample welds to verify the qualifications of the welders. Before testing, field welded joints shall be coated with the same material as used for coating its pipe in accordance with the requirements of AWWA.
4. Flanged joints shall be made up by installing the gasket between the flanges. The threads of the bolts and the faces of the gaskets shall be coated with a suitable lubricant immediately before installation.
5. Joints using Dresser couplings shall be made up as recommended by the manufacturer.
6. Use of perforated band iron (plumber's strap), wire or chain as pipe hangers will not be acceptable. Supports for pipe less than 1-1/2 inches nominal size shall not be more than 8-feet on centers and pipe 2-inches nominal size and larger shall be supported at not more than 10-feet on centers, unless otherwise indicated. Supports for PVC pipe shall be spaced one-half the distance specified above unless otherwise indicated. Any noticeable sagging shall be corrected by the addition of extra supports at the Contractor's expense.

J. INSTALLATION OF HDPE SERVICES

Furnish and install a 10 gauge stranded copper blue tracer wire above all HDPE services.

3.04 FIELD QUALITY CONTROL

- A. All water mains shall be flushed to remove all sand, debris, rock and other foreign matter. Dispose of the flushing water without causing a nuisance or property damage.
- B. Pressure and Leakage Testing: Hydrostatically test all pressure pipe. Test Ductile Iron Pipe mains in accordance with ANSI/AWWA C600-10 once all backfill is in place and fully compacted, and after all thrust blocks have cured to their design strength. Do not test against closed valves. All pumps, piping and gauges shall be furnished, installed and operated by the Contractor and all such equipment and devices and their installation shall be approved by the Engineer. Pump shall be of a non-pulsating type suitable for this application and gauge accuracy certification may be required at the Engineer of Record's discretion. All pressure and leakage testing shall be done in the presence of a representative of the Department as a condition precedent to the approval and acceptance of the system.
- C Disinfection:

Disinfect in accordance with ANSI/AWWA C651-14 – Disinfecting Water Mains. During the period that the chlorine solution or slug is in the section of pipeline, open and close valves to obtain a chlorine residual at hydrants and other pipeline appurtenances. Swab exposed faces of valves and blind flanges prior to bolting flanges in place with a 1% sodium hypochlorite solution. Disinfect isolation valves, pipe, and appurtenances per AWWA C651, Section 4.7.

Flush with potable water until discolored water, mud, and debris are eliminated. Swab interior of pipe and fittings with a 1% sodium hypochlorite solution. After disinfection, flush with potable water again until water is free of chlorine odor. After confirming the chlorine residual, flush the excess chlorine solution from the pipeline until the chlorine concentration in the water leaving the pipe is either within 0.5 mg/L of the replacement water or no higher than that generally prevailing in the distribution system.

Discharge of chlorinated water into watercourses or surface waters is regulated by the National Pollutant Discharge Elimination System (NPDES). Disposal of the chlorinated disinfection water and the flushing water is the Contractor's responsibility. Schedule the rate of flow and locations of discharges in advance to permit review and coordination with Owner and cognizant regulatory authorities. For measuring chlorine concentration, supply and use a medium range, drop count, DPD drop dilution method kit per AWWA C651, Appendix A.1. Maintain kits in good working order available for immediate test of residuals at point of sampling.

D. Tests for Drain and Gravity Sewer Lines:

1. Drain and gravity sewer lines shall be tested for infiltration and exfiltration.
2. The allowable limits of infiltration or exfiltration or leakage for the drain or sewer lines, or any portion thereof shall not exceed a rate of 100 gallons per inch of internal pipe diameter per mile of pipe per 24 hours with no allowance for laterals or manholes. Duration of test shall be a minimum of two hours.
3. Any part or all of the system may be tested for infiltration or exfiltration, as directed by the Engineer. Prior to testing for infiltration, the system shall be pumped out so that normal infiltration conditions exist at the time of testing. The amounts of infiltration or exfiltration shall be determined by pumping into or out of calibrated drums, or by other approved methods.
4. The exfiltration test will be conducted by filling the portion of the system being tested with water to a level which will provide a minimum head of 2-feet in a lateral connected to the test portion, or, in the event there are no laterals in the test portion, a minimum difference in elevation of 5-feet between the crown of the highest portion of the drain or sewer and the test level.
5. Where infiltration or exfiltration exceeds the allowable limits specified herein, the defective pipe, joints, or other faulty construction shall be located and repaired by the Contractor.
6. Furnish all labor, equipment and materials and shall conduct all testing required, under the direction of the Engineer of Record. No separate payment will be made for this work and the cost for this work shall be included in the prices quoted in the Proposal.
7. Locate and repair all leaks until the leakage is reduced to the limits specified. Any observed leaks or obviously defective joints or pipes shall be repaired or replaced as directed by the Engineer of Record, even though the total leakage is below that specified above.

END OF SECTION

SECTION 15100
VALVES, GENERAL

PART 1 - GENERAL

1.01 SCOPE

- A. The Contractor shall provide all tools, supplies, materials, equipment, and labor necessary for furnishing, installing, adjusting, and testing of all valves and appurtenant work, complete and operable. For buried valves, the Contractor shall furnish and install valve boxes to grade, with covers, extensions, and position indicators.
- B. The provisions of this Section shall apply to all valves and valve operators called out in the various Sections of these Specifications except where otherwise specified. Valves and operators in particular locations may require a combination of units, sensors, limit switches, and controls specified in other sections of these Specifications.
- C. All valves specified herein shall be furnished with an affidavit from the manufacturer(s) certifying that the valves furnished comply with the applicable provisions of the AWWA specifications, as modified herein. That they were factory tested in accordance with the AWWA Standard Leakage and Hydrostatic Tests as modified herein, with a certified test report furnished to the Department for each valve.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Piping, General
- B. Painting
- C. Equipment General Provisions
- D. Electrical
- E. Valve (by type) Specification Sections

1.03 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

- A. Codes: All codes, as referenced herein, are specified in Section entitled "Reference Standards." As used herein, "ANSI" denotes the American National Standards Institute; "AWWA", the American Water Works Association; and "ASTM", the American Society for Testing and Materials.
- B. Commercial Standards:

ANSI B16.1	Cast Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250, and 800.
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ANSI B16.5	Pipe Flanges and Flanged Fittings, Steel Nickel Alloy and Other Special Alloys.
ANSI/ASME B1.20.1	General Purpose Pipe Threads (Inch).
ANSI/ASME B31.1	Power Piping.
ASTM A 36	Specification for Structural Steel.
ASTM A 48	Specification for Gray Iron Castings.
ASTM A 126	Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
ASTM A 536	Specification for Ductile Iron Castings.
ASTM B 61	Specification for Steam or Valve Bronze Castings.
ASTM B 62	Specification for Composition Bronze or Ounce Metal Castings.
ASTM B 148	Specification for Aluminum-Bronze Castings.
ASTM B 584	Specification for Copper Alloy Sand Castings for General Applications.
ANSI/AWWA C500	Gate Valves for Water and Sewerage Systems.
AWWA C550	Protective Interior Coatings for Valves and Hydrants.

1.04 MANUFACTURER

All valves shall be the product of domestic manufacturing firms which have been engaged in the production of valves for not less than five (5) years.

1.05 QUALITY ASSURANCE

- A. Valve Testing: The Contractor is advised that he is required to furnish all labor, materials and equipment necessary to pressure test each valve furnished by himself or the Department, bi-directionally, prior to installation, to the satisfaction of the Engineer of Record. 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 Proposal Item(s), no other compensation will be provided.
- B. Bronze Parts: Unless otherwise specified, all interior bronze parts of valves shall conform to the requirements of ASTM B 62.
- C. Provide valves that have the manufacturer's name and valve rating cast in body.

1.06 SUBMITTALS

- A. Shop Drawing: Shop drawings of all valves and operators including associated wiring diagrams and electrical data.
- B. Approved Drawings: The Engineer of Record's drawings, which constitute an integral part of this Contract, indicate the general layout of the complete system. Field verification of scale dimensions on plans is directed since actual locations, distances and levels will be governed by actual field conditions. The Contractor shall also review architectural, structural, and mechanical plans and shall adjust his work to conform to all conditions indicated thereon. Discrepancies shown on different plans, or between plans and actual field conditions, or between plans and specifications, shall promptly be brought to the attention of the Engineer of Record, for a decision. All items not specifically mentioned in the specifications or noted on the drawings, but which can be reasonably assumed as necessary to make a complete working installation shall be included.

PART 2 - PRODUCTS

2.01 VALVES

- A. General: The Contractor shall furnish all valves, gates, valve operating units, stem extensions, operators and other accessories as shown or specified. All valves and gates shall be new and of current manufacture. All non-buried valves, 6-inch and larger, shall have operators with position indicators. Where buried, these valves shall be provided with valve boxes, covers and valve extensions. Valves mounted higher than 6-feet above working level shall be provided with chain operators. All valves shall have a minimum design pressure rating of 150 psi unless otherwise specified elsewhere herein.
- B. Cast iron parts of valves shall meet the requirements of ASTM A126, "Standard Specifications for Gray Iron Castings for Valves, Flanges and Pipe Fittings, Class 'B'." Flanged ends shall be flat-faced and have bolt circle and bolt patterns conforming to ANSI B16.1 Class 125.
- C. All castings shall be clean and sound, without defects of any kind and no plugging, welding or repairing of defects will be permitted. All bolt heads and nuts shall be hexagonal conforming to ANSI B18.2. Gaskets shall be full-face and made of synthetic elastomers in conformance with ANSI B16.21 suitable for the service characteristics, especially chemical compatibility and temperature. Non-ferrous alloys of various types shall be used for parts of valves as specified. Where no definite specification is given, the material shall be the recognized acceptable standard for that particular application.
- D. All buried valves shall be provided with cast-iron valve boxes unless otherwise indicated. The boxes shall conform with Department Standards and be installed perpendicularly, centered around and covering the upper portions of the valve operator. The top of each valve box shall be placed flush with finish grade unless otherwise indicated on the Drawings. Valve boxes shall be as specified elsewhere in this Section.

- E. All buried valves and other valves located below a concrete operating deck or level, specified or noted to be key operated, shall have an operator to finish grade or deck level, non-rising stem, a 2-inch square AWWA nut with skirt, and cover or box and cover, as may be required.
- F. Valve Flanges: The flanges of valves shall be in accordance with Section 15060, "Piping and Fittings."
- G. Gate Valve Stems: Gate valve stems shall be of bronze in accordance with AWWA C515, containing not more than 5 percent of zinc nor more than 2 percent of aluminum.
- H. Protective Coating: Except where otherwise specified, ferrous surfaces, exclusive of stainless steel surfaces, in the fluid passages of all valves 4-inch and larger shall receive an epoxy coating in accordance with AWWA C550. Flange faces of valves shall not be epoxy coated. The valve manufacturer, shall certify in writing that such coating has been applied and tested in the manufacturing plant prior to shipment, in accordance with these Specifications. Exterior coating shall be asphalt varnish conforming to Federal Specification TT-C-494A.
- I. Valve Labeling: A label shall be provided on all shut-off valves exclusive of hose bibs and chlorine cylinder valves. The label shall be of 1/16-inch brass or stainless steel, minimum 2 inches by 4 inches in size, and shall be permanently attached to the valve or on the wall adjacent to the valve or as indicated by the Department.

2.02 VALVE OPERATORS

A. General

- 1. All butterfly valves, plug valves over 8-inch size and gate valves installed horizontally shall be furnished with geared operators, provided by the manufacturer. All valves of a particular size and pressure rating by a given manufacturer shall be supplied with the same operator. No variation will be permitted during the contract. All valve operators, regardless of type, shall be installed, adjusted, and tested by the valve manufacturer at the manufacturing plant. Operator orientation shall be verified with the Department prior to fabrication. If this requirement is not met, changes to orientation shall be made at no cost the Department.
- 2. All operators shall turn counter-clockwise to open. Operators shall have the open direction clearly and permanently marked. Field adjustment and testing of the operators and valves to ensure proper installation and operation shall be the responsibility of the Contractor.

B. Manual Operators

- 1. All manual operators shall be equipped with AWWA square nuts, handwheels or chain drives as appropriate. Some small (6-inch or less) valves may be lever operated if so specified elsewhere herein. Where buried, the valves shall have extensions with square nuts or floor stands as indicated on the Drawings. Valves mounted higher than 6 feet above floor or operating level shall have chain operators with chain terminating 4 feet above operating level.

2. Operation of valves and gates shall be designed so that the effort required to operate the handwheel, lever or chain shall not exceed 40 pounds applied at the extremity of the wheel or lever. The handwheels on valves 14 inches and smaller shall not be less than 8 inches in diameter, and on valves larger than 14 inches the handwheel shall not be less than 12 inches in diameter.
3. Chainwheel operator shall be fabricated of malleable iron with pocketed type chainwheels with chain guards and guides. Chainwheel operators shall be marked with an arrow and the word "open" indicating direction to open. The operators shall have galvanized smooth welded link type chain. Chain that is crimped or has links with exposed ends is not acceptable.

2.03 TORQUE LIMITING DEVICE

Each butterfly valve shall be provided with a torque limiting device designed to protect the actuator and valve parts. The device shall consist of an overtorque protection mechanism enclosed in a hermetically sealed cast iron housing. The mechanism shall be permanently lubricated and factory set to trip between 200 and 220 ft. lbs. of applied torque. The housing shall have integrally cast, 2-inch AWWA operating nut and matching socket to operate and to fit over the actuator or extension shaft nuts, respectively. The socket shall be provided with a set screw to fit the device. The direction of rotation shall be permanently shown with word and arrow next to the operating nut. The entire device shall be coated inside and out with a 2-part epoxy. The torque limiting device shall be as manufactured by Annspace Controls Company of St. Louis, Missouri, or approved equal.

2.04 FLOOR STANDS

Floor stands shall be cast iron, non-rising stem type with lockable hand wheel operator, valve position indicator and stainless steel or bronze extension stem. Hand wheel shall be lockable in the full open and full closed positions. The floor stand shall be furnished with an armored padlock and six keys. Lock shall be as manufactured by Master, Schlage or equal. Floor stand shall be standard pattern type as manufactured by Clow Corporation, or equal.

2.05 VALVE BOXES

Cast iron valve boxes shall be provided for all valves installed underground. All valves boxes shall be No. 2 or 3 (for water) and No. 52 or 53 (for sewer) in accordance with Department Standards.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. General: All work shall be performed by skilled workmen experienced in similar installations. All valves shall be adequately supported by clamps, brackets, straps, concrete supports or other devices as shown or specified. All supports shall be secured to structures by approved inserts or expansion shields and bolts.

- B. All valves shall be thoroughly cleaned internally before being installed. Installation of valves shall be done in accordance with construction methods specified in "Pipes and Fittings" Section of these Specifications.
- C. Install valves as recommended by manufacturer.
- D. Install valves so that they are easily accessible for operation, visual inspection and preventive maintenance.
- E. Location of valves and chain operators: Install valves so as to be accessible for operation and free from interferences when operated. Position so that leakage will not contact any electrical equipment that may be located below.
- F. The installation of all underground valves shall include a valve box and riser in accordance with the Details shown on the Plans or in the Standard Details for the various sizes and types of valves to be installed. Riser pipes and valve boxes 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 Standard Details.
- G. 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 box lid or manhole cover. Valves at connections to existing Department mains shall only be operated by Department forces.

END OF SECTION

1. ALL MATERIALS AND LABOR UNDER THIS PROJECT SHALL BE IN STRICT ACCORDANCE WITH THE REQUIREMENTS OF THE MIAMI-DADE WATER AND SEWER DEPARTMENT AND SHALL CONFORM TO THE STANDARDS AND SPECIFICATIONS AVAILABLE AND ON FILE WITH THE DEPARTMENT. SUBMIT SHOP DRAWINGS FOR ALL MATERIALS.
2. COVER OVER WATER OR SEWER FORCE MAINS SHALL BE 4'-0" MIN.
3. ALL MAIN LINE VALVES SHALL BE INSTALLED COMPLETE WITH 10" RISER PIPES AND NO. 3 OR 53 VALVE BOXES FIRE HYDRANTS AND SERVICE VALVES SHALL BE INSTALLED COMPLETE WITH 6" RISER PIPES AND NO. 2 VALVE BOXES.
4. ALL FORCE MAIN SERVICE CONNECTIONS INTO PRESSURE TRANSMISSION MAINS SHALL HAVE A SHUT OFF VALVE AND CHECK VALVE AT THE POINT OF ENTRY.
5. ALL GRAVITY SYSTEMS SHALL BE CONSTRUCTED IN ACCORDANCE WITH DEPARTMENT STANDARDS.
6. ALL WATER METERS WILL BE INSTALLED BY THE MIAMI-DADE WATER AND SEWER DEPARTMENT PROVIDING THE APPROPRIATE CHARGES HAVE BEEN PREPAID.
7. FIRE HYDRANT REQUIREMENTS (NUMBER AND LOCATION) SHALL BE AS REQUIRED BY THE MIAMI-DADE COUNTY FIRE DEPARTMENT OR THE APPROPRIATE FIRE AGENCY WITH INSTALLATION IN ACCORDANCE WITH DEPARTMENT STANDARDS.
8. CONTRACTOR MUST CALL M-DWASD INSPECTION DIVISION TO ARRANGE FOR A PRECONSTRUCTION MEETING 2 FULL BUSINESS DAYS PRIOR TO PROPOSED START OF CONSTRUCTION. CONTACT ONE CALL CENTER 48 HRS PRIOR TO EXCAVATION.
9. CONTRACT INSPECTOR WILL INSPECT ANY FACILITIES APPROVED BY THE DEPARTMENT. ALL OTHER REQUIREMENTS OF THE PERMITTING AGENCY SHALL BE IN ACCORDANCE WITH THEIR STANDARDS AND REQUIREMENTS.
10. WORK PERFORMED UNDER THIS PROJECT WILL NOT BE CONSIDERED AS COMPLETE UNTIL FINAL ACCEPTANCE OF THE SYSTEM BY THE DEPARTMENT AND UNTIL THE FOLLOWING DOCUMENTS ARE RECEIVED AND APPROVED BY THE DEPARTMENT.
 - a. EASEMENTS, IF REQUIRED.
 - b. CONTRACTOR'S WAIVER AND RELEASE OF LIEN.
 - c. ABSOLUTE BILL OF SALE.
 - d. i. CONTRACTOR'S LETTER OF WARRANTY (I.E., LETTER AGREEMENT).
ii. DEVELOPER'S CONTRACT BOND (I.E., CONTRACT AGREEMENT).
 - e. "AS-BUILT" PRINTS 24"x36" SHOWING SPECIFIC LOCATIONS, DEPTH, ETC. OF ALL WATER AND SEWER FACILITIES AS LOCATED BY A LICENSED FLORIDA SURVEYOR, ALONG WITH PRINTS OF "AS-BUILT" WHICH HAVE BEEN SIGNED AND SEALED BY A REGISTERED SURVEYOR. (No. OF PRINTS: 3-FOR WATER, 4-FOR GRAVITY SEWER AND 5-FOR FORCE MAIN OR PUMP STATION PROJECTS). THE DEPARTMENT RESERVES THE RIGHT TO REQUIRE SUBMITTAL ON ELECTRONIC MEDIA IN ACCORDANCE WITH SEC. 01775 "MAGNETIC MEDIA SUBMITTAL".
 - f. H.R.S. LETTER OF RELEASE REQUIRED FOR ALL WATER PROJECTS.
 - g. BILL OF SALE SKETCH (8½"x11") FOR WATER AND SEWER, SEPARATELY.
11. ALL NEW CONNECTIONS FROM EXISTING DEPARTMENT MAINS TO BE MADE BY DEPARTMENT FORCES ONLY. THE CONTRACTOR TO EXCAVATE AT REQUIRED LOCATIONS, PROVIDE AND INSTALL MATERIAL WITH FITTINGS, PRIOR TO TAP.
12. AN APPROVED PAVING AND DRAINAGE PLAN MUST BE SUBMITTED TO MDWASD FOR ALL NEW SUBDIVISIONS PRIOR TO APPROVAL OF WATER AND SEWER PERMIT PLANS, UPON REQUEST.
13. UNLESS OTHERWISE SPECIFIED, ALL TAPS 20 INCHES AND SMALLER FOR CONNECTIONS TO EXISTING MAINS WILL BE DONE BY DEPARTMENT FORCES. UNDER NO CIRCUMSTANCES WILL THE CONTRACTOR BE PERMITTED TO TAP EXISTING MAINS IN THE SIZE RANGE SPECIFIED ABOVE. THE TAPPING SLEEVE AND TAPPING VALVE ARE FURNISHED AND INSTALLED BY THE CONTRACTOR UNDER THE SUPERVISION OF THE INSPECTOR.

I T E M	CROSS REF.	SPEC. REF.



ISSUE DATE	APPROVED BY
03/01/2010	V.F.C.

S T A N D A R D D E T A I L
**STANDARD REQUIREMENTS
 WATER AND SEWER
 CONSTRUCTION**

GS
0.5
 SHEET 1 OF 2

1. AT THE COMPLETION OF ANY WATER AND SEWER JOB, EITHER DONATION OR CONTRACT, THE CONTRACTOR SHALL SUBMIT:
 - a. AS-BUILT PRINTS WHICH HAVE BEEN SIGNED AND SEALED BY A FLORIDA LICENSED PROFESSIONAL SURVEYOR AND MAPPER. (QTY. OF PRINTS, AS REQUIRED BY THE DEPARTMENT.)
2. "AS-BUILT" FORMAT:
 - a. 24"x36" PRINTS
 - b. LOCATION MAP SCALE SHOULD BE 1"=300' AND SECTION-TOWNSHIP-RANGE SHOULD BE SHOWN.
 - c. THE WORD "AS-BUILT" IN LARGE LETTERS.
 - d. TITLE BLOCK WITH DEPARTMENT DS, DW OR ER NUMBER AND PERTINENT INFORMATION.
 - e. PREFERRED SCALE TO BE 1"= 40' HORIZONTALLY AND 1"= 4' VERTICALLY*.
 - f. STREET NOMENCLATURE.
 - g. SEPARATE AS-BUILTS FOR WATER AND SEWER.
 - h. SEPARATE WATER AND SEWER PROFILE.
 - i. STATIONING STARTING WITH 0+00 AT PERMANENT REFERENCE POINT (I.E., \odot , \otimes , ETC.) OR AS SHOWN ON DESIGN PERMIT PLANS, AND TO RUN CONTINUOUSLY TO END OF MAIN.
 - j. EASEMENTS, IF ANY, TIED TO PERMANENT REFERENCE POINT.
 - k. IDENTIFY ALL CONTROL LINES (I.E. BLDG. LINE, PROPERTY LINE, R/W, ETC).
 - l. ALL "PROPOSED" INFORMATION TO BE REMOVED FROM PRINTS, LEAVING ONLY "AS-BUILT" INFORMATION REFLECTED IN DRAWINGS.
3. WATER "AS-BUILTS" MUST INCLUDE:
 - a. PLANS SHOWING PIPE SIZE, MATERIAL AND OFFSET OF MAIN, DEFLECTIONS (IF ANY), STATION OF SERVICES, HYDRANTS AND FITTINGS AT THE MAINLINE (IF PERPENDICULAR TO IT), AND AT MAIN AND END OF SERVICES IF ANY, OTHER ANGLE, AND DEFLECTION OF PIPE, IF ANY.
 - b. PROFILE SHOWING TOP OF GROUND AND TOP OF PIPE ELEVATIONS AT EVERY 100' STATION AND AT ANY CHANGE IN GRADE (WITH CORRESPONDING STATION), PIPE SIZE AND PIPE MATERIALS REFERENCED TO PLAN.
4. SEWER "AS-BUILTS" MUST INCLUDE:
 - a. PLAN SHOWING MANHOLE NUMBER, PIPE SIZE AND PIPE MATERIAL OF PIPE, DEFLECTION, IF ANY (FORCE MAIN ONLY), AND LOCATION OF LATERALS WITH REFERENCE TO MANHOLE.
 - b. PROFILE SHOWING MANHOLE NUMBER (AS PER PLAN), RIM AND INVERT ELEVATIONS (IF MORE THAN ONE INVERT, LABEL NORTH, SOUTH , ETC), AND STATION STARTING AT EACH 0+00 AT DOWNSTREAM MANHOLE.
5. FORCE MAIN "AS-BUILT" SAME AS WATER MAIN ABOVE.
6. EACH AS-BUILT SHALL SHOW THE FLORIDA STATE PLANE COORDINATES (CURRENT READJUSTMENT) OF ALL THE MANHOLES AND VALVES AND OF AT LEAST TWO HORIZONTAL CONTROL POINTS PROPERLY IDENTIFIED AND LOCATED WITHIN THE PROJECT.

* OTHER SCALE MAY BE PERMITTED, BUT MUST BE APPROVED BY THE DEPARTMENT OF DRAWINGS.

I T E M	CROSS REF.	SPEC. REF.



ISSUE DATE	APPROVED BY
03/11/2009	V.F.C.

S T A N D A R D D E T A I L

"AS-BUILT" REQUIREMENTS

GS
0.5
SHEET 2 OF 2

MIN. LENGTH OF PIPE (FEET) TO BE RESTRAINED

(SOURCES: DIPRA RESTRAINT LENGTH CALCULATION PROGRAM FOR DUCTILE IRON PIPE , RELEASE 3.2)

NOTES:

1. THE DATA IN TABLES ARE BASED UPON THE FOLLOWING INSTALLATION CONDITIONS:
 SOIL TYPE-SILT 2 (OR, SOIL WITH EQUIVALENT PROPERTIES)
 TEST PRESSURE-100 PSI TRENCH TYPE-4 SAFETY FACTOR-1.5
 MINIMUM PIPE LENGTH ALONG TEE RUN-20'
2. RESTRAINED PIPE LENGTHS APPLY TO DUCTILE IRON AND PVC PIPES.
3. ALL JOINTS BETWEEN BENDS AT ALL HORIZONTAL & VERTICAL OFFSETS SHALL BE RESTRAINED.
4. DUCTILE IRON FITTINGS UP TO 20-INCHES IN DIAMETER SHALL BE RESTRAINED BY MECHANICAL MEANS, I.E. RESTRAINING JOINTS, MEGALUGS OR APPROVED EQUAL, FIELD-LOK GASKETS OR APPROVED EQUAL.
5. 24-INCH AND ABOVE DIAMETER DUCTILE IRON FITTINGS SHALL BE RESTRAINED BY MECHANICAL MEANS, I.E. RESTRAINING JOINTS, MEGALUGS OR APPROVED EQUAL, FIELD-LOK GASKETS OR APPROVED EQUAL, ETC., WITH THRUST BLOCKS AND CONCRETE ANCHORS BEING OPTIONAL AT THE DISCRETION OF THE ENGINEER OF RECORD.
6. ANY THRUST BLOCKS AND ANCHORS ARE TO BE DESIGNED BY THE ENGINEER OF RECORD. SIGNED AND SEALED CALCULATIONS SHALL BE SUBMITTED TO MDWASD FOR APPROVAL PRIOR TO INSTALLATION.
7. THRUST BLOCKS CONSISTING OF POURED-IN-PLACE CONCRETE SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 2,500 PSI AFTER 28 DAYS CURING AGE.
8. TABLES SHOWN ON SHEETS 1 OF 5 THRU 5 OF 5 SHALL SERVE AS A GENERAL DESIGN AND CONSTRUCTION GUIDE ONLY. IT IS THE SOLE RESPONSIBILITY OF THE ENGINEER-OF-RECORD TO JUSTIFY AND DOCUMENT ANY DEVIATIONS FROM THE PIPE LENGTHS SPECIFIED IN SAID TABLES BASED ON THE INSTALLATION & FIELD CONDITIONS.
9. 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.

XXXXX		
I T E M	CROSS REF.	SPEC. REF.


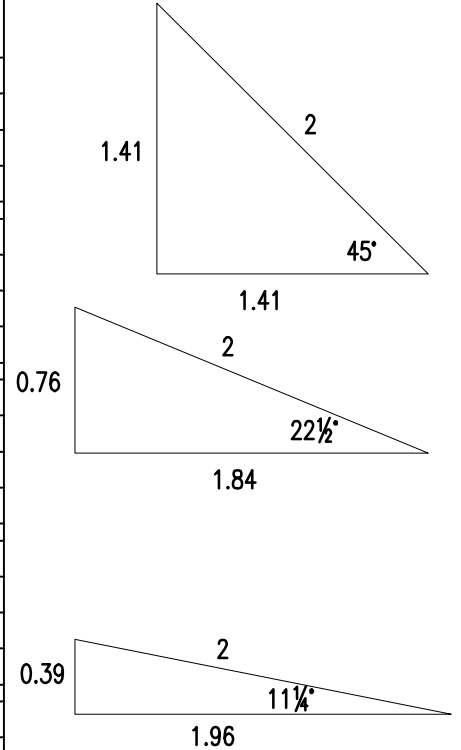
 MIAMI-DADE COUNTY <i>Delivering Excellence Every Day</i>	ISSUE DATE	APPROVED BY	STANDARD DETAIL		
	4/10/2014	J. F.	STANDARD REQUIREMENTS FOR WATER AND SEWER MECHANICAL THRUST RESTRAINT	GS 2.0 SHEET 1 OF 5	

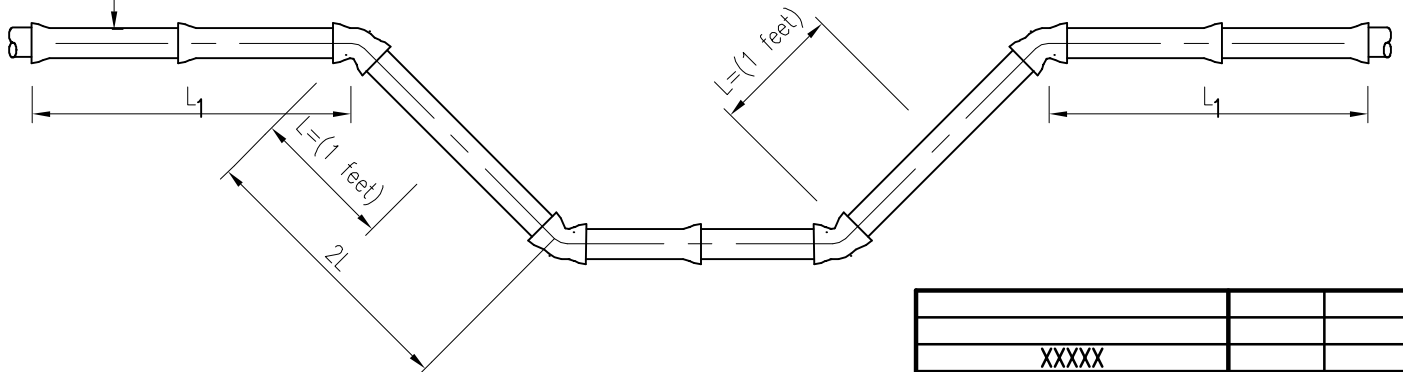
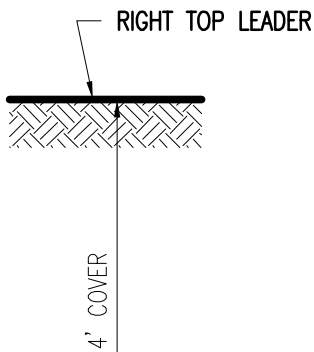
TABLE No.1
 (Combined Vertical Offset Under Object/other utility)
MIN. LENGTH OF PIPE (FEET) TO BE RESTRAINED
 100 psi pressure, Soil Designation: Silt 2

L= 1 Foot (Minimum or Maximum) H= Depth of cover (ft.)
 ϕ= Bend angle in degrees D= Nominal diameter (in.)

H	D	ϕ	L ₁ Bare Pipe	L ₁ Polywrapped Pipe
4'	6"	90	62	89
		45	25	36
		22½	12	17
		11¼	5	8
	8"	90	81	116
		45	33	47
		22½	15	22
		11¼	7	11
	10"	90	98	141
		45	40	58
		22½	19	27
		11¼	9	13
	12"	90	115	165
		45	47	68
		22½	22	32
		11¼	10	15
* 16"	90	148	212	
	45	61	87	
	22½	28	41	
	11¼	13	20	
* 20"	90	180	257	
	45	74	106	
	22½	35	50	
	11¼	16	24	



* 16" ϕ L=1.4'
 * 20" ϕ L=1.5'



XXXXX		
ITEM	CROSS REF.	SPEC. REF.



ISSUE DATE	APPROVED BY
11/01/2006	V. E. F.

STANDARD DETAIL
 THRUST RESTRAINT DESIGN
 DUCTILE IRON/PVC PIPE
 (VERTICAL OFFSETS)

GS
2.0
 SHEET 2 OF 5

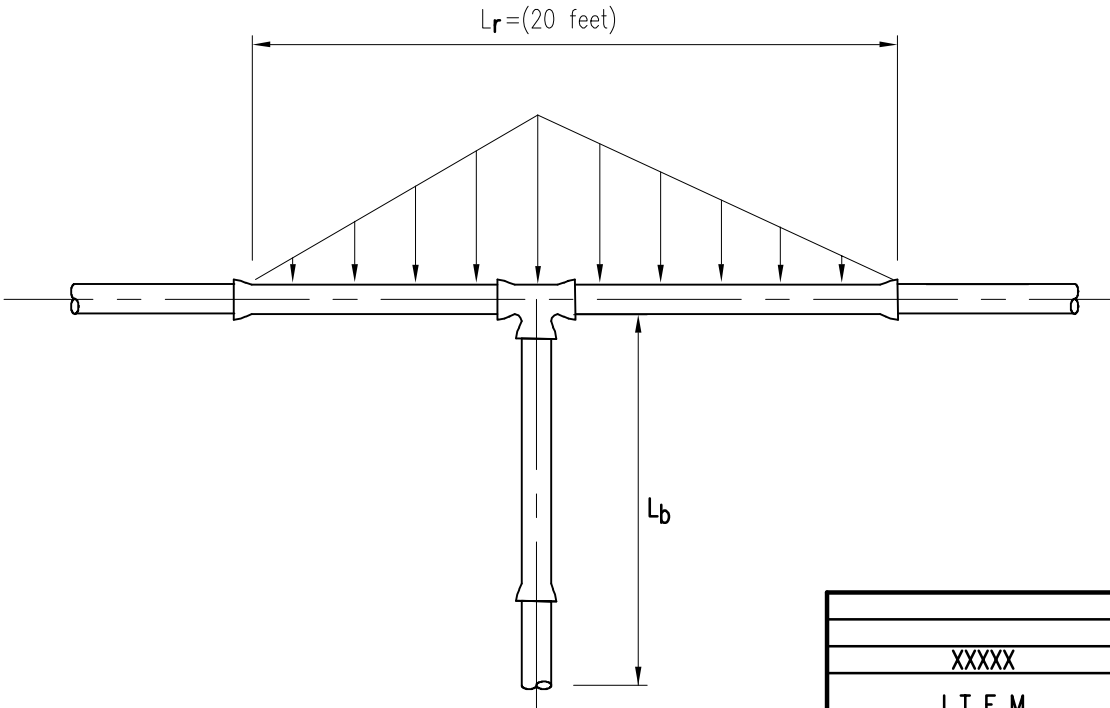
TABLE No.2 (Tee)
MIN. LENGTH OF PIPE (L_b in Feet) TO BE RESTRAINED

100 psi pressure, Soil Designation: Silt 2

H= Depth of cover (ft.)

D= Nominal diameter (in.)

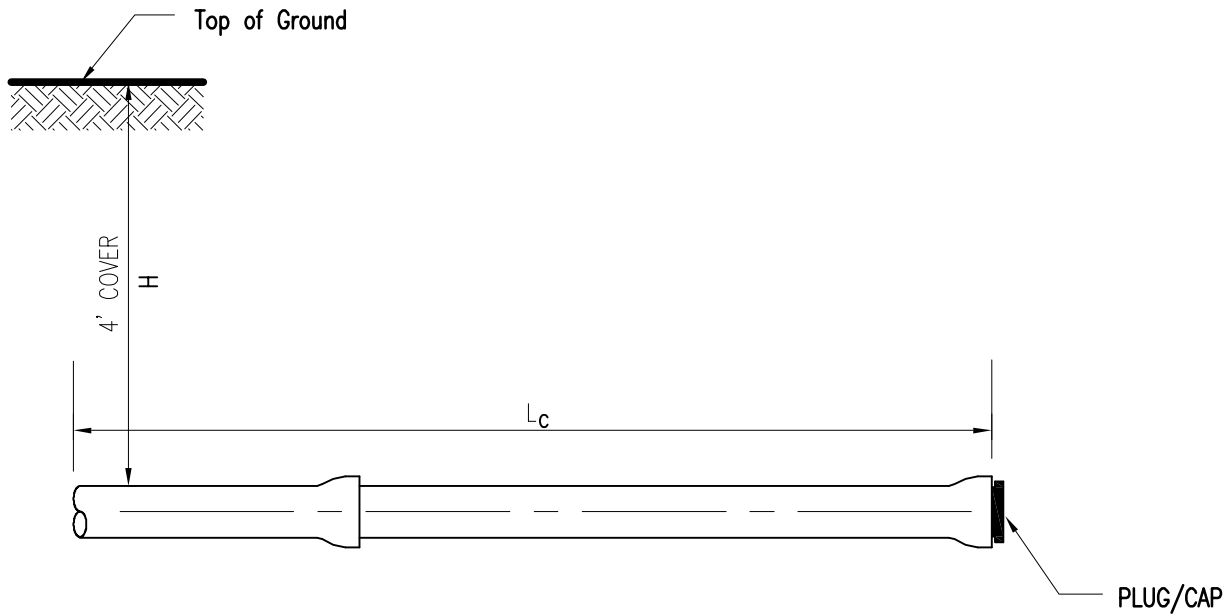
D	H=4 Bare Pipe	H=4 Polywrapped Pipe
	L _b	L _b
8" x 8"	10	14
8" x 6"	0	0
10" x 10"	19	26
10" x 8"	2	3
12" x 12"	27	38
12" x 10"	12	17
12" x 8"	0	0
16" x 16"	43	62
16" x 12"	15	22
16" x 10"	0	0
20" x 20"	59	84
20" x 16"	34	49
20" x 12"	3	4
20" x 10"	0	0



XXXXX		
ITEM	CROSS REF.	SPEC. REF.

	ISSUE DATE	APPROVED BY	STANDARD DETAIL THRUST RESTRAINT DESIGN DUCTILE IRON/PVC PIPE (Tee and Tapping Sleeve)	GS 2.0 SHEET 3 OF 5
	11/01/2006	V. E. F.		

TABLE No.3 (Dead Ends)			
MIN. LENGTH OF PIPE (L_c (in feet)) TO BE RESTRAINED			
100 psi pressure, Soil Designation: Silt 2			
H= Depth of cover (ft.)			
D= Nominal diameter (in.)			
H	D	DEAD END Bare Pipe	DEAD END Polywrapped Pipe
4'		L_c	L_c
	6"	32	45
	8"	41	58
	10"	50	71
	12"	58	83
	16"	75	107
	20"	91	127



XXXXX		
ITEM	CROSS REF.	SPEC. REF.

	ISSUE DATE	APPROVED BY	STANDARD DETAIL THRUST RESTRAINT DESIGN DUCTILE IRON/PVC PIPE (Dead Ends)	GS 2.0 SHEET 4 OF 5
	11/01/2006	V. E. F.		

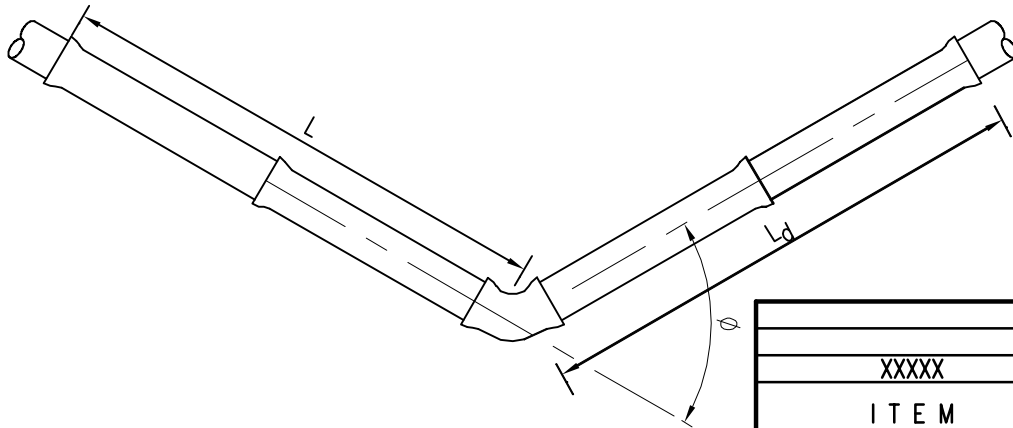
TABLE No.4 (Horizontal Bends)

MIN. LENGTH OF PIPE (L_d in feet) TO BE RESTRAINED

100 psi pressure, Soil Designation: Silt 2

ϕ = Bend angle in degrees H= Depth of cover (ft.) D= Nominal diameter (in.)

		H = 2.5		H = 4		H = 6	
D	ϕ	Bare Pipe	Polywrapped Pipe	Bare Pipe	Polywrapped Pipe	Bare Pipe	Polywrapped Pipe
6"	90	19	22	12	14	9	10
	45	8	9	5	6	4	4
	22½	4	4	2	3	2	2
	11¼	2	2	1	1	1	1
8"	90	25	28	16	18	11	13
	45	10	12	7	8	5	5
	22½	5	6	3	4	2	2
	11¼	2	3	2	2	1	1
10"	90	29	33	19	22	13	15
	45	12	14	8	9	6	6
	22½	6	7	4	4	3	3
	11¼	3	3	2	2	1	1
12"	90	34	38	23	26	16	18
	45	14	16	9	11	7	7
	22½	7	8	5	5	3	4
	11¼	3	4	2	3	2	2
16"	90	43	48	29	33	20	23
	45	18	20	12	14	8	10
	22½	8	10	6	7	4	5
	11¼	4	5	3	3	2	2
20"	90	51	57	35	39	25	28
	45	21	24	14	16	10	12
	22½	10	11	7	8	5	6
	11¼	5	6	3	4	2	3



XXXXX		
ITEM	CROSS REF.	SPEC. REF.



ISSUE DATE	APPROVED BY
11/01/2006	V. E. F.


STANDARD DETAIL
 THRUST RESTRAINT DESIGN
 FOR DUCTILE IRON/PVC PIPE
 (Horizontal Bends)

GS
 2.0
 SHEET 5 OF 5

THE FOLLOWING REQUIREMENTS SHALL APPLY TO ALL CASTINGS
(OR FABRICATED MATERIALS) CONTAINED HEREIN:

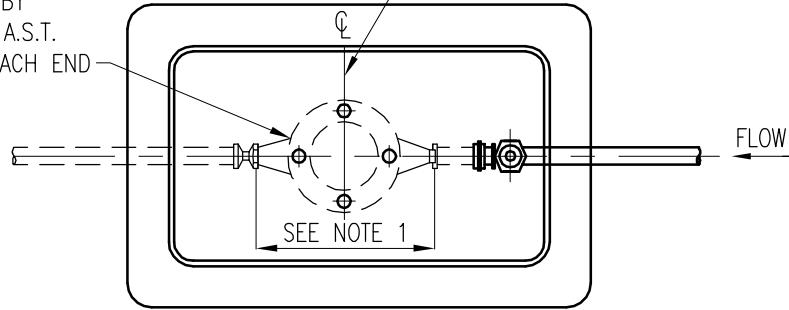
1. SUB-COMPONENTS OF ALL CASTINGS FROM THE SAME SUPPLIER SHALL BE INTERCHANGEABLE.
2. MATING SURFACES OF ALL CASTINGS SHALL BE MACHINED, WITH NO ROCKING PERMITTED.
3. ALL CASTINGS SHALL BE IN ACCORDANCE WITH ASTM-A48, AS MODIFIED HEREIN:
 - A. ARTICLE 10.1.3.1. SHALL NOT APPLY, TIME LIMIT IS 4 HRS. MAXIMUM.
 - B. NOTIFICATION TIME LIMIT IN ARTICLE 16.2 SHALL NOT APPLY.
 - C. SUPPLIER SHALL PROVIDE CERTIFIED TEST RESULTS WITH EACH LOT OF CASTING SHIPPED. CERTIFICATION SHALL IDENTIFY LOT.
 - D. SIGNATURE IN ARTICLE 17.2 SHALL BE REQUIRED. CERTIFICATION SHALL BE SIGNED BY LICENSED PROFESSIONAL ENGINEER, OR EQUIVALENT WHEN IN FOREIGN COUNTRY.
 - E. SUPPLIER SHALL PROVIDE CAST TEST BAR, SUITABLE FOR MACHINING, FOR EACH FOUNDRY LOT OF CASTINGS SHIPPED. TEST BAR SHALL IDENTIFY LOT AND SHALL BE SUITABLE FOR CLASS NO. 35B SPECIMEN.
4. MANUFACTURER'S NAME AND LOCATION (I.E. FOUNDRY AND COUNTRY OF ORIGIN) SHALL BE PERMANENTLY CAST ON THE BOTTOM OF ALL CAST COVERS AND LIDS.
5. SUPPLIER OF FABRICATED ITEMS (I.E. NON-CAST ITEMS) SHALL PERMANENTLY MARK HIS NAME AND DATE OF MANUFACTURE ON MATERIAL, BY WELDING, STAMPING OR OTHER METHOD APPROVED BY THE DEPARTMENT.

I T E M	CROSS REF.	SPEC. REF.

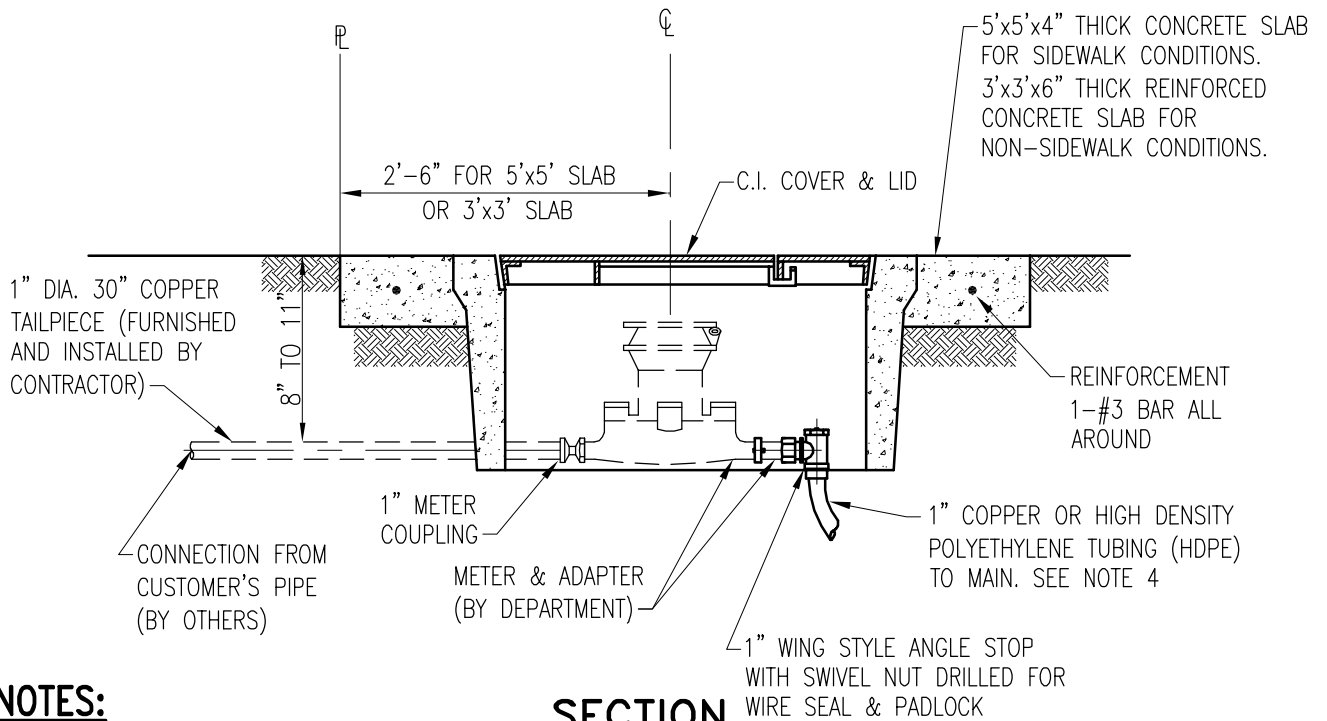
 <p>MIAMI-DADE COUNTY <i>Delivering Excellence Every Day</i></p>	<u>ISSUE DATE</u>	<u>APPROVED BY</u>	S T A N D A R D D E T A I L CASTING STANDARDS	WS 2.05 SHEET 1 OF 1
	6/01/2015	J.F.		

5/8" x 3/4" WATER METER (BY DEPARTMENT) WITH 1 1/4" A.S.T. MALE CONNECTION ON EACH END

METER SHALL BE ALIGNED WITH CL OF METER BOX AS SHOWN. (TYP.)



PLAN



SECTION

NOTES:

1. METER LAYING LENGTH AS SHOWN:
10 3/4" (OUTLET TO OUTLET) FOR 5/8" OR 1" METER (11" WITH GASKETS).
2. USE SINGLE METER BOX.
3. CONCRETE SLAB REINFORCEMENT SHALL HAVE 1-#3 BAR ALL AROUND.
4. USE 1" BLUE COLOR HDPE OR 1" COPPER TUBING FOR POTABLE WATER SERVICE. USE ONLY 1" PURPLE COLOR HDPE (NO COPPER ALLOWED) FOR RECLAIMED WATER SERVICE.
5. METERS WILL NOT BE INSTALLED IF THE METER BOX IS IN A DRIVING SURFACE.
6. WHEN USING 1" HDPE SERVICE A TEN GAUGE BLUE (PURPLE FOR RECLAIMED WATER) DIRECT BURY STANDARD COPPER TRACE WIRE IS TO BE TAPED CONTINUOUSLY WITH POLY OR DUCT TAPE TO THE SERVICE FOR LOCATION PURPOSES. WIRE SHALL BE ATTACHED TO WATER MAIN. WIRE MUST EXTEND INTO METER BOX.
7. IF USED FOR RECLAIMED WATER, THE COVER SHALL BE PERMANENTLY EMBOSSED WITH THE WORDING: "RECLAIMED WATER-DO NOT DRINK-NO BEBER-PA BOUE".
8. ALL SPACER TUBES AND TAILPIECES SHALL BE FURNISHED AND INSTALLED BY CONTRACTOR.
9. REPAIRS TO SLAB AND METER ARE PROHIBITED.

1" SERVICE CONNECTION	WS 4.11	
TYPICAL SERVICE PLAN	WS 4.10	
ITEM	CROSS REF.	SPEC. REF.

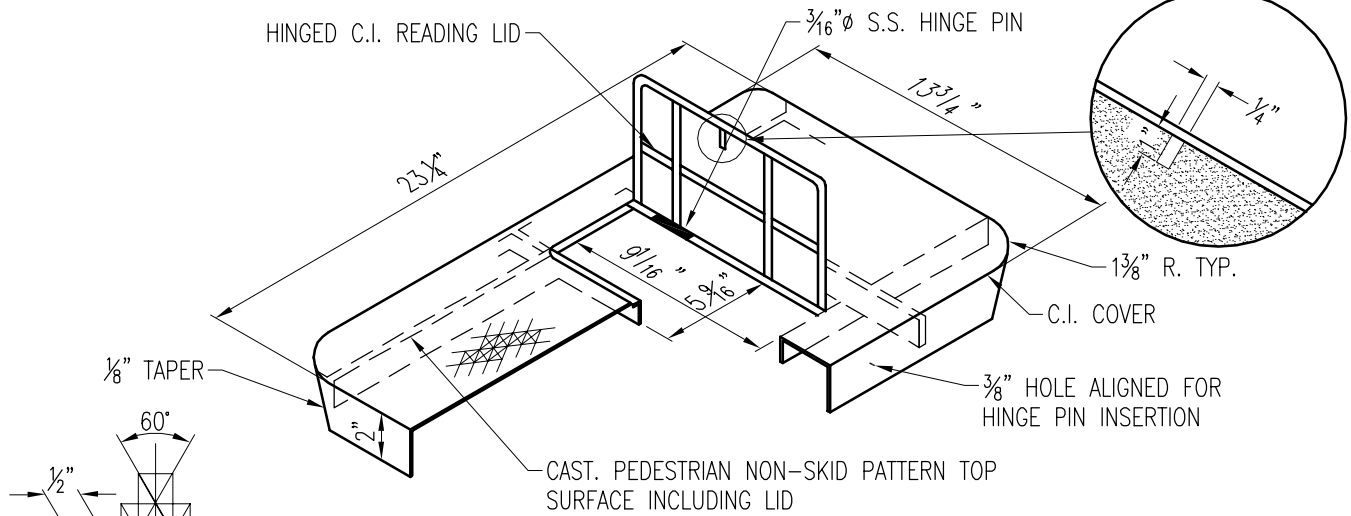


ISSUE DATE	APPROVED BY
06/01/2008	V.F.C.

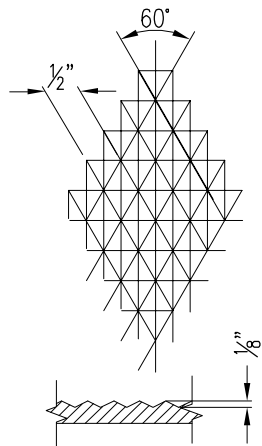
STANDARD DETAIL
SINGLE METER BOX
INSTALLATION

WS
2.10
SHEET 1 OF 3

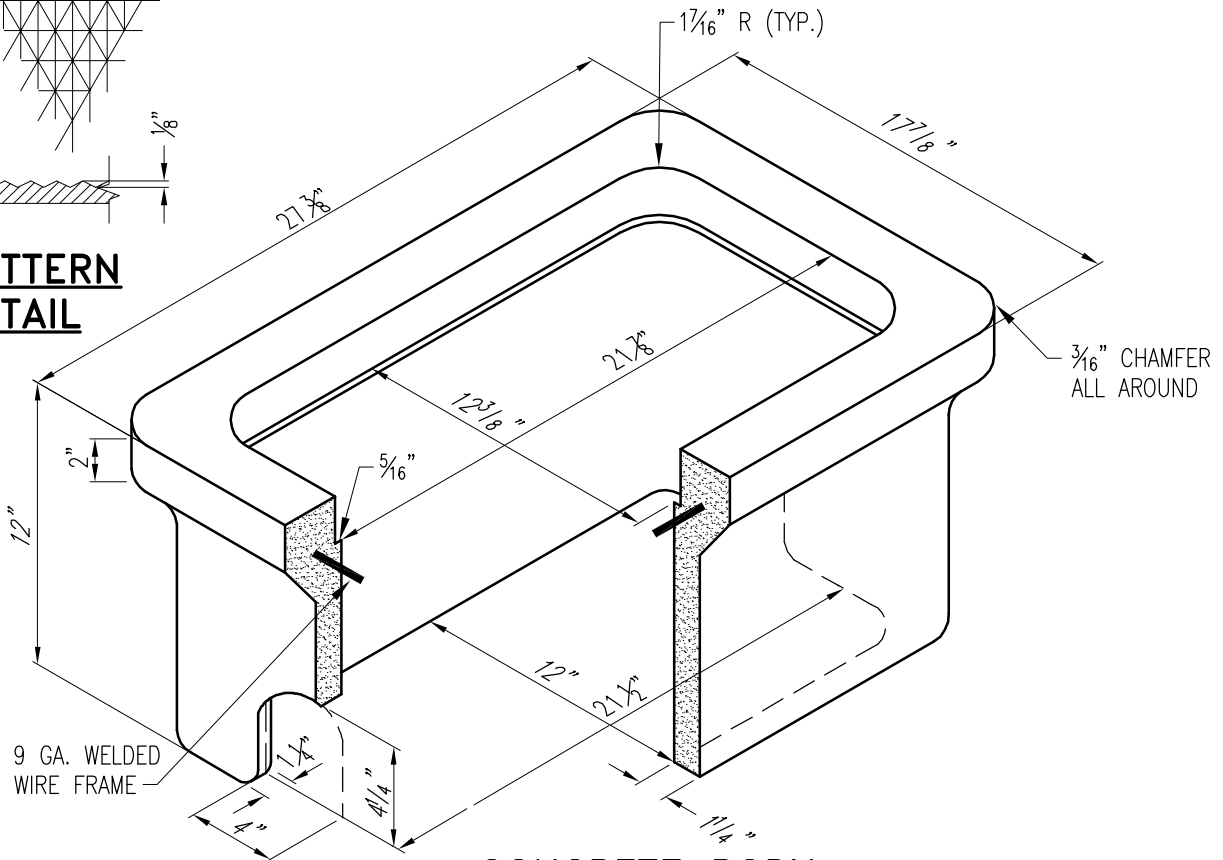
PICKHOLE DETAIL



C.I. COVER WITH HINGER LID



PATTERN DETAIL



CONCRETE BODY

NOTES:

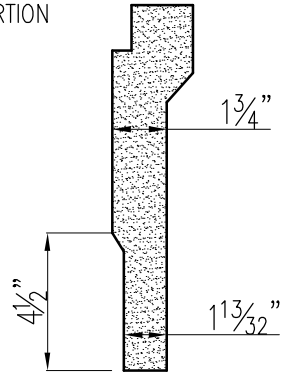
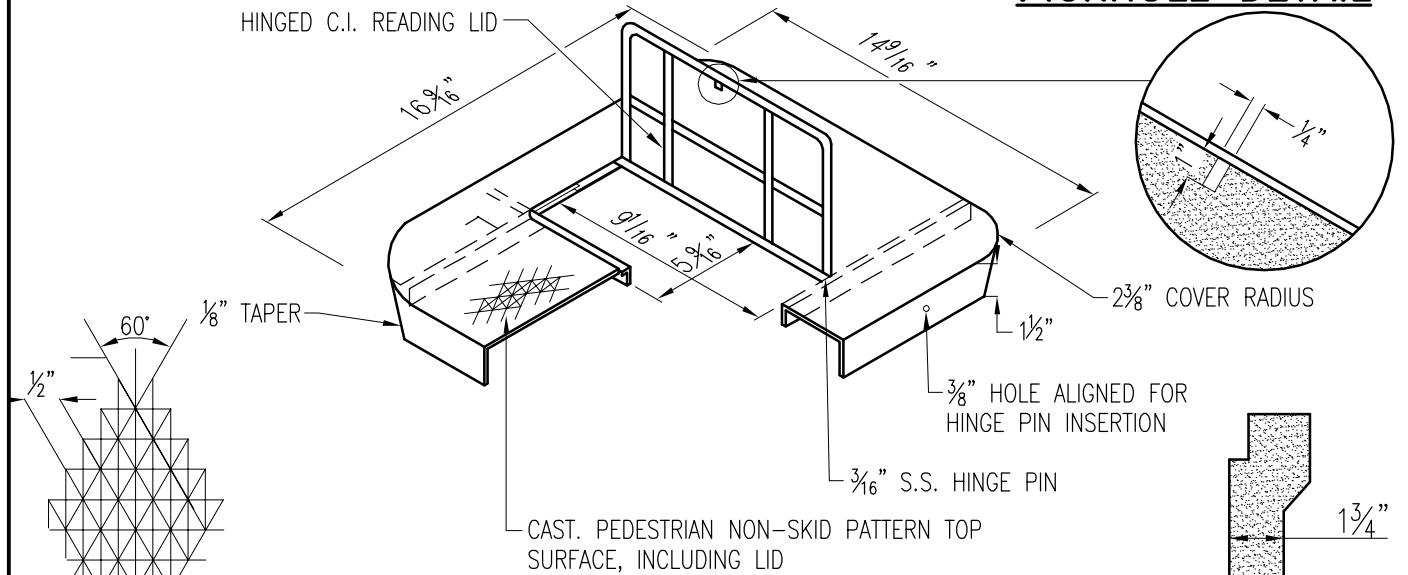
- SOME DIMENSIONS MAY VARY WITH DEPARTMENT APPROVAL.
LID W.T.= MAX. 53 LBS., MIN. 42 LBS.
- METERS WILL NOT BE INSTALLED IF THE METER BOX IS IN A DRIVING SURFACE.

1" SERVICE CONNECTION	WS 4.11	
TYPICAL SERVICE PLAN	WS 4.10	
ITEM	CROSS REF.	SPEC. REF.

ISSUE DATE	APPROVED BY
06/01/2008	V.F.C.

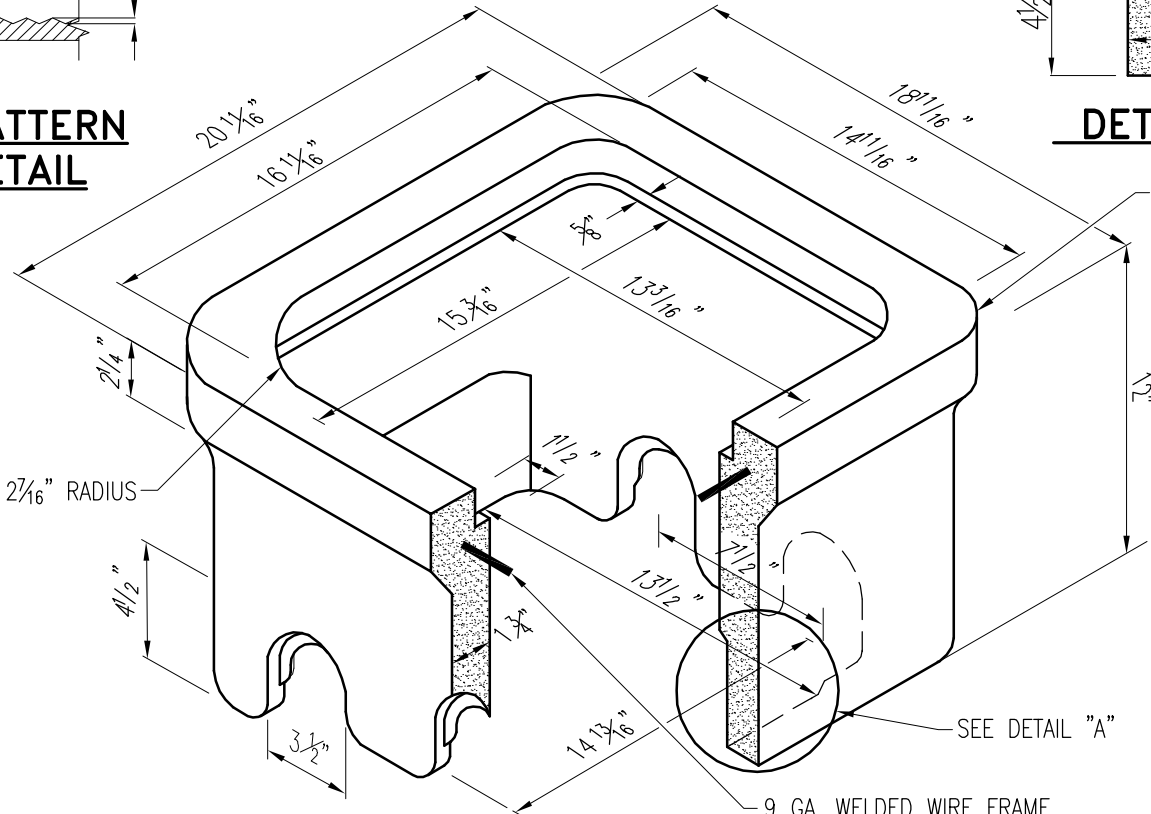
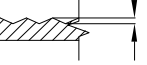
PICKHOLE DETAIL

HINGED C.I. READING LID



C.I. COVER WITH HINGED LID

**PATTERN
DETAIL**



DETAIL "A"

CONCRETE BODY

NOTE:

- SOME DIMENSIONS MAY VARY WITH DEPARTMENT APPROVAL.
LID W.T.= MAX. 33 LBS., MIN. 26 LBS.
- METERS WILL NOT BE INSTALLED IF THE METER BOX IS IN A DRIVING SURFACE.

ITEM	CROSS REF.	SPEC. REF.



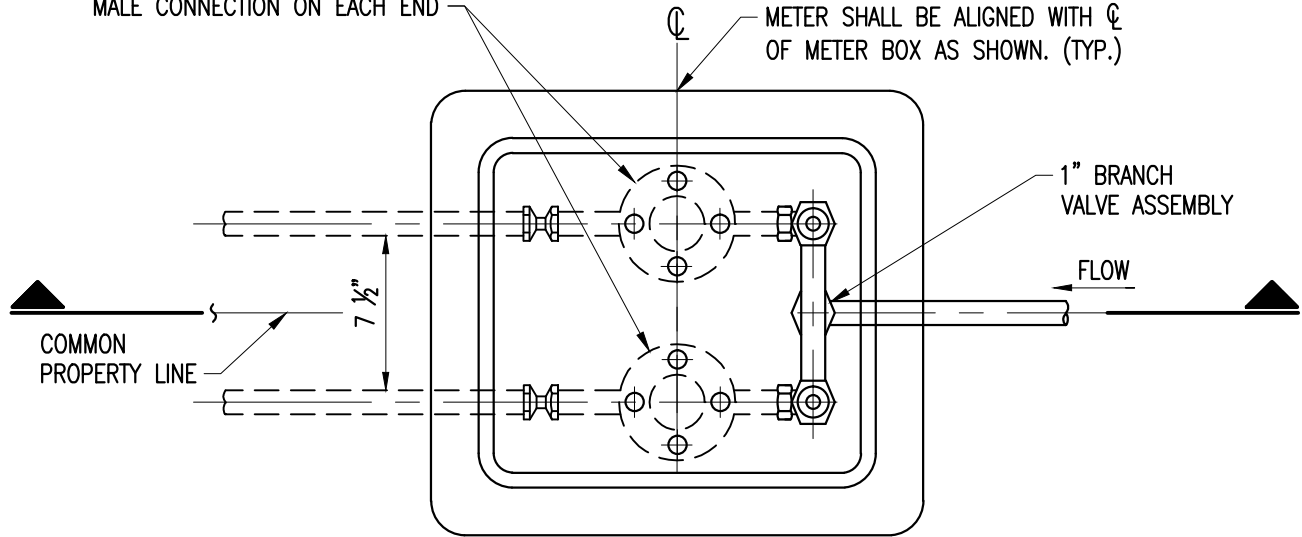
ISSUE DATE	APPROVED BY
11/01/2006	V.F.C.

STANDARD DETAIL
 DUAL METER BOX
 INSTALLATION

WS
 2.12
 SHEET 1 OF 2

(2) 5/8" x 3/4" WATER METERS (BY DEPARTMENT) WITH 3/4" A.S.T. MALE CONNECTION ON EACH END

METER SHALL BE ALIGNED WITH C OF METER BOX AS SHOWN. (TYP.)

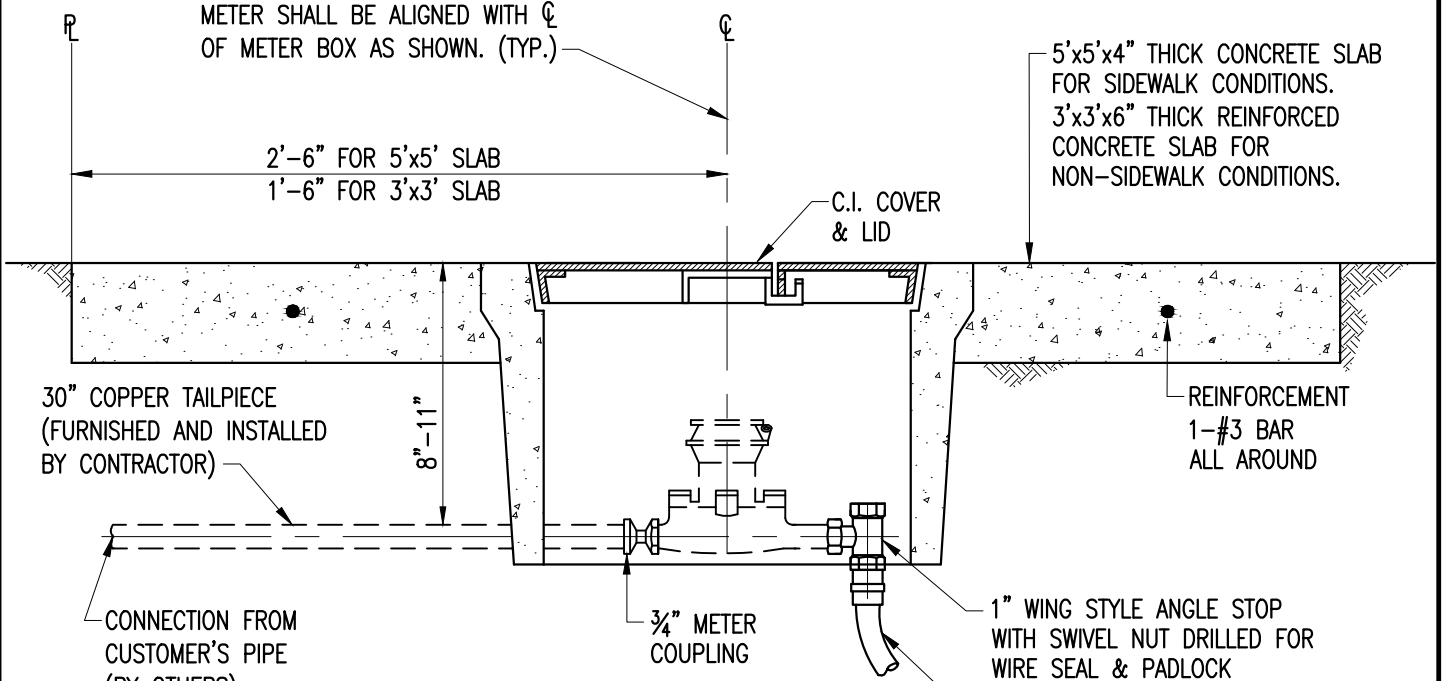


PLAN

METER SHALL BE ALIGNED WITH C OF METER BOX AS SHOWN. (TYP.)

5'x5'x4" THICK CONCRETE SLAB FOR SIDEWALK CONDITIONS. 3'x3'x6" THICK REINFORCED CONCRETE SLAB FOR NON-SIDEWALK CONDITIONS.

2'-6" FOR 5'x5' SLAB
1'-6" FOR 3'x3' SLAB



SECTION

NOTES:

1. USE DUAL METER BOX.
2. CONCRETE SLAB REINFORCEMENT SHALL BE ONE No. 3 BAR ALL ROUND.
3. FOR SIDEWALK CONDITIONS, METER BOX SHALL BE INSTALLED IN A SINGLE CONCRETE SIDEWALK FLAG.
4. METERS WILL NOT BE INSTALLED IF THE METER BOX IS IN A DRIVING SURFACE.
5. REPAIRS TO CONCRETE SLAB AND METER BOX ARE PROHIBITED.
6. ALL SPACER TUBES AND TAILPIECES SHALL BE FURNISHED AND INSTALLED BY CONTRACTOR.

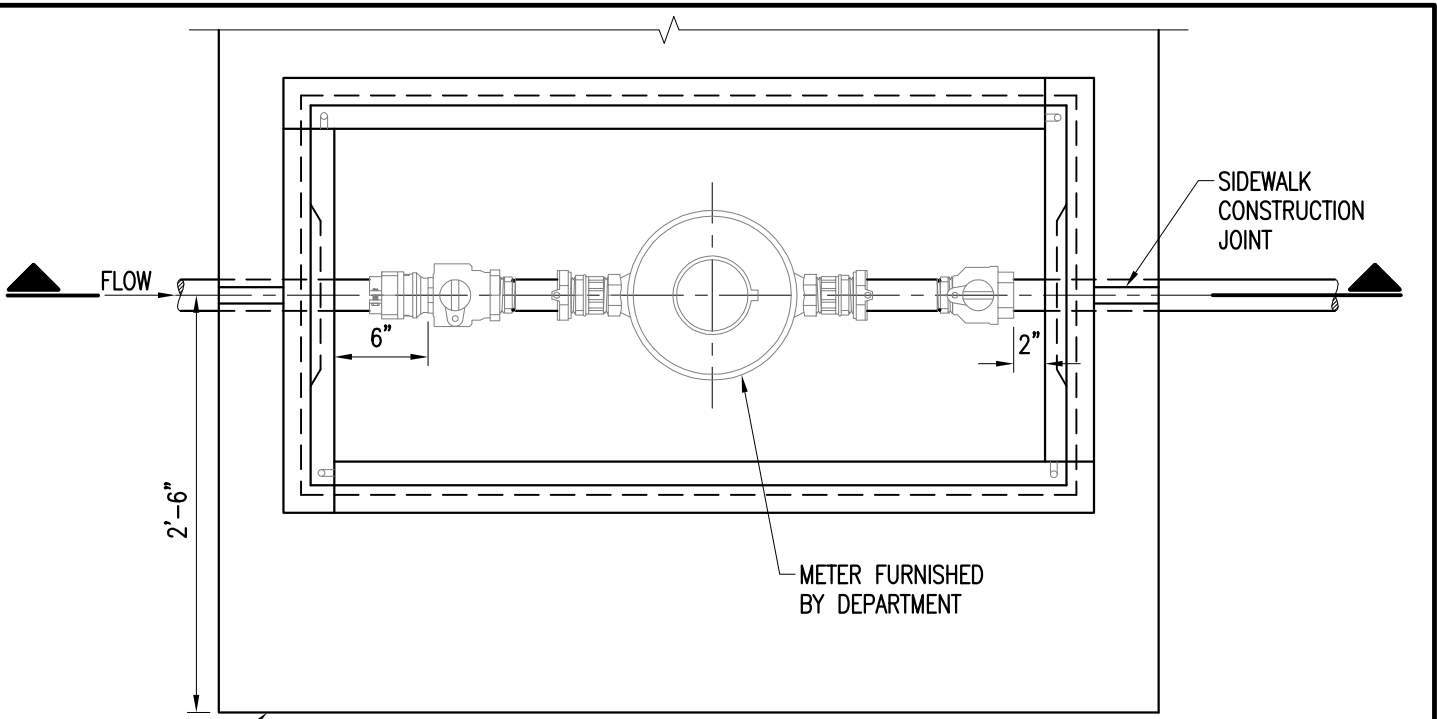
1" SERVICE CONNECTION	WS 4.11	
TYPICAL SERVICE PLAN	WS 4.10	
ITEM	CROSS REF.	SPEC. REF.



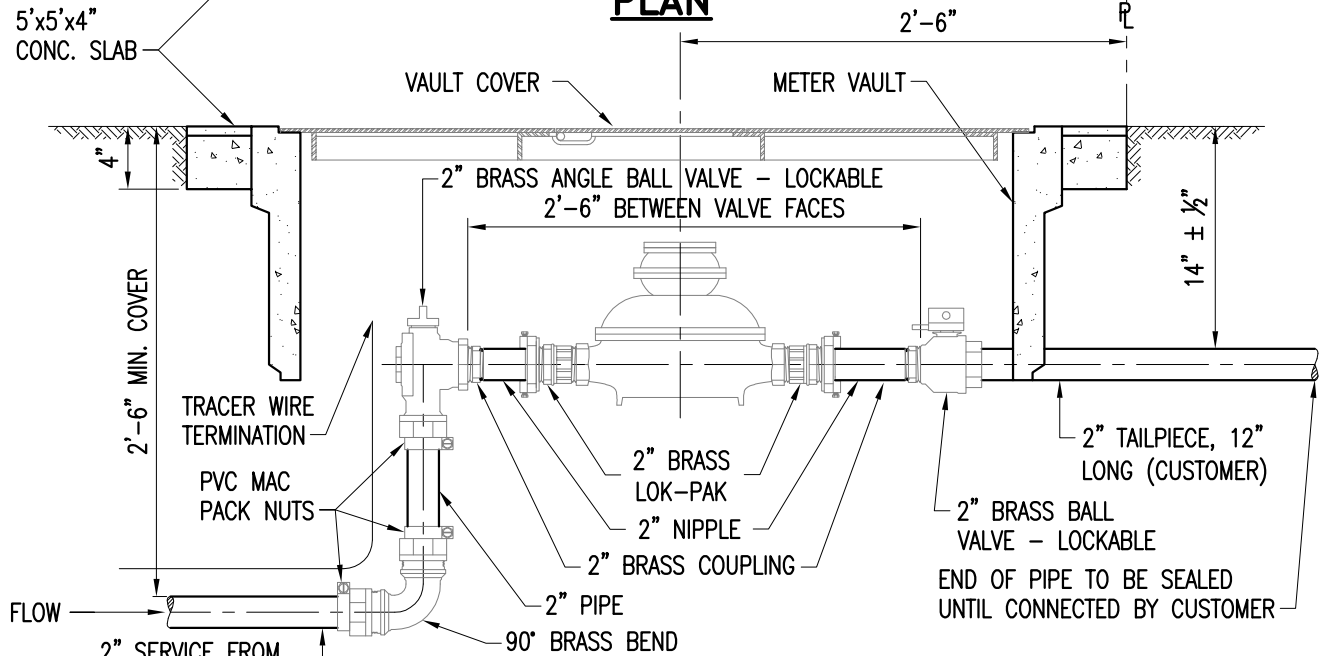
ISSUE DATE	APPROVED BY
10/29/2010	V.F.C.

STANDARD DETAIL
**DUAL 5/8" METER INSTALLATION
 FOR TYPICAL 3/4" DOMESTIC
 SERVICE LINES**

**WS
 2.12
 SHEET 2 OF 2**



PLAN



SECTION

NOTES:

1. USE 2'x4' METER VAULT.
2. METER BOX TO BE IN 5'x5'x4" THICK CONCRETE SLAB WITH 6x6-W1.4xW1.4 W.W.M.
3. A TEN GAUGE BLUE (PURPLE FOR RECLAIMED WATER) DIRECT BURY STRANDED COPPER TRACER WIRE TO BE TAPED CONTINUOUSLY WITH POLY OR DUCT TAPE TO THE SERVICE FOR LOCATION PURPOSES. WIRE MUST BE ATTACHED TO WATER MAIN AND EXTEND INTO THE WATER METER BOX.
4. USE 2" BLUE COLOR HDPE FOR POTABLE WATER SERVICE. USE 2" PURPLE COLOR HDPE FOR RECLAIMED WATER SERVICE.
5. METERS WILL NOT BE INSTALLED IF THE METER BOX IS LOCATED ON A DRIVING SURFACE.
6. METER BOX SHALL BE INSTALLED BETWEEN TWO SEPARATE FLAGS OF CONCRETE.
7. ALL BRASS COMPONENTS SHALL BE MARKED "NL" MEETING THE S3874 AMENDMENT TO THE SAFE DRINKING WATER ACT.

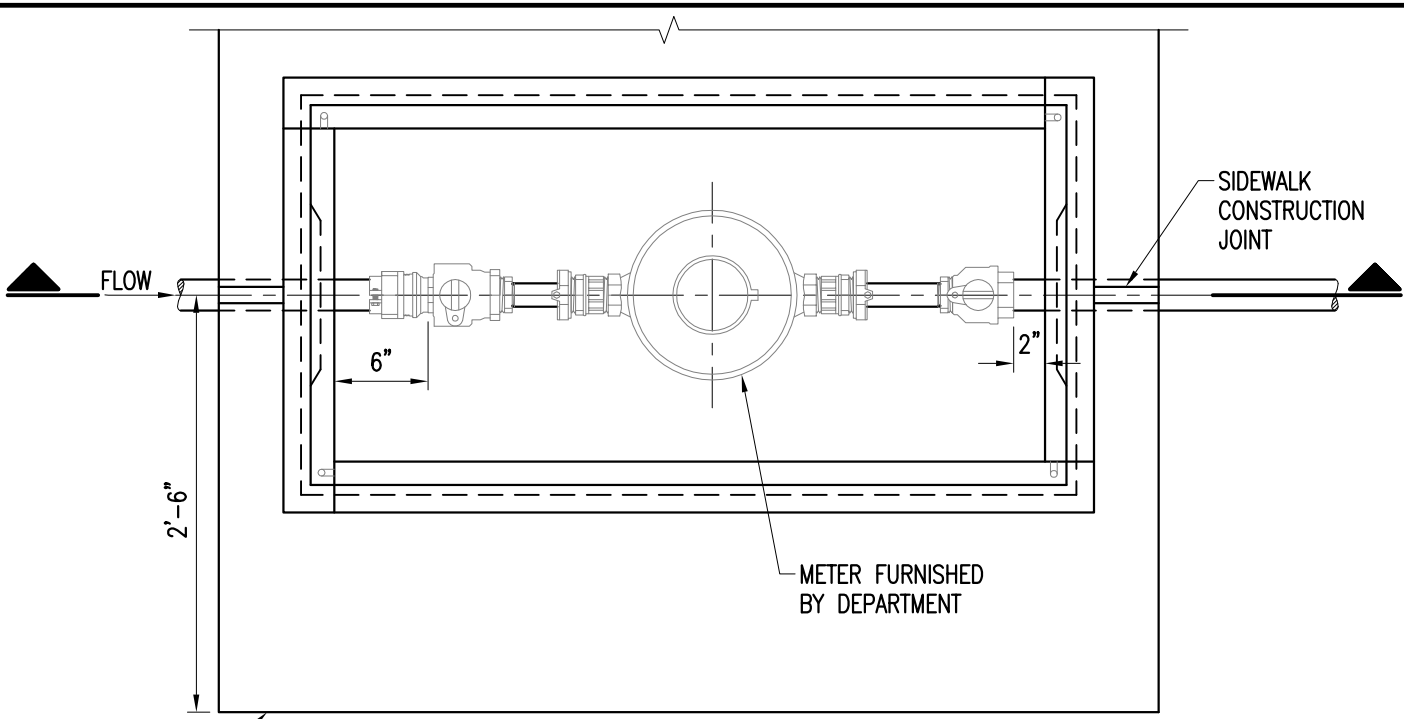
TYPICAL SERVICE PLAN	WS 4.10	
2'x4' METER VAULT	WS 2.17	
ITEM	CROSS REF.	SPEC. REF.



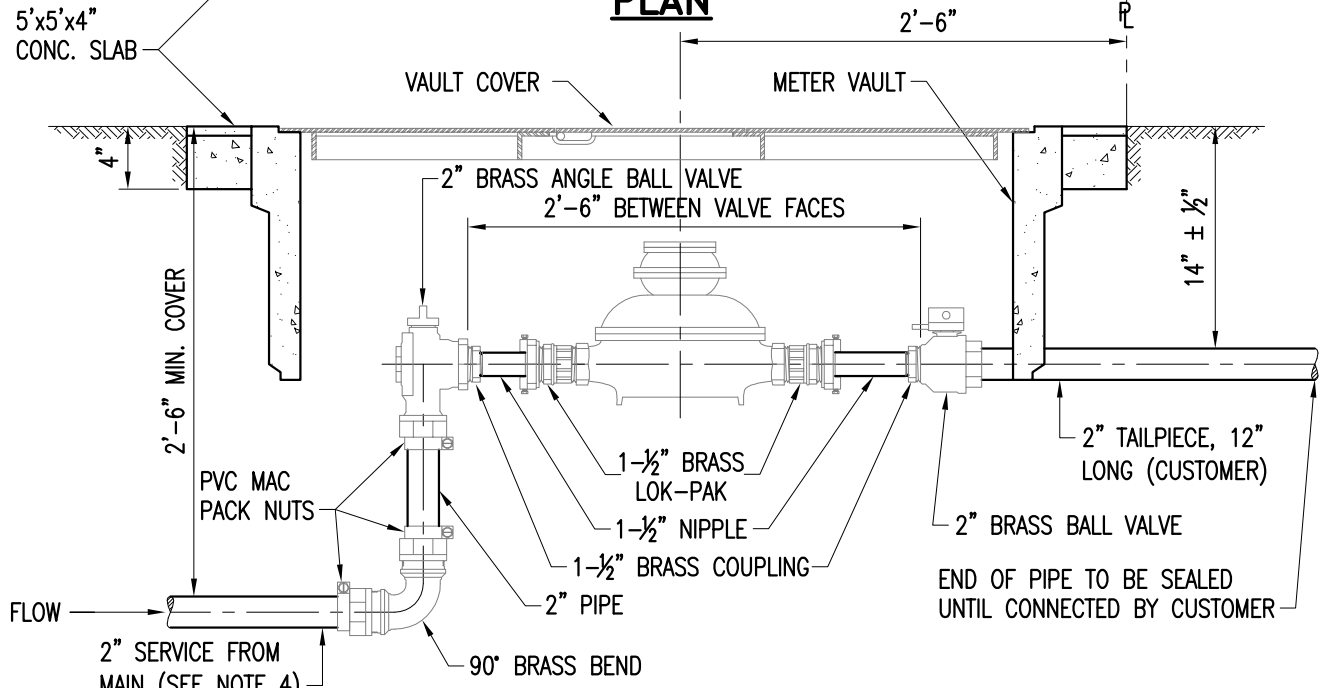
ISSUE DATE	APPROVED BY
05/31/2013	E.A.V.

STANDARD DETAIL
 TYPICAL 2" SERVICE
 INSTALLATION WITH A 2" METER

WS
 2.16
 SHEET 1 OF 4



PLAN



SECTION

NOTES:

1. USE 2'x4' METER VAULT.
2. METER BOX TO BE IN 5'x5'x4" THICK CONCRETE SLAB WITH 6x6-W1.4xW1.4 W.W.M.
3. A TEN GAUGE DIRECT BURY STRANDED COPPER TRACER WIRE TO BE TAPED CONTINUOUSLY WITH POLY OR DUCT TAPE TO THE SERVICE FOR LOCATION PURPOSES. WIRE MUST BE ATTACHED TO RECLAIMED WATER MAIN AND EXTEND INTO THE METER BOX.
4. USE 2" BLUE COLOR HDPE FOR POTABLE WATER SERVICE. USE 2" PURPLE COLOR HDPE FOR RECLAIMED WATER SERVICE.
5. METERS WILL NOT BE INSTALLED IF THE METER BOX IS IN A DRIVING SURFACE.
6. FOR SIDEWALK CONDITIONS, METER BOX SHALL BE INSTALLED IN A SINGLE CONCRETE SIDEWALK FLAG.
7. ALL BRASS COMPONENTS SHALL BE MARKED "NL" MEETING THE S3874 AMENDMENT TO THE SAFE DRINKING WATER ACT.

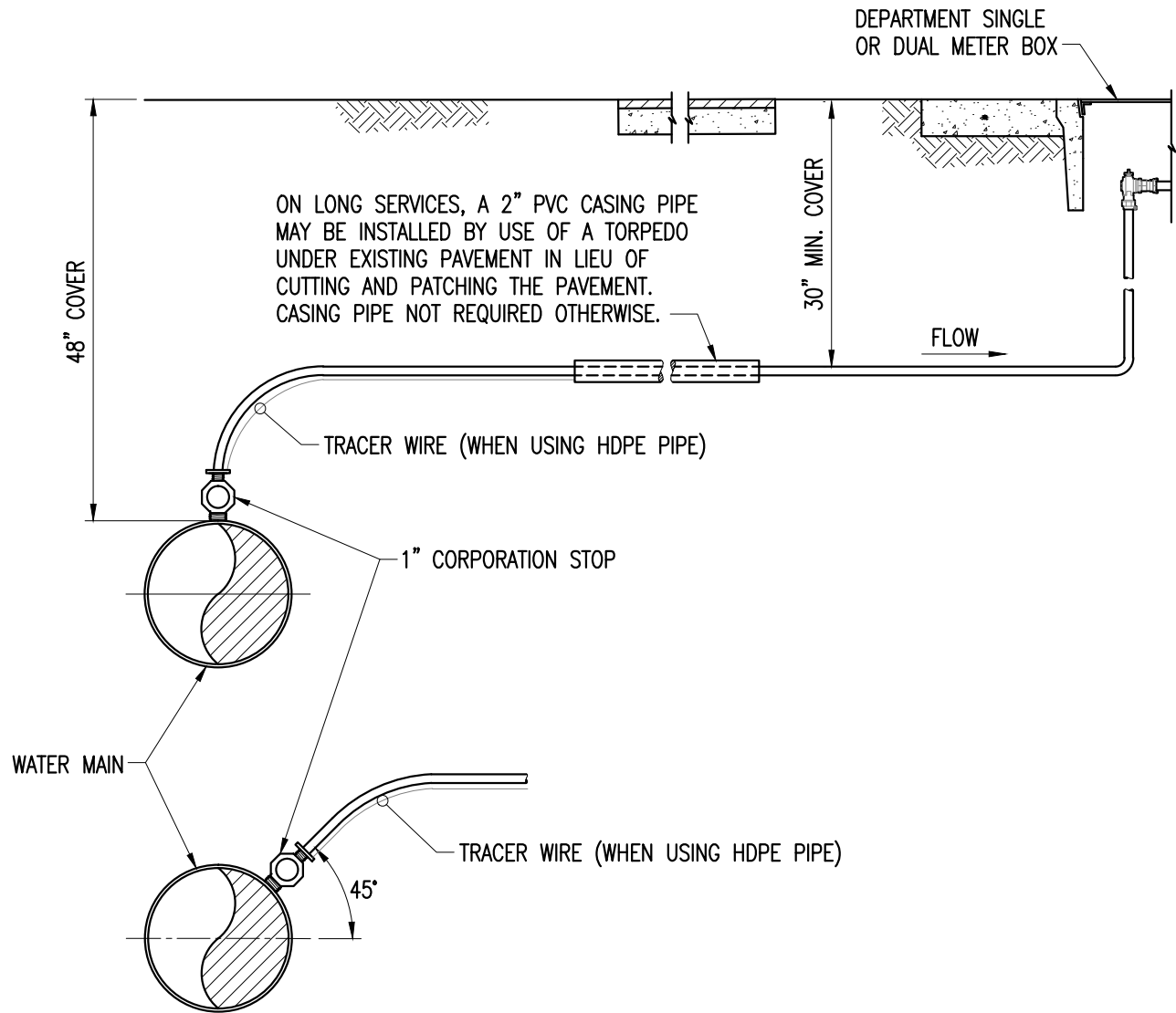
TYPICAL SERVICE PLAN	WS4.10	
2'x4' METER VAULT	WS2.17	
ITEM	CROSS REF.	SPEC. REF.



ISSUE DATE	APPROVED BY
5/31/2013	E.A.V.

STANDARD DETAIL
**TYPICAL 2" SERVICE
 INSTALLATION WITH A 1-1/2" METER**

**WS
 2.16**
 SHEET 2 OF 4



NOTES:

1. CONTRACTOR HAS THE OPTION OF TAPPING AT 45°.
2. METERS WILL NOT BE INSTALLED IF THE METER BOX IS LOCATED ON A DRIVING SURFACE.
3. PROVIDE 36" MIN. COVER FOR SERVICES INSTALLED WITHIN ARTERIAL ROADS (INCLUDING ALL SECTION LINE AND HALF-SECTION LINE ROADS).
4. INSTALL TAPPING SADDLE FOR: THICKNESS CLASS D.I. MAINS 4" & SMALLER, PRESSURE CLASS D.I. WATER MAINS 6" & SMALLER, OR WHEN MAIN IS PVC, HDPE OR AC PIPE.
5. WHEN MAIN IS SHALLOWER THAN 48", A 1/8" OR 1/4" BEND MUST BE USED.
6. WHEN USING HDPE SERVICE PIPE, A TEN GAUGE BLUE TRACER WIRE TO BE TAPED TO THE PIPE EVERY 2 FT. WITH POLY OR DUCT TAPE. TRACER WIRE TO BE MECHANICALLY FASTENED TO THE MAIN WHEN A METAL WATER MAIN IS USED.
7. USE SERVICE SADDLE AND TAPPING SLEEVE FOR PVC RECLAIMED WATER MAIN.

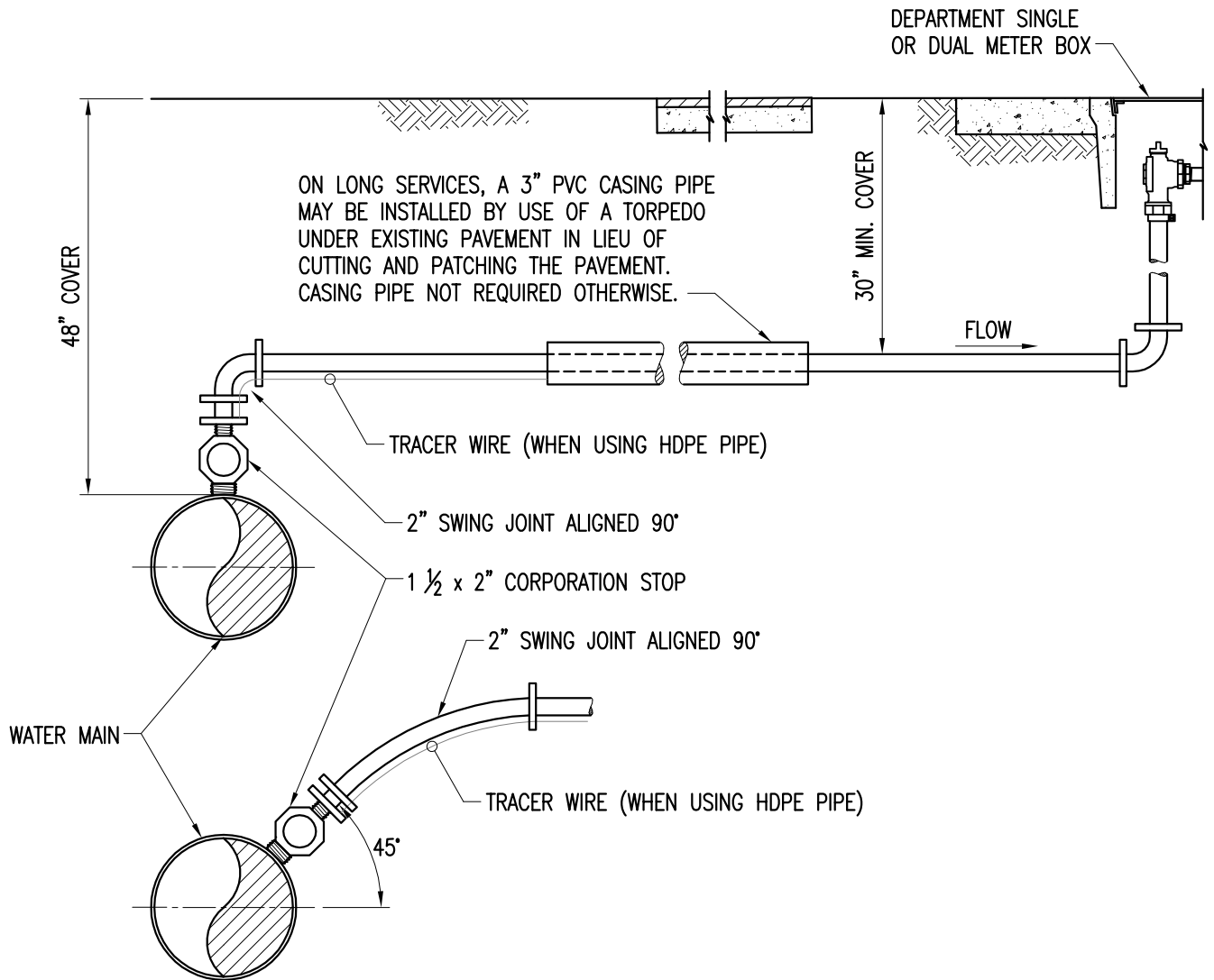
TYPICAL SERVICE PLAN	WS. 4.10	
ITEM	CROSS REF.	SPEC. REF.



ISSUE DATE	APPROVED BY
1/3/2011	V.F.C.

STANDARD DETAIL
TYPICAL 1" SERVICE CONNECTION
 (COPPER OR HDPE)

WS
2.16
 SHEET 3 OF 4



NOTES:

1. CONTRACTOR HAS THE OPTION OF TAPPING AT 45°.
2. METERS WILL NOT BE INSTALLED IF THE METER BOX IS LOCATED ON A DRIVING SURFACE.
3. PROVIDE 36" MIN. COVER FOR SERVICES INSTALLED WITHIN ARTERIAL ROADS (INCLUDING ALL SECTION LINE AND HALF-SECTION LINE ROADS).
4. INSTALL TAPPING SADDLE FOR: THICKNESS CLASS D.I. MAINS 4" & SMALLER, PRESSURE CLASS D.I. WATER MAINS 8" & SMALLER, OR WHEN MAIN IS PVC, HDPE OR AC PIPE.
5. WHEN MAIN IS SHALLOWER THAN 48", A 1/8 OR 1/4 BEND MUST BE USED.
6. WHEN USING HDPE SERVICE PIPE, A TEN GAUGE BLUE TRACER WIRE TO BE TAPED TO THE PIPE EVERY 2 FT. WITH POLY OR DUCT TAPE. TRACER WIRE TO BE MECHANICALLY FASTENED TO THE MAIN WHEN A METAL WATER MAIN IS USED.
7. USE SERVICE SADDLE AND TAPPING SLEEVE FOR PVC RECLAIMED WATER MAIN.

DUAL METER BOX	WS 2.12	
SINGLE METER BOX	WS 2.10	3.02
ITEM	CROSS REF.	SPEC. REF.

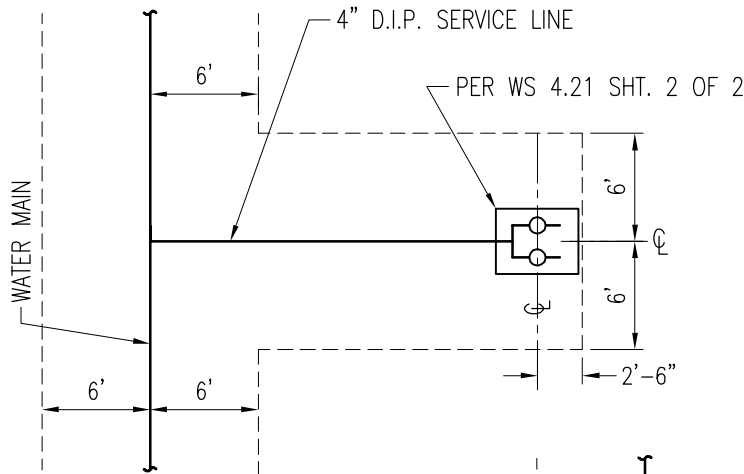


ISSUE DATE	APPROVED BY
12/16/2009	V.F.C.

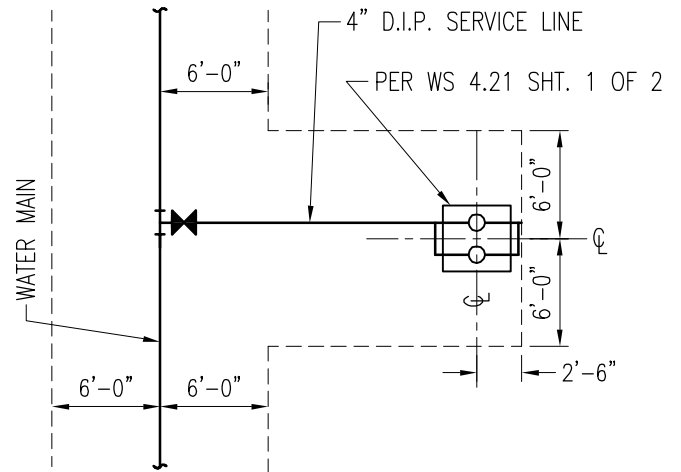
STANDARD DETAIL
 TYPICAL 2" SERVICE CONNECTION (HDPE)

WS
 2.16
 SHEET 4 OF 4

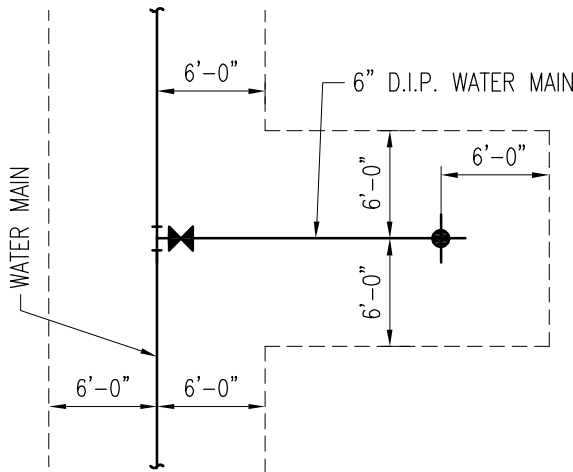
1"-2" & 4"
WATER SERVICE



4" WATER SERVICE



FIRE HYDRANT
F.H. PER WS 4.5



LEGEND:

----- LIMITS OF WASD EASEMENT

ITEM	CROSS REF.	SPEC. REF.



WATER & SEWER DEPARTMENT

ISSUE DATE

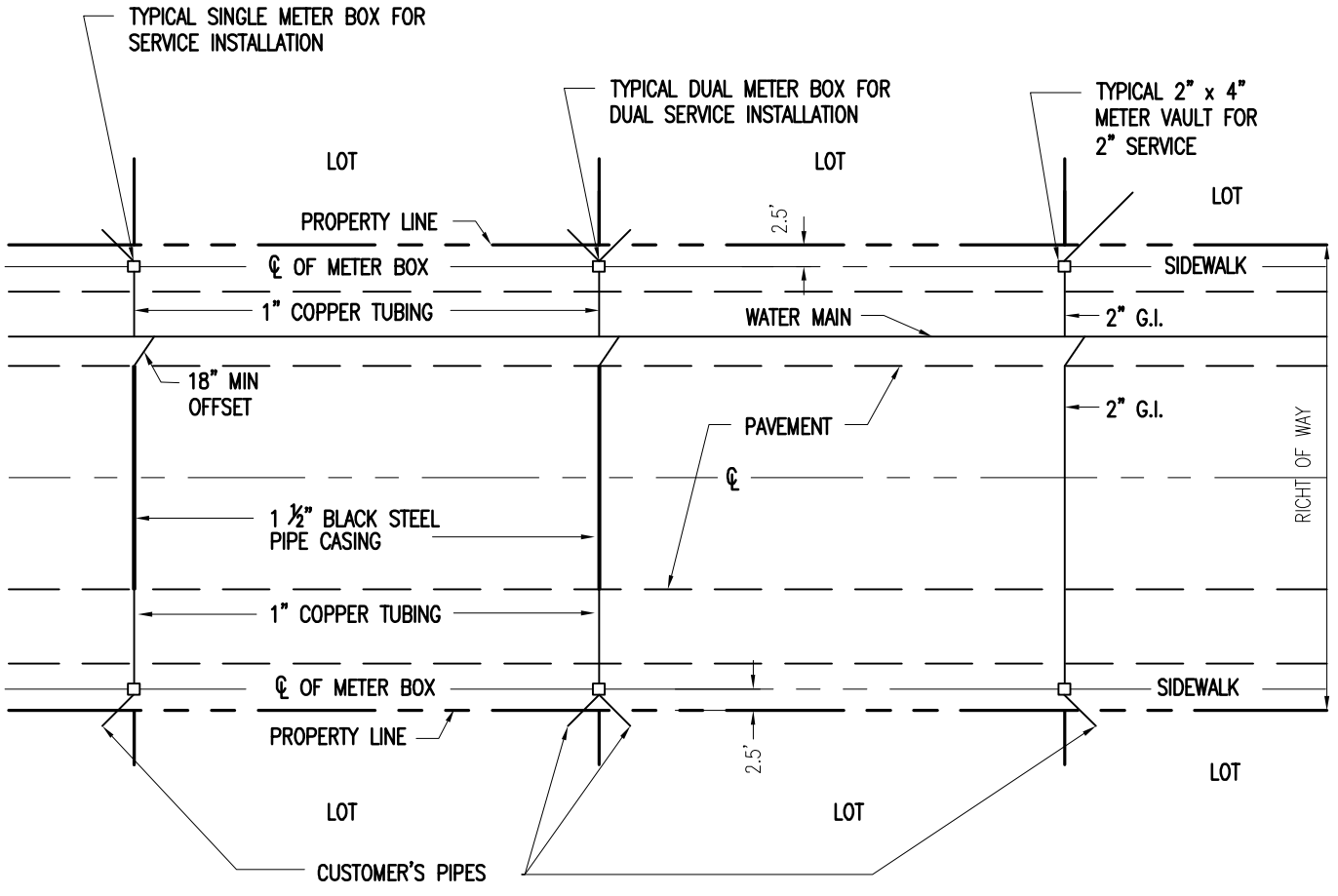
10/05/2009

APPROVED BY

V.F.C.

STANDARD DETAIL
EASEMENT REQUIREMENTS
FOR SERVICE & FIRE HYDRANT

WS
2.21
SHEET 1 OF 3



PLAN

NOTE: METERS WILL NOT BE INSTALLED IF THE METER BOX IS IN A DRIVING SURFACE.

ITEM	CROSS REF.	SPEC. REF.



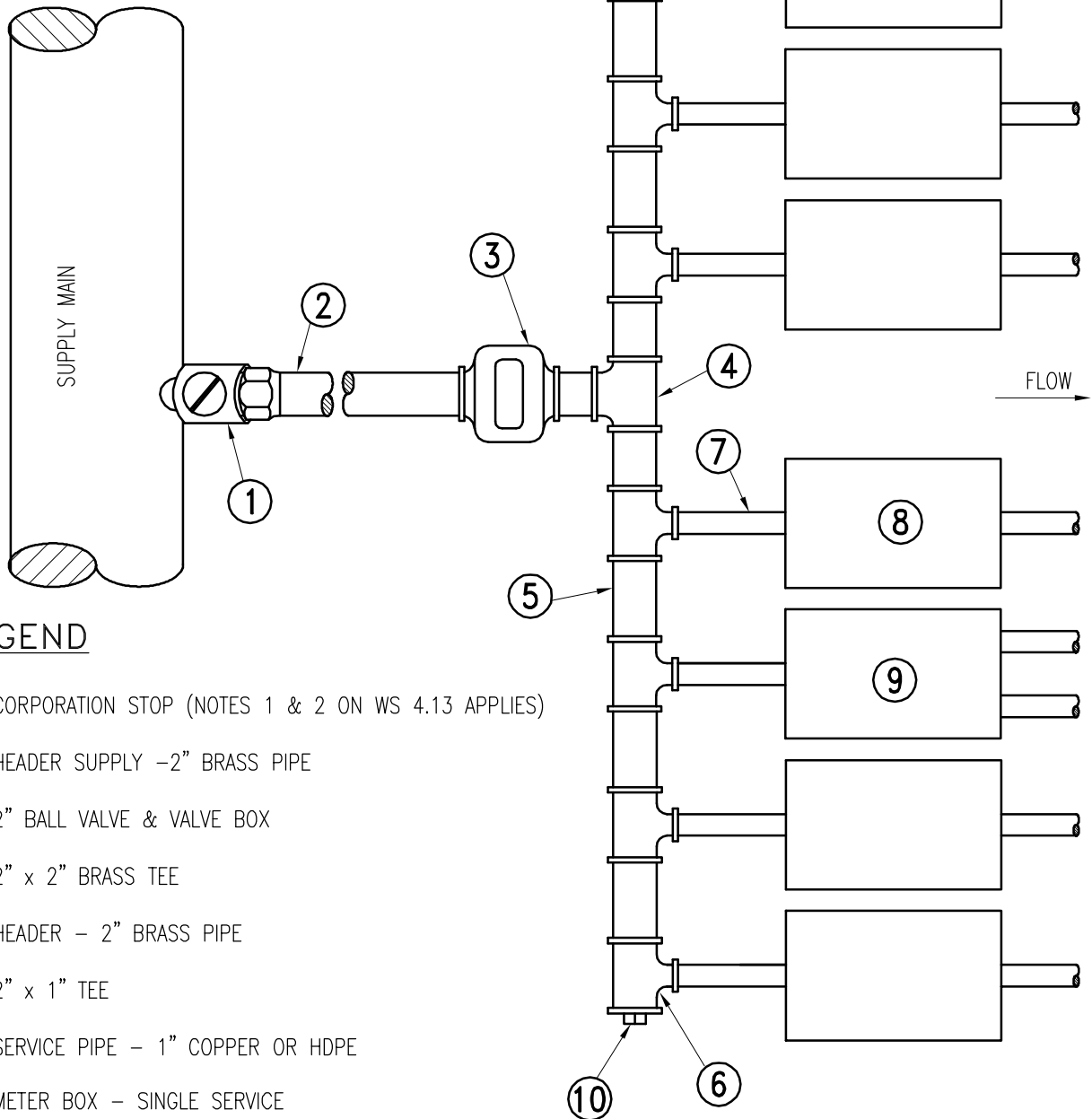
ISSUE DATE	APPROVED BY
11/01/2006	V.E.F.

STANDARD DETAIL
TYPICAL SERVICE PLAN

WS
4.10
SHEET 1 OF 1

NOTES:

1. MAXIMUM OF 10-⁵/₈" METERS OR 5-1" METERS.
2. FOR LARGER DEMAND SEE WS 4.16 SHEET 2 OF 2.
3. METERS WILL NOT BE INSTALLED IF THE METER BOXES ARE IN A DRIVING SURFACE.



LEGEND

- ① CORPORATION STOP (NOTES 1 & 2 ON WS 4.13 APPLIES)
- ② HEADER SUPPLY - 2" BRASS PIPE
- ③ 2" BALL VALVE & VALVE BOX
- ④ 2" x 2" BRASS TEE
- ⑤ HEADER - 2" BRASS PIPE
- ⑥ 2" x 1" TEE
- ⑦ SERVICE PIPE - 1" COPPER OR HDPE
- ⑧ METER BOX - SINGLE SERVICE
- ⑨ METER BOX - DUAL SERVICE
- ⑩ 2" BRASS PLUG

DUAL METER BOX	WS 2.12	
SINGLE METER BOX	WS 2.10	
TYP. GATE VALVE	WS 1.0	
ITEM	CROSS REF.	SPEC. REF.

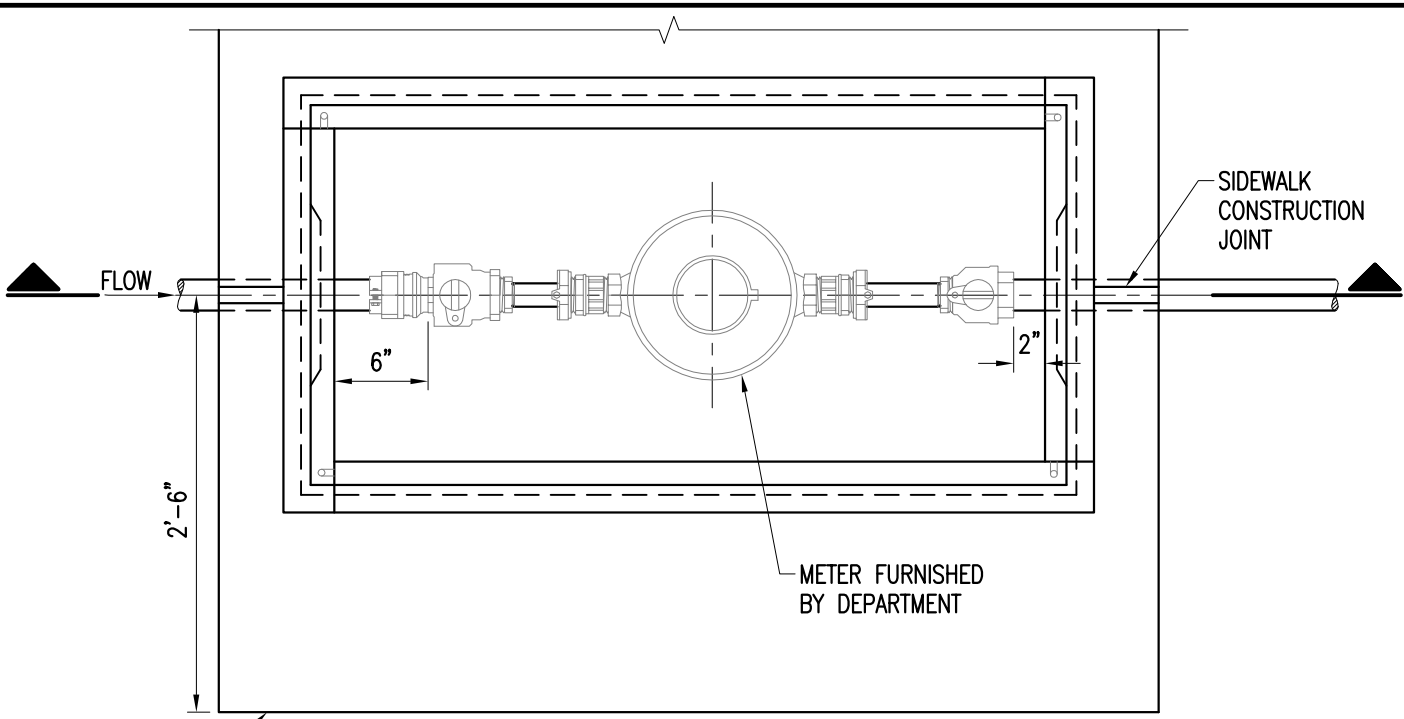


ISSUE DATE	APPROVED BY
11/01/2006	V.F.C.

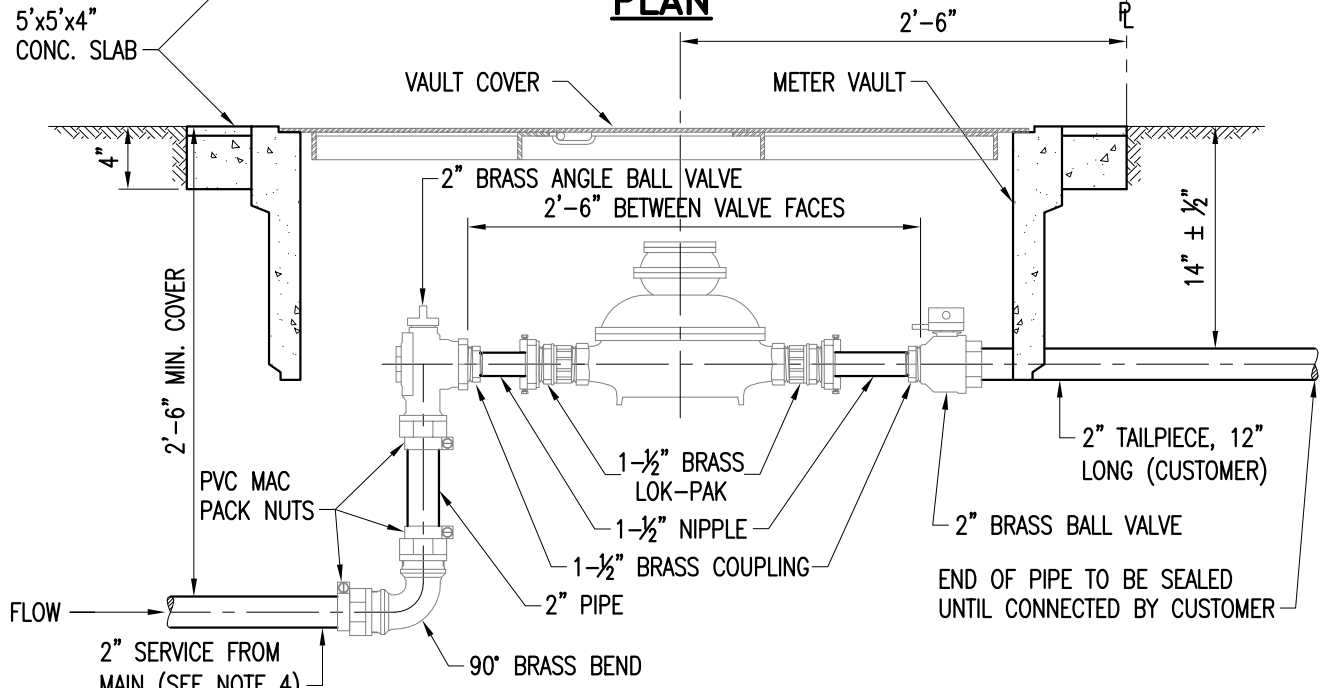
STANDARD DETAIL

METER BANK - 2" SUPPLY

WS
4.16
SHEET 1 OF 2



PLAN



SECTION

NOTES:

1. USE 2'x4' METER VAULT.
2. METER BOX TO BE IN 5'x5'x4" THICK CONCRETE SLAB WITH 6x6-W1.4xW1.4 W.W.M.
3. A TEN GAUGE DIRECT BURY STRANDED COPPER TRACER WIRE TO BE TAPED CONTINUOUSLY WITH POLY OR DUCT TAPE TO THE SERVICE FOR LOCATION PURPOSES. WIRE MUST BE ATTACHED TO RECLAIMED WATER MAIN AND EXTEND INTO THE METER BOX.
4. USE 2" BLUE COLOR HDPE FOR POTABLE WATER SERVICE. USE 2" PURPLE COLOR HDPE FOR RECLAIMED WATER SERVICE.
5. METERS WILL NOT BE INSTALLED IF THE METER BOX IS IN A DRIVING SURFACE.
6. FOR SIDEWALK CONDITIONS, METER BOX SHALL BE INSTALLED IN A SINGLE CONCRETE SIDEWALK FLAG.
7. ALL BRASS COMPONENTS SHALL BE MARKED "NL" MEETING THE S3874 AMENDMENT TO THE SAFE DRINKING WATER ACT.

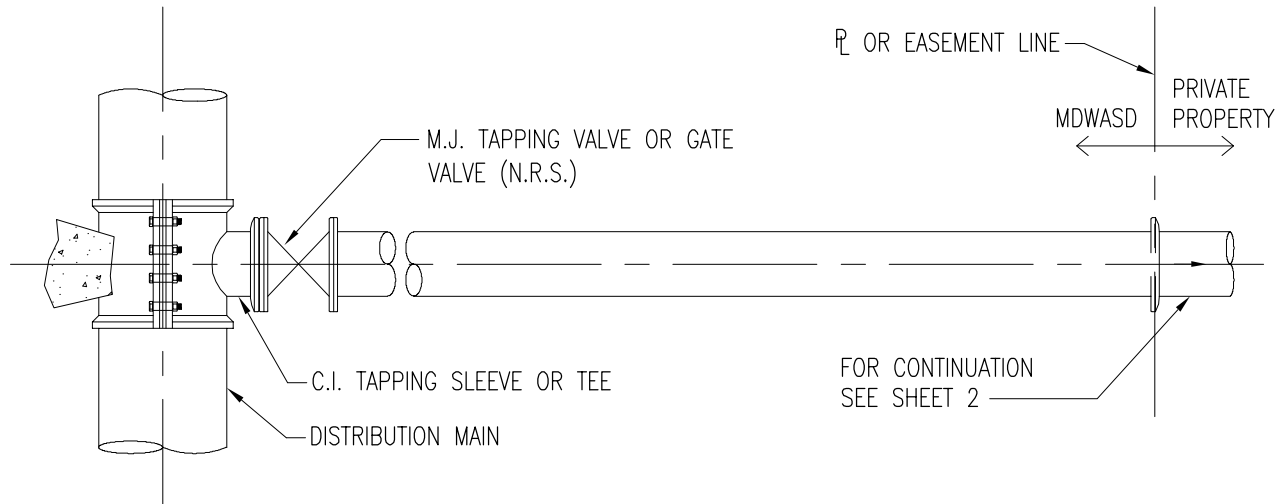
TYPICAL SERVICE PLAN	WS4.10	
2'x4' METER VAULT	WS2.17	
ITEM	CROSS REF.	SPEC. REF.



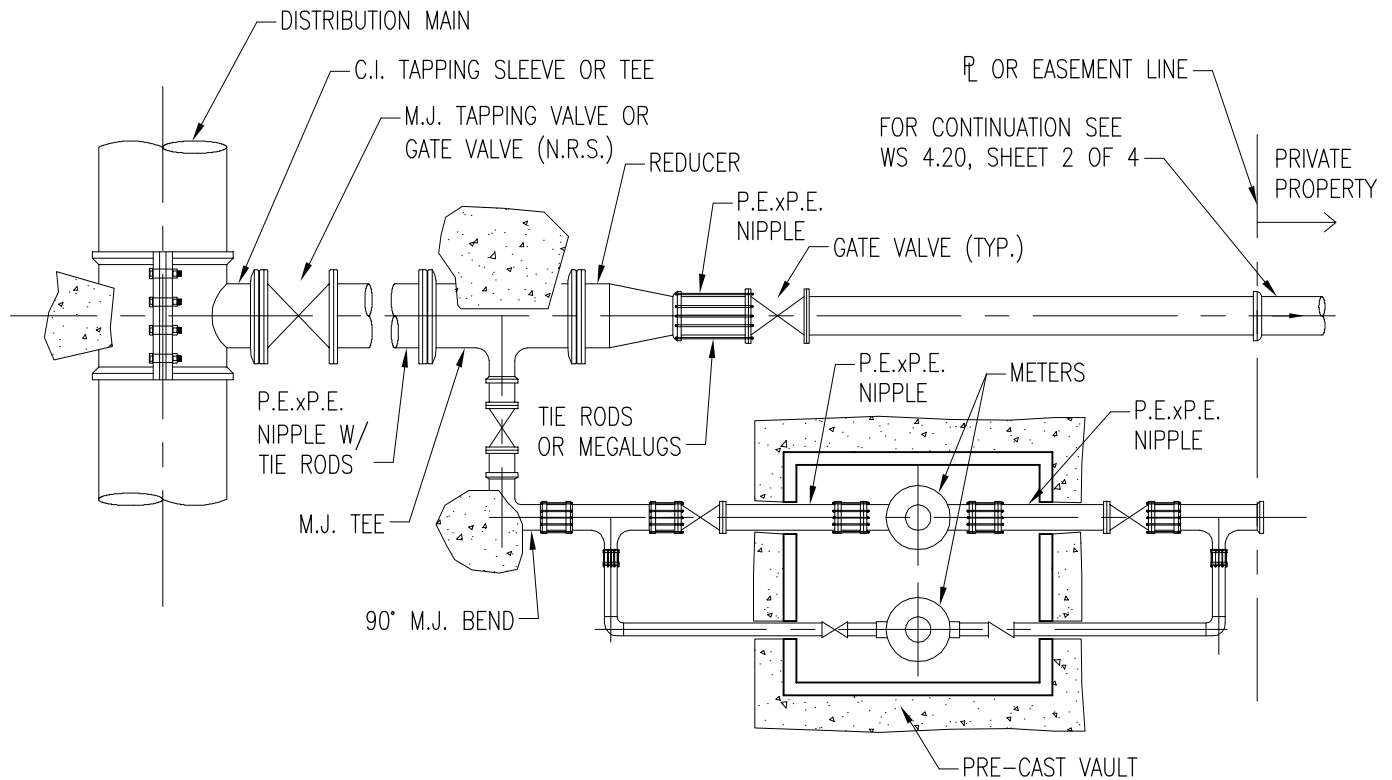
ISSUE DATE	APPROVED BY
5/31/2013	E.A.V.

STANDARD DETAIL
**TYPICAL 2" SERVICE
 INSTALLATION WITH A 1-1/2" METER**

**WS
 2.16**
 SHEET 2 OF 4



TYPICAL FIRE SERVICE CONNECTION TO MAIN



TYPICAL FIRE & DOMESTIC WATER CONNECTION TO MAIN

NOTES:

1. ALL EXPOSED METALLIC THREADS ARE TO BE COATED WITH BITUMASTIC PAINT AFTER INSTALLATION.
2. CONCRETE SLAB REQUIRED FOR SECTIONAL VAULTS ONLY.
3. FOR DETAILS OF TIE RODS, SEE DETAIL WS 1.10.
4. DOMESTIC SERVICES 1", 2" & 4" (PER WS 4.21).

4" x 4" VAULT	WS 2.20	
No. 2 & No. 3 VALVE BOX	WS 3.11	
CONC. ANCHORS	GS 1.1	
I T E M	CROSS REF.	SPEC. REF.

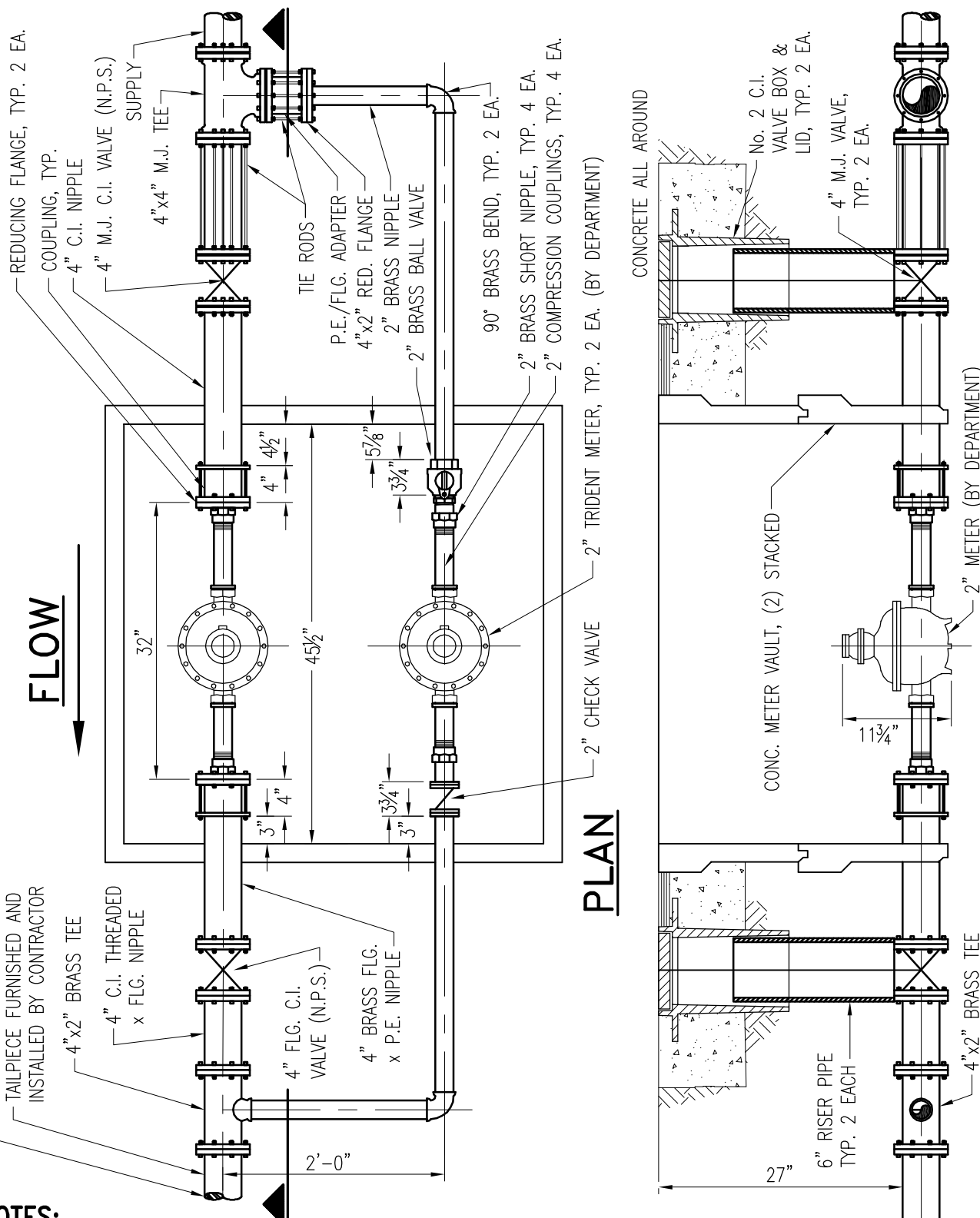


ISSUE DATE	APPROVED BY
10/05/2009	V.F.C.

STANDARD DETAIL

TYPICAL FIRE & DOMESTIC WATER SERVICE CONNECTIONS

WS
4.20
SHEET 1 OF 4



FLOW

PLAN

SECTION

NOTES:

1. ALL EXPOSED METALLIC THREADS ARE TO BE COATED WITH BITUMASTIC PAINT AFTER INSTALLATION.
2. USE 4' x 4' VAULT.
3. METERS WILL NOT BE INSTALLED IF THE METER BOX IS LOCATED ON A DRIVING SURFACE.
4. ALL SPACER TUBES AND TAILPIECES SHALL BE FURNISHED AND INSTALLED BY CONTRACTOR.

No. 2 VALVE BOX & LID	WS 3.10	
TIE RODS	GS 1.0	
CONC. ANCHORS	GS 1.1	
ITEM	CROSS REF.	SPEC. REF.



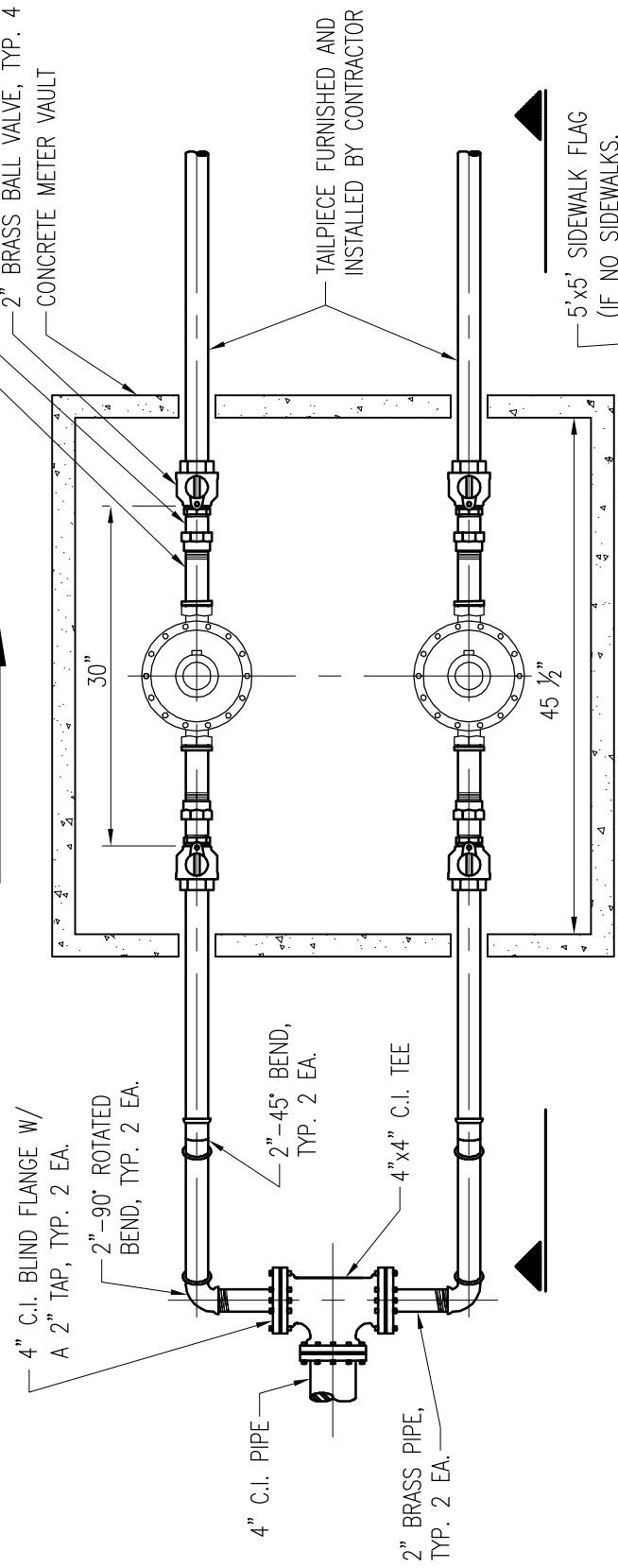
ISSUE DATE	APPROVED BY
10/05/2009	V.F.C.

STANDARD DETAIL
**DUAL 2" METER INSTALLATION
 FOR TYPICAL 4" DOMESTIC
 SERVICE LINES**

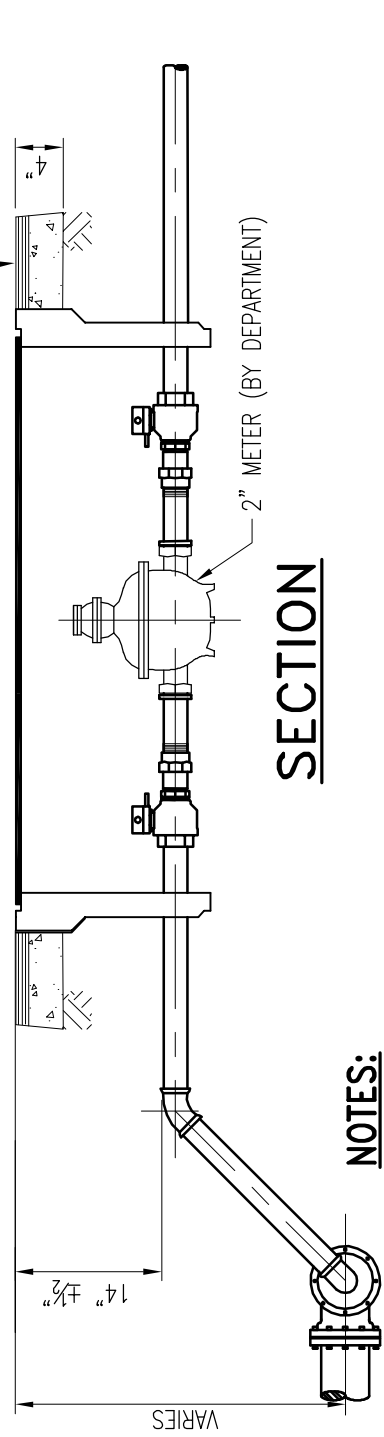
**WS
 4.21**
 SHEET 1 OF 2

- 2" LOK-PAK COUPLING, TYP. 4 EA.
- 2" GI. SHORT NIPPLE, TYP. 4 EA.
- 2" BRASS BALL VALVE, TYP. 4 EA.
- CONCRETE METER VAULT

FLOW



PLAN



SECTION

NOTES:

1. METER BOX TO BE IN 5'x5'x4" THICK CONCRETE SLAB WITH 6x6- W1.4 x W1.4 W.W.M.N.
2. ALL EXPOSED METALLIC THREADS ARE TO BE PAINTED WITH BITUMASTIC PAINT AFTER INSTALLATION.
3. USE 4'x4' VAULT.
4. ALL 2" PIPING TO BE SCH. 40 BRASS.
5. METER WILL NOT BE INSTALLED IF THE METER BOX IS LOCATED ON A DRIVING SURFACE.
6. ALL SPACER TUBES AND TAILPIECES SHALL BE FURNISHED AND INSTALLED BY CONTRACTOR.

No. 2 VALVE BOX & LID	GS 1.1	
ITEM	CROSS REF.	SPEC. REF.



ISSUE DATE	APPROVED BY
09/16/2008	V.F.C.

STANDARD DETAIL
**DUAL 2" METER INSTALLATION
 FOR TYPICAL 2" DOMESTIC
 SERVICE LINES**

**WS
 4.21
 SHEET 2 OF 2**