

# CLIFTON PARK WATER AUTHORITY

STANDARD SPECIFICATIONS

FOR

WATER DISTRIBUTION SYSTEMS



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CLIFTON PARK WATER AUTHORITY  
TOWN OF CLIFTON PARK, NEW YORK

STANDARD SPECIFICATIONS  
FOR  
FURNISHING AND INSTALLING  
DUCTILE IRON  
WATER DISTRIBUTION SYSTEMS  
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STANDARD SPECIFICATIONS FOR FURNISHING AND INSTALLING  
DUCTILE IRON WATER DISTRIBUTION SYSTEMS

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**CLIFTON PARK WATER AUTHORITY**  
**STANDARD SPECIFICATIONS FOR FURNISHING AND INSTALLING**  
**DUCTILE IRON WATER DISTRIBUTION SYSTEMS**

**1. GENERAL**

- A. No water mains, water services, or appurtenances shall be installed within the District except in conformance with these standards, except as specifically herein provided. The following specifications apply to all water mains and services installed on public or private property that are connected or intended to be connected directly or indirectly to the Clifton Park Water Authority System. All plans and specifications for such water mains and appurtenances shall be reviewed and approved in writing by the Clifton Park Water Authority and/or the Authority's Engineer prior to construction. The installation of all water mains and appurtenances shall also be approved by the Authority.
- B. Standard Detail Sheets 1 and 2 of the Clifton Park Water Authority supplement these specifications and shall be considered an integral part hereof.

**2. DEFINITIONS**

- A. As used in these specifications, the following words are defined:

- Authority - shall mean the Clifton Park Water Authority, Town of Clifton Park, New York. Whenever the words "ordered," "directed," "required," "approved," or "accepted" or variations thereof are used, they shall refer to action by the Water Board, its Chairman, Authority Administrator, the Authority's Engineer or their designated representative(s), unless otherwise specified.
- Owner - shall mean the party, such as a developer, who initiates and installs the water distribution system. In the case of water services, the Owner shall mean the applicant who applies for water service.
- Engineer - shall mean the licensed engineer, architect or surveyor who is employed by the Owner to design and the water distribution system and review material submittals.
- Contractor - shall mean the party who is employed by the Owner to actually construct the water distribution system.

- Authority's Engineer - shall mean the party retained by the Authority to review plans and observe the installation of water mains built by an Owner and his Contractor.
- Water Main - shall generally mean pipe six inches (6") diameter or larger supplying water as part of a system to one or more buildings.
- Water Services - shall generally mean pipe smaller than six inches (6") in diameter supplying water to one or more buildings.
- ANSI - American National Standards Institute
- AWWA - American Water Works Association

B. When ANSI or AWWA standards are referenced to in these standards, the date of the standard shall be that in effect at the time of plan approval by the Authority.

**3. DUCTILE IRON PIPE AND FITTINGS**

- A. All pipe for water mains six inches (6") through twenty-four inches (24") in diameter and for water services larger than two inches (2") in diameter shall be ductile iron pipe. All ductile iron pipe four inches (4") in diameter and larger shall be furnished in sixteen (16), eighteen (18) or twenty (20) foot nominal laying lengths.
- B. All ductile iron pipe shall be centrifugally cast in metal molds or sand-lined molds with all details of manufacture and supply in substantial conformance with ANSI/AWWA C151/A21.50. All ductile iron pipe shall be designed and selected in accordance with ANSI/AWWA C151/A21.50. All ductile iron pipe up through sixteen inches (16") in diameter shall have a minimum wall thickness equal to Class 52 per ANSI/AWWA C150/A21.50. In other sizes, pipe shall be designated for a 250 psi working pressure minimum.
- C. All pipe shall have push-on joints in complete conformance with ANSI/AWWA C111/A 21.11. The pipe manufacturer shall furnish the required rubber joint gaskets and joint lubricant. Two serrated brass wedges shall be installed at each push-on joint to ensure electrical conductivity along the pipe run.
- D. All ductile iron pipe for hydrant connections, minimum size six inches (6") in diameter, shall conform to the same specifications as given previously for main line ductile iron pipe; except that hydrant connection pipe shall have mechanical joints in complete conformance with ANSI/AWWA C111/A21.11. The pipe manufacturer shall furnish the required joint accessories consisting of ductile iron glands, Cor-ten steel tee-bolts and nuts coated with a fluorocarbon SC-1 coating as manufactured by Stanco or equal, and required joint lubricant.

- E. All pipe fittings shall be ductile iron, and shall be short body in complete conformance with ANSI/AWWA C153/A21.10. All fittings shall have a minimum pressure rating of 250 pounds per square inch (psi). All fittings shall have mechanical joints in complete conformance with ANSI/AWWA C111/A21.11. The pipe manufacturer shall furnish the required joint accessories consisting of ductile iron glands, Cor-ten steel tee-bolts and nuts coated with a fluorocarbon SC-1 coating as manufactured by Stanco or equal, rubber gaskets, and required joint lubricant.
- F. All ductile iron pipe and ductile iron fittings shall be cement mortar lined and paint seal coated in conformance with ANSI/AWWA C104/A21.4. The thickness of the lining shall be twice the standard and shall be not less than 1/8 inch thick for all pipe three inches (3") through twelve inches (12") in diameter. Fittings may also be supplied with Permafuse® or equal epoxy coatings on interior and exterior surfaces in accordance with ANSI/AWWA C104/A21.7.

#### **4. GATE VALVES AND VALVE BOXES**

- A. All gate valves and valve boxes for water mains six inches (6") through twelve inches (12") in diameter, including those for hydrant connections, and for water services larger than two inches (2") in diameter shall meet the same specifications. All such gate valves shall conform to ANSI/AWWA C509 or C515 and shall be suitable for a minimum working pressure of 250 psi after having been hydrostatically tested to 500 psi after manufacture. All valves shall open left with a standard two inch (2") square operating nut. All valves shall be furnished with mechanical joint ends complete with ductile iron glands, Cor-ten steel tee-bolts and nuts coated with a fluorocarbon SC-1 coating as manufactured by Stanco or equal, plain backed rubber gaskets, and required joint lubricant.
- B. All valves three inches (3") through sixteen inches (16") shall be resilient wedge, iron body, bronze mounted, non-rising stem, and shall be furnished with double O-Ring packings. All bolts shall be stainless steel.
- C. All gate valves shall be American Flow Control Series 2500, Mueller Model 2362 (less than or equal to 12") 2361 (greater than 12"), Clow Model F-6100 or AVK Model 25.
- D. All valves boxes shall be of cast iron, telescopic pattern, and five and one quarter inch (5<sup>1/4</sup>) in diameter. Valve boxes for valves three inches (3") through eight inches (8") shall have a twenty-six inch (26") top section and a thirty-six inch (36") bottom section, but in all cases and for valves larger than eight inches (8"), valve boxes shall be furnished to match the specific valve dimensions and trench depth involved.

- E. All valve boxes shall be furnished with a cast iron cover, drop style, with bolts the word "WATER" and an arrow indicating the direction of the valve opening (open left) cast on the cover in raised characters. Valve boxes shall be Clow F-2452 Model 664-A with a F-2490 cover, or approved equal. A gate box seat, equal or similar to Quality Water Products #45158 shall be placed on the valve for centering of box.
- F. Gate valve and valve box installation shall conform to the requirements on Sheet 1 of the Standard Detail Sheets. All hydrant leads shall incorporate a gate valve which in general, shall be located as far from the hydrant and as close to the main as possible. Gate valves at main line junctions shall be located four (4) ± feet away, measured center of the valve to center of the junction or fitting. Gate valves on ductile iron water services shall generally be located on the street line or property line or where required by the Authority. All gate valve locations shall be reviewed and approved by the Authority prior to valve installation and preferably during the design of the system. Tops of the valve boxes shall be set flush with grade in paved areas and set one inch (1") above grade in grassed areas. Valves buried greater than the standard valve key depth shall be provided with a valve stem extension at the time of installation to allow the valve to be operated with a standard length valve key.
- G. All valves and valve boxes larger than sixteen inches (16") in diameter shall be of a type approved by the Authority.
- H. Tapping sleeves shall be Ford All Stainless Tapping Sleeve Style FTSS, or approved equal.

## **5. FIRE HYDRANTS**

- A. All fire hydrants shall conform to ANSI/AWWA C502-85 with five inch (5") minimum main valve opening and six inch (6") minimum mechanical joint inlet connection furnished complete with ductile iron glands, Cor-ten steel tee-bolts and nuts coated with a fluorocarbon SC-1 coating as manufactured by Stanco or equal, plain backed rubber gaskets, and required joint lubricant. Hydrants shall be suitable for a five foot (5') deep trench. Each hydrant shall have two (2) two and one half inch (2<sup>1/2</sup>" ) hose connections and one (1) four and one half inch (4<sup>1/2</sup>" ) pumper connection, all with National Standard hose threads and with outlet nozzle caps and cap chains. All hydrants shall have double O-Ring packing, and shall open left with a National Standard five (5) sided operating nut measuring one and one half inch (1<sup>1/2</sup>" ) flat to point. The outlet nozzle cap nuts shall be the same as the operating nut.
- B. All fire hydrants shall be of break flange construction with a frangible break flange located slightly above the ground line and a cast iron break coupling on the stem at the same location, which shall be so designed that in case of breakage, only the break flange and cast iron coupling need be replaced to complete repair.

- C. All hydrants shall receive a finish coat of paint above the ground line after installation. Paint shall be weather resistant Sherwin Williams enamel, or approved equal. Hydrants shall be painted red including operating nut and nozzle caps. All hydrants shall be furnished completely shop primed or painted in the same color and pattern as that required above for the finish coat of paint. Shop primer or paint shall be chosen so as to be compatible with the type of finish paint specified above.
- D. All fire hydrants shall be American-Darling Model B62B-5, Kennedy Guardian or Mueller Super Centurion.
- E. Hydrant installation shall conform to the requirements on Sheet 1 of the Standard Detail Sheets. The type of hydrant installation shall be installed truly vertical at the locations set by the Authority and shall be carefully plumbed before the connection is made. Hydrants shall be set on a solid precast concrete slab at least twelve inches (12") square and four inches (4") thick; the concrete slab to be supported by firm undisturbed material or well consolidated fill. Crushed stone to a minimum depth and thickness of twelve inches (12") shall be placed around the drain up to a level at least six inches (6") above the drain to provide for hydrant drainage in previous soil, such as sand or gravel. In impervious soil, such as clay, a drainage pit two feet (2') in diameter and three feet (3') deep shall be excavated below each hydrant and filled completely with crushed stone under and around the bottom of the hydrant up to a level at least six inches (6") above the drain. In both cases, the top of crushed stone shall be completely covered with polyethylene or building paper to prevent the backfill from sifting down into the crushed stone drain. When required by the Authority because of evidence of high ground water, the hydrant drain opening shall be plugged to prevent the entrance of ground water. In this case, no crushed stone need be placed under the hydrant.
- F. All hydrants leads shall include a gate valve located as far from the hydrant and as close to the main as possible. Separate mechanical restraint shall be used to secure the hydrant to the valve and then the valve to the main line tee or other fitting. An anchoring fitting shall be the standard installation method used to restrain the hydrant valve to the main. From the valve to the hydrant, various means of hydrant restraint may be required. A mechanical joint anchoring pipe shall be the preferred method of hydrant restraint. Other types of hydrant restraint, if required by the CPWA, will be used to suit the specific installation. Retainer glands may be required. Mechanical joint retainer glands shall be ductile iron.
- G. All hydrant-lead-valve assemblies shall be blocked against movement with solid precast concrete blocks, or poured-in-place concrete blocks both behind the hydrant and behind the tee as shown on Sheet 1 of the Standard Detail Sheets. These blocks shall bear against undisturbed material.



- H. When required by the Engineer and/or Authority, hydrant guard posts shall be installed around hydrants as shown on Sheet 1 of the Standard Detail Sheets. These posts shall consist of a six inch (6") diameter piece of ductile iron pipe set vertically plumb four feet (4') in the ground with its tip extending six inches (6") above the top of the adjacent hydrant. The pipe shall be filled with crushed stone with the top twelve inches (12") of the pipe neatly capped with concrete. After installation, the portion of the guard posts above the ground line shall be painted in alternating six inch (6") wide red and white strips starting with red on top. Paint shall consist of a double coat of weather resistant enamel paint matching in type and color the finish paint coat on the hydrant.
- I. Hydrants shall be located within five feet (5') of the curb line of fire lanes, streets, private streets, when installed along such access ways, as specified in NFPA 1141-3-6.5 and at other locations when approved by the Authority.
- J. Hydrants shall be placed at least forty feet (40') from the building being protected.
- K. Hydrant marker shall be Hydra-Finder™ with bolt-on Mini-Flags™ by RoDon, or approved equal. The marker shaft shall be a 3/8 inch diameter fiberglass shaft five feet (5') long with reflective red and white color. The shaft shall be attached to a heavy duty zinc plated carbon steel or stainless steel spring that allows 360° movement. The unit shall attach to the hydrant bonnet with a 5/8 inch diameter bolt-on flat mounting bracket of zinc coated carbon or stainless steel. The fiberglass shaft shall be UV resistant. A bolt-on Mini-Flag™ visibility enhancer 4" x 5" shall be bolted to the top of the fiberglass shaft.

## **6. WATER SERVICES**

- A. Water services 1, 1<sup>1/4</sup>, 1<sup>1/2</sup>, and 2 inch in diameter shall be installed on public property or right-of-way by the Contractor, extending from the water main to the property or right-of-way line. Refer to Sheet 1 of the Standard Detail Sheets for installation details.
  - (1) The complete one inch (1") through two inch (2") water service shall consist of the tap, corporation stop, service clamp or tapped tee if required, HDPE (High-Density Polyethylene) service pipe and fittings, tracer wire and curb stop and box. Taps will generally be made by the Authority or a Contractor approved by the Authority after the main has been tested, accepted and placed in service. If tapped tees are used in lieu of taps, the tapped tees shall be supplied by the Owner and installed by the Contractor. HDPE service pipe shall be run in trenches with five feet (5') depth of cover minimum, as measured from finished grade. The curb stop and box shall

generally be located on the property or right-of-way line with the top of the curb box set one inch (1") above grade in grassed areas and set flush with grade in paved areas.

- (2) Water services of 1<sup>1/2</sup> inches through two inches (2") shall be connected to the main through the use of service clamps or tapped tees in accordance with Sheet 1 of the Standard Detail Sheets.
- (3) Methods used for service connections to existing mains in the water system shall be approved in advance by the Authority.
- (4) The charges for installation of water services by the Authority are explained in "Clifton Park Water Authority Water Service Fee Schedule."

B. Water services larger than two inches (2") in diameter in any location shall be furnished and installed by the Owner completely at his own expense. For installation details, refer to Sheet 1 of the Standard Detail Sheets.

- (1) The complete larger than two inch (2") water service shall generally consist of a main line tee or tapping sleeve and valve, ductile iron service pipe and fittings and standard gate valve and valve box. Such ductile iron service pipe and fittings shall meet the same specifications as given previously in Section 3 for the main line pipe and fittings, and shall be installed in a trench that provides at least five feet (5') of cover or more over the barrel of the pipe, all as measured from finished grade.
- (2) The standard gate valve and valve box shall located on the property or right-of-way line or where required by the Authority. The gate valve and valve box shall meet the same specifications as given previously in Section 4 for main line valves and valve boxes.
- (3) The exact configuration of these water services larger than two inches (2") in diameter shall be reviewed and approved by the Authority prior to their construction.

C. The portion of a water service of any size on private property shall be furnished and installed by the Owner completely at his own expense. All such services shall meet all the same material and installation details as given in these specifications for other water services. Installation details shall be reviewed and approved by the Authority before the service is installed.

## **7. HDPE SERVICE PIPE AND FITTINGS**

A. All water services 1, 1<sup>1/4</sup>, 1<sup>1/2</sup> and 2 inch in diameter shall be made with HDPE service pipe of the same diameter. No other size below

two inch (2") shall be allowed. All HDPE service pipes shall be Pressure Class 200 tubing conforming to ASTM Specification D3350. Continuous lengths from the curb stop to the interior of the building are required, where available, with no couplings along the pipe run. HDPE service pipe shall have the following dimensions:

Nominal Pipe Size (Inches)	Outside Diameter (Inches)	Min. Wall Thickness (Inches)
1"	1.125"	0.125
1 <sup>1</sup> / <sub>4</sub> "	1.375"	0.153
1 <sup>1</sup> / <sub>2</sub> "	1.625"	0.181
2"	2.125"	0.236

- B. Fittings for one inch (1") HDPE service pipe shall have compression type connections with thaw nuts and screws for conductivity. Three (3) part unions for HDPE to HDPE shall be Mueller H-15403 or McDonald 4758Q. Other fittings as required shall be Mueller or McDonald items of the same series.
- C. Fittings for 1<sup>1</sup>/<sub>4</sub> inch, 1<sup>1</sup>/<sub>2</sub> inch and 2 inch HDPE service pipe shall have compression type connections with thaw nuts and screws for conductivity. Three (3) part unions for HDPE to HDPE shall be Mueller H-15403 110 Compression Connections or McDonald 4758Q Compression Connections. Other fittings as required shall be Mueller or McDonald items of the same series.

## **8. CORPORATION STOPS**

- A. One inch (1') corporation stops shall be ball valves and have compression connections with thaw nuts and screws for conductivity, and shall be Mueller B-2500807 or McDonald 4701BQA, both with AWWA inlet threads.
- B. 1<sup>1/4</sup> inch, 1<sup>1/2</sup> inch and 2 inch corporation stops shall be ball valves and have compression connections with thaw nuts and screws for conductivity, and shall be Mueller B-2500807, or shall be McDonald 4701BQA. Both corporation stops have AWWA taper inlet threads.
- C. When tapped tees are used that have iron pipe thread taps, Mueller B-2500807 or McDonald 4704BQA corporation stops with iron pipe inlet threads may be used for 1 inch, 1<sup>1/2</sup> inch and 2 inch sizes.
- D. Whether tapped in or used with tapped tees, corporation stops shall be installed tilted up at about fifteen (15) degrees from horizontal so that a partial loop can be formed in the service pipe to allow for possible differential movement of the service pipe and main. A minimum of 4<sup>1/2</sup> feet of cover below finished grade shall be maintained over the top of the partial loop in the service pipe.
- E. Multiple corporation stops for use with branch connections shall be installed eighteen inches (18") on center measured along the main and shall be staggered off-line around the circumference of the main.
- F. Corporation stop taps larger than the maximum tap size allowable in the main shall not be made. AWWA and DIPRA (Ductile Iron Pipe Research Association) recommendations shall be followed. Consideration shall be given to minimum pipe wall thickness required for each tap size to ensure a serviceable threaded connection. Service conditions should indicate the extent of full-thread engagement necessary. As a guide, tap size should be limited so that at least three (3) full threads of the corporation stop are engaged in the pipe wall for ductile iron pipe.

## **9. TRACER WIRE**

- A. Tracer wire shall be #10 AWG high-strength copper-clad steel conductor with high-density, high molecular weight polyethylene (HDPE) insulation, such as Copperhead #10 CCS Reinforced Tracer Wire, Pro-Line Pro-Trace HF-CCS PE30, or approved equal. Jacket color shall be blue.
- B. Except for approved splice connections, tracer wire shall be continuous and without splices from valve to valve. If necessary to splice or repair tracer wire, connection shall be made using connectors designed to displace moisture, such as Copperhead Locking SnakeBite, DryConn Direct Bury Lug Aqua connectors, or approved equivalent.

- C. Bare ends of tracer wire shall be enclosed with waterproof connectors, such as DryConn King 6 Blue Connectors or approved equal.
- D. Tracer wire shall be installed on all non-metallic water services. The wire shall be installed in such a manner as to be able to properly trace the entire water service without loss or deterioration of signal, or without the signal migrating off the tracer wire. For installation details, refer to Sheet 3 of the Standard Details.
- E. Tracer wire shall be laid flat and securely affixed to each fitting using the included bonding screws on the thaw nuts, and to the pipe in the three o'clock position at intervals of no more than 40 inches using non-adhesive silicone tape.
- F. Tracer wire shall be protected from damage during excavation or backfilling of the service line. No breaks or cuts in the tracer wire or tracer wire insulation shall be permitted.

## **10. CURB STOPS AND BOXES**

- A. Curb stops for one inch (1") HDPE service pipe shall be non-draining Mueller B-2520907 or McDonald 6100QA with compression connections with thaw nuts and screws for conductivity. The curb stops shall be set on a solid concrete block. Curb boxes for these curb stops shall be of the extension type with a stationary stainless steel rod and arch pattern base suitable for a five foot (5') deep trench and having a one inch (1") inside diameter upper section. Curb boxes shall be Mueller H-10314, 5<sup>1/2</sup> feet extended length telescoping to 4<sup>1/2</sup> feet, with matching stainless steel stationary rods and #88982 lids. As an alternate, curb boxes may be McDonald 5601, 4<sup>1/2</sup> feet to 5<sup>1/2</sup> feet adjustment, with matching stationary stainless steel rods and two (2)-hole covers.
- B. When either of these Mueller or McDonald curb boxes for one inch (1") services are installed in concrete or paved surfaces, cast iron curb box sleeves shall be installed to allow freedom of movement of the ground key lid. Curb box sleeves shall be Mueller H-10342 or McDonald 5639.
- C. Curb stops for 1<sup>1/4</sup> inch, 1<sup>1/2</sup> inch and 2 inch copper service pipe shall be non-draining McDonald 6100Q or Mueller B-25209 with Compression Connections. The Mueller curb stops shall be set on a concrete block. Curb boxes shall be Mueller H-10306, with 1<sup>1/4</sup> inch inside diameter upper section, 5<sup>1/2</sup> feet extended length telescoping to 4 feet 8<sup>1/2</sup> inches, with matching stainless steel stationary rods and #88982 lids and plugs. As an alternate, curb boxes may be McDonald 5600, 4<sup>1/2</sup> feet to 5<sup>1/2</sup> feet adjustment, with matching stainless steel stationary rods and two (2)-hole covers. When

installed in concrete or paved surfaces, these curb boxes do not require curb box sleeves.

- D. Stainless steel stationary rods for all curb stop/curb box installations shall be ½" diameter minimum.

## **11. WATER METERS**

- A. Water service to all connections to the Authority's water system, whether such service be in public or private Ownership, shall be metered. Water meters for all water services must be purchased from the Authority.
- B. All water meters one inch (1") or smaller shall be installed by the Authority.
- C. All water meters larger than one inch (1") in size shall be supplied by the Authority, installed by the Owner and the installation shall be approved by the Authority. The Authority shall determine the type of meter (i.e. disc, turbine or compound) required for the proposed service. Installation details shall be reviewed and approved by the Authority before the work is done. All water meter installations larger than four inch (4") shall have a bypass line of equal size.
- D. Water meters shall be located in the basement or mechanical/utility room if one is available. The water meter shall be placed where the water service line comes through the basement wall or basement floor. Where no basement is provided, the meter shall be placed where the service line comes through the wall or floor of the mechanical/utility room. All water meters installed within buildings shall be in a horizontal position, a minimum of 18 inches, but no more than 42 inches, from where the water service first penetrates the floor or wall of the structure. The base of a single water meter shall be set at a height of not less than 12 inches, and not more than 42 inches above the floor surface. Meters shall be indoors and protected from freezing and other damage. No meters shall be installed in a crawl space under a residence. A meter pit may be installed outside the residence if the meter cannot be installed in the basement or mechanical/utility room. All meters shall be accessible to the Authority for inspection and reading.

## 12. INSTALLATION OF WATER SYSTEMS

- A. In addition to the various miscellaneous installation requirements given in preceding sections of this specification, all water distribution system installation shall be done in accordance with ANSI/AWWA C600 recommendations. Also, all work shall be done in accordance with the requirements of the Authority.
- B. Trenches shall be open cut from the surface deep enough to provide a minimum of five feet (5') of cover over the barrel of the pipe from finished grade. Trenches should be wide enough to provide at least six inches (6") of clearance on each side of the bell of the pipe. The maximum trench width at the top of the pipe shall be no greater than the nominal pipe size or diameter plus twenty-four inches (24"). Refer to Sheet 2 of the Standard Detail Sheets for standard trench details.
- C. All pipe and fittings shall be laid on good foundations trimmed to shape, and where required, secured against settlement, all in a manner to provide full support for the entire length of pipe. At the joints, enough width and depth, including bell holes, shall be made to permit proper jointing. Blocking support of pipe shall not be permitted unless the pipe is to be laid with a concrete cradle or encasement or inside a tunnel or casing pipe. When pipe is laid in tunnels or casings, the pipe shall be blocked in such a manner so as to take the weight off the bells. Sufficient selected bedding and backfill shall be placed or other precautions taken to prevent flotation, movement, or damage to the pipe, fittings and coatings.
- D. Standard pipe installation in trench in earth shall conform to ANSI/AWWA C600 laying Condition Type 2 with the pipe laid on a flat or slightly shaped natural trench bottom with bell holes and tamped pipe zone backfill up to the springline of the pipe. Excavation to grade and backfilling shall be in accordance with ANSI/ AWWA C600. When backfilling use satisfactory excavated material, or sand, gravel or other special trench backfill as required by the Engineer. The backfill shall be brought by hand or approved mechanical means to a depth of 1 foot (1') over the pipe to provide a cushion and prevent movement and damage to the pipe during subsequent backfilling with equipment.
- E. An Alternate pipe installation for trench in earth, when ordered by the Authority's Engineer, shall conform to ANSI/AWWA C600 Laying Condition Type 4 with the pipe bedded in tamped and shaped select bedding material to a depth of 1/8 of the pipe diameter or a four inch (4") minimum, whichever is greater, followed with tamped pipe zone backfill up to the top of the pipe. This installation method shall be used to secure better support for the pipe and/or to replace unstable trench bottoms with sound material. Excavation below grade and select bedding shall be in accordance with Section 3.2 of ANSI/AWWA C600. Select bedding material shall consist of

compacted sand, gravel, or crushed stone depending on conditions. Backfilling shall be the same as above.

- F. The Standard pipe installation for trench in rock shall conform to ANSI/AWWA C600 Laying Condition Type 4 with the pipe bedded in tamped and shaped select bedding material to a depth of 1/8 of the pipe diameter or a four inch (4") minimum, whichever is greater, followed with tamped pipe zone backfill up to the top of the pipe. Rock excavation below grade and select bedding shall be in accordance with Section 3.2 of ANSI/AWWA C600. Ledge rock, boulders, and large stones shall be removed to provide a clearance of at least six inches (6") below and on each side of all pipe (including bells), valves, and fittings. Such excavated rock shall be replaced with select compacted bedding material, generally sand, gravel, or crushed stone, depending on conditions. Backfilling shall be the same as above.
- G. All trench excavation and any required sheeting and shoring shall be done in accordance with the latest revisions of the following codes: Subpart 23-4 "Excavation Operations" of the New York State Department of Labor Industrial Code Rule 23, and Subpart P, "Excavations, Trenching and Shoring" of the U.S. Department of Labor OSHA Regulations for Construction. The more stringent requirement in each code shall apply.
- H. Proper and suitable tools and equipment for convenient and proper handling and laying of pipe and fittings shall be used. Great care shall be taken to prevent entrance of dirt or foreign matter into the pipe and to prevent damage of pipe lining and coating. Open ends of pipes shall be kept plugged or bulkheaded during construction.
- I. No defective materials shall be used or installed.
- J. Whenever pipes require cutting to fit into other lines, the work shall be done with approved cutting tools specifically designed to cut pipe, so as to leave a smooth end at right angles to the axis of the pipe. The cut end shall be ground or filled to a slight taper so as not to damage rubber gaskets. The spigot ends of pipe shall be installed at the correct depth in the bells with a rubber gasket.
- K. When making plain end connections with a sleeve on six inch (6") diameter pipe, ends shall butt together or a filler piece or pipe stop shall be installed between the ends.
- L. In order to be accepted by the Authority, all valve boxes and curb boxes shall be clean, shall be set squarely down on the valve or curb stop, shall be centered and plumb over the wrench nut of the valve or operating rod of the curb stop, and shall not be over extended. All valves and curb stops shall be suitably marked and adequately protected during construction.



- M. Water mains shall be installed at least ten feet (10') horizontally from any existing or proposed sanitary sewer. The distance shall be measured from edge to edge. In cases where it is not practical to maintain a ten foot (10') separation, the water main may be installed closer to the sanitary sewer provided that the water main is laid in a separate trench or on an undisturbed earth self located on one side of the sanitary sewer at such an elevation that the bottom of the water main is at least eighteen inches (18") above the top of the sanitary sewer. Water mains crossing sanitary sewers shall be installed to provide a minimum vertical distance of eighteen inches (18") between the outside of the water main and the outside of the sanitary sewer. This shall apply whether the water main crosses above or below the sanitary sewer. For all crossings, one full length of water main pipe shall be located so that each joint shall be as far away as possible from the sanitary sewer. Special structural support of the water main and sanitary sewer may be required as conditions dictate.

### DUST CONTROL

- N. In order to control dust conditions during the water main construction, the Contractor shall furnish and apply either water or calcium chloride. When water is used on streets or roads, it shall be applied uniformly with a pressure distributor spray bar or by other approved equipment. When water is used on areas that shall be sodded or seeded later, it shall be free from acids, oils, salts, or any other substances injurious to plant growth. Calcium chloride shall be in accordance with ASTM Standard D98 and shall be delivered in unopened, waterproof bags. It shall be applied to unpaved streets, roads, driveways or other areas at such times as directed by the Engineer. It shall be applied uniformly after the surface has been thoroughly watered as specified above.

### **13. THRUST BLOCKING AND RESTRAINT**

- A. All plugs, caps, tees, bends and other fittings shall be provided with concrete thrust blocking to resist test pressures or shall be prevented from moving by using suitable metal rods or clamps. Refer to Sheet 2 of the Standard Detail Sheets for typical concrete thrust block details. All concrete to be 3,000 psi and shall be placed around the fittings to completely fill the space between the fittings and the undisturbed walls of the trench. Concrete shall not overlap any joint and shall be placed so as not to interfere with removing or installing any of the jointing hardware.
- B. Other means of thrust restraint utilizing anchoring fittings and retainer glands may be used where appropriate. These thrust restraint options shall be as previously described for use with hydrants in Section 5 of these specifications and as illustrated on Sheet 1 of the Standard Detail Sheets.

- C. Foster Adaptors® may also be used to provide restraint at mechanical joint fittings and valves.

**14. PROTECTION FROM CORROSION**

- A. Pipelines constructed of ductile iron pipe and fittings shall be protected from external corrosion through the use of polyethylene encasement.
- B. Installation of polyethylene encasement shall be done in accordance with AWWA C105, unless the manufacturer’s recommendations dictate otherwise.

**15. CONNECTION TO EXISTING SYSTEMS**

- A. Connections to existing systems shall be reviewed and considered on an individual basis with the Authority or the Authority's Engineer. In general, connections shall be made with a minimum of, or no disruption to, water service in the existing system.

**16. TEMPORARY PLUGGING**

- A. At times when pipe laying is not actually in progress, the open ends of the pipes shall be closed temporarily with pipe plugs or by other means. If water is in the trench when work is resumed, the trench shall be dewatered and the plugs shall not be removed until all danger of water entering the pipe is past.

**17. CLEANING LINES**

- A. At the conclusion of the work, the Contractor shall thoroughly clean all new pipes by flushing with water or other means to remove all dirt, stones, pieces of wood, etc., which may have entered during the construction period. If, after this cleaning, any obstructions remain, they shall be removed to the satisfaction of the Engineer and the Authority. Pipes shall be flushed at a rate of 2.5 feet per second for a duration suitable to the Engineer and the Authority. The rates of flow required to produce 2.5 feet per second flushing velocity in different sizes of pipe are as shown in the following table:

<u>Pipe Size (Inches)</u>	<u>Flow Required to Produce 2.5 FPS Velocity (Gallons per Minute)</u>	<u>Hydrant Opening Required at 40 PSI Residual</u>
4	100	one - 2 <sup>1/2</sup> "
6	220	one - 2 <sup>1/2</sup> "
8	390	one - 2 <sup>1/2</sup> "

**18. HYDROSTATIC TESTING** - (Testing shall be done within seventy-two (72) hours of conclusion of installation.)

- A. Hydrostatic acceptance tests, consisting of a pressure test and a leakage test, shall be performed on all sections of all water systems installed after the trench has been backfilled. Hydrostatic presumptive tests may be performed when the system is partially backfilled to simply check the work, but acceptance of the system shall be based on hydrostatic tests run on the finished system after it is completely backfilled. All hydrostatic tests shall be performed in accordance with Section 4 of ANSI/AWWA C600.
- B. For the pressure test, the system shall be pressure tested by pressurizing to a minimum of one hundred and fifty (150) pounds per square inch or one and one-half times the working pressure whichever is greater, based on the elevation of the lowest point in the section under test and corrected to the elevation of the gage. Provisions shall be made to relieve air trapped at high points in the system through adjacent hydrants or through taps and corporation stops installed for this purpose by the Contractor. After this pressure has been maintained successfully, with further pumping as required, for a period of at least one (1) hour, the section under test shall be considered to have passed the pressure test and leakage tests shall then be performed.
- C. Leakage tests shall be performed under a minimum test pressure of 150 pounds per square inch or one and one-half times the working pressure whichever is greater, based on the elevation of the lowest point of the section under test and corrected to the elevation of the gage. The test section should be limited to a maximum length of about 2,000 feet. The leakage test duration shall be a minimum of two (2) hours after the leakage rate has stabilized.
- D. The maximum allowable leakage for a two (2) hour test per 1,000 feet length of different sizes and nominal laying lengths of pipe shall be as shown in the following table:

Pipe Size (Inches)	Allowable Leakage at 150 PSI (Gallons per Two Hours per 1,000 Feet of Pipe)
3	0.56
4	0.74
6	1.10
8	1.48
12	2.20

- E. All water for tests shall be furnished and disposed of by the Contractor at his own expense. Source and/or quality of the water which the Contractor proposed to use in testing the lines shall be acceptable to the Engineer and the Authority.

**19. STERILIZATION**

- A. All pipes and fittings connected to and forming a portion of a potable water supply shall be sterilized and flushed in a manner acceptable to the Engineer and the Authority. Sterilization shall be accomplished after the pipe has passed the pressure and leakage tests.
- B. Sterilization shall be performed in accordance with ANSI/AWWA C656 (excluding Section 5.1 covering the tablet method). Sterilization shall be accomplished by applying a chlorine solution that will give a fifty (50) ppm chlorine residual throughout the main being disinfected. The chlorine solution shall remain in the water mains for a minimum period of twenty-four (24) hours. At the termination of this period, the chlorine residual shall be a minimum of twenty-five (25) ppm. If the residual is less than twenty-five (25) ppm, the entire procedure shall be repeated. The chlorine solution shall be thoroughly flushed out prior to placing the new section of the main in service. The chlorine solution shall be disposed of in a manner that will in no detrimental way affect fish, plant, or animal life.
- C. After the water mains have been flushed with potable water to the satisfaction of the Engineer and the Authority, samples of water from the mains shall be taken by the Authority for bacteriological analysis.
- D. The number of samples and their collection points shall be reviewed with and be acceptable to the Authority. Also, the testing laboratory that will do the bacteriological analysis shall be as designated by the Authority. As a minimum two (2) water samples taken on consecutive days at each location tested shall test bacteriologically safe before the water mains are placed in service.

**20. TIME OF CONSTRUCTION**

- A. Unless specifically approved by the Authority In writing, no water distribution system installation and construction shall take place during the winter months from November 1st through April 1st.

**21. RECORD MAPS AND CERTIFICATION**

- A. At the conclusion of the water system installation, the Engineer shall prepare detailed record maps of the completed water distribution system. These records maps shall be of a form acceptable to the Authority. The Engineer shall furnish at least two (2) complete sets of 22" x 34" prints of these record drawings to the Authority. An

electronic copy of the record drawings in TIFF format shall also be provided to the Authority.

- B. Also at the conclusion of the water system installation, the Engineer is required to furnish to the Authority, an Engineer's Certification stating that the water system is complete and was installed in accordance with the previously submitted and approved plans and specifications. The Authority will submit a copy of the Engineer's Certification and a copy of the laboratory bacteriological analysis to the regional office of the New York State Department of Health.
- C. As an alternate, the Authority may have the Authority's Engineer observe construction and prepare record maps.

**22. WATER DISTRICT CONTROL**

- A. All installation and construction of all water mains and services installed in public or private property that are connected directly or indirectly to the Authority system shall be subject to the control of the Authority.
- B. Operation of all valves and hydrants under pressure shall be done only by representatives of the Authority or by such responsible person approved by the Authority.
- C. The Authority shall be notified at least twenty-four (24) hours prior to the start of making connections to the existing systems. Also, the Authority shall be notified at least twenty-four (24) hours prior to the start of pressure testing, leakage testing and sterilization.
- D. The Authority will not authorize any meter installations, in any subdivision, prior to receiving record drawings and certifications.
- E. Fire department personnel may operate hydrants in emergency situations, during drills and during training exercises. The Authority shall be notified forty-eight (48) hours in advance of all non-emergency use and as soon as possible when hydrants are used in an emergency.

**23. FEES FOR REVIEW AND CONSTRUCTION OBSERVATION**

- A. The Owner shall be responsible for all costs associated with plan review and construction observation by the Authority's Inspector or designated Inspecting Engineer.

**24. CONFORMANCE WITH REGULATIONS**

- A. It is intended that these Standard Specifications conform in all ways with the regulations and requirements of the New York State Department of Health and NFPA. In cases where discrepancies exist, Health Department Regulations shall govern.

**25. OWNERSHIP OF WATER DISTRIBUTION SYSTEM**

- A. All water mains, fittings and valves larger than six inches (6") in diameter and all hydrants shall be owned by the Authority after their construction by the Owner and their inspection and acceptance by the Authority. Such facilities shall be located in public right-of-way or in easements granted to the Authority.
- B. All water services of any size from the main up to and including the curb stop, shall be owned by the Authority. Such facilities shall be located in public rights-of-way or in easements granted to the Authority.
- C. All water meters, with the exception of commercial irrigation meters, shall be owned and maintained by the Authority.
- D. Any check valves or backflow prevention devices required on a water service due to the Owner's, the Authority's or code requirements, shall be owned and maintained by the Owner.
- E. Any pressure regulating valves required on a water service due to distribution system pressures shall be owned and maintained by the Owner.

**26. DUCTILE IRON WATER MAIN INSTALLED BY DIRECTIONAL DRILLING OR WITHIN CASED BORES**

- A. Ductile iron water main may be installed by directional drilling or within a casing boring when conventional excavation techniques for installation are not allowed (i.e. County and State Road crossings for example) or where ground conditions are difficult (i.e. open water, wetland areas).
- B. Either method may be used but the requirements of this section must be followed at a minimum.
- C. For directional drilling the following material and installation requirements apply.
  - 1. TR Flex Pipe by US Pipe or equal shall be used for directional drilling.
  - 2. The maximum pulling force and joint deflection allows during directional drilling is as follows for TR Flex Pipe.

Pipe Diameter (Inches)	Maximum Pulling Force (Pounds)	Maximum Joint Deflection (Degrees)
4	8,100	5

6	16,800	5
8	28,900	5
12	61,500	5
16	107,000	3 <sup>1/4</sup>
20	164,800	2 <sup>3/4</sup>
24	235,200	2 <sup>1/4</sup>

3. All pipe installed by directional drilling shall be double polyethylene encased. The polyethylene encasement shall meet the requirements of ANSI/AWWA C105/A21.5. The polyethylene encasement shall be protected from damage during the pulling operation by the use of a sand cushion, filter fabric or other means.
4. The pipe may be preassembled or installed via the cartridge method of installation.
5. The pipe shall be installed in general conformance with the procedures outlined in the publication "Horizontal Direction Drilling with Ductile Iron Pipe" by DIPRA.

D. For ductile iron pipe installation within cased bores plans and details showing the location of the boring pits, receiving parts and cased bored shall be submitted to the Authority's Engineer for review and approval. The following material and installation requirements shall apply.

1. Casing pipe shall be seamless steel pipe per ANSI/ASTM A252 with continuous butt welded pipe seams.
2. Casing pipe shall have a thickness equal to or greater than the minimum required by the regulatory Authority governing the installation. The minimum casing pipe size and thickness allowed for use with ductile iron carrier pipe is as follows:

Water Main Diameter (Inches)	Maximum Casing Diameter (Inches)	Casing Wall Thickness (Inches)
4 - 12	24	1/4
16	30	5/8
20	36	7/16
24	42	1/2

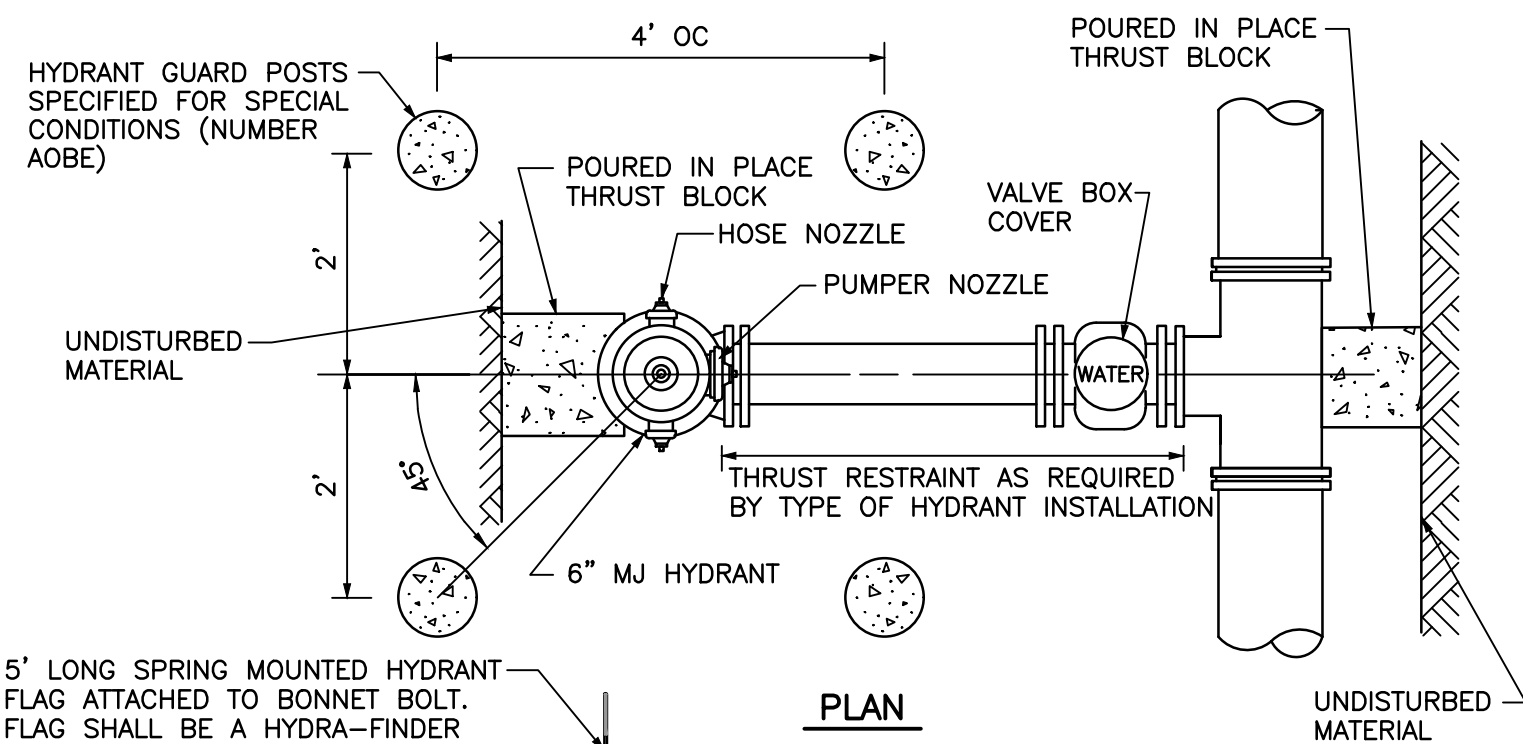
3. The carrier pipe shall be supported on two (2) sets of skids strapped to the pipe for each length of pipe.

4. Casing pipes shall be installed a minimum of five feet (5') below the top of the road surface.
5. Casings shall be filled with pea stone and shall be bricked up at each end with weep holes, after the pipe is installed.

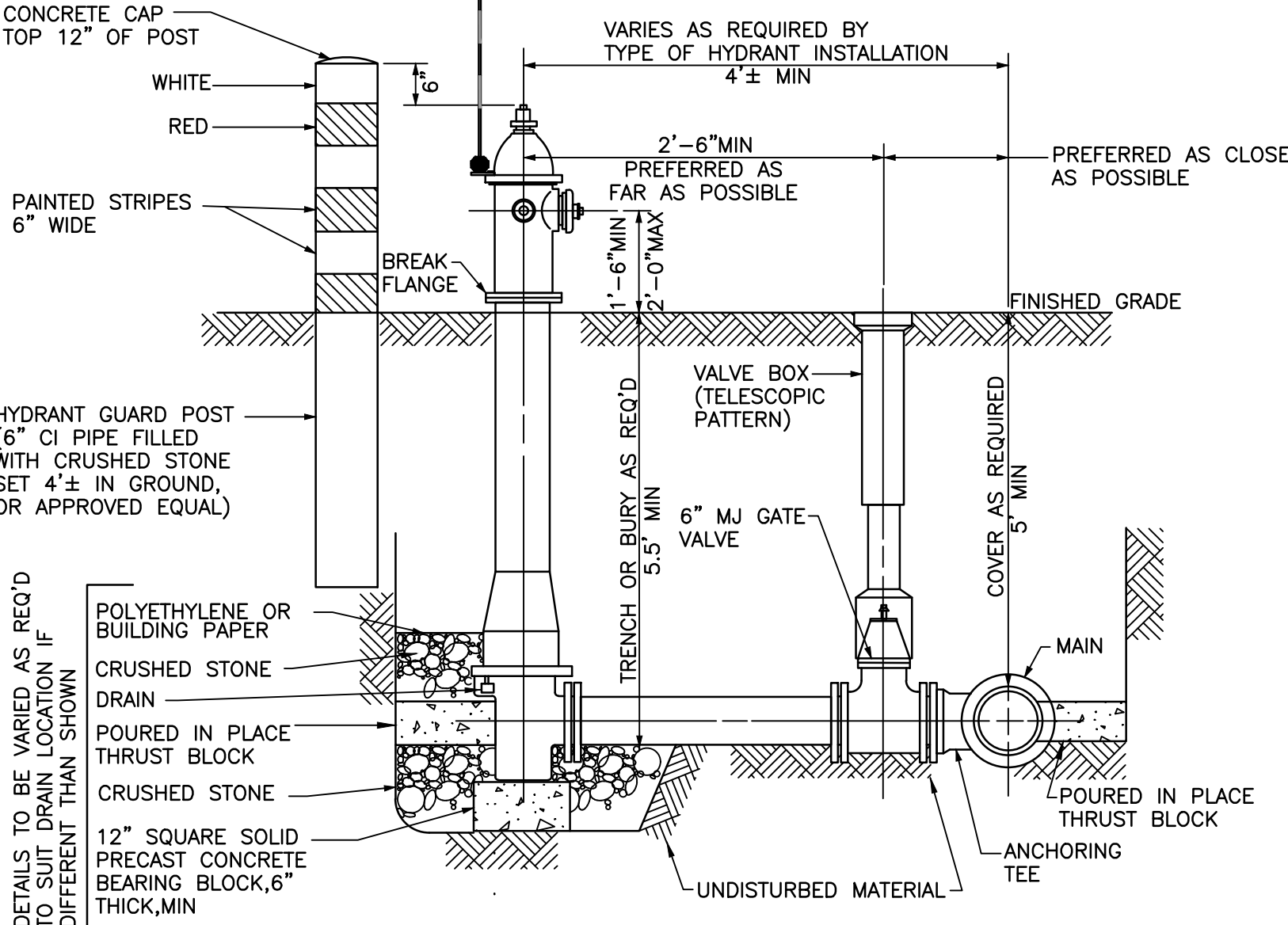
**27. OUTSIDE METER PITS**

- A. Water meters may be installed in outside meter pits when approved by the Authority.
- B. For meters over 1<sup>1/4</sup> inch size, Engineer's drawings shall be submitted by the applicant for approval.
- C. For meters less than 1<sup>1/4</sup> inch size, the meter pits shall be PVC plastic pit setters for cold climates as manufactured by the Ford Meter Box Company or equal. Included in the pit shall be a copper tube riser, a Ford Model BA13-232W or equal angle ball valve and a Ford Model HHCA31-323 or equal angle cartridge dual check valve. The pit depth shall be a six foot (6') minimum and have a double lid type cover.
- D. The meter pit shall be installed plumb and level in accordance with the manufacturer's requirements and shall be located in a non traffic location.





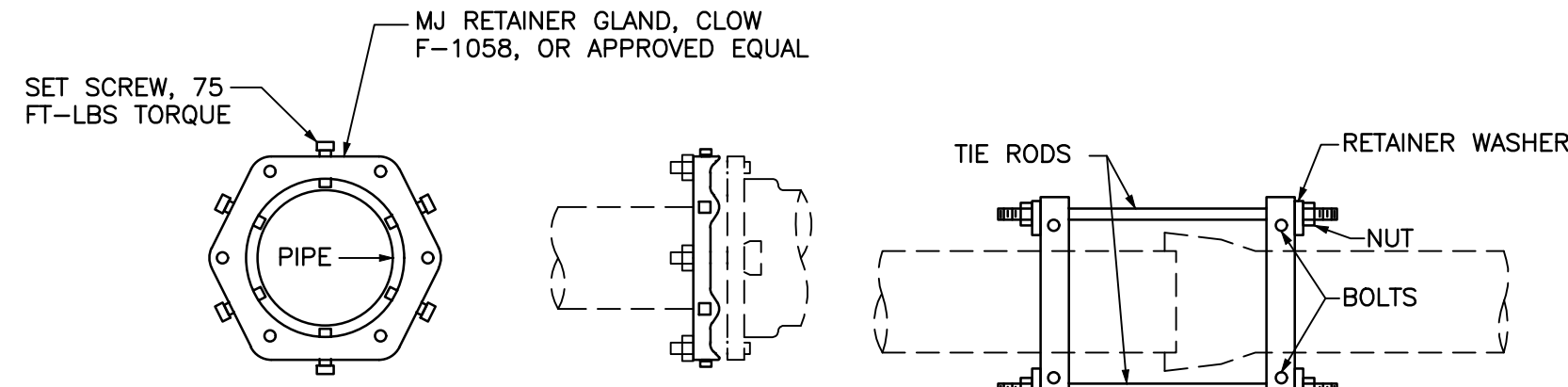
PLAN



ELEVATION

**1 TYPICAL HYDRANT INSTALLATION**

SCALE: NONE  
CROSS REFERENCE: NONE

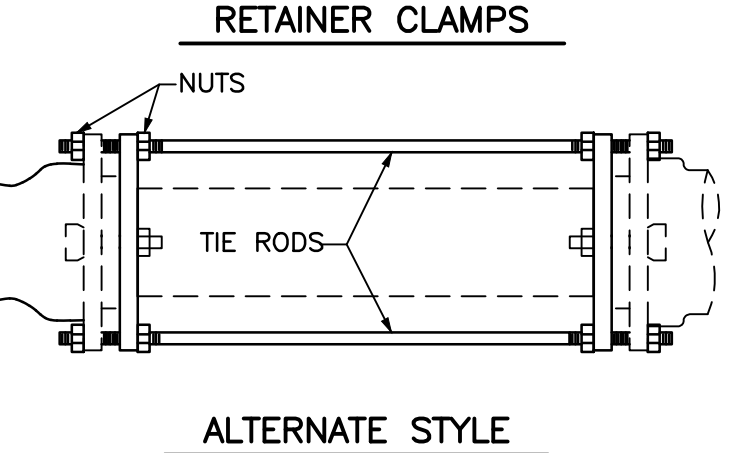


**RETAINER GLAND**  
PREFERRED RESTRAINT METHOD

**NO. OF TIE RODS REQ'D**

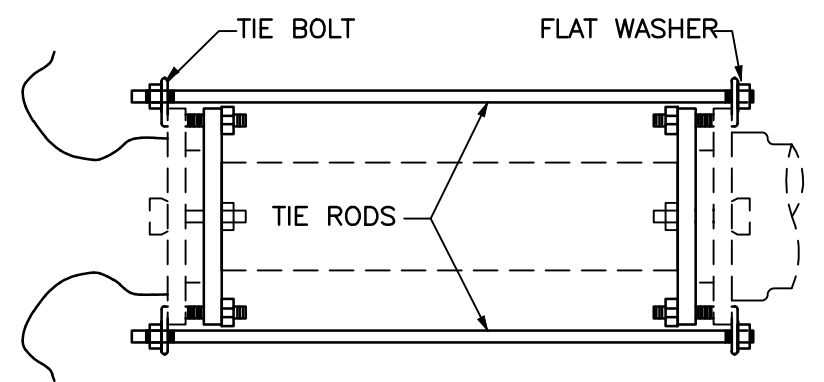
PIPE SIZE INCHES	MIN NO. OF 3/4" RODS
2	2 <sup>1</sup>
3	2 <sup>1</sup>
4	2
6	2
8	2
10	2
12	2
16	4
20	6
24	8

NOTES:  
1. APPLIES TO 5/8" RODS AS WELL.



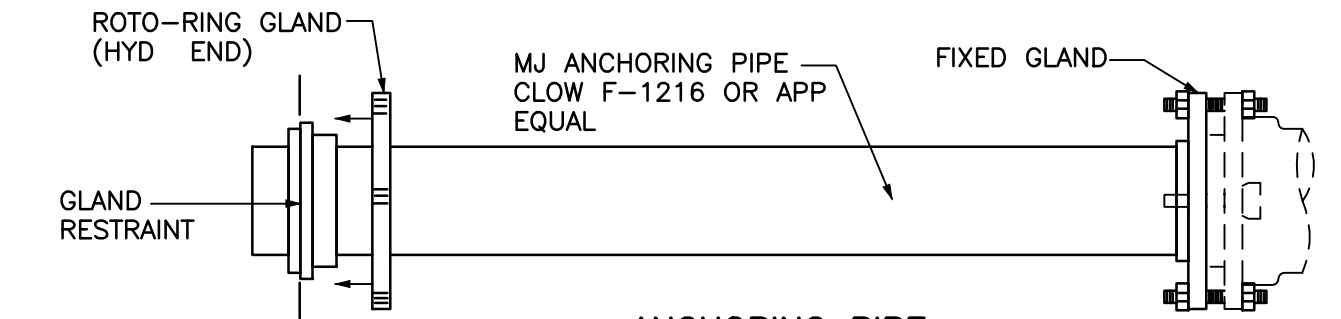
**RETAINER CLAMPS**

**ALTERNATE STYLE**



**TIE RODS**

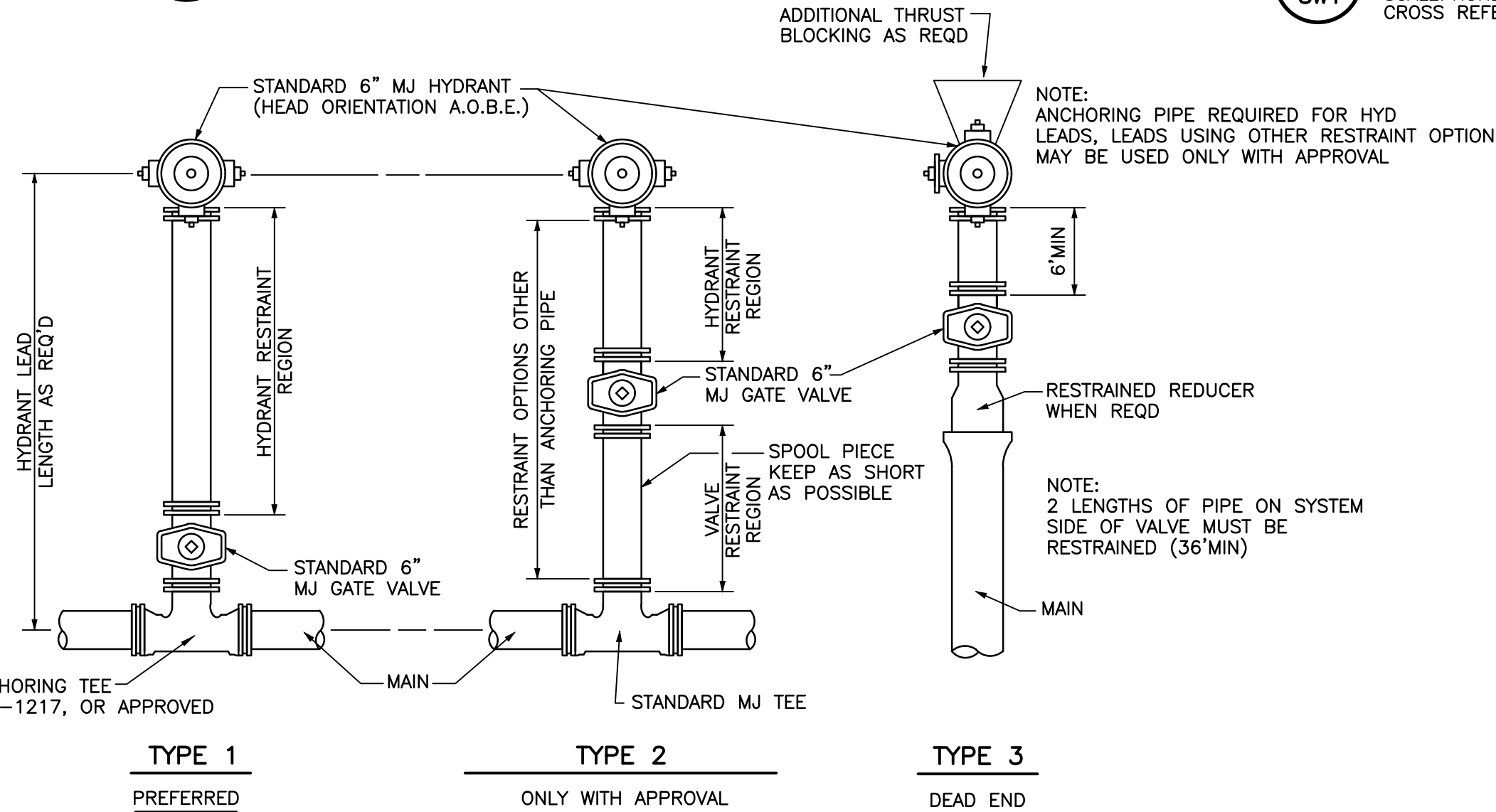
AS MANUFACTURED BY STAR SUPPLY CORP OR APP EQUAL, HIGH-STRENGTH CORTEN



**ANCHORING PIPE**  
PREFERRED FOR HYD INSTALLATION

**3 THRUST RESTRAINT OPTIONS**

SCALE: NONE  
CROSS REFERENCE: NONE

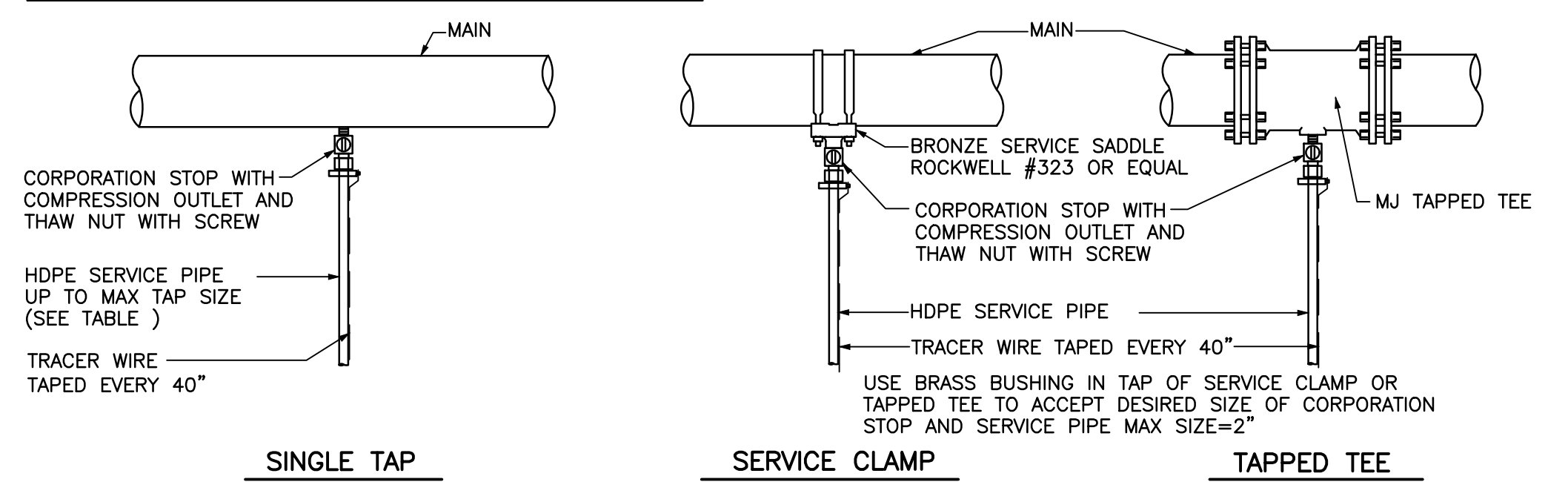


**4 TYPES OF HYDRANT INSTALLATIONS**

SCALE: NONE  
CROSS REFERENCE: NONE

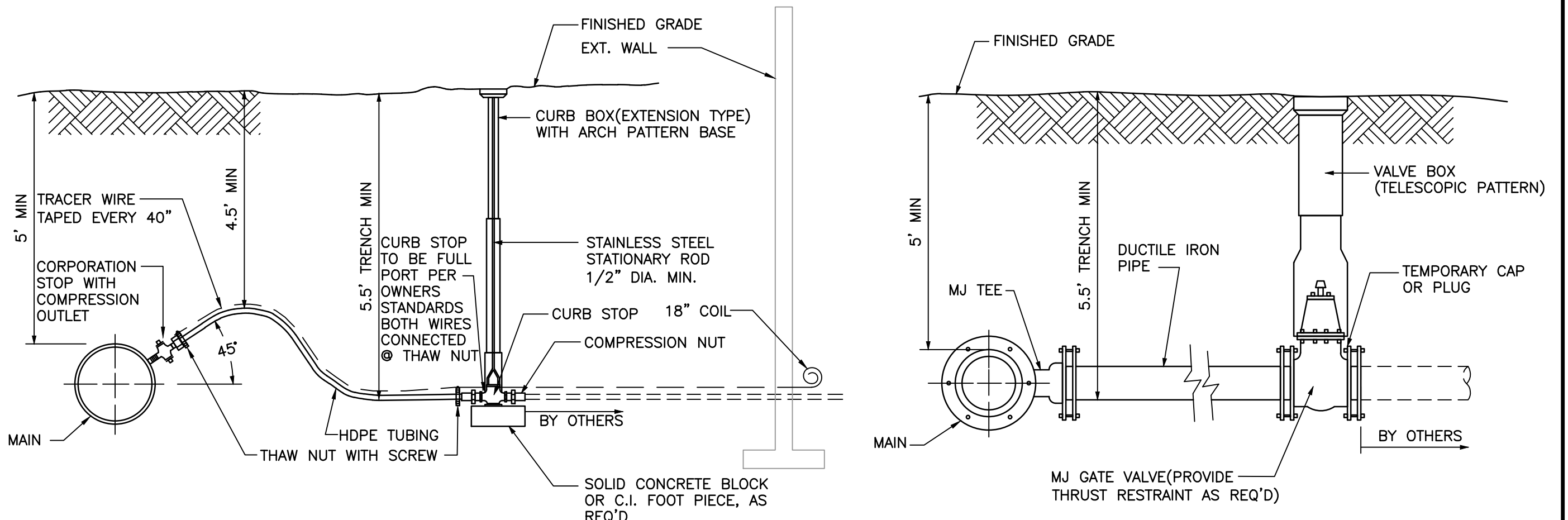
**TABLE-MAXIMUM TAP SIZE**

MAIN SIZE-INCHES	3	4	6	8	10	12 & LARGER
MAX TAP SIZE-INCHES	1/2	3/4	1	1 1/4	1 1/2	2



**5 TYPICAL HDPE SERVICE PIPE CONNECTIONS**

SCALE: NONE  
CROSS REFERENCE: NONE

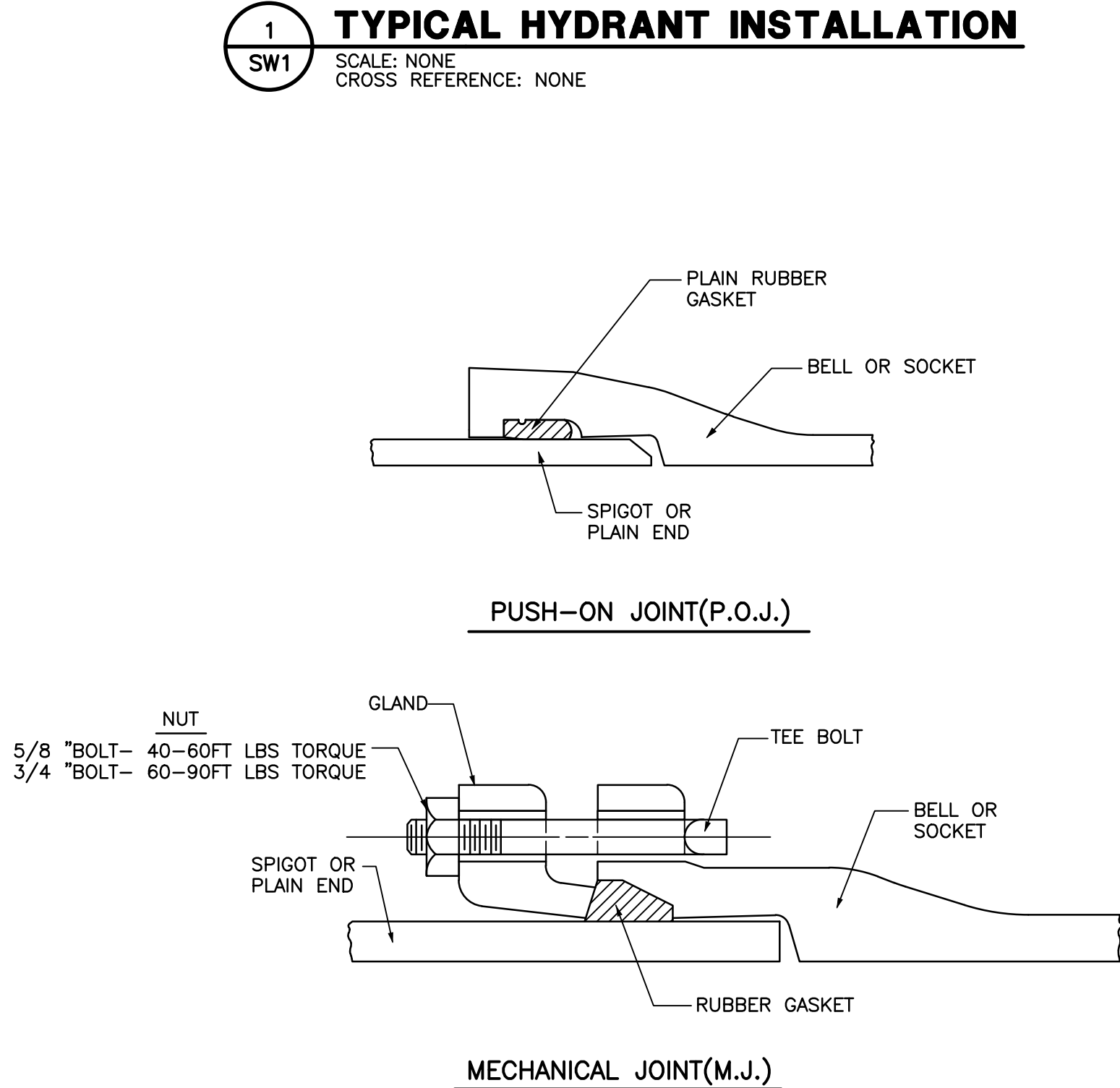


**6 HDPE SERVICE PIPE**

SCALE: NONE  
CROSS REFERENCE: NONE

**7 DUCTILE IRON SERVICE PIPE**

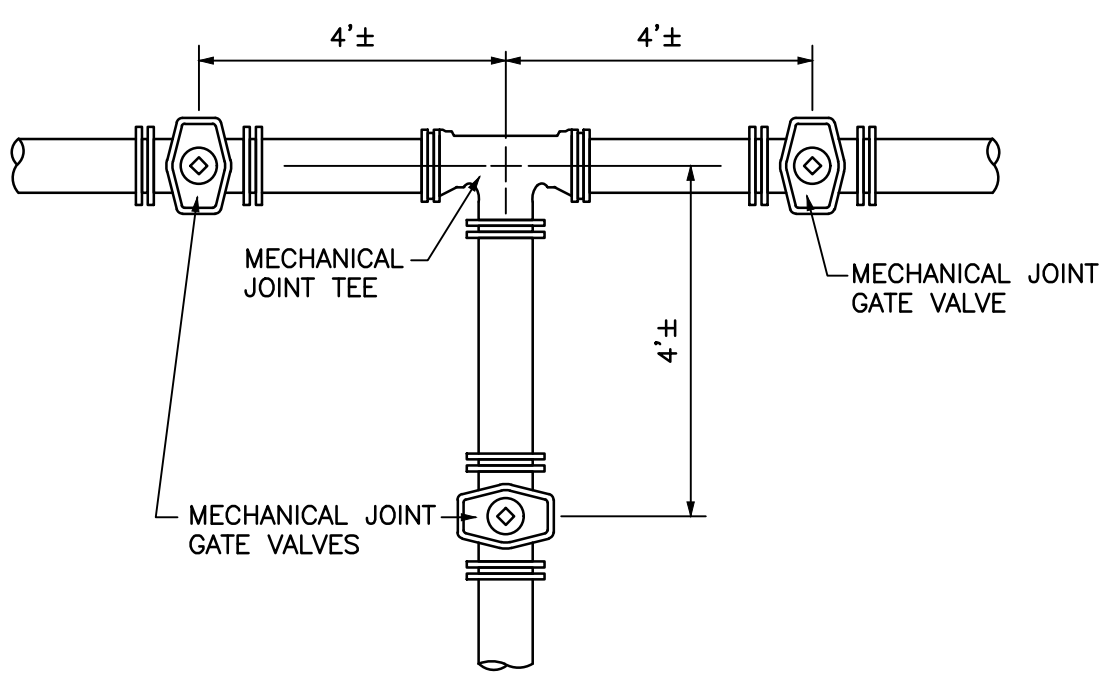
SCALE: NONE  
CROSS REFERENCE: NONE



**MECHANICAL JOINT(M.J.)**

**2 TYPICAL JOINT DETAIL**

SCALE: NONE  
CROSS REFERENCE: NONE



**8 TYPICAL JUNCTION LAYOUT**

SCALE: NONE  
CROSS REFERENCE: NONE

DATE	REVISIONS RECORD/DESCRIPTION	DRAFTER	CHECK	APPR.	UNAUTHORIZED ALTERATION OR ADDITION TO THIS DOCUMENT IS A VIOLATION OF THE NEW YORK STATE EDUCATION LAW.
12/06/19	REVISD DETAIL 6/SW1 & REMOVED 6A/SW1	SMW	KCS	CRK	

**STANDARD DETAILS - DUCTILE IRON WATER DISTRIBUTION SYSTEMS**

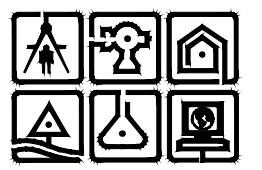
**CONTRACT NO. 29**  
**CRESCENT ROAD MAIN TO SAMBROOK**

TOWN OF CLIFTON PARK SARATOGA COUNTY, NEW YORK

**C.T. MALE ASSOCIATES**

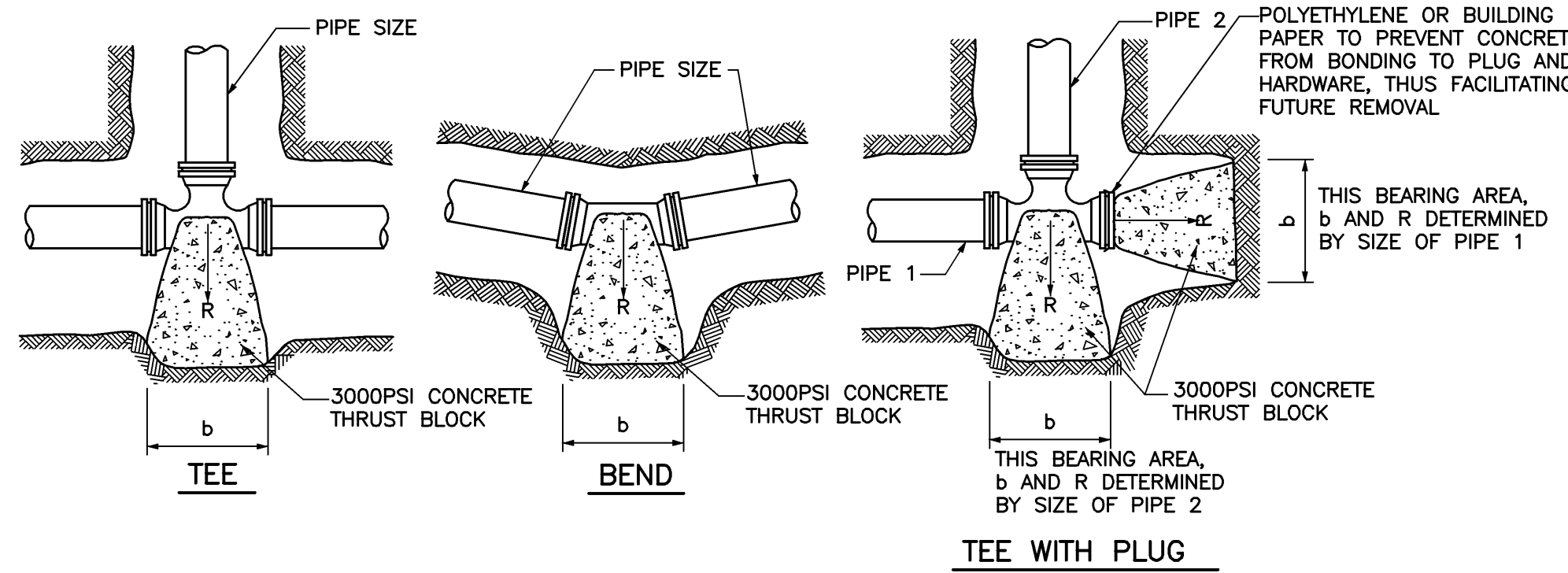
Engineering, Surveying, Architecture & Landscape Architecture, P.C.

50 CENTURY HILL DRIVE, LATHAM, NY 12110  
518.786.7400 \* FAX 518.786.7299



**SW1**

SHEET 11 OF 17  
DWG. NO: 13-0179



- NOTES:
- CONCRETE NOT TO OVERLAP ANY JOINT.
  - CONCRETE TO BE PLACED SO AS NOT TO INTERFERE WITH REMOVING OR INSTALLING ANY OF THE JOINTING HARDWARE.
  - FOR REDUCERS USE MECHANICAL JOINT FITTINGS WITH RETAINER GLANDS.

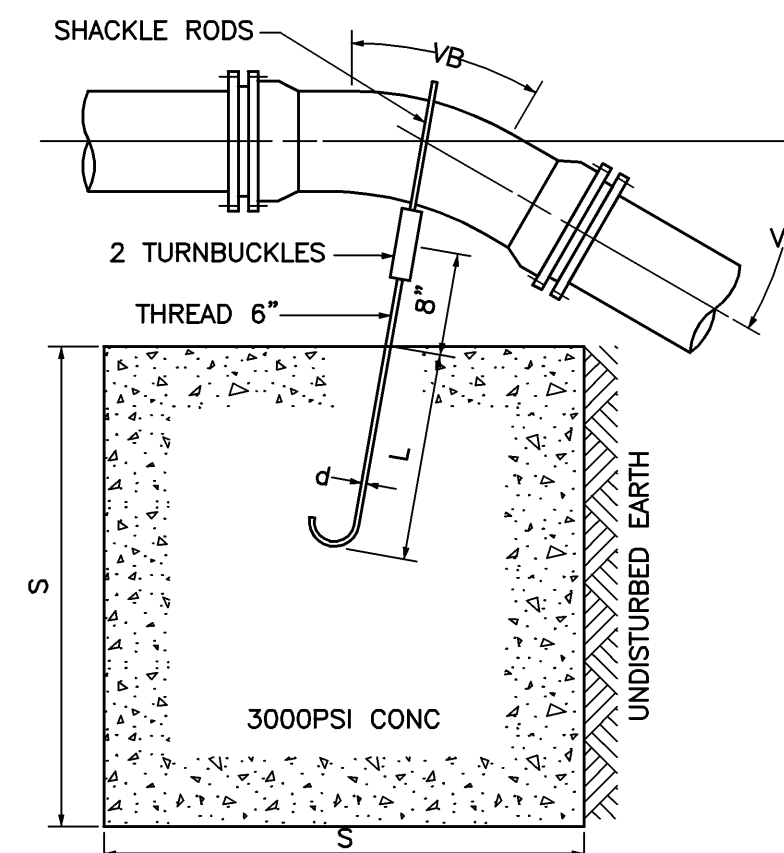
**1 TYPICAL CONC THRUST BLOCK DETAILS**

SCALE: NONE  
CROSS REFERENCE: NONE

**TYPE A BLOCKING**  
FOR 11 1/4 - 22 1/2 VERT BENDS

PIPE SIZE NOM DIA (INCHES)	VERTICAL BEND DEGREE	NO. OF CUTS OF CONC BLOCKING	SIDE OF CUBE (FEET)	DIA OF SHACKLE RODS (INCHES)	DEPTH OF RODS IN CONC (FEET)
4"	11 1/4	8	2.0	3/4"	1.6
	22 1/2	16	2.5		
6"	11 1/4	16	2.5	3/4"	1.6
	22 1/2	32	3.2		
8"	11 1/4	28	3.0	3/4"	1.6
	22 1/2	56	3.8		
10"	11 1/4	42	3.5	3/4"	1.6
	22 1/2	84	4.4		
12"	11 1/4	60	3.9	3/4"	1.6
	22 1/2	118	4.9	7/8"	2.2
16"	11 1/4	104	4.7	7/8"	2.2
	22 1/2	205	5.9	1 1/8"	3.7
20"	11 1/4	161	5.4	7/8"	2.2
	22 1/2	316	6.8	1 1/4"	4.6
24"	11 1/4	229	6.1	1"	2.9
	22 1/2	450	7.7	3/8"	5.7

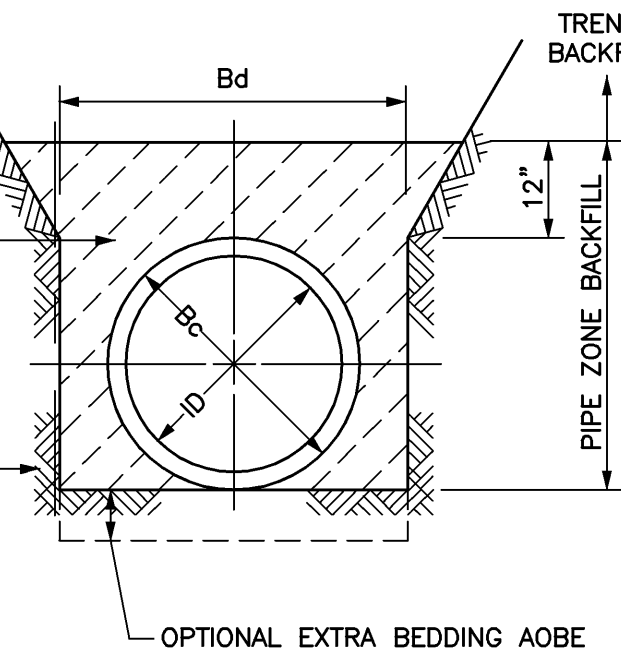
\* FOR 60KSI THREADED REBAR



**TYPE A BLOCKING**  
FOR 11 1/4 - 22 1/2 VERTICAL BENDS

**5 LAYING CONDITION TYPE 4**

SCALE: NONE  
CROSS REFERENCE: NONE  
THIS IS THE STANDARD CONSTRUCTION METHOD AND SHOULD BE USED UNLESS OTHERWISE DIRECTED BY ENGINEER



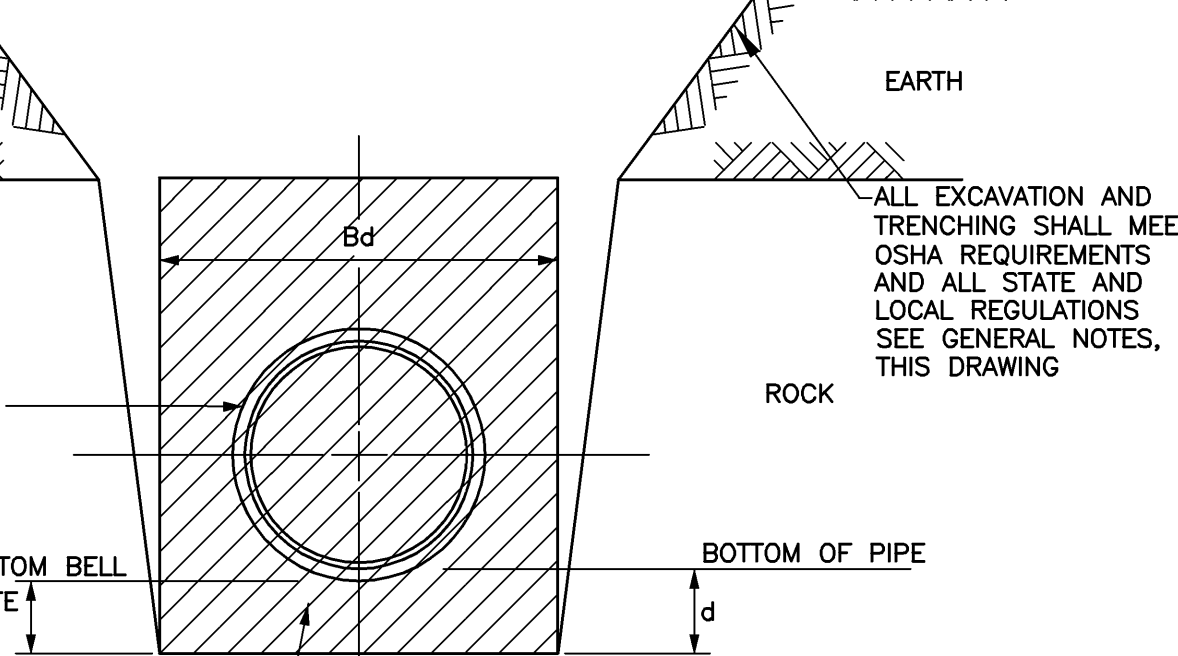
- NOTE:
- AOBE: AS ORDERED BY ENGINEER.
  - OVEREXCAVATE FOR BELLS.

**6 LAYING CONDITION TYPE 2**

SCALE: NONE  
CROSS REFERENCE: NONE

**7 LAYING CONDITION TYPE 5**

SCALE: NONE  
CROSS REFERENCE: NONE

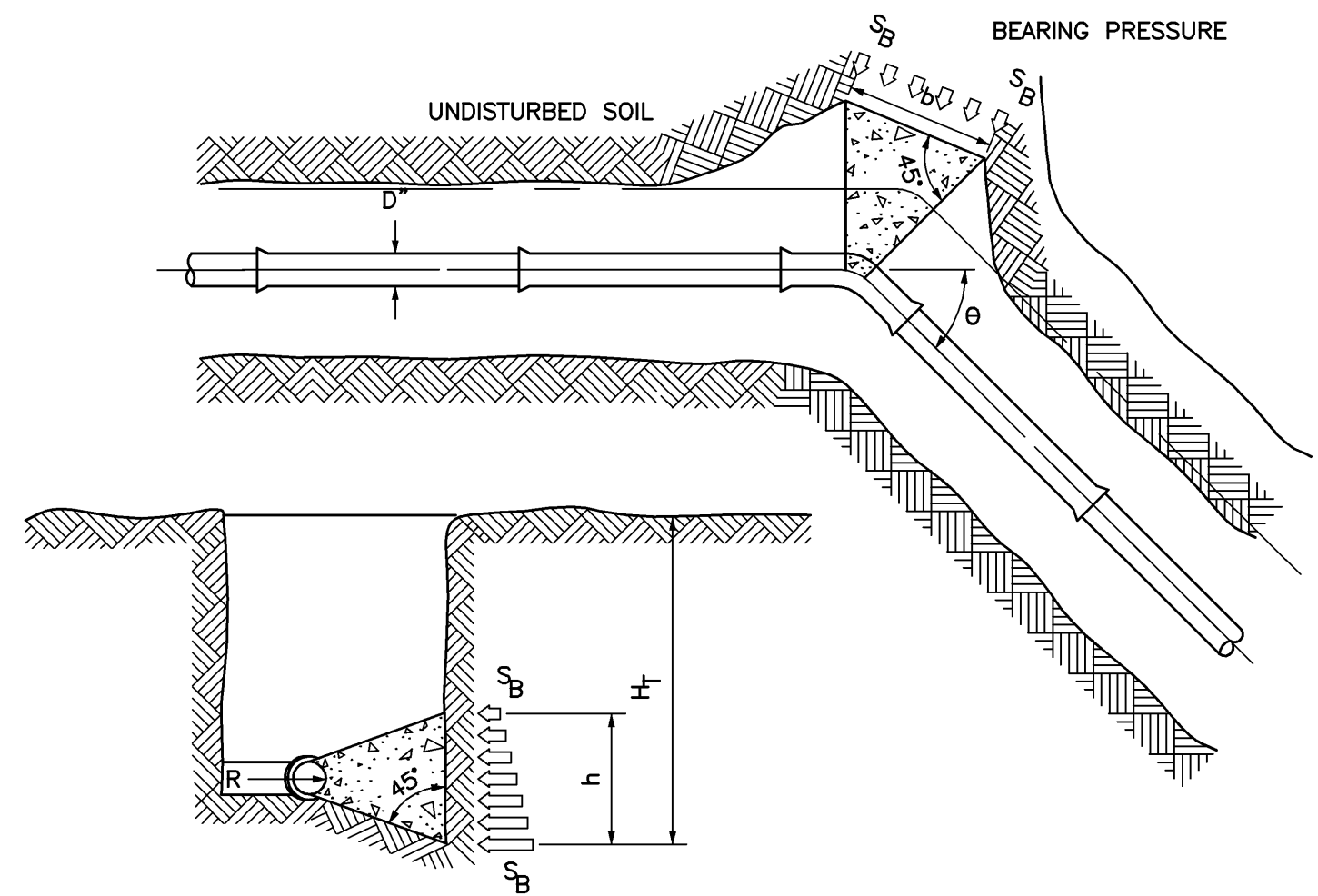


- NOTE:
- AOBE: AS ORDERED BY ENGINEER.
  - OVEREXCAVATE AT BELLS TO PROVIDE 4" BEDDING BELOW BELLS.

**8 TYPICAL TRENCH WITH ROCK EXCAVATION**

SCALE: NONE  
CROSS REFERENCE: NONE

ALL EXCAVATION AND TRENCHING SHALL MEET OSHA REQUIREMENTS AND ALL STATE AND LOCAL REGULATIONS. SEE GENERAL NOTES, THIS DRAWING



- NOTES:
- BEARING SURFACE SHOULD, WHERE POSSIBLE, BE PLACED AGAINST UNDISTURBED SOIL. WHERE IT IS NOT POSSIBLE, THE FILL BETWEEN THE BEARING SURFACE AND UNDISTURBED SOIL MUST BE COMPACTED TO AT LEAST 90% STANDARD PROCTOR DENSITY.
  - BLOCK HEIGHT (h) SHOULD BE EQUAL TO OR LESS THAN ONE-HALF THE TOTAL DEPTH TO THE BOTTOM OF THE BLOCK, (HT), BUT NOT LESS THAN THE PIPE DIAMETER (D').
  - BLOCK HEIGHT (h) SHOULD BE CHOSEN SUCH THAT THE CALCULATED BLOCK WIDTH (b) VARIES BETWEEN ONE AND TWO TIMES THE HEIGHT.

**2 BEARING BLOCK DETAILS**

SCALE: NONE  
CROSS REFERENCE: NONE

**REQUIRED BEARING AREAS -b (SQFT) FOR BEARING BLOCKS\***

PIPE SIZE (INCHES)	TEE	90° BEND	45° BEND	22 1/2° BEND	11 1/4° BEND
4	2.0	2.8	1.5	0.8	0.4
6	4.2	5.9	3.2	1.6	0.8
8	7.2	10.1	5.5	2.8	1.4
10	10.9	15.4	8.3	4.2	2.1
12	15.4	21.8	11.8	6.0	3.0
16	26.8	37.9	20.5	10.4	5.2
20	41.2	58.2	31.5	16.1	8.1
24	58.8	83.1	45.0	22.9	11.5

**THRUST REACTIONS-R(LB) PER 100PSI INTERNAL PRESSURE**

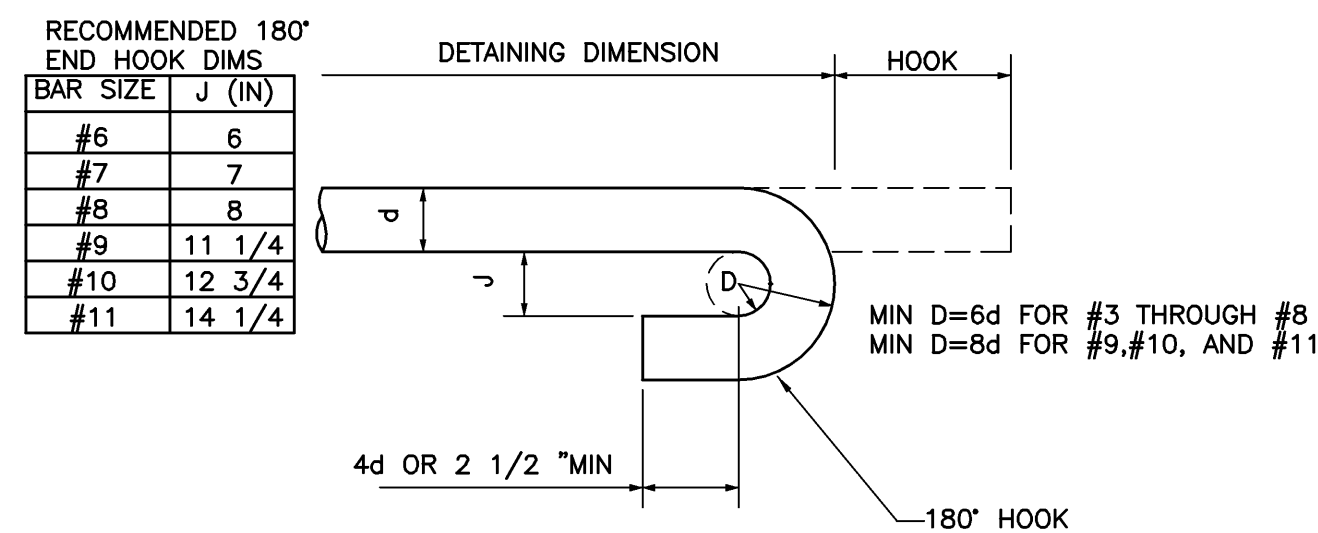
NOM PIPE DIA IN.	DEAD END	90° BEND	45° BEND	22 1/2° BEND	11 1/4° BEND
4	1,810	2,559	1,385	706	355
6	3,739	5,288	2,862	1,459	733
8	6,433	9,097	4,923	2,510	1,261
10	9,677	13,685	7,406	3,776	1,897
12	13,685	19,353	10,474	5,340	2,683
16	23,779	33,628	18,199	9,278	4,661
20	36,644	51,822	28,046	14,298	7,183
24	52,279	73,934	40,013	20,398	10,249

- \*FACTOR OF SAFETY=1.5  
SOIL BEARING OF 3,000 PSI  
225 PSI DESIGN PRESSURE
- NOTES:
- VALUES FOR TEE APPLY TO TEES, END PLUGS, CAPS, AND TAPPING SLEEVES.
  - REQUIRED BEARING AREAS ARE DUE TO THRUSTS CAUSED BY 150PSI WORKING PRESSURE PLUS 50%(75 PSI) SURGE ALLOWANCE RESULTING IN 225 PSI TOTAL INTERNAL PRESSURE.
  - REQUIRED BEARING AREAS ARE BASED ON ALLOWABLE SOIL BEARING CAPACITY OF 3,000 POUNDS PER SQUARE FOOT. DUE TO OTHER SOIL CONDITIONS ENCOUNTERED, BEARING AREAS MAY BE MODIFIED BY THE ENGINEER.

**BEARING STRENGTH (LB/SQ FT)**

SOIL	BEARING STRENGTH (LB/SQ FT)
MUCK	0
SOFT CLAY	1,000
SILT	1,500
SANDY SILT	3,000
SAND	4,000
SANDY CLAY	6,000
HARD CLAY	9,000

4. IN MUCK, PEAT, OR RECENTLY PLACED FILL ALL THRUSTS SHALL BE RESISTED BY PILES OR TIE RODS TO SOLID FOUNDATIONS, OR BY REMOVAL OF SUCH UNSTABLE MATERIAL AND REPLACEMENT WITH BALLAST OF SUFFICIENT STABILITY TO RESIST THE THRUSTS, ALL AS REQUIRED BY THE ENGINEER.



**3 ACI STANDARD HOOKS**

SCALE: NONE  
CROSS REFERENCE: NONE

PIPE DIMENSIONS				TRENCH DIMENSIONS	
NOMINAL ID	DISPLACEMENT 1/2 PIPE OD (CY/LF)	BARREL OD (Bc)	BELL OD	Bd	ROCK* EXCAVATION BELOW PIPE (d)
6"	0.005	6.9"	8.75"	30"	6"
8"	0.008	9.1"	11.1"	32"	6"
10"	0.012	11.1"	13.2"	34"	6"
12"	0.018	13.2"	15.3"	36"	6"
16"	0.031	17.4"	20.0"	40"	6"
20"	0.047	21.6"	24.3"	44"	6"
24"	0.067	25.8"	28.5"	48"	6"

\*BELOW AND ON EACH SIDE OF ALL PIPE, VALVES & FITTINGS.

DATE	REVISIONS RECORD/DESCRIPTION	DRAFTER	CHECK	APPR.	UNAUTHORIZED ALTERATION OR ADDITION TO THIS DOCUMENT IS A VIOLATION OF SECTION 7209 SUBDIVISION 2 OF THE NEW YORK STATE EDUCATION LAW.
04/02/08	UPDATED DETAILS	MAF	ELV	ELV	

**STANDAR DETAILS**  
**THRUST RESTRAINT AND TRENCH DETAILS**

**CLIFTON PARK WATER AUTHORITY**

TOWN OF CLIFTON PARK SARATOGA COUNTY, NEW YORK

**C.T. MALE ASSOCIATES, P.C.**

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518.786.7400 \* FAX 518.786.7299

ARCHITECTURE & BUILDING SYSTEMS ENGINEERING \* CIVIL ENGINEERING  
ENVIRONMENTAL SERVICES \* SURVEY & LAND INFORMATION SERVICES

DATE :  
PROJ. NO :  
SCALE : AS SHOWN

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C.T. MALE ASSOCIATES, P.C.  
DESIGNED :  
DRAFTED :  
CHECKED :  
DATE :

**SW2**  
SHEET 2 OF 2  
DWG. NO: