# TOWN OF FRANKLIN

## STANDARD SPECIFICATIONS AND DETAILS FOR CONSTRUCTION

**January 2007**

**FOR MORE INFORMATION, CONTACT:**

**Town of Franklin**

**95 E. Main St.**
**Franklin, North Carolina 28734**

# TOWN OF FRANKLIN

## TABLE OF CONTENTS

# SECTION "S"

## WATER AND SEWER LINE SPECIFICATIONS

| | |
|---|---|
| **02601** | **Bore and Encasement** |
| **02640** | **Water Valves and Appurtenances** |
| **02660** | **Water Pipe and Appurtenances** |
| **02661** | **Domestic Water Connection** |
| **02664** | **PVC Water Pipe and Appurtenances** |
| **02730** | **Sanitary Sewer Pipe and Appurtenances** |
| **02731** | **Sanitary Sewer Service Connection** |
| **02900** | **Landscaping** |
| **02905** | **Restoration of Surfaces** |
| **02931** | **Seeding, Fertilizing, and Mulching** |
| **03301** | **Miscellaneous Concrete Construction** |
| **11312** | **Submersible Sewage Pumps** |
| **16620** | **Diesel Engine Generator** |
| **16620** | **Propane Fueled Generator** |

# SECTION 02601 BORE AND ENCASEMENT

## PART 1: GENERAL

### 1.01 SCOPE OF WORK

A. The work under this section consists of furnishing all materials, labor, equipment and services required for the complete installation of encasement pipe and carrier pipes under highways and railroads by boring and jacking as shown on the drawings and specified herein.

All work in connection with constructing encasement pipes under highways and railroads shall comply with all current requirements of governing highway and railroad agencies. The Contractor shall be familiar with these requirements.

The Contractor shall inspect the locations at the proposed crossings and shall familiarize himself with the conditions under which the work will be performed, and with all necessary details and the suitability of his equipment and methods for the work required.

## PART 2: PRODUCTS

### 2.01 MATERIALS

A. Encasement pipe shall be smooth wall welded steel conforming to ASTM Designation A139, Grade B. Minimum pipe diameter and wall thickness shall be as follows:

| Carrier Pipe Diameter | *Min. Encasement Pipe Diameter | Wall Thickness | |
|---|---|---|---|
| | | Roadway | Railroad |
| 8-inch DIP or PVC | 16 inches | 0.250 inches | .0312 inches |
| 8-inch DIP or PVC | 18 inches | 0.250 inches | 0.312 inches |
| 10-inch DIP or PVC | 20 inches | 0.250 inches | 0.344 inches |
| 12-inch DIP or PVC | 24 inches | 2.250 inches | 0.406 inches |
| 15-inch PVC | 30 inches | 0.312 inches | 0.465 inches |
| 16-inch DIP | 30 inches | 0.312 inches | 0.469 inches |
| 18-inch DIP or PVC | 30 inches | 0.312 inches | 0.469 inches |
| 18-inch RCP | 36 inches | 0.375 inches | 0.562 inches |
| 20-inches | 36 inches | 0.375 inches | 0.562 inches |
| 21-inch RCP or PVC | 36 inches | 0.375 inches | 0.562 inches |
| 24-inch DIP or PVC | 36 inches | 0.375 inches | 0.562 inches |
| 24-inch RCP | 42 inches | 0.500 inches | 0.625 inches |

***Minimum Encasement Pipe Diameter to be utilized unless a larger size is noted on the drawings or in the Bid Schedule**

## PART 3: EXECUTION

### 3.01 INSTALLATION

A. Encasements shall be installed by boring and jacking unless field conditions require otherwise. It shall be the Contractor's responsibility to notify the Town or other appropriate regulatory agency immediately if conditions do not permit a jack and bore installation.

B. The encasement pipe shall be of the diameter indicated on the chart above.

C. Installation of encasement pipe shall include all related work and services such as mobilization of equipment, constructing and maintaining working pits, right-of-way maintenance and restoration, traffic maintenance, mining, excavations, dewatering, sheeting, shoring and bracing for embankments, operating pits, and as elsewhere required shall be placed and maintained in order that work may proceed safely and expeditiously.

D. Installation of the casing pipe shall be carried out without disturbance of the embankment, pavement, tracks, or other railroad or highway facilities and without obstructing the passage of traffic at any time.

E. The driven portions of the casing shall be advanced from the lower end of the casing unless specific permission to do otherwise is obtained by the Contractor from the Town or other appropriate regulatory agency.

F. The alignment and grade shall be carefully maintained and the encasement pipe installed in a straight line.

G. The space outside the encasement and the ground shall be filled with grout, sand or pea gravel, as directed by the Town and other appropriate regulatory agencies. Those agencies will direct that this space be filled if the space is large enough to cause any earth settling.

H. Before the pipe is installed in the casing, bolt-on metal skids painted with bitumastic paint shall be rigidly fastened to the barrel of the pipe. After completion of the casing, the Contractor shall insert the pipeline in pre-jointed segments. No contact will be permitted between the casing and the carrier pipeline.

I. Work done within NCDOT controlled roadway shall also be done in strict accordance with all NCDOT requirements. Prior to beginning work within NCDOT rights-of-way, developer shall provide copies of all NCDOT approvals to the Town.

## END OF SECTION

# SECTION 02640 WATER VALVES AND APPURTENANCES

## PART 1: GENERAL

### 1.01 SCOPE OF WORK

A. This specification covers the requirements for furnishing and installing valves and other appurtenances for the various water system improvements shown on the Drawings.

B. Furnish all labor, equipment, materials and incidentals necessary to install and complete water valve and appurtenance installation in accordance with the plans and specifications approved by the Town. All valves and appurtenance material shall be of the type and class specified herein.

C. All water valve and appurtenance excavation, bedding, pipe laying, jointing and coupling of pipe joints and backfilling shall be completed as described herein.

### 1.02 DELIVERY, STORAGE AND HANDLING

A. The Contractor shall unload valves and appurtenances so as to avoid deformation or other injury thereto. The Contractor shall store valves and appurtenances above storm drainage levels. All valves shall be drained and so stored as to protect them from freezing.

B. If any defective material is discovered after installation, it shall be removed and replaced with sound pipe or shall be repaired by the Contractor in an approved manner and at his own expense.

### 1.03 WARRANTY

All materials shall be guaranteed to be free from defects in materials and workmanship for a period of one (1) year after final acceptance by the Town.

## PART 2: PRODUCTS

### 2.01 MATERIALS

A. GATE VALVES

All gate valves shall be designed for a minimum working pressure of 200 psi unless otherwise specified. Valves shall have a clear waterway equal to the full nominal diameter of the pipe. Valves shall be opened by turning counterclockwise. Each valve shall have the initials or name of the maker, pressure rating and year of manufacture cast on the body. Prior to shipment from the factory, each valve shall be tested by hydraulic pressure equal to twice the specified working pressure. Valves shall be operated by handwheel for above ground installations or 2" square operating nut for below ground installations. Valves shall have an arrow cast in the metal indicating the direction of opening.

Valves to be installed underground (Buried) shall be of the non-rising stem type and shall have mechanical joint connections.

Valves installed above ground or in structures shall have rising stems with outside stem and yoke and 18" diameter minimum hand wheel and shall have flanged ends with 125# flanges unless others noted.

1. 2" Gate Valves

   a. 2-inch gates valves shall be full body, resilient wedge built to manufacturer's standards with material and construction conforming to AWWA C-500, or ball curb stop.

   b. Each valve shall have a 2" operating nut. Valves shall have screwed ends conforming to NPT standards.

2. Resilient Seated Wedge Valve

   a. Gate valves 3" through 12" diameter size shall be of cast iron or ductile iron body, resilient seated wedge type meeting the requirements set forth in AWWA C-509 and AWWA C-500. Valves shall be manufactured by Mueller Co., ModelA-2360.

   b. Gate valves shall have body, bonnet and gate manufactured of cast iron or ductile iron conforming to ASTM A-536. The shell thickness of all components shall conform to the thicknesses in Table 2, Section 4.4 of AWWA C-509 and C-500. The valve body and bonnet shall be coated on both the

interior and exterior surfaces with a fusion bonded epoxy paint conforming to AWWA C-550.

c. The gate shall be fully covered with a rubber cover over all exterior and interior ferrous surfaces. The rubber shall be securely bonded to the gate body, including the part which houses the stem nut. The gate and rubber coat shall conform to ASTM D429.

d. Valve stems shall be cast bronze. The stuffing box shall use "O"-ring seal type with two rings located above the thrust collar. The rings shall be replaceable with the valve fully open and under pressure.

B. Butterfly Valves

1. All valves larger than 12" shall be of Butterfly configuration. Valve shall be designed, manufactured, and tested in accordance with AWWA C504, latest revision. Valve shall be rated and tested for absolute, zero leakage shut-off. Valve shall include the following design features.

a. Valve body shall be cast iron per ASTM A 126 Class B or ductile iron per ASTM A536 Grade 65-45-12. Flanged end valves shall be faced and drilled per ANSI B 16.1, Class 125. Mechanical joint ends shall be per ANSI A21.11 and include MJ end accessories. Valve body to include a stainless steel seat ring that is mechanically retained without use of clamping devices, adjusting segments, or other hardware being in the waterway.

b. Valve disc shall be solid type ductile iron without any external vanes, ribs, etc., to obstruct flow. Resilient seat shall be located on edge of disc, offset from the shaft, and seal against mating stainless steel body seat with 360º uninterrupted contact. The resilient seal shall be locked on the disc by three separate means of retention, and field adjustable, in necessary, with no tools other than a standard socket wrench. Replacement of seat in field shall be possible without valve disassembly. The disc shall be connected to the offset stainless steel shaft by locking taper wedge keys and stainless steel retaining nuts on the back side of the disc. Taper keys shall be heated treated 416 Stainless Steel for added strength. Shaft shall be stub type for valves 30" and larger; one piece for valves 24" and smaller. The valve shall

be equipped with adjustable thruster for centering the disc on 30” and larger valve is required.

c. Shaft shall have nylon sleeve or woven Teflon fiberglassed backed sleeve for bearing surfaces. Bearings shall be self lubricating.

d. Valve body shall be primed with manufacturer’s standard primer.

e. Valve shall be Mueller or approved equal.

C. VALVE BOXES

Valve boxes shall be provided for all valves installed below grade. All valve boxes shall be cast iron and shall conform to ASTM A48. Valve boxes shall be of the adjustable screw type with a base to fit the valve yoke with a removable cover with the word "water" cast thereon.

D. FIRE HYDRANTS

1. Fire hydrants shall comply with all of the applicable requirements of the AWWA C-502, latest revision, for dry-barrel fire hydrants and with these specifications. Hydrants shall be of the traffic model type incorporating a break-away flange arrangement which will permit the upper section of the hydrant barrel to separate from the lower section upon impact. Each hydrant shall include an automatic system designed to lubricate the entire length of the threaded part of the valve stem each time the hydrant is operated. It shall be further equipped with “O”-ring seals to insure that threads on the valve stem do not come into contact with water at any time.

2. Hydrants shall open counterclockwise with a compression base valve opening against and closing with pressure and be capable of withstanding 250 psi working pressures and 500 psi hydrostatic test pressures, unless otherwise specified. The pentagonal operating nut shall be 1-1/2” from the point to the flat. Hydrants shall be equipped with one (1) 4-1/2” pumper nozzle and two (2) 2-1/2” hose nozzles, all with National Standard Threads per Appendix A of AWWA C-502, and chained nozzle caps. Nozzles shall be reverse threaded into the fire hydrant barrel.

3. Unless otherwise indicated on the plans approved by the Town, all hydrants shall have 6” mechanical joint bottom connections. For hydrants connected to 6” water mains, the hydrant shall have a 4½” main valve opening. For hydrants connected to water mains 8” and

larger, the hydrant shall have a 5¼" main valve opening. The hydrant main valve shall be of the full compression design, opening against and closing with pressure. The valve seat ring shall thread into a bronze sub-seat, and all gaskets sealing the seat ring shall be a bronze-to-bronze surface.

4. All hydrants shall be painted the manufacturer's standard yellow unless otherwise specified. Following installation and testing all hydrants shall be painted with two (2) 6-mil coats of epoxy paint.

5. All fire hydrants shall be Mueller Super Centurion.

6. All iron parts within fire hydrants shall be ductile iron.

7. The bury length (distance from ground line to insert of the hydrant inlet) shall be 4'-0" unless ground conditions shown on the Town approved plans warrant a deeper bury.

8. Drain valves shall be all bronze and allow complete draining of all residual water from the hydrant barrel.

9. All bolting and fasteners below ground shall be stainless steel.

10. The operating machine shall utilize two (2) "O"-ring seals between the revolving nut and bronze-sheathed upper section of the valve rod. The top of the rod shall also be fitted with a travel stop nut to limit downward travel of the rod. All-weather grease shall be used to provide permanent lubrication. A thermoplastic thrust washer shall be used to reduce friction in the thrust collar while opening the hydrant.

11. The hydrant inlet shall be mechanical joint. Joint restraint shall be accomplished for mechanical joint by use of mechanical joint gripper glands or ¾"Ø galvanized threaded rods.

E. AIR RELIEF VALVE

1. The air relief valve shall be rated for a working pressure of 150 psi and hydrostatic test pressure of 300 psi and shall automatically function to release to atmosphere small amounts of air that accumulate in the pipeline. Once the air has been exhausted, the valve shall seat tightly to prevent water leakage.

2. All air release valves shall be Golden Anderson Fig. 910.

F. MANHOLE SECTIONS AND APPURTENANCES

1. Precast concrete manhole bases, risers and cones shall conform to ASTM C478, latest revision, for precast reinforced concrete manhole sections. Tapered sections and transition sections, where required, shall be of eccentric cone design, having the same wall thickness and reinforcement as the cylindrical ring sections. Flat slab tops shall be required for very shallow manholes and where shown or specified. Cast iron manhole covers and assemblies shall be cast into slab tops for access into manholes.

2. Minimum compressive strength of concrete shall be 4000 psi and the maximum permissible absorption shall be 6.5%. Risers shall be reinforced with a single cage of steel placed within the center third of the wall. The tongue or the groove of the joint shall contain one line of circumferential reinforcement equal in area to that in the barrel of the manhole riser. The minimum cross-sectional area of steel per linear foot shall be 0.12 square inches for larger sizes. Precast manhole sections shall fit together readily and shall have a self-contained "0"-ring rubber gasket conforming to ASTM C443.

3. The quality of materials, the process of manufacture, and the finished manhole sections shall be subject to inspection and approval by the Town. The manhole sections shall be perpendicular to their longitudinal axis, within the limits listed in ASTM C478.

4. Castings for manhole frames and covers shall be tough, even grained soft gray iron, free from burnt on sand and other injurious defects and conform to the requirements of ASTM A48, latest revision, Class 30, with “WATER” cast into the cover.

5. Brick for manholes and other structures shall conform to applicable requirements of ASTM C62, latest revision, Grade SW.

G. TAPPING SLEEVE AND VALVE

1. Tapping sleeves shall consist of 18-8 type 304 Stainless Steel full circumference band. The flanges shall meet AWWA C207 Class D, ANSI 150# drilling, recessed for tapping valve, fusion bonded. Gasket shall be Nitrile (Buna-N) NSF 61 compounded t resist water at temperatures up to 180ºF.

2. Bolts and nuts shall be 18-8 type 304 stainless steel heavy hex nuts stud bolts & washers. Nuts and studs shall be coated to prevent galling.

3. The sleeves shall have flanged outlets which will accommodate the tapping valves. Valves will be identical to resilient wedge gate valves elsewhere specified with outlet end adaptable to the tapping machine and to provide mechanical joint connections to discharge pipes.

4. Tapping Sleeve shall be Smith Blair or Ford.

## PART 3: EXECUTION

### 3.01 INSTALLATION

A. EXCAVATION

1. The work covered by this section consists of the excavation and satisfactory disposal of all materials excavated in the construction of trenches.

2. Trenches will be defined as all excavation for the installation of storm sewers, sanitary sewers, water pipe, manholes, catch basins, hydrants, watergates, sewer services, water taps, drainage structures, drainage ditches and other unclassified excavation as may be deemed necessary by the Town.

3. The excavation shall be done to the lines, grades, typical sections, and details shown on the approved plans or established by the Town or authorized representative. All work covered by this section shall be coordinated with the grading, construction of drainage structures, and other work along the project, and shall be maintained in a satisfactory condition so that adequate drainage is provided at all times. Any roots which protrude into the trench shall be trimmed flush with the sides of the trench. Trenches for pipe lines shall be completed before the pipe is installed unless otherwise permitted by the Town.

4. All excavation shall be by open cut unless otherwise authorized by the Town. If the bottom of the excavation is found to consist of rock or any materials that cannot be excavated to give a uniform bearing surface, the material shall be removed to a depth at least 6” below established bottom grade and backfilled to grade with suitable bedding material thoroughly compacted in place. Any excavations carried below the depths indicated, without specific directions, shall be backfilled in the same manner. The excavation shall be of

sufficient width to allow a clearance of not less than 6" between the side of the trench and the outside of the pipe, or in case of pipe with a bell, the outside of the bell of the pipe. This rule will apply at all times, and consequently, proper allowance must be made for additional space required for sheeting the trench where necessary.

5. Sheeting, Bracing Trenches, and Trench Boxes

Sheeting and Bracing shall be provided in accordance with all applicable federal, state, and local safety and health regulations.

6. No sheeting or bracing shall extend closer than 2'-0" off the ground surface, or within subgrade, and no timbers shall be left in the trench that may form pockets or cavities that cannot easily be filled during the operation of backfilling and settling or compacting the trench backfill. It is understood that the Town will be under no obligation to pay for sheeting or bracing left in place by the Contractor. Failure to sheet and brace trenches or other excavation shall be the Contractor's risk, and he will be held responsible for caving, settlement, and all other damage resulting therefrom.

7. Excavated materials to be used for backfill will be approved by the Town, and if acceptable shall be neatly deposited at the sides of the trenches where space is available. Where stockpiling of excavated material is required, the Contractor shall so maintain his operations as to provide for natural drainage and not present an unsightly appearance.

B. INSTALLING VALVES AND APPURTENANCES

1. Thrust Blocks

a. All plugs, caps, tees, bends, reducers and other fittings shall be provided with adequate thrust blocks. Thrust blocks shall be constructed to the minimum dimensions shown on the drawings or as directed. Thrust blocks shall be made of concrete having a compressive strength of 28 days of 3000 psi and shall bear directly against the undisturbed trench wall. Where possible, the backing shall be so placed that the fitting joints will be accessible for repair. All bolts and pipe joints shall be protected against contact with thrust block concrete by the installation of a polyethylene film placed between the fittings and the poured concrete. Where any section of a main is provided with concrete thrust blocks, the hydrostatic pressure test shall not be made until three days after installation of the concrete thrust blocks unless otherwise

approved by the Town. Where trench conditions are, in the opinion of the Town, unsuitable for thrust blocks, the Contractor shall provide steel tie rods and socket clamps to adequately anchor the piping. All tie rods and clamps shall be given a bituminous protective coating or shall be galvanized.

b. Concrete for thrust blocks shall consist of a mix of Portland Cement, Fine Coarse aggregate and water to produce concrete with a minimum compressive strength at 28 days of not less than 3000 psi when tested in accordance with ASTM C39 or C42. Sakrete or any similar material will not be permitted under any circumstances.

2. Valves

Before setting each valve, the Contractor shall make sure the interior is clean and test opening and closing. Valves shall be set with stems plumb, unless horizontal installation is called for on the plans, and at the exact locations shown. Trench backfill shall be tamped thoroughly for a distance of 3'-0" on each side of valves boxes.

3. Valve Boxes

A valve box shall be installed over each underground valve. All boxes shall be set plumb with their top flush with finished grade. A precast concrete ring or 24"x24"x6" cast in place concrete pad shall be placed around each valve box located out of roadway pavement.

4. Fire Hydrant

Fire hydrants shall be located as shown on the approved plans. Each hydrant shall be connected to the main with a 6" branch line having at least as much cover as the distribution main. Hydrants shall be set plumb with the pumper nozzle facing the roadway and with the center of the lowest outlet not less than 18" above the finished grade. Unless otherwise specified, the backfill around hydrants shall be thoroughly compacted to the final grade immediately after installation in order to put the hydrant into service as soon as practicable. Not less than seven (7) cubic feet of clean crushed stone shall be placed around the base of the hydrant to insure drainage of the hydrant barrel. A cap block shall be set under the fire hydrant foot for a solid bottom.

5. Air Relief Valves

Each air relief valve shall be installed at the exact location shown in a precast concrete manhole as shown in detail on the approved plans.

1. Air release valves installed directly to water main shall be installed in 4' manhole sections. Manhole shall be set plumb and on a firm foundation. Each joint between sections and all wall openings shall be sealed inside and out with a 2:1 sand-cement mortar and made watertight. When so directed, the Contractor shall install a flat slab top, precast with a standard frame and cover. Flat slab tops shall be traffic bearing.

2. Offset air release valves shall be installed in a standard water meter box. The air release valves shall be connected to the water main with ¾" CTS poly pipe. The air release valves will be isolated by a ¾" bronze ball valve located inside the meter box.

C. BACKFILLING AND COMPACTION

1. Backfill trenches immediately after approval of the pipeline construction.

2. Roadways and Road Crossings

Use select backfill placed in uniform layers not exceeding 6" in thickness for full trench depth and width, thoroughly compacted with mechanical tampers under optimum moisture conditions to 95% compaction (100% for the top 2'-0" of subgrade beneath pavements). Replace removed paving and base course with new material of equal or better quality and of the same texture and color as the adjacent roadway.

3. All backfill shall be compacted so as not to damage the pipe and appurtenances and shall be compacted to 95% of the Standard Proctor Test (100% for the top 2'-0" of subgrade beneath pavements) for the various types of backfill material. Methods of backfilling shall be in strict accordance with the pipe manufacturer's recommendations. All backfill material shall have been approved by the Town. Select backfill material shall be used when requested by the Town.

4. Care shall be taken during backfill and compaction operations to maintain alignment and prevent damage to the joints. The backfill shall be kept free from stones, frozen lumps, chunks of highly plastic clay, or other objectionable material. All pipe backfill areas shall be graded and maintained in such a condition that erosion or saturation will not damage the pipe bed or backfill.

5. Heavy equipment shall not be operated over any pipe until it has been properly backfilled and has a minimum cover as required by the approved plans. Where any part of the required cover is above the proposed finish grade, the Contractor shall place, maintain, and finally remove such material. Pipe which becomes mis-aligned, shows excessive settlement, or has been otherwise damaged by the Contractor's operations, shall be removed and replaced by the Contractor.

6. The Contractor shall maintain all pipes installed in a condition that they will function continuously from the time the pipe is installed until the project is accepted.

7. Cleanup

Grade all areas disturbed to a finish ordinarily obtained from a blade grader with no abrupt changes in grade or irregularities that will hold water. Prior to final inspection and acceptance, remove all rubbish and excess material and leave area in a neat, satisfactory condition.

## 3.02 QUALITY CONTROL

A. TESTING

Testing of valves and appurtenances shall be incidental to the testing of the water lines, and shall be performed as part of that testing.

## END OF SECTION

# SECTION 02660 WATER PIPE AND APPURTENANCES

## PART 1: GENERAL

### 1.01 SCOPE OF WORK

A. Furnish all labor, equipment, materials and incidentals necessary to install and complete installation of ductile iron and polyvinyl chloride (PVC) water lines in accordance with the plans. All pipe and appurtenance material shall be of the type and class specified herein.

B. All water pipe excavation, bedding, pipe laying, jointing and coupling of pipe joints and backfilling shall be completed as described herein.

### 1.02 DELIVERY, STORAGE AND HANDLING

A. The Contractor shall unload pipe so as to avoid deformation or other injury thereto. Pipe shall not be placed within pipe of a large size and shall not be rolled or dragged over gravel or rock during handling. When any joint or section of pipe or other material is damaged during transporting, unloading, handling or storing, the undamaged portions of the pipe or material may be used or if damaged sufficiently, the Town will reject the material as being unfit for installation.

B. If any defective material is discovered after installation, it shall be removed and replaced with sound pipe or shall be repaired by the Contractor in an approved manner and at his own expense.

## PART 2: PRODUCTS

### 2.01 MATERIALS

A. DUCTILE IRON PIPE

1. All materials shall be first quality with smooth interior and exterior surfaces, free from cracks, blisters, honeycombs, and other imperfections, and true to theoretical shapes and forms throughout. All materials shall be subject to the inspection of the Town at the plant, trench, or other point of delivery, for the purpose of culling and rejecting material which does not conform to the requirements of these specifications. Such material shall be marked by the Town, and the Contractor shall remove it from the project site upon notice being received of its rejection.

2. As specific specifications are cited, the designation shall be construed to refer to the latest revision under the same specification number, or to superseding specifications under a new number, except provisions in revised specifications which are clearly inapplicable.

3. Ductile Iron Pipe shall be manufactured in accordance with AWWA C151. All Ductile Iron Pipe shall be 350 psi class unless otherwise specified and shall be lined with a cement mortar lining not less then 1/16" thick conforming to AWWA C104. Pipe wall thickness for all Ductile Iron Pipe shall conform to "Thickness Design for Ductile Iron Pipe," AWWA C150. The standard laying condition shall be type 2. The exterior of all Ductile Iron Pipe shall have a protective coating of a coal tar or asphaltic material a minimum of 1 mil thickness conforming to AWWA C151.

   a. Flanged Joints

      i. Flanged pipe shall have flanges with long hubs, shop fitted on the threaded end of the pipe.

      ii. Where required, flanges shall be tapped for stud bolts. Flanges shall be accurately faced at right angles to the pipe axis and shall be drilled smooth and true, and covered with coal tar pipe varnish or otherwise protected against corrosion of flange faces. Flange faces shall be cleaned to bare metal with wire brushed before installation of pipe.

      iii. Ductile iron flanged joint pipe shall have a thickness of Class 350 minimum and shall conform to AWWA C110 and AWWA C115. Pipe shall be ordered in lengths needed as no pipe shall be cut, threaded or flanged in the field. All pipe shall have 125 lb. flanges conforming to AWWA C110 unless otherwise specified.

      iv. Flanged joints shall be made up with through bolts of the required size. Bolts shall be zinc plated, with good and sound, well fitting threads, so that the nuts may be turned freely by hand.

      v. Flanged joints shall be made up using only full face gaskets with a minimum thickness of 1/8". Ring gaskets are not acceptable. Gasket material shall be rubber or approved equal as recommended by the Manufacturer.

vi. Connecting flanges shall be in proper alignment and no external force shall be used to bring them together.

b. Mechanical Joints

i. All mechanical joint pipe shall be manufactured in accordance with AWWA C111. Pipe shall be manufactured in accordance with AWWA C151, and the pipe thickness shall be 350 psi class as determined by AWWA C150 unless otherwise noted.

ii. All bolts shall be tightened by means of torque wrenches in such a manner that the follower shall be brought up toward the pipe evenly. If effective sealing is not obtained by tightening the bolts to the specified torques, the joint shall be disassembled and reassembled after thorough cleaning.

iii. Bolts for mechanical joints shall be high grade steel, low alloy type, with tee or hex head and American Standard threads. Mechanical joint gland shall be gray iron and shall utilize a plain rubber gasket.

c. Slip Joints

i. Slip or "push-on" joints shall be manufactured in accordance with AWWA C111. Pipe thickness shall be 350 psi class as determined by AWWA C150.

ii. Bells of "slip" joint pipe shall be contoured to receive a bulbshaped circular rubber gasket, and plain ends shall have a slight taper to facilitate installation. The lubricant used in making up the joints shall be furnished by the pipe manufacturer. The jointing shall be done by guiding the plain end into the bell until contact is made with the gasket and by exerting a sufficient compressive force to drive the joint home until plain end makes full contact with the base of the bell. No joint may exceed a maximum deflection of eleven inches (11") in an 18-foot joint of pipe (3°).

4. Fittings

a. All ductile iron pipe fittings for pipe shall be mechanical joint type in accordance with AWWA C153 (ductile iron, compact type) for 3"-24", and AWWA C110 (ductile iron, full body type) for pipe larger than 24". Where flanged pipe is used ductile iron fittings shall be flanged in accordance with AWWA C153 or C110 where applicable for exposed piping. All flanges shall be Class 125 unless otherwise noted.

b. All fittings shall be lined with cement mortar not less then 1/16" thick in conformance with AWWA C104 and suitable for a minimum of 250 psi working pressure unless otherwise specified.

c. All mechanical joints shall be manufactured in accordance with AWWA C111.

## PART 3: EXECUTION

### 3.01 INSTALLATION

A. EXCAVATION

1. Trenches will be defined as all excavation for the installation of water pipe, hydrants, valves, water services, water taps, and other excavations as may be necessary to complete the installation.

2. The excavation shall be done to the lines, grades, typical sections, and details shown on the approved plans or established by the Town. All work covered by this section shall be coordinated with the grading, construction of drainage structures, and other work along the project, and shall be maintained in a satisfactory condition so that adequate drainage is provided at all times. Any roots which protrude into the trench shall be trimmed flush with the sides of the trench. Trenches for pipe lines shall be completed before the pipe is installed unless otherwise permitted by the Town.

3. All excavation shall be by open cut unless otherwise authorized by the Town or their authorized representative. If the bottom of the excavation is found to consist of rock or any materials that cannot be excavated to give a uniform bearing surface, the material shall be removed to a depth at least 6" below established bottom grade and backfilled to grade with #57 washed stone. Any excavations carried below the depths indicated, without specific directions, shall be backfilled in the same manner. The excavation shall be of sufficient width to allow a clearance of not less than 6" between the side of the

trench and the outside of the pipe, or in case of pipe with a bell, the outside of the bell of the pipe. This rule will apply at all times, and consequently, proper allowance must be made for additional space required for sheeting the trench where necessary.

4. Sheeting and bracing shall be provided in accordance with all applicable federal, state, and local safety and health regulations.

5. No sheeting or bracing shall extend closer than 2'-0" off the ground surface, or within subgrade, and no timbers shall be left in the trench that may form pockets or cavities that cannot easily be filled during the operation of backfilling and settling or compacting the trench backfill. Failure to sheet and brace trenches or other excavation shall be the Contractor's risk, and he will be held responsible for caving, settlement, and all other damage resulting therefrom.

6. Excavated materials to be used for backfill will be approved by the Town, and if acceptable shall be neatly deposited at the sides of the trenches where space is available. Where stockpiling of excavated material is required, the Contractor shall so maintain his operations as to provide for natural drainage and not present an unsightly appearance.

7. Materials which are excess to the needs of the project will be disposed of by the Contractor.

8. In order to protect existing pavement structures and to make clean-up easier the Contractor shall place a 2" layer of sand on all asphalt or concrete surfaces prior to placing excavated material.

9. <u>Pipe Foundations</u>

   a. The preparation of the pipe bedding shall be in accordance with the typical trench cross-sections as shown on the plans for the type of pipe being installed. Unless otherwise noted all pipe shall be installed using a Type 2 trench foundation as defined in AWWA C151.

   b. The pipe foundation shall be prepared to be uniformly firm and shall be true to the lines and grades as shown on the approved plans. Any deviation or field adjustment will require the approval of the Town.

   c. Whenever the nature of the ground will permit, the excavations at the bottom of the trench shall have the shape and dimensions of the outside lower third of the circumference of the pipe, care being taken to secure a firm bearing support uniformly throughout the length of the pipe.

A space shall be excavated under and around each bell to sufficient depth to relieve it of any load and to allow ample space for filling and finishing the joint. The pipe, when thus bedded firmly, shall be on the exact grade.

d. In case the bed shaped in the bottom of the trench is too low, the pipe shall be completely removed from position, and #57 washed stone of suitable quality shall be placed and thoroughly tamped to prepare a new foundation for the pipe. In no case shall the pipe be brought to grade by blocking up under the barrel or bell of same, but a new and uniform support must be provided for the full length of the pipe.

e. Where rock or boulders are encountered in the bottom of the trench, the same shall be removed to such depth that no part of the pipe, when laid to grade, will be closer to the rock or boulders than 6". #57 washed stone shall be placed to bring the bottom of the trench to proper subgrade over rock or boulders.

f. Where the foundation material is found to be of poor supporting value, the Town may permit minor adjustment in the location of the pipe to provide a more suitable foundation. Where this is not practical, the foundation shall be conditioned by removing the existing foundation material by undercutting to the depth as directed by the Town, within limits established on the approved plans, and backfilling with #57 washed stone as approved by the Town.

g. The Contractor shall remove all water which may be encountered or which may accumulate in the trenches by pumping or bailing and no pipes shall be laid until the water has been removed from the trench. Water so removed from the trench must be disposed of in such a manner as not to cause injury to work completed or in progress.

h. Whenever the bottom of the trench shall be of such nature as to provide unsatisfactory foundation for the pipe, the Town will require the pipe to be laid on a washed stone foundation.

B. INSTALLING PIPE AND APPURTENANCES

1. Laying Pipe

a. All piping is to be installed in strict accordance with the manufacturer's recommendations, AWWA C600, AWWA C605 and the contract material specifications. Installation manuals from various material suppliers will be furnished to the Town for their review and approval prior to installation of any materials. The Town may augment any manufacturer's installation recommendations if, in their opinion, it will best serve the interest of the Town.

b. No pipe shall be laid except in the presence of the Town or their Representative, or with special permission from the Town.

c. Proper tools, implements and facilities satisfactory to the Town shall be provided and used for the safe and convenient prosecution of pipe laying. All pipe, fittings, valves, and other materials used in the laying of pipe will be lowered into the trench piece by piece by means of suitable equipment in such a manner to prevent damage to the pipe, materials, to the protective coating on the pipe materials, and to provide a safe working condition to all personnel in the trench. Each piece of pipe being lowered into the trench shall be clean and free of defects. It shall be laid on the prepared foundations, as specified elsewhere to produce a straight line on a uniform grade, each pipe being laid so as to form a smooth and straight inside flow line.

d. Pipe shall be removed at any time if broken, injured or displaced in the process of laying same, or of backfilling the trench.

e. When cutting short lengths of pipe, a pipe cutter, as approved by the Town, will be used and care will be taken to make the cut at right angles to the center line of the pipe or on the exact skew as shown on the plans. In the case of push-on pipe, the cut ends shall be tapered with a portable grinder or coarse file to match the manufactured taper.

f. All pipe joints shall be constructed in strict accordance with the pipe manufacturer’s specifications and materials and any deviation must have prior approval of the Town.

g. The maximum deflection per joint of flexible joint pipe shall be that deflection recommended by the manufacturer. However, at no time will a deflection greater than 3° (11") be allowed.

h. All water lines shall have a minimum 12" vertical separation from storm sewer and shall have a minimum of 10'-0" horizontal separation from sanitary sewer or 18" vertical separation with the water line over the sewer line. In the event these separations cannot be met, both water line and sanitary sewer shall be constructed of ductile iron pipe as directed by the Town or as shown on the approved drawings.

2. Thrust Blocks

a. All plugs, caps, tees, bends, and other fittings shall be provided with adequate thrust blocks. Thrust blocks shall be constructed to the minimum dimensions shown on the approved drawings or as directed by the Town. Thrust blocks shall be made of ready mix concrete having a compressive strength of 28 days of 3000 psi and shall bear directly against the undisturbed trench wall. Where possible, the concrete shall be so placed that the fitting joints will be accessible for repair. All bolts and pipe joints shall be protected against contact with thrust block concrete by the installation of a 20 mil polyethylene film placed between the fittings and the concrete. Where any section of a main is provided with concrete thrust blocks, the hydrostatic pressure test shall not be made until three days after installation of the concrete thrust blocks unless otherwise approved by the Town. Where trench conditions are, in the opinion of the Town, unsuitable for thrust blocks, the Contractor shall provide steel tie rods and socket clamps to adequately anchor the piping. All tie rods and clamps shall be given a bituminous protective coating or shall be galvanized.

b. Concrete for thrust blocks shall consist of a ready mix of Portland Cement, fine and coarse aggregate, and water to produce concrete with a minimum compressive strength at 28 days of not less than 3000 psi when tested in accordance with ASTM C39. Sakrete or any similar material will not be permitted under any circumstances.

3. Exposed Pipe

a. Exposed pipe to be installed inside tanks, wetwells, vaults and buildings shall be installed as shown on the approved drawings and field painted as described below. All exposed ductile iron pipe shall utilize flanged joints unless otherwise noted.

b. All exposed cast or ductile iron pipe, fittings and valves shall be field painted with two (2) coats of epoxy paint as recommended by the paint manufacturer. Color of paint shall be as selected by the Town.

C. BACKFILLING AND COMPACTION

1. Backfill trenches immediately after approval of the pipeline construction.

2. Use backfill material carefully placed in uniform layers not exceeding 6” in thickness to a depth of 3’-0” over the top of the pipe. Place material and fill the area under the pipe haunches. Place each layer, moisten as necessary; then uniformly compact by use of hand, pneumatic, or mechanical tampers exercising care to prevent lateral displacement. Areas of backfill 2’-0” over top of pipe to top of trench, shall be backfilled with material containing no rocks larger than 6” in the greatest dimension and shall be free of material with an exceptionally high void content. The initial backfill shall meet the same requirements except no rocks over 4” in diameter will be allowed.

3. If material excavated from the trench is unsuitable to be used as backfill, “Select Backfill” shall be transported to the site by the Contractor from outside the project limits to be used as backfill material.

4. Moisten backfill as necessary above 2’-0” over the top of the pipe and place in 8” layers. Compact each layer with hand, pneumatic or mechanical compactor. Puddling or flooding of trench for consolidation of backfill or use of wheel rolling by construction equipment will not be permitted.

5. Use select backfill placed in uniform layers not exceeding 6” in thickness for full trench depth and width, thoroughly compacted with mechanical tampers under optimum moisture conditions to 95% compaction (100% for the top 2’-0” of subgrade beneath pavements). Replace removed paving and base course with new

material of equal or better quality and of the same texture and type as the adjacent roadway.

6. All backfill shall be compacted so as not to damage the pipe and appurtenances and shall be compacted to 95% of the maximum dry density as determined by Standard Proctor Test (100% for the top 2'-0" of subgrade beneath pavements) for the various types of backfill material. Methods of backfilling shall be in strict accordance with the pipe manufacturer's recommendations. All backfill material shall have been approved by the Town. Select backfill material shall be used when requested by the Town.

7. Care shall be taken during backfill and compaction operations to maintain alignment and prevent damage to the joints. The backfill shall be kept free from stones, frozen lumps, chunks of highly plastic clay, or other objectionable material. All pipe backfill areas shall be graded and maintained in such a condition that erosion or saturation will not damage the pipe bed or backfill.

8. Heavy equipment shall not be operated over any pipe until it has been properly backfilled and has a minimum cover as required by the approved plans. Where any part of the required cover is above the proposed finish grade, the Contractor shall place, maintain, and finally remove such material. Pipe which becomes mis-aligned, shows excessive settlement, or has been otherwise damaged by the Contractor's operations, shall be removed and replaced by the Contractor.

9. The Contractor shall maintain all pipes installed in a condition that they will function continuously from the time the pipe is installed until the project is accepted.

D. Cleanup

a. Grade all areas disturbed to a finish ordinarily obtained from a blade grader with no abrupt changes in grade or irregularities that will hold water. Prior to final inspection and acceptance, remove all rubbish and excess material and leave area in a neat, satisfactory condition.

b. Cleanup and seeding is part of the pipeline installation. No more than 3,000 L.F. of water line may be laid prior to completion of cleanup of the first section of pipeline laid.

## 3.02 QUALITY CONTROL

A. TESTING

1. After the pipeline has been satisfactorily constructed, complete with the required fire hydrants, services, and all other appurtenances, and the trench sufficiently backfilled, the newly constructed pipeline and valved sections shall be subjected to a hydrostatic pressure test. Each completed section of the pipeline shall be plugged at both ends and slowly filled with water. At no time shall more than 4,000 linear feet of main be tested. As the main is being filled with water in preparation of the tests, all air shall be expelled from the pipe. The main shall be subjected to hydrostatic pressure of 200 pounds per square inch (at the lowest point of the line section under test) for a period of two (2) hours unless otherwise specified. Pressure shall be applied to the main by means of a hand pump for small lines or by use of a gasoline pump or fire engine for larger lines.

2. Air removal. Before applying the specified test pressure, air shall be expelled completely from the section of piping under test. If permanent air valves are not located at all high points, corporation cocks shall be installed at these points to expel the air as the line is filled with water. At the conclusion of a successful pressure test, the corporation cocks shall be removed and the pipe plugged.

3. Examination. Any exposed pipe, fittings, valves, hydrants, and joints shall be examined carefully during the test. Any damage or defective pipe, fittings, valves, hydrants, or joints that are discovered following the pressure test shall be repaired or replaced with reliable material, and the test shall be repeated until satisfactory results are obtained.

4. The test allowance shall be determined at 15 minute intervals by means of volumetric measurement of the water added during the test until the rate has stabilized at the constant value for three consecutive 15 minute periods.

5. Test Allowance is defined as the quantity of water to be supplied into the newly laid pipe, or any valved section thereof, necessary to maintain the specified test pressure after the pipe has been filled with water and the air expelled. No piping installation will be accepted until the makeup water is less than shown in the following table:

ALLOWABLE MAKEUP WATER PER 1000 FEET OF PIPELINE* (gph)

| Avg. Test Pressure *Psi (bar)* | Nominal Pipe Diameter 3 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 24 | 30 | 36 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 250 | 0.36 | 0.47 | 0.71 | 0.95 | 1.19 | 1.42 | 1.66 | 1.90 | 2.14 | 2.37 | 2.85 | 3.56 | 4.27 |
| 225 | 0.34 | 0.45 | 0.68 | 0.90 | 1.13 | 1.35 | 1.58 | 1.80 | 2.03 | 2.25 | 2.70 | 3.38 | 4.05 |
| 200 | 0.32 | 0.43 | 0.64 | 0.85 | 1.06 | 1.28 | 1.48 | 1.70 | 1.91 | 2.12 | 2.55 | 3.19 | 3.82 |
| 175 | 0.30 | 0.40 | 0.59 | 0.80 | 0.99 | 1.19 | 1.39 | 1.59 | 1.79 | 1.98 | 2.38 | 2.98 | 3.58 |
| 150 | 0.28 | 0.37 | 0.55 | 0.74 | 0.92 | 1.10 | 1.29 | 1.47 | 1.66 | 1.84 | 2.21 | 2.76 | 3.31 |
| 125 | 0.25 | 0.34 | 0.50 | 0.67 | 0.84 | 1.01 | 1.18 | 1.34 | 1.51 | 1.68 | 2.01 | 2.52 | 3.02 |
| 100 | 0.23 | 0.30 | 0.45 | 0.60 | 0.75 | 0.90 | 1.05 | 1.20 | 1.35 | 1.50 | 1.80 | 2.25 | 2.70 |

*If the pipeline under test contains sections of various diameters, the allowable makeup water will be the sum of the computed makeup water for each size.

In inch-pound units:

$$L = \frac{SD\sqrt{P}}{133{,}200}$$

Where:

L = testing allowance (makeup water) in gallons per hour
S = length of pipe tested
D = nominal diameter of pipe, in inches
P = average test pressure during the hydrostatic test, in pounds per square inch (gauge)

6. No leakage will be allowed under the above tests for piping under or in buildings and structures.

7. Cracked or defective pipe, joints, fittings, valves, or hydrants discovered in consequence of this test shall be removed and replaced with sound materials, and the test shall be repeated until the test results are satisfactory. Precautions shall be taken to remove or otherwise protect equipment in, or attached to, pipe to prevent damage or injury thereto.

8. Tests of insulated and concealed piping shall be made before the piping is covered or concealed.

9. The Contractor shall notify the Town when the work is ready for testing with all testing done in the presence of the Town or its representative. All labor, equipment, water and materials, including meters and gauges shall be furnished by the Contractor.

B. STERILIZATION

1. After the pressure-leakage test is completed and before the use of water is permitted from any portion of newly constructed water line which will hold or carry potable water, it shall be flushed, cleaned, and chlorinated in the presence of and directed by the Town, or their Representative.

2. Pipelines may, at the option of the Contractor, be chlorinated in sections isolated by means of gate valves or other approved means.

3. Each unit of the completed water line shall be sterilized as specified below as prescribed by AWWA C651 “continuous feed” method. The unit to be sterilized shall be thoroughly flushed with water until all entrained dirt and mud have been removed before introducing the chlorinating material. The chlorinating material shall provide a chlorine dosage of not less than 50 parts per million and shall be introduced into the water line in an approved manner. The retention time shall be at least 24 hours and shall produce not less than 25 PPM of chlorine at the extreme end of the line at the end of the retention period. All valves on the lines being sterilized shall be opened and closed several times during the contact period.

4. Following chlorination, all treated water shall be thoroughly flushed from the pipe until the replacement water shall, upon test, both chemically and bacteriologically, be proven equal to the water quality served to the public from the existing water supply system. The Contractor shall be responsible for taking the necessary precautions, such as dechlorination, to ensure that the flushing does not harm the environment and complies with all appropriate regulatory requirements. The Contractor shall pay all costs for bacteriological tests. Bacteriological tests shall be performed by a State Approved laboratory.

5. During the flushing period, each fire hydrant on the line shall be opened and closed several times. The Town or their authorized Representative will take samples of water in properly sterilized containers for bacterial examination. The sterilization procedure shall be repeated until tests indicate the absence of pollution for at least two full days. The unit will not be accepted until satisfactory bacteriological results have been obtained. The samples shall not be taken from a fire hydrant.

6. Final connections to existing mains shall be made where indicated on the drawings or as directed after satisfactory samples have been obtained.

## END OF SECTION

# SECTION 02661 DOMESTIC WATER CONNECTION

## PART 1: GENERAL

### 1.01 SCOPE OF WORK

The work covered under this section shall consist of furnishing all materials, labor, equipment and services for the complete installation of a domestic water service connection from the water main line to the property to be served.

## PART 2: PRODUCTS

### 2.01 MATERIALS

A. The service line shall be constructed of CTS Poly Service Tubing with tracing wire.

B. Corporation stops shall be manufactured by Mueller and be of a ball curb with ground key design .

C. Meter box shall be standard rectangular meter box design. Meter box shall be sized to accept a 5/8" water meter, specifically MB-6 or Dexor Plastics DX1015-24 CIR.

D. The inlet and outlet pipes that pass through the box wall shall be brass and shall be locked in place with brass hex nuts on straight external pipe threads. The inlet and outlet of these nipples shall have external tapered pipe threads and shall be protected by Polyethylene Cap Plugs. An In-Line quarter turn shut off valve with internal tapered pipe thread inlet and water meter coupling outlet shall be used upstream of the water meter. The valves shall be soft seating with a padlock wing. The valves internal components shall be removable from the top of the valve body. An In-Line Dual Check Valve with independent acting checks shall be used downstream of the water meter. The check valve shall have a meter coupling inlet and shall be contained inside the box. The internal parts of the check valve shall be removable without disconnecting the check valve the outlet piping. All brass materials used in contact with the water shall have a minimum copper content of 80% and a maximum zinc content of 10%. Water meter installation shall be according to the detail (W-14, 5/8” Water Meter Box Detail).

## PART 3: EXECUTION

### 3.01 INSTALLATION

A. The standard service connection shall connect to the main at a brass corporation stop tapped to the main line. Service saddle shall be manufactured by Smith Blair or Ford, epoxy coated ductile iron with steel alloy straps. Corporation Stops shall be Ford ground key design.

B. Meters shall be provided and installed by the Town of Franklin.

## END OF SECTION

# SECTION 02664 PVC WATER PIPE AND APPURTENANCES

## PART 1: GENERAL

### 1.01 SCOPE OF WORK

A. Furnish all labor, equipment, materials and incidentals necessary to install and complete installation of C-900 PVC water lines in accordance with the plans. All pipe and appurtenance material shall be of the type and class specified herein. This specification applies to PVC water lines which are 4" diameter or larger.

B. All water pipe excavation, bedding, pipe laying, jointing and coupling of pipe joints and backfilling shall be completed as described herein.

### 1.02 SUBMITTALS

A. Shop drawings or submittals shall be required for the following:

1. All sizes and types of pipe on the project.

2. Pipe fittings and appurtenances.

### 1.03 DELIVERY, STORAGE AND HANDLING

A. The Contractor shall unload pipe so as to avoid deformation or other injury thereto. Pipe shall not be placed within pipe of a large size and shall not be rolled or dragged over gravel or rock during handling. When any joint or section of pipe or other material is damaged during transporting, unloading, handling or storing, the undamaged portions of the pipe or material may be used or if damaged sufficiently, the Engineer will reject the material as being unfit for installation.

B. If any defective material is discovered after installation, it shall be removed and replaced with sound pipe or shall be repaired by the Contractor in an approved manner and at his own expense.

## PART 2: PRODUCTS

### 2.01 MATERIALS

A. Polyvinyl Chloride (PVC) Pressure Pipe, AWWA C-900:

1. All materials shall be first quality with smooth interior and exterior surfaces, free from cracks, blisters, honeycombs, and other imperfections, and true to theoretical shapes and forms throughout.

All materials shall be subject to the inspection of the Engineer at the plant, trench, or other point of delivery, for the purpose of culling and rejecting material which does not conform to the requirements of these specifications. Such material shall be marked by the Engineer, and the Contractor shall remove it from the project site upon notice being received of its rejection.

2. As specific specifications are cited, the designation shall be construed to refer to the latest revision under the same specification number, or to superseding specifications under a new number, except provisions in revised specifications which are clearly inapplicable.

3. PVC Pipe shall be manufactured in accordance with AWWA C-900. All PVC Pipe shall be class 150 and conform to the requirements of DR 18 unless otherwise specified. The exterior of all PVC Pipe shall bear a stamp which shows the AWWA certification, SDR, size, and NSF seal.

   a. All pipes shall have slip or "push-on" joints which are manufactured in accordance with AWWA C900. Pipe shall have a bell with integral rubber gasket.

   b. Bells of "slip" joint pipe shall be contoured to receive a bulbshaped circular rubber gasket, and plain ends shall have a slight taper to facilitate installation. The lubricant used in making up the joints shall be furnished by the pipe manufacturer. The jointing shall be done by guiding the plain end into the bell until contact is made with the gasket and by exerting a sufficient compressive force to drive the joint home until the assembly mark on the pipe barrel is flush with the end of the bell. No joint may exceed a maximum deflection of eleven inches (11") in an 18-foot joint of pipe (3°).

4. <u>Fittings:</u>

   a. Fittings for all PVC pipe shall be ductile iron pipe fittings, mechanical joint type in accordance with AWWA C110 and AWWA C111 for underground piping.

   b. All fittings shall be lined with cement mortar not less then 1/16" thick in conformance with AWWA C104 and suitable for a minimum of 250 psi working pressure unless otherwise specified.

   c. All mechanical joints shall be manufactured in accordance with AWWA C111. The Contractor shall provide suitable 3"

plugs with stainless steel threaded nipples and sleeves for connection of fittings for PVC pipe 2" in diameter and smaller.

## PART 3: EXECUTION

### 3.01 INSTALLATION

A. Excavation:

1. Trenches will be defined as all excavation for the installation of water pipe, hydrants, valves, water services, water taps, and other unclassified excavation as may be deemed necessary by the Engineer.

2. The excavation shall be done to the lines, grades, typical sections, and details shown on the plans or established by the Engineer. All work covered by this section shall be coordinated with the grading, construction of drainage structures, and other work along the project, and shall be maintained in a satisfactory condition so that adequate drainage is provided at all times. Any roots which protrude into the trench shall be trimmed flush with the sides of the trench. Trenches for pipe lines shall be completed before the pipe is installed unless otherwise permitted by the Engineer.

3. All excavation shall be by open cut method unless otherwise authorized by the Engineer. If the bottom of the excavation is found to consist of rock or any materials that cannot be excavated to give a uniform bearing surface, the material shall be removed to a depth at least 6" below established bottom grade and backfilled to grade with #57 washed stone. Any excavations carried below the depths indicated, without specific directions, shall be backfilled in the same manner. The excavation shall be of sufficient width to allow a clearance of not less than 6" between the side of the trench and the outside of the pipe, or in case of pipe with a bell, the outside of the bell of the pipe. This rule will apply at all times, and consequently, proper allowance must be made for additional space required for sheeting the trench where necessary. Maximum trench width, unless as otherwise authorized by the Engineer, as measured at a depth of 2'-0" above the top of the pipe shall be 30" or 10" clearance from each side of the pipe, whichever is greater.

4. If necessary, the Contractor will be required to keep the sides of the excavation vertical by sheeting and/or bracing or the use of a trench box to prevent movement by slides or settling of the sides of the trench to prevent injury or displacement of the pipe or appurtenances or diminish the working space required at the sides

of the pipe. The Contractor may be required, for the purpose of preventing injury to persons or property or adjacent structures in place or to be constructed, to leave sheeting and bracing in place. The Contractor shall provide all means necessary to comply with all Federal, State and Local Health and Safety regulations.

5. No sheeting or bracing shall extend closer than 2'-0" off the ground surface, or within subgrade, and no timbers shall be left in the trench that may form pockets or cavities that cannot easily be filled during the operation of backfilling and settling or compacting the trench backfill. The Owner will be under no obligation to pay for sheeting or bracing left in place by the Contractor. Failure to sheet and brace trenches or other excavation shall be the Contractor's risk, and he will be held responsible for caving, settlement, and all other damage resulting therefrom.

6. Excavated materials to be used for backfill will be approved by the Engineer, and if acceptable shall be neatly deposited at the sides of the trenches where space is available. Where stockpiling of excavated material is required, the Contractor shall so maintain his operations as to provide for natural drainage and not present an unsightly appearance.

7. Materials which are excess to the needs of the project will be disposed of by the Contractor.

8. In order to protect existing pavement structures and to make clean-up easier the Contractor shall place a 2" layer of sand on all asphalt or concrete surfaces prior to placing excavated material.

9. <u>Pipe Foundations:</u>

   a. The preparation of the pipe bedding shall be in accordance with the typical trench cross-sections as shown on the plans for the type of pipe being installed. Unless otherwise noted all pipe shall be installed using a Type 2 trench foundation as defined in AWWA C-900.

   b. The pipe foundation shall be prepared to be uniformly firm and shall be true to the lines and grades as shown on the plans. Any deviation or field adjustment will require the approval of the Engineer.

   c. Whenever the nature of the ground will permit, the excavations at the bottom of the trench shall have the shape and dimensions of the outside lower third of the

circumference of the pipe, care being taken to secure a firm bearing support uniformly throughout the length of the pipe. A space shall be excavated under and around each bell to sufficient depth to relieve it of any load and to allow ample space for filling and finishing the joint. The pipe, when thus bedded firmly, shall be on the exact grade.

d. In case the bed shaped in the bottom of the trench is too low, the pipe shall be completely removed from position, and #57 washed stone shall be placed and thoroughly tamped to prepare a new foundation for the pipe. In no case shall the pipe be brought to grade by blocking up under the barrel or bell of same, but a new and uniform support must be provided for the full length of the pipe.

e. Where rock or boulders are encountered in the bottom of the trench, the same shall be removed to such depth that no part of the pipe, when laid to grade, will be closer to the rock or boulders than 6". #57 washed stone shall be placed to bring the bottom of the trench to proper subgrade over rock or boulders.

f. Where the foundation material is found to be of poor supporting value, the Engineer may make minor adjustment in the location of the pipe to provide a more suitable foundation. Where this is not practical, the foundation shall be conditioned by removing the existing foundation material by undercutting to the depth as directed by the Engineer, within limits established on the plans, and backfilling with #57 washed stone as approved by the Engineer.

g. The Contractor shall remove all water which may be encountered or which may accumulate in the trenches by pumping or bailing and no pipes shall be laid until the water has been removed from the trench. Water so removed from the trench must be disposed of in such a manner as not to cause injury to work completed or in progress.

h. Whenever the bottom of the trench shall be of such nature as to provide unsatisfactory foundation for the pipe, the Engineer will require the pipe to be laid on a washed stone foundation.

B. Installing Pipe and Appurtenances:

1. Laying Pipe:

a. All piping is to be installed in strict accordance with the manufacturer's recommendations and AWWA C605, Unibell UNI-B-3 and the contract material specifications. Installation manuals from various material suppliers will be furnished the Engineer for his review and approval prior to installation of any materials. The Engineer may augment any manufacturer's installation recommendations if, in his opinion, it will best serve the interest of the Owner.

b. No pipe shall be laid except in the presence of the Engineer or his Representative, or with special permission from the Engineer.

c. Proper tools, implements and facilities satisfactory to the Engineer shall be provided and used for the safe and convenient prosecution of pipe laying. All pipe, fittings, valves, and other materials used in the laying of pipe will be lowered into the trench piece by piece by means of suitable equipment in such a manner to prevent damage to the pipe, materials, to the protective coating on the pipe materials, and to provide a safe working condition to all personnel in the trench. Each piece of pipe being lowered into the trench shall be clean and free of defects. It shall be laid on the prepared foundations, as specified elsewhere to produce a straight line on a uniform grade, each pipe being laid so as to form a smooth and straight inside flow line.

d. Pipe shall be removed at any time if broken, injured or displaced in the process of laying same, or of backfilling the trench.

e. When cutting short lengths of pipe, a pipe cutter, as approved by the Engineer, will be used and care will be taken to make the cut at right angles to the center line of the pipe. In the case of push-on pipe, the cut ends shall be tapered with a portable grinder or coarse file to match the manufactured taper.

f. All pipe joints shall be constructed in strict accordance with the pipe manufacturer’s specifications and materials and any deviation must have prior approval of the Engineer.

g. The maximum deflection per joint of flexible joint pipe shall be that deflection recommended by the manufacturer. However, at no time will a deflection greater than 3° (11”) be allowed.

h. All water lines shall have a minimum 12” vertical separation from storm sewer and shall have a minimum of 10’-0” horizontal separation from sanitary sewer or 18” vertical separation with the water line over the sewer line. In the event these separations cannot be met, both water line and sanitary sewer shall be constructed of ductile iron pipe as directed by the Engineer or as shown on the drawings.

2. Thrust Blocks:

a. All plugs, caps, tees, bends, and other fittings shall be provided with adequate thrust blocks. Thrust blocks shall be constructed to the minimum dimensions shown on the drawings or as directed by the Engineer. Thrust blocks shall be made of ready mix concrete having a compressive strength at 28 days of 3000 psi and shall bear directly against the undisturbed trench wall. Where possible, the concrete shall be so placed that the fitting joints will be accessible for repair. All bolts and pipe joints shall be protected against contact with thrust block concrete by the installation of a 20 mil polyethylene film placed between the fittings and the concrete. Where any section of a main is provided with concrete thrust blocks, the hydrostatic pressure test shall not be made until three days after installation of the concrete thrust blocks unless otherwise approved by the Engineer. Where trench conditions are, in the opinion of the Engineer, unsuitable for thrust blocks, the Contractor shall provide steel tie rods and socket clamps to adequately anchor the piping. All tie rods and clamps shall be given a bituminous protective coating or shall be galvanized.

b. Concrete for thrust blocks shall consist of a ready mix of Portland Cement, Fine Coarse aggregate and water to produce concrete with a minimum compressive strength at 28 days of not less than 3000 psi when tested in accordance with ASTM C39. Sakrete or any similar material will not be permitted under any circumstances.

C. Backfilling and Compaction:

1. Backfill trenches immediately after approval of the pipeline construction.

2. Use backfill carefully placed in uniform layers not exceeding 6” in thickness to a depth of 3’-0” over the top of the pipe. Place material and fill the area under the pipe haunches. Place each layer, moisten as necessary; then uniformly compact by use of hand, pneumatic, or mechanical tampers exercising care to prevent lateral displacement. Areas of backfill 2’-0” over top of pipe to top of trench, shall be backfilled with a material containing no rocks larger than 6” in the greatest dimension and shall be free of material with an exceptionally high void content. The initial backfill shall meet the same requirements except no rocks over 4” in diameter will be allowed.

3. If material excavated from the trench is unsuitable to be used as backfill, “select backfill” shall be transported to the site by the Contractor from outside the project limits to be used as backfill material. Material excavated in conjunction with the construction of the project is not considered “select backfill” for payment purposes.

4. Moisten backfill as necessary above 2’-0” over the top of the pipe and place in 8” layers. Compact each layer with hand, pneumatic or mechanical compactor. Puddling or flooding of trench for consolidation of backfill or use of wheel rolling by construction equipment will not be permitted.

5. Use backfill placed in uniform layers not exceeding 6” in thickness for full trench depth and width, thoroughly compacted with mechanical tampers under optimum moisture conditions to 95% compaction (100% for the top 2’-0” of subgrade beneath pavements). Replace removed paving and base course with new material of equal or better quality and of the same texture and type as the adjacent roadway.

6. All backfill shall be compacted so as not to damage the pipe and appurtenances and shall be compacted to 95% of the maximum dry density as determined by Standard Proctor Test (100% for the top 2’-0” of subgrade beneath pavements) for the various types of backfill material. Methods of backfilling shall be in strict accordance with the pipe manufacturer's recommendations. All backfill material shall have been approved by the Engineer. Select backfill material shall be used when requested by the Engineer.

7. Care shall be taken during backfill and compaction operations to maintain alignment and prevent damage to the joints. The backfill shall be kept free from stones, frozen lumps, chunks of highly plastic clay, or other objectionable material. All pipe backfill areas shall be

graded and maintained in such a condition that erosion or saturation will not damage the pipe bed or backfill.

8. Heavy equipment shall not be operated over any pipe until it has been properly backfilled and has a minimum cover as required by the plans. Where any part of the required cover is above the proposed finish grade, the Contractor shall place, maintain, and finally remove such material at no cost to the Owner. Pipe which becomes mis-aligned, shows excessive settlement, or has been otherwise damaged by the Contractor's operations, shall be removed and replaced by the Contractor at no cost to the Owner.

9. The Contractor shall maintain all pipes installed in a condition that they will function continuously from the time the pipe is installed until the project is accepted.

10. Cleanup:

    a. Grade all areas disturbed to a finish ordinarily obtained from a blade grader with no abrupt changes in grade or irregularities that will hold water. Prior to final inspection and acceptance, remove all rubbish and excess material and leave area in a neat, satisfactory condition.

    b. Cleanup and seeding is part of the pipeline installation. No more than 3,000 L.F. of water line may be laid prior to completion of cleanup of the first section of pipeline laid. To facilitate this the Owner reserves the right to withhold up to 30% of the unit price bid for water line if in the opinion of the Owner and Engineer completed sections have not been properly cleaned.

## 3.02 QUALITY CONTROL

A. Testing:

1. After the pipeline has been satisfactorily constructed, complete with the required fire hydrants, services, and all other appurtenances, and the trench sufficiently backfilled, the newly constructed pipeline and valved sections shall be subjected to a hydrostatic pressure-leakage test. Each completed section of the pipeline shall be plugged at both ends and slowly filled with water. At no time shall more than 4,000 linear feet of main be tested. Additional valves shall be paid for at the unit price bid for valves. As the main is being filled with water in preparation of the tests, all air shall be expelled from the pipe. The main shall be subjected to hydrostatic pressure

of 200 pounds per square inch (at the lowest point of the line section under test) for a period of two (2) hours unless otherwise specified. Pressure shall be applied to the main by means of a hand pump for small lines or by use of a gasoline pump or fire engine for larger lines.

2. Air removal. Before applying the specified test pressure, air shall be expelled completely from the section of piping under test. If permanent air vents are not located at all high points, corporation cocks shall be installed at these points to expel the air as the line is filled with water. After the air has been expelled, the corporation cocks shall be closed and the test pressure applied. At the conclusion of a successful pressure test, the corporation cocks shall be removed and the pipe plugged.

3. Examination. Any exposed pipe, fittings, valves, hydrants, and joints shall be examined carefully during the test. Any damage or defective pipe, fittings, valves, hydrants, or joints that are discovered following the pressure test shall be repaired or replaced with reliable material, and the test shall be repeated until satisfactory results are obtained.

4. The test allowance shall be determined at 15 minute intervals by means of volumetric measurement of the water added during the test until the rate has stabilized at the constant value for three consecutive 15 minute periods.

5. Test Allowance is defined as the quantity of water to be supplied into the newly laid pipe, or any valved section thereof, necessary to maintain the specified test pressure after the pipe has been filled with water and the air expelled. No piping installation will be accepted until the makeup water is less than shown in the following table:

Allowable Makeup Water per 1,000 Feet of Pipeline* (gph)

| Avg. Test Pressure *Psi (bar)* | Nominal Pipe Diameter | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 24 | 30 | 36 |
| 250 | 0.47 | 0.71 | 0.95 | 1.19 | 1.42 | 1.66 | 1.90 | 2.14 | 2.37 | 2.85 | 3.56 | 4.27 |
| 225 | 0.45 | 0.68 | 0.90 | 1.13 | 1.35 | 1.58 | 1.80 | 2.03 | 2.25 | 2.70 | 3.38 | 4.05 |
| 200 | 0.43 | 0.64 | 0.85 | 1.06 | 1.28 | 1.48 | 1.70 | 1.91 | 2.12 | 2.55 | 3.19 | 3.82 |
| 175 | 0.40 | 0.59 | 0.80 | 0.99 | 1.19 | 1.39 | 1.59 | 1.79 | 1.98 | 2.38 | 2.98 | 3.58 |
| 150 | 0.37 | 0.55 | 0.74 | 0.92 | 1.10 | 1.29 | 1.47 | 1.66 | 1.84 | 2.21 | 2.76 | 3.31 |
| 125 | 0.34 | 0.50 | 0.67 | 0.84 | 1.01 | 1.18 | 1.34 | 1.51 | 1.68 | 2.01 | 2.52 | 3.02 |
| 100 | 0.30 | 0.45 | 0.60 | 0.75 | 0.90 | 1.05 | 1.20 | 1.35 | 1.50 | 1.80 | 2.25 | 2.70 |

*If the pipeline under test contains sections of various diameters, the allowable makeup water will be the sum of the computed makeup water for each size.

In inch-pound units:

$$L = \frac{SD\sqrt{P}}{133{,}200}$$

Where:

L = testing allowance (makeup water), in gallons per hour
S = length of pipe tested, in feet
D = nominal diameter of pipe, in inches
P = average test pressure during the hydrostatic test, in pounds per square inch (gauge)

6. No leakage will be allowed under the above tests for piping under or in buildings and structures.

7. Cracked or defective pipe, joints, fittings, valves, or hydrants discovered in consequence of this test shall be removed and replaced with sound materials, and the test shall be repeated until the test results are satisfactory. Precautions shall be taken to remove or otherwise protect equipment in, or attached to, pipe to prevent damage or injury thereto.

8. Tests of insulated and concealed piping shall be made before the piping is covered or concealed.

9. The Contractor shall notify the Engineer when the work is ready for testing with all testing done in the presence of the Engineer. All labor, equipment, water and materials, including meters and gauges shall be furnished by the Contractor at his own expense.

B. Sterilization:

1. After the pressure-leakage test is completed and before the use of water is permitted from any portion of newly constructed water line which will hold or carry potable water, it shall be flushed, cleaned, and chlorinated in the presence of and directed by the Engineer or his Representative.

2. Pipelines may, at the option of the Contractor, be chlorinated in sections isolated by means of gate valves or other approved means.

3. Each unit of the completed water line shall be sterilized as specified below as prescribed by AWWA C651 “continuous feed” method. The unit to be sterilized shall be thoroughly flushed with water until all entrained dirt and mud have been removed before introducing the chlorinating material. The chlorinating material shall provide a chlorine dosage of not less than 50 parts per million and shall be

introduced into the water line in an approved manner. The retention time shall be at least 24 hours and shall produce not less than 25 PPM of chlorine at the extreme end of the line at the end of the retention period. All valves on the lines being sterilized shall be opened and closed several times during the contact period.

4. Following chlorination, all treated water shall be thoroughly flushed from the pipe until the replacement water shall, upon test, both chemically and bacteriologically, be proven equal to the water quality served to the public from the existing water supply system. The Contractor shall be responsible for taking the necessary precautions, such as dechlorination, to ensure that flushing does not harm the environment and complies with all appropriate regulatory requirements. The Contractor shall pay all costs for bacteriological tests.

5. During the flushing period, each fire hydrant on the line shall be opened and closed several times. The Engineer will take samples of water in properly sterilized containers for bacterial examination. The sterilization procedure shall be repeated until tests indicate the absence of pollution for at least two full days. The unit will not be accepted until satisfactory bacteriological results have been obtained. The samples shall not be taken from a fire hydrant.

Final connections to existing mains shall be made where indicated on the drawings or as directed after satisfactory samples have been obtained.

## END OF SECTION

# SECTION 02730 SANITARY SEWER PIPE AND APPURTENANCES

## PART 1: GENERAL

### 1.01 SCOPE OF WORK

A. Furnish all labor, equipment, materials and incidentals necessary to install and complete the sanitary sewer and/or force main installation in accordance with the approved plans. All pipe and appurtenance material shall be of the type and class specified herein.

B. All sewer pipe and force main excavation, bedding, pipe laying, jointing and coupling of pipe joints and backfilling shall be completed as described herein.

### 1.02 DELIVERY, STORAGE AND HANDLING

A. The Contractor shall unload pipe and appurtenances so as to avoid deformation or other injury thereto. Pipe shall not be placed within pipe of a larger size and shall not be rolled or dragged over gravel or rock during handling. The Contractor shall store the pipe and appurtenances on sills above storm drainage level and deliver for laying after the trench is excavated. When any material is damaged during transporting, unloading, handling or storing, the undamaged portions may be used as needed, or, if damaged sufficiently, the Town will reject the material as being unfit for installation.

## PART 2: PRODUCTS

### 2.01 MATERIALS

A. PIPE

1. All materials shall be first quality with smooth interior and exterior surfaces, free from cracks, blisters, honeycombs and other imperfections, and true to theoretical shapes and forms throughout. All materials shall be subject to the inspection of the Town at the plant, trench, or other point of delivery, for the purpose of culling and rejecting materials which do not conform to the requirements of these specifications. Such material shall be marked by the Town and the Contractor shall remove it from the project site upon notice being received of its rejection.

2. As particular specifications are cited, the designation shall be construed to refer to the latest revision under the same specification number, or to superseding specifications under a new number except provisions in revised specifications which are clearly inapplicable.

3. Ductile Iron Sewer Pipe (DIP) – Gravity Sewer and Force Mains

   a. Ductile Iron Pipe shall be as manufactured in accordance with ASTM A 746, ANSI Specification A21.50 and A21.51 and shall be Class 350 unless otherwise approved by the Town.

   b. The pipe interior shall be cement mortar lined and seal coated, standard thickness, in accordance with ANSI Specification A21.4.

   c. The exterior of all pipe shall be coated with either a coal or asphaltic base bituminous pipe coating in accordance with ANSI Specification A21.8.

   d. Pipe shall be furnished with Slip Joints, Mechanical Joints, or Flanged Joints as indicated on the approved drawings and in accordance with the specifications described below:

   e. Slip Joints - This pipe joint shall be done by guiding the plain end of the pipe into the bell end until contact is made with a gasket and by exerting a sufficient compressive force to drive the plain end through the gasket until the plain end makes full contact with the base of the bell.

      i. Bells of slip-joint pipe shall be contoured to receive a circular rubber gasket and plain ends shall have a slight taper to facilitate installation.

      ii. The circular gasket shall be furnished by the pipe manufacturer and shall be manufactured in accordance with ANSI Specification A21.11.

      iii. The pipe manufacturer shall also furnish the lubricant used to assist in the pipe installation.

   f. Mechanical Joints - This pipe joint is essentially the same as the slip joint except it is furnished with a cast iron clamp which acts as a retainer to hold circular rubber gasket in place. All mechanical type joints shall be furnished by the

pipe manufacturer and manufactured in accordance with ANSI Specification A21.11.

i. All bolts shall be tightened by means of torque wrenches in such a manner that the following shall be brought up toward the pipe evenly. If effective sealing is not obtained by tightening the bolts to the specified torques, the joint shall be disassembled and reassembled after thorough cleaning.

g. Flanged Joints - The flanged pipe joint is composed of a flat steel plate shop fitted on the threaded end of the ductile iron pipe. The flanges shall be accurately faced at right angles to the pipe axis and shall be drilled smooth and true.

i. Flanged joints shall be furnished with 125 lb. flanges drilled in accordance with ANSI Specification B16.1.

ii. In general, flanged joints shall be made up with through bolts of the required size. Stud or tap bolts shall be used only where shown or required.

iii. Gaskets for flanged joints shall be the ring type of cloth inserted rubber or rubber with a minimum thickness of 1/8".

iv. Connecting flanges shall be in proper alignment and no external force shall be used to bring them together. Bolts and gaskets shall be furnished by the installer of piping for joints connecting the piping with equipment, as well as for those between pipe and fittings, whether such equipment and piping is furnished by the installer or not.

h. Long Span Pipe – "Long span" type ductile iron pipe shall be used for unsupported spans greater than 20'-0". "Long span" ductile iron pipe and associated pipe joints shall be designed by the pipe manufacturer specifically for elevated crossings with unsupported spans shown on the drawings. The Contractor shall submit shop drawings from the pipe manufacturer for the long span pipe. Shop drawings shall include material specifications for the pipe and joints, and shall specify locations of joints with respect to the pier locations shown on the drawings. Long span ductile iron pipe shall be as manufactured by American, U.S. Pipe, or approved equal.

4. Polyvinyl Chloride Sewer Pipe (PVC)

a. Gravity - Polyvinyl Chloride Pipe shall be as manufactured in accordance with ASTM D-3034, latest edition, and shall be suitable for use as a gravity sanitary sewer pipe. The standard dimension ratio (SDR) shall be 35 unless otherwise specified on the contract drawings.

b. All polyvinyl chloride pipe joints shall be of an integral bell and spigot of the same material as the pipe. It shall have a solid cross-section with rubber "0" ring securely locked in place at the point of manufacture.

c. Force Main - Polyvinyl chloride pipe shall be as manufactured in accordance with ASTM D-2241, latest edition, and shall be suitable for use as a sanitary sewer force main pipe. The standard dimension ratio (SDR) shall be 18 or 21 as shown on the approved drawings. PVC force main piping shall have a green exterior color. Under no circumstances shall pipe with a blue exterior color be accepted.

d. Where PVC pipe is installed in iron pipe size (IPS), an IPS gasket shall be furnished with each fitting to insure compatibility.

5. Fittings

Whenever the sanitary sewer force main has a significant change in alignment or grade it will be necessary to furnish and install a fitting made of either cast/ductile iron or galvanized steel.

The specifications for the force main fittings are described below:

a. Cast Iron/Ductile Iron - All cast iron and ductile iron fittings shall be mechanical joint manufactured in accordance with ANSI Specification A-21.1 and AWWA Standard C-110 for underground piping.

The interior of the fittings shall be cement mortar lined and seal coated in accordance with ANSI Specification A21.4 and AWWA C-104.

6. Gate Valves

All gate valves shall be designed for a working pressure of 200 psi unless otherwise specified and shall have a clear waterway equal to the full nominal diameter of the pipe and shall be opened by

turning counterclockwise. Each valve shall have the initials of the maker, pressure rating and year of manufacture cast on the body. Prior to shipment from the factory, each valve shall be tested by hydraulic pressure equal to twice the specified working pressure. Valves shall be operated by handwheel or operating nut as herein specified and shall have an arrow cast in the metal indicating the direction of opening. Valves to be installed underground shall be non-rising stem type while valves installed above ground or in buildings and structures shall have rising stems. All gate valves 16" or larger shall have a 3" bypass with valve.

a. 2" Gate Valves

I. 2-inch gates valves shall be full body, resilient wedge built to manufacturer's standards with material and construction conforming to AWWA C-500, or ball curb stop.

II. Each valve shall have a 2" operating nut. Valves shall have screwed ends conforming to NPT standards.

b. Resilient Seated Wedge Valve

i. Gate valves 3" through 24" diameter size shall be of the ductile iron body, resilient seated wedge type meeting the requirements set forth in AWWA C-509 and AWWA C-500. All valves shall be from one manufacturer and parts interchangeable.

ii. Gate valves shall have body, bonnet and gate manufactured of ductile iron conforming to ASTM A-536. The shell thickness of all components shall conform to the thicknesses in Table 2, Section 4.4 of AWWA C-509 and C-500. The valve body and bonnet shall be coated on both the interior and exterior surfaces with a fusion bonded epoxy paint conforming to AWWA C-550.

iii. The gate shall be fully covered with a rubber cover over all exterior and interior ferrous surfaces. The rubber shall be securely bonded to the gate body, including the part which houses the stem nut. The gate and rubber coat shall conform to ASTM D429.

iv. Valve stems shall be cast bronze. The stuffing box shall use "O"-ring seal type with two rings located above the thrust collar. The rings shall be

replaceable with the valve fully open and under pressure.

v. Valves larger than 12" diameter shall be designed for horizontal installation with beveled gear boxes with reduction gears to reduce the number of turns required to operate valve.

vi. Gate valves shall be manufactured by Mueller Co., A-2360 Resilient Wedge.

7. Sewage Combination Air Relief Valves

a. The combination air valve shall be designed specifically for use on sanitary sewer pressure (force) mains. It shall be designed to exhaust large volumes of air from the system during filling of the main or on pump start-up. It shall also allow large volumes of air to enter the system during draining (prevents vacuum from forming). In addition, the valve shall release small amounts of accumulated air while the system is in normal operation (under pressure).

b. The combination air valve shall be provided in a single body constructed of cast iron. The float and stem shall be constructed of stainless steel. The needle and seat shall be constructed of Buna-N. The valve shall be equipped with an inlet valve.

c. Combination air valves shall be manufactured by APCO, Val-Matic, GA Industries, or approved equal.

8. Flexible Couplings

Whenever it becomes necessary to join sewer pipe lines of dissimilar materials or pipe sizes it shall be required to use a flexible coupling. The coupling shall be made of virgin polyvinyl chloride (PVC) and shall not harden and shall be impervious to all known soil conditions. The coupling shall provide a permanent leakproof seal approved by the Southern Building Code Congress and manufactured in accordance with ASTM #C-594-70. The couplings shall be as manufactured by Fernco Joint Sealer Company or an approved equal.

9. Manholes

a Precast concrete manhole bases, risers and cones shall conform to ASTM C 478, latest revision of Precast Reinforced Concrete Manhole Sections. Tapered section

and transition sections, where required, shall be of eccentric cone design, having the same wall thickness and reinforcement as the cylindrical ring sections. Flat slab tops shall be required for very shallow manholes and where shown or specified.

b. Minimum compressive strength of concrete shall be 4,000 psi and the maximum permissible absorption shall be 6.5%. Risers shall be reinforced with a single cage of steel placed within the center third of the wall. The tongue or the groove of the joint shall contain one (1) line of circumferential reinforcement equal in area to that in the barrel of the manhole riser. The minimum cross-sectional area of steel per linear foot shall be 0.12 square inches for larger sizes. Precast manhole section shall fit together readily and shall have a self-contained "O" ring rubber gasket conforming to ASTM C-443.

c. The quality of materials, the process of manufacture, and the finished manhole sections shall be subject to inspection and approval by the Town and his representative. The manhole sections shall be perpendicular to their longitudinal axis within the limits listed in ASTM C 478.

10. Frames and Covers

a. Frames and covers shall be cast iron of superior quality, tough and even texture. Castings shall be gray iron conforming to ASTM A 48, size as indicated, free from blow holes, porosity, hard spots, shrinkage distortion, or other defects, and well cleaned. The bearing surface between frame and cover shall be machined to prevent rocking and rattling.

b. The standard manhole casting shall be designed for heavy duty use with a 190 pound frame and 125 pound cover. Acceptable products include U.S. Foundry USF 669 ring and KL cover, or an approved equal. Frame and cover shall meet North Carolina DOT 840.54 standard unless otherwise noted.

c. Special waterproof manhole frame and covers shall be installed only at those locations indicated on the contract drawings. Watertight rings and lids shall be U.S. Foundry 669-KL-BWTL with a 125-pound cover. Ring shall have a flat type gasket and cover shall be bolted down with a minimum of four (4) bolts.

d. The frame and cover shall be properly set in a bed of mortar and aligned to fit the top section of the manhole. Concrete brick, set in mortar, shall be used to adjust the top of the frame and cover to finished grade; however, no more than four (4) courses of brick will be used for adjustment.

11. Manhole Steps

a. Steps shall be a copolymer polypropylene plastic reinforced with a ½ inch diameter, grade 60 bar and have serrated tread and tall end lugs. Step pull out strength shall be a minimum of 2,000 pounds when tested according to ASTM C-497.

b. Steps shall be required in all structures with a depth greater than four (4) feet. Steps shall be vertically aligned and uniformly spaced for the entire depth of the structure. Steps shall be located in the structures along the vertical face of the eccentric cone and so as to land upon a bench.

c. Steps shall be vertically spaced no greater than sixteen (16) inches on center. Step width shall be a minimum of twelve (12) inches. Steps shall protrude from the wall of the structure a minimum of five (5) inches and a maximum of seven (7).

d. Secure steps to the wall with a compression fit in tapered holes. Steps shall not be vibrated or driven into freshly cast concrete. Steps shall not be grouted in place.

12. Manhole Inverts

a. Manhole inverts and benches shall be constructed in accordance with the standard details shown on the approved drawings. Invert shall be a U-shaped channel with a height of 0.8 of the diameter and be a smooth continuation of the pipe. The benches shall be constructed with a slope of 1" per foot to the channel.

b. The channel and invert shall be constructed with a minimum of 2000 psi concrete or brick fill with concrete finish minimum 1" thick. Where sewer changes directions at the manhole, channel shall be constructed with a smooth curve with as large a radius as the diameter of the manhole will allow.

13. Manhole Drops

Standard drop manholes will be constructed only at those locations shown on the approved drawings or as otherwise approved by the Town. The design of the drop connection shall be in accordance with the standard detail drawing.

14. Manhole Vents

a. Where designated on the approved drawings, a 4" diameter vent pipe shall be installed as an integral part of the manhole. The vent pipe is to be tapped in to the upper most section of the manhole, anchored in concrete and extended vertically to the elevation shown on the drawings. The pipe shall have a reverse bend and screen to prohibit rain and foreign materials from entering pipe.

b. The pipe material shall be Schedule 40 Galvanized Steel with two (2) coats of epoxy paint approved by the Town.

## PART 3: EXECUTION

## 3.01 INSTALLATION

A. EXCAVATION

1. The work covered by this section consists of the excavation and satisfactory disposal of all materials excavated in the construction of trenches.

2. Trenches will be defined as all excavation for the installation of storm sewers, sanitary sewers, water pipe, manholes, catch basins, hydrants, watergates, sewer services, water taps, drainage structures, drainage ditches and other excavation as may be necessary to complete the installation.

3. The excavation shall be done to the lines, grades, typical sections, and details shown on the approved plans or established by the Town. All work covered by this section shall be coordinated with the grading, construction of drainage structures, and other work along the project, and shall be maintained in a satisfactory condition so that adequate drainage is provided at all times. Any roots which protrude into the trench shall be trimmed flush with the sides of the trench. Trenches for pipe lines shall be completed before the pipe is installed unless otherwise permitted by the Town.

4. All trenches shall be excavated in accordance with all Federal, State, and Local Health and Safety regulations having jurisdiction at the project site.

5. All excavation shall be by open cut unless otherwise authorized by the Town. If the bottom of the excavation is found to consist of rock or any materials that cannot be excavated to give a uniform bearing surface, the material shall be removed to a depth at least 6" below established bottom grade and backfilled to grade with #57 stone. Any excavations carried below the depths indicated, without specific directions, shall be backfilled in the same manner. The excavation shall be of sufficient width to allow a clearance of not less than 6" between the side of the trench and the outside of the pipe, or in case of pipe with a bell, the outside of the bell of the pipe. This rule will apply at all times, and consequently, proper allowance must be made for additional space required for sheeting the trench where necessary.

6. Sheeting, Bracing Trenches, and Trench Boxes

   a. Sheeting and bracing shall be provided in accordance with all applicable Federal, State and Local safety and health regulations.

   b. No sheeting or bracing shall extend closer than 2'-0" off the ground surface, or within subgrade, and no timbers shall be left in the trench that may form pockets or cavities that cannot easily be filled during the operation of backfilling and settling or compacting the trench backfill. Failure to sheet and brace trenches or other excavation shall be the Contractor's risk, and he will be held responsible for caving, settlement, and all other damage resulting therefrom

7. Excavated materials to be used for backfill will be approved by the Town, and if acceptable shall be neatly deposited at the sides of the trenches where space is available. Where stockpiling of excavated material is required, the Contractor shall so maintain his operations as to provide for natural drainage and not present an unsightly appearance. Materials which are excess to the needs of the project will be disposed of by the Contractor.

8. Pipe Foundations

   a. The preparation of the pipe bedding shall be in accordance with the typical trench cross-sections as shown on the standard details for the type of pipe being installed.

b. The pipe foundation shall be prepared to be uniformly firm and shall be true to the lines and grades as shown on the approved plans. Any deviation or field adjustment will require the approval of the Town. When a representative of the Town is present on the site and is so requested by the Contractor, he may check the position of grades and lines but the Contractor shall be responsible for the finished work conforming to exact and proper line and grade.

c. Whenever the nature of the ground will permit, the excavations at the bottom of the trench shall have the shape and dimensions of the outside lower third of the circumference of the pipe, care being taken to secure a firm bearing support uniformly throughout the length of the pipe. A space shall be excavated under and around each bell to sufficient depth to relieve it of any load and to allow ample space for filling and finishing the joint. The pipe, when thus bedded firmly, shall be on the exact grade.

d. In case the bed shaped in the bottom of the trench is too low, the pipe shall be completely removed from position, and earth of suitable quality shall be placed and thoroughly tamped to prepare a new foundation for the pipe. In no case shall the pipe be brought to grade by blocking up under the barrel or bell of same, but a new and uniform support must be provided for the full length of the pipe.

e. Where rock or boulders are encountered in the bottom of the trench, the same shall be removed to such depth that no part of the pipe, when laid to grade, will be closer to the rock or boulders than 6". A suitably tamped and shaped foundation of approved material shall be placed to bring the bottom of the trench to proper subgrade over rock or boulders.

f. Where the foundation material is found to be of poor supporting value, the Town may permit minor adjustment in the location of the pipe to provide a more suitable foundation. Where this is not practical, the foundation shall be conditioned by removing the existing foundation material by undercutting to the depth as directed by the Town, within limits established on the approved plans, and backfilling with either an approved material secured from unclassified excavation or borrow along the project, or foundation conditioning material consisting of crushed stone or gravel approved by the Town as being suitable for the purpose

intended. The selection of the type of backfill material to be used for foundation conditioning will be made by the Town.

g. The Contractor shall remove all water which may be encountered or which may accumulate in the trenches by pumping or bailing and no pipes shall be laid until the water has been removed from the trench. Water so removed from the trench must be disposed of in such a manner as not to cause injury to work completed or in progress.

h. Whenever the bottom of the trench shall be of such nature as to provide unsatisfactory foundation for the pipe, the Town will require the pipe to be laid on a washed stone foundation per detail. Class I embedment for DIP shall be used only for wet conditions and only as directed by the Town.

## B. INSTALLING PIPE AND APPURTENANCES

### 1. Laying Pipe

a. The layout of gravity sanitary sewer lines and invert elevations at governing points are as shown on the approved drawings.

b. The Contractor shall do all layout work for lines and grades from that information shown on the approved drawings or as furnished by the Town.

c. When a laser beam instrument is used to set line and grade, the unit must be maintained in good working order, and the calibration checked daily for both alignment and percent grade. In the event the required accuracy of alignment and grade is not adhered to, the Town will prohibit the use of laser beams.

d. Gravity sanitary sewer lines shall be laid with bell ends facing in the opposite direction of flow, unless directed otherwise by the Town. In all cases, pipe is to be installed in strict accordance with the manufacturer's recommendations and the contract material specifications. The Town may augment any manufacturer's installation recommendations if, in their opinion, it will best serve the interest of the Town.

e. Proper tools, implements, and facilities satisfactory to the Town shall be provided and used for the safe and convenient prosecution of pipe laying. All pipe and other materials used in the laying of pipe will be lowered into the trench piece by piece by means of suitable equipment in such a manner to prevent damage to the pipe, materials, to the protective coating on the pipe materials, and to provide a safe working condition to all personnel in the trench. Each piece of pipe being lowered into the trench shall be clean, sound and free from defects. It shall be laid on the prepared foundation, as specified elsewhere to produce a straight line on a uniform grade, each pipe being laid so as to form a smooth and straight inside flow line. Pipe shall be removed at any time if broken, injured or displaced in the process of laying same, or of backfilling the trench.

f. When cutting short lengths of pipe, a pipe cutter, as approved by the Town, will be used and care will be taken to make the cut at right angles to the centerline of the pipe or on the exact skew as shown on the approved plans. In the case of push-on pipe, the cut ends shall be tapered with a portable grinder, or coarse file to match the manufactured taper.

g. During times when pipe laying is not in progress, the open ends of pipe shall be closed and no trench water or other material shall be permitted to enter the pipe.

h. Where the pipe is laid on a grade of 20% or greater, the laying shall start at the bottom of the slope and proceed upward with the bell end of the new pipe upgrade. All pipe laid on a grade of 20% or greater shall require thrust blocking or keying as shown on the drawings and standard details.

i. Where pipe lines of different materials are joined together, a standard sewer repair coupling shall be used. The couplings shall be Eastern Standard Sewer Repair Couplings (Mission Rubber Company), the Fernco Joint Sealer Company or an equal product approved by the Town.

j. All gravity sewer shall have minimum 12” vertical separation from storm sewer and shall have minimum 10’-0” horizontal separation from water mains or 18” vertical separation below the bottom of the water main. In the event these separations cannot be met, sanitary sewer and the water main, if applicable, shall be constructed of ductile iron pipe as directed by the Town or as shown on the approved

drawings. In addition, all gravity sewer shall have a minimum 100'-0", horizontal separation from wells or other water supplies.

2. Manholes

a. Sanitary sewer manholes shall be installed at each break in line or grade in each sanitary sewer line as shown on the approved drawings.

b. The manhole foundation shall be prepared so as to provide a firm, level area on which to place the precast concrete manhole base section. When poor foundation soil is encountered or excess groundwater exists, the foundation shall be excavated 12" below the final subgrade elevation backfilled with washed stone to provide a proper foundation.

c. The manhole sections shall be lifted from the side of the excavation to the bottom of the trench with equipment and support slings capable of safely handling the heavy concrete pieces. The manhole shall be set plumb and adjusted to the final finished surface grade with brick and mortar.

d. Pipe openings shall be exactly aligned to that of the pipe entering and leaving the manhole. The gravity sanitary sewer pipe lines shall be placed in the manhole openings, properly aligned, and set to grade. Sanitary sewer shall be connected to the manholes using lock joint flexible manhole sleeves or equal.

e. For large diameter pipe where a flexible rubber sleeve is not available, the pipe line shall be sealed into the manhole using an expanding type or non-shrink type grout.

f. For manhole steps, refer to the precast manhole section above.

3. Manhole Frames and Covers

The frame and cover shall be properly set in a bed of mortar and aligned to fit the top section of the manhole. Concrete brick, set in mortar, shall be used to adjust the top of the frame and cover to finished grade; however, no more than four (4) courses of brick will be used for adjustment.

4. Manhole Inverts

a. Manhole inverts and benches shall be constructed in accordance with the standard details shown on the drawings. Invert shall be a U-shaped channel with a height of 0.8 of the diameter and be a smooth continuation of the pipe. The benches shall be constructed with a slope of 1" per foot to the channel.

b. The channel and invert shall be constructed with a minimum of 2000 psi concrete or brick fill with concrete finish minimum 1" thick. Where sewer changes directions at the manhole, channel shall be constructed with a smooth curve with as large a radius as the diameter of the manhole will allow.

5. Manhole Drops

Standard drop manholes will be constructed only at those locations shown on the approved drawings or as otherwise approved by the Town. The design of the drop connection shall be in accordance with the standard detail drawing.

6. Manhole Vents

a. Where designated on the approved drawings, a 4" diameter vent pipe shall be installed as an integral part of the manhole. The vent pipe is to be tapped in to the upper most section of the manhole, anchored in concrete and extended vertically to the elevation shown on the approved drawings. The pipe shall have a reverse bend and screen to prohibit rain and foreign materials from entering pipe.

b. The pipe material shall be Schedule 40 Galvanized Steel with two coats of epoxy paint approved by the Town.

7. Fittings (Force Main)

a. All plugs, caps, tees, bends, and other fittings shall be provided with adequate thrust blocks. Thrust blocks shall be constructed to the minimum dimensions shown on the drawings or as directed. Thrust blocks shall be made of concrete and shall bear directly against the undisturbed trench wall. Where possible, the backing shall be so placed that the fitting joints will be accessible for repair. All bolts and pipe joints shall be protected against contact with thrust block concrete by the installation of a polyethylene film placed between the fittings and the poured concrete. Where any section of a main is provided with concrete thrust blocks, the hydrostatic pressure test shall not be made until three

days after installation of the concrete thrust blocks unless otherwise approved by the Town.

b. Where trench conditions are, in the opinion of the Town, unsuitable for thrust blocks, the Contractor shall provide steel tie rods and socket clamps to adequately anchor the piping. All tie rods and clamps shall be given a bituminous protective coating or shall be galvanized.

c. Concrete for thrust blocks shall consist of a mix of Portland Cement, fine and coarse aggregate and water to produce concrete with a minimum compressive strength at 28 days of not less than 3000 psi when tested in accordance with ASTM Specifications C 39 or C 42. Sakrete or any similar material will not be permitted under any circumstances.

8. Gate Valve and Valve Box (Force Main)

a. When shown on the contract drawings, a standard gate valve shall be installed in the sanitary sewer force main. Before setting each valve, the Contractor shall make sure the interior is clean and shall test the valve for proper opening and closing. Valves shall be set with stems plumb, unless horizontal installation is called for on the approved drawings, and at the exact location(s) shown on the approved drawings.

b. A standard type valve box shall be installed over each underground sanitary sewer force main valve. All valve boxes shall be set plumb with their top set flush with the finished grade.

c. Trench backfill shall be properly tamped for a distance of 3'-0" on each side of the valve and valve box.

9. Sewage Combination Air Relief Valve (Force Main)

a. A sanitary sewage combination air relief valve shall be installed at the actual high points in the line.

b. A combination air relief valve installation shall consist of the force main tap, air relief valve, precast concrete manhole sections, and standard heavy duty iron frame and cover.

10. Exposed Pipe

a. Exposed pipe to be installed inside tanks, wetwells, vaults and buildings shall be installed and field painted as described below. All exposed ductile iron pipe shall utilize flanged joints unless otherwise noted.

b. All exposed cast or ductile iron pipe, fittings and valves shall be field painted with two (2) coats of epoxy paint as recommended by the paint manufacturer. Color of paint shall be as selected by the Town.

C. BACKFILLING AND COMPACTION

1. Backfill trenches immediately after approval of the pipeline construction.

2. Pipes

a. PVC pipe shall be installed using Class I embedment for 6" below the pipe and to the spring line per the standard detail. Class I embedment shall be defined as #57 washed stone or approved equal per NCDOT Standard Specifications.

b. For DIP pipe with backfill material other than Class I embedment, use backfill carefully placed in uniform layers not exceeding 6" in thickness to a depth of 2'-0" over the top of the pipe. Place material and fill the area under the pipe haunches. Place each layer, moisten; then uniformly compact by use of hand, pneumatic, or mechanical tampers exercising care to prevent lateral displacement. Areas of backfill 2'-0" over top of pipe to top of trench, shall be backfilled with a material containing no rocks larger than 6" in the greatest dimension and shall be free of material with an exceptionally high void content. The initial backfill shall meet the same requirements except no rocks over 4" in diameter will be allowed.

c. Moisten backfill above 2'-0" over the top of the pipe and place in 8" layers. Compact each layer with hand, pneumatic or mechanical compactor. Puddling or flooding of trench for consolidation of backfill or use of wheel rolling by construction equipment will not be permitted.

d. Foundation stone as required for wet or unstable conditions per the details, shall be defined as #57 or #57 stone per NCDOT Standard Specifications or approved equal.

Foundation stone shall be used only as directed by the Town.

3. If material excavated from the trench is unsuitable to be used as backfill, “select backfill” shall be transported to the site by the Contractor from outside the project limits to be used as backfill material.

4. Roadways and Road Crossings

   Use backfill placed in uniform layers not exceeding 6” in thickness for full trench depth and width, thoroughly compacted with mechanical tampers under optimum moisture conditions to 95% compaction (100% for the top 2’-0” of subgrade beneath pavements). Replace removed paving and base course with new material of equal or better quality and of the same texture and color as the adjacent roadway.

5. All backfill shall be compacted so as not to damage the pipe and appurtenances and shall be compacted to 95% of the Standard Proctor Test (100% for the top 2’-0” of subgrade beneath pavements) for the various types of backfill material. Methods of backfilling shall be in strict accordance with the pipe manufacturer's recommendations. All backfill material shall have been approved by the Town. Select backfill material shall be used when requested by the Town.

6. Care shall be taken during backfill and compaction operations to maintain alignment and prevent damage to the joints. The backfill shall be kept free from stones, frozen lumps, chunks of highly plastic clay, or other objectionable material. All pipe backfill areas shall be graded and maintained in such a condition that erosion or saturation will not damage the pipe bed or backfill.

7. Heavy equipment shall not be operated over any pipe until it has been properly backfilled and has a minimum cover as required by the approved plans. Where any part of the required cover is above the proposed finish grade, the Contractor shall place, maintain, and finally remove such material. Pipe which becomes mis-aligned, shows excessive settlement, or has been otherwise damaged by the Contractor's operations, shall be removed and replaced by the Contractor.

8. The Contractor shall maintain all pipes installed in a condition that they will function continuously from the time the pipe is installed until the project is accepted.

9. Cleanup

a. Grade all areas disturbed to a finish ordinarily obtained from a blade grader with no abrupt changes in grade or irregularities that will hold water. Prior to final inspection and acceptance, remove all rubbish and excess material and leave area in a neat, satisfactory condition.

b. Cleanup and seeding is part of the pipeline installation. No more than 3,000 LF of sewer line may be laid prior to completion of cleanup of the first section of pipeline laid.

## 3.02 QUALITY CONTROL

A. TESTING

1. Line Cleaning

a. Prior to inspection of any section(s) of gravity sanitary sewer pipe or force main the Contractor shall completely clean the lines of all debris, silt, etc. The pipe line shall be ready for use by the Town and shall be proved to be in first class condition and constructed properly in accordance with the approved drawings these specifications,

b. The Contractor shall maintain the project, insofar as his construction work is concerned, in first class condition for such time as is necessary to satisfy the Town that all installations are correct and acceptable.

2. Inspection and Testing (Gravity Sewer)

a. Alignment and grade between manholes shall be tested by the Town by flashing a light between manholes. A full circle of light shall be seen when reviewed from the adjoining end of the line. All defects disclosed as a result of this test shall be corrected by the Contractor at his expense.

b. PVC pipe shall pass a go-no go Mandrel sized to 95% of the pipe diameter with the pipe in place and properly backfilled. All pipe which will not pass the Mandrel shall be relaid or replaced by the Contractor. The allowable deflection (less than 5%) shall be calculated using the pipe stiffness formula in ASTM D 2321. The mandrel test shall not take place until the final backfill has been in place for 30 days (minimum).

c. When the sewers are completed they shall be inspected by the Town for conformance with the provisions of the approved plans and these specifications, particularly line and grade, and tested to determine the amount of ground water infiltration into the sewer. All visible and audible leaks will be stopped and the remaining infiltration will be measured using a V-notch weir and/or other devices, which shall be furnished by the Contractor. The Contractor shall also furnish all required assistance for measuring the infiltration.

d. If infiltration into the whole system or any segment thereof exceeds 100 gallons per 24 hours per inch of diameter per mile of sewer, necessary corrective measures shall be taken by the Contractor to limit the infiltration to the maximum specified above. The Town shall decide the number and length of segments of sewer line on which the testing shall be performed.

e. All gravity sanitary sewer lines shall be subjected to a low pressure air test to determine the presence of damaged pipe or faulty installation. The Contractor will furnish all facilities and personnel for conducting the test(s).

f. The acceptance air test shall be made after backfilling has been completed and compacted and in the presence of the Town. The test shall be performed as described under ASTM C 828, latest edition, Standard Practice for Low Pressure Air Testing of V.C. Pipe lines.

i. Compressor capacity shall be sufficient to pressurize the sewer main to 4 PSIG within a time equal to or less than the required test time. The following equation may be used to insure compliance with this requirement:

$$C = \frac{0.17 \times D^2 \times L}{T} + Q$$

Where: C=Required Compressor Capacity (cfm)
T=Required Test Time (min)
D=Pipe Internal Diameter (feet)
L=Length of Test Section (feet)
Q=Allowable Air Loss Rate (cfm)

The following allowable air loss rates will be used for all pipe tests:

| PIPE SIZE | Q (cfm) | PIPE SIZE | Q(cfm) |
|---|---|---|---|
| 4” | 2.0 | 15” | 4.0 |
| 6” | 2.0 | 18” | 5.0 |
| 8” | 2.0 | 21” | 5.5 |
| 10” | 2.5 | 24” | 6.0 |
| 12” | 3.0 | | |

ii. The sewer section shall be plugged at both ends and air pressure shall be applied until the pressure inside the pipe reaches 4 PSIG. When a stable condition has been reached, the pressure shall be bled back to 3.5 PSIG. At 3.5 PSIG, the time and pressure shall be observed and recorded. If groundwater is present at the sewer, the height of the groundwater above the top of the pipe shall be added to the above air pressure readings (height of water in feet X 0.433 = air pressure in psig). A minimum of five (5) readings will be required for each test.

iii. If the time for the air pressure to decrease from 3.5 PSIG to 2.5 PSIG is equal to or greater than that shown in the following table, the pipe shall be presumed to be free from defect. When these times are not attained, pipe breakage, joint leakage, or leaking plugs are indicated and the cause must be determined and corrected. After repairs have been made, the sewer sections shall be retested. This process shall be repeated until all sewer sections pass the air tests.

**Minimum Test Time for Pipe**

| LENGTH TESTED | Pipe Size | 4" | 6" | 8" | 10" | 12" | 15" | 18" | 21" | 24" |
|---|---|---|---|---|---|---|---|---|---|---|
| | 25 | 0:04 | 0:10 | 0:17 | 0:22 | 0:26 | 0:31 | 0:36 | 0:44 | 0:53 |
| | 50 | 0:09 | 0:20 | 0:35 | 0:44 | 0:53 | 1:02 | 1:12 | 1:29 | 1:47 |
| | 75 | 0:13 | 0:30 | 0:53 | 1:06 | 1:20 | 1:34 | 1:48 | 2:14 | 2:40 |
| | 100 | 0:17 | 0:40 | 1:11 | 1:29 | 1:47 | 2:05 | 2:24 | 2:58 | 3:33 |
| | 125 | 0:22 | 0:50 | 1:29 | 1:51 | 2:13 | 2:36 | 3:00 | 3:43 | 4:27 |
| | 150 | 0:26 | 1:00 | 1:47 | 2:13 | 2:40 | 3:07 | 3:36 | 4:27 | 5:20 |
| | 175 | 0:31 | 1:10 | 2:04 | 2:35 | 3:07 | 3:39 | 4:12 | 5:12 | 6:14 |
| | 200 | 0:35 | 1:20 | 2:22 | 2:58 | 3:33 | 4:10 | 4:48 | 5:57 | 7:07 |
| | 225 | 0:40 | 1:30 | 2:40 | 3:20 | 4:00 | 4:41 | 5:24 | 6:41 | 8:00 |
| | 250 | 0:44 | 1:40 | 2:58 | 3:42 | 4:27 | 5:13 | 6:00 | 7:26 | 8:54 |
| | 275 | 0:49 | 1:50 | 3:16 | 4:05 | 4:53 | 5:44 | 6:36 | 8:10 | 9:47 |
| | 300 | 0:53 | 2:00 | 3:33 | 4:27 | 5:20 | 6:15 | 7:12 | 8:55 | 10:41 |
| | 325 | 0:58 | 2:10 | 3:51 | 4:49 | 5:47 | 6:47 | 7:48 | 9:40 | 11:34 |
| | 350 | 1:02 | 2:20 | 4:09 | 5:11 | 6:14 | 7:18 | 8:25 | 10:24 | 12:28 |
| | 375 | 1:06 | 2:30 | 4:27 | 5:34 | 6:40 | 7:49 | 9:01 | 11:09 | 13:21 |
| | 400 | 1:11 | 2:40 | 4:45 | 5:56 | 7:07 | 8:21 | 9:37 | 11:54 | 14:14 |
| | 425 | 1:15 | 2:50 | 5:02 | 6:18 | 7:34 | 8:52 | 10:13 | 12:38 | 15:08 |
| | 450 | 1:20 | 3:00 | 5:20 | 6:40 | 8:00 | 9:23 | 10:49 | 13:23 | 16:01 |
| | 475 | 1:24 | 3:10 | 5:38 | 7:03 | 8:27 | 9:54 | 11:25 | 14:07 | 16:55 |
| | 500 | 1:29 | 3:20 | 5:56 | 7:25 | 8:54 | 10:26 | 12:01 | 14:52 | 17:48 |
| | 525 | 1:33 | 3:30 | 6:14 | 7:47 | 9:21 | 10:57 | 12:37 | 15:37 | 18:42 |
| | 550 | 1:38 | 3:40 | 6:31 | 8:09 | 9:47 | 11:28 | 13:13 | 16:21 | 19:35 |
| | 575 | 1:42 | 3:50 | 6:49 | 8:32 | 10:14 | 12:00 | 13:49 | 17:06 | 20:28 |
| | 600 | 1:47 | 4:00 | 7:07 | 8:54 | 10:41 | 12:31 | 14:25 | 17:51 | 21:22 |

iv. For testing a sewer system with one or more installed service lateral pipes, an effective pipe length shall be added to the total sewer main pipe length. The equation used to calculate Effective Pipe Length is as follows:

$$L_e = \frac{d^2 \times l}{D^2}$$

Where: $L_e$=Effective Pipe Length (added to Total Test Length)
d=Diameter of Service Lateral Pipe
l=Length of Sewer Lateral
D=Diameter of Sewer Main Pipe being tested

g. Failure of any section of the pipeline to meet the requirements of this test shall cause the Contractor to determine the source(s) of leakage, and repair or replace all defective materials or workmanship. The repaired section(s) of line shall be re-tested to insure conformance with the requirements of these specifications.

3. Inspection and Testing (Force Main)

a. When the sanitary sewer force main is completed, the Town shall inspect the line for conformance with the provisions of the approved drawings and these specifications, particularly with respect to alignment and depth.

b. All newly constructed sanitary sewer force main and valved sections shall be subjected to a hydrostatic pressure-leakage test. Force mains shall be tested in sections not to exceed 4,000 lineal feet per test section. The Contractor shall install sufficient additional valves if not shown on the approved drawings to allow testing.

c. Each completed section of the pipeline shall be plugged at both ends and slowly filled with water. As the main is being filled with water in preparation of the test, all air shall be expelled from the pipe. The main shall be subjected to hydrostatic pressure of 100 pounds per square inch for a period of two hours unless otherwise specified. Pressure shall be applied to the main by means of a hand pump for small lines or by use of a gasoline pump or fire engine for larger lines.

d. The rate of leakage shall be determined at 15 minute intervals by means of volumetric measure of the water added during the test until the rate has stabilized at the constant value for three consecutive 15 minute periods.

e. Leakage is defined as the quantity of water to be supplied into the newly laid pipe, or any valved section thereof, necessary to maintain the specified leakage test pressure after the pipe has been filled with water and the air expelled. No piping installation will be accepted until the leakage is less than ten (10) gallons per inch of pipe diameter per mile of pipe per 24 hours.

f. Cracked or defective pipe, joints, fittings, or valves discovered in consequence of this test shall be removed and replaced with sound materials, and the test shall be repeated until the test results are satisfactory. Precautions shall be taken to remove or otherwise protect equipment in, or attached to, pipe to prevent damage or injury thereto.

g. Tests of insulated and concealed piping shall be made before the piping is covered or concealed. No leakage will be allowed under the above tests for piping in buildings, structures or on bridges.

h. The Contractor shall notify the Town when the work is ready for testing with all testing done in the presence of the Town. All labor, equipment, water and materials, including meters and gauges, shall be furnished by the Contractor.

4. Inspection and Testing (Manholes)

Manholes shall be constructed to provide a true circular inside diameter with properly corbeled tops, satisfactory inverts and properly placed steps and castings. Any visible leaks in the manholes shall be completely stopped to the satisfaction of the Town.

## END OF SECTION

# SECTION 02731 SANITARY SEWER SERVICE CONNECTION

## PART 1: GENERAL

### 1.01 SCOPE OF WORK

A. The work covered under this section shall consist of furnishing all materials, labor, equipment, and services for the complete installation of a sanitary sewer service connection from the sanitary sewer (gravity) main line to the edge of the property to be served as shown on the approved project drawings.

## PART 2: PRODUCTS

### 2.01 MATERIALS

A. Main line connections shall use a "wye" branch constructed by the same material as the main line.

B. Sewer service lines shall be constructed of either PVC (Schedule 40) or Ductile Iron (CL350) as shown on approved plans.

C. When joining pipes of different materials, a flexible, watertight, rubber transition coupling shall be used.

## PART 3: EXECUTION

### 3.01 INSTALLATION

A. CONNECTION TO MAIN

The standard sewer service connection shall be 4” in diameter unless shown otherwise on the approved drawings, and shall connect to the main at a "wye" branch connection installed with the pipe line as it is being laid. The "wye" branch shall be of the same material as the main pipe line. Direct taps into the sewer main will not be acceptable unless approved by the Town prior to the laying of the main line.

B. CONNECTION TO MANHOLE

When directed by the Town, a sewer service connection shall be made into a manhole. The connection shall be made at the manhole invert. The invert shall be rebuilt so as to provide a smooth transition from

service connection to main line. Inverts and benches shall be constructed in such a way as to prevent the deposition of solids in the manhole.

C. SERVICE LINES

The service line shall be installed from the "wye" branch connection to the edge of the public or utility right-of-way as shown on the approved plans.

Less than 3'-0" of cover will require the use of ductile iron pipe.

D. CLEANOUT AND PLUG

At the edge of the public or utility right-of-way, a "cleanout" shall be installed. The cleanout shall consist of a "wye" branch connection, 45° bend, riser pipe, and threaded plug installed flush with finished ground elevation.

The end of the Town's sewer service connection shall terminate at the end of the pipe which will normally extend five feet beyond the "wye" branch for the cleanout. A watertight plug shall be installed at the end of this line until such time as the property owner connects his facilities to the sewer system.

**END OF SECTION**

# SECTION 02900 LANDSCAPING

## PART 1: GENERAL

### 1.01 SCOPE OF WORK

A. GENERAL

This section covers the furnishing of all labor, equipment and materials necessary for the installation of all trees, shrubs, ground covers, herbaceous plants and bulbs. Also included is the seeding or sodding of lawn areas.

B. REFERENCES

1. ANSI Z60.1 -- "American Standard for Nursery Stock", current edition.
2. NAAS -- National Arborist Association "Standards", current edition.
3. "Hortus Third", Macmillian Publishing Company, current edition.

### 1.02 QUALITY ASSURANCE

A. The landscape installer shall have at least five years of satisfactory experience including at least two completed jobs of dollar value and scope similar to this work.

B. No substitutions will be permitted without the prior written approval of the Town.

C. The Town may inspect trees and shrubs either at place of growth or at site before planting, for compliance with requirements for genus, species, variety, size and quality. The Town retains the right to further inspect trees and shrubs for size and conditions of balls and root systems, insects, injuries and latent defects, and to reject unsatisfactory or defective material at any item during progress of work. Contractor shall remove rejected trees or shrubs immediately from project site.

D. The landscape installer should be familiar with the quality of materials available from suppliers in order to minimize the likelihood that unacceptable products will be rejected.

E. Tagging of plants prior to digging at the nursery is recommended.

## 1.03 SUBMITTALS

A. Certificates of Inspection as required by law or governing authorities to accompany shipments.

B. Vendors certified analysis for soil amendments, fertilizer materials, and grass seed.

C. Evidence of State certification for sod.

D. Certificates indicating nursery source of each plant.

E. Soil analysis report for existing soil and proposed supply of soil, if needed. Also indicate location of source.

F. Source of mulch for approval and five gallon bucketful physical sample.

G. Proposed planting schedule, indicating dates for each type of landscape work during normal seasons for such work. Once accepted, revise dates only as approved in writing, after documentation of reasons for delays.

H. Written instructions for the Town's maintenance of landscaping. Include initial maintenance recommendations, 12 month, and long term recommendations. Submit prior to acceptance of landscaping.

## 1.04 DELIVERY, STORAGE AND HANDLING

A. Products shall be packed and shipped in a manner which will not damage them.

B. Damaged products shall be rejected upon delivery and promptly removed from the site.

C. Products which must be stored prior to installation shall be protected from damage and theft.

D. Time delivery of sod so that it will be placed within 36 hours after harvesting. Protect sod against drying and breaking of rolled strips.

E. Schedule delivery of plant material to avoid storage on site. If planting does not occur on same day as delivery, store in a location protected from sun and weather. Protect from vandalism.

1. Do not prune trees and shrubs before delivery.

2. Cover to protect stock during transport. Wind burned or wilted plants will not be accepted.

3. Bind stock to protect branches, bark, and overall shape during transport.

4. Provide freshly dug balled and burlapped or container grown stock unless otherwise approved.

5. Do not drop stock. Load and unload with care.

6. Delivery stock only after soil has been prepared. Schedule harvesting and delivery in quantities suitable for immediate planting upon arrival. Plant immediately. If planting cannot be accomplished immediately, provide shade, protect from wind, protect balls or roots from drying by covering at all times with moist saw dust, wood chips, shredded bark, peat moss, or other similar mulching material.

## 1.05 PROJECT CONDITIONS

A. Schedule and coordinate work with all trades involved.

B. Verify that the areas of work have been properly contoured prior to beginning work.

C. Consult record drawings and installers to determine actual underground utility and drainage system locations in the vicinity of this work. Damage to known or unrecorded utilities will be repaired at the Contractor's expense.

D. Notify the Town of any unforeseen conditions which will affect plant installation or growth.

E. Test internal drainage of soils at representative planting locations by digging a hole 12” deep and approximately 12” in diameter, then filling the hole with water. If the water drains away within 24 hours, the drainage should be adequate.

F. The results of the soil tests may indicate recommendations which will affect the type and analysis of soil amendments.

## 1.06 SCHEDULE OF PERMANENT SEEDED VEGETATION

A. SOIL AMENDMENTS — PER 1000 SF

1. Dolomitic limestone ..... 90 lbs
2. 10-20-20 ..... 12 lbs

B. SEED MIXTURE — PER 1000 SF

1. "Rebel" turftype fescue ..... 3 lbs
2. "Falcon" turftype fescue ..... 3 lbs
3. Total Mix ..... 6 lbs

C. MULCH — PER 1000 SF

1. Grain Straw ..... 1 1/2 bale
2. Wood Cellulose Fiber ..... 35 lbs

D. OPTIMUM SEEDING DATES

1. March 15 - April 15
2. August 15 - September 15

Consult with the Town prior to planning seeding outside of the above dates.

## 1.07 ENVIRONMENTAL REQUIREMENTS

A. Applicator must be properly trained to use all herbicides and must be licensed to purchase and use restricted herbicides, if any.

## 1.08 WARRANTY OF LANDSCAPE WORK

A. Following the date of acceptance plants shall be warranted for one year excluding conditions of vandalism, theft, accident, acts of God and Town's negligent maintenance.

B. Replace each unacceptable plant as soon as season requirements permit.

C. Only one replacement per plant will be required, except for losses due to failure to comply with specifications.

## PART 2: PRODUCTS

### 2.01 MATERIALS

A. MANUFACTURERS

1. When a manufacturer's name and product are identified, the purpose is to set a standard of quality and/or design and is not intended to limit competition.

2. If a substitution is desired, see Quality Assurance above.

B. IMPORTED SOIL

1. Table and homogenous locally occurring soil obtained from a well-drained, arable site and not delivered in a muddy or frozen condition. It shall be reasonably free of subsoil, stones, clods, sticks, roots, or other extraneous matter and shall contain no toxic materials. Soil is subject to approval by Town.

C. LIME

1. Free flowing dolomitic agricultural grade lime in compliance with state, federal and local regulations.

2. All lime shall contain at least 75% calcium carbonate and 10% magnesium carbonate and shall be crushed so at least 90% will pass the No. 10 sieve and 50% through a No. 100 mesh sieve.

D. FERTILIZER

1. Conforming to state and federal standards, dry, free flowing, granular or pellet form commercial product. Ratio indicates N-P-K requirements.

2. Fertilizer tablets: Agriform Planting Tablets 20-10-5 as manufactured by Sierra Chemical Company, 1001 Yosemite Drive, Milpitas, CA 95035, or equal, telephone (408) 263-8080. May be used at installer's option.

3. Encapsulated fertilizer: Osmocote 19-6-12 as manufactured by Sierra Chemical Company, or equal. May be used at installer's option.

E. ORGANIC MATTER

1. Sawdust: Well rotted sawdust, free of chips, stones, sticks, soil or toxic substances and with 7.5 lbs. nitrogen uniformly mixed into each cubic yard.

2. Manure: Well rotted, unleached stable or cattle manure not less than 8 months or more than 2 years old, containing not more than 25% by volume of straw, sawdust or other bedding materials and containing no chemicals or ingredients harmful to plants.

3. Commercial Bagged Manure Such as "Black Cow": or "Baa Baa Doo," or equal.

F. GRASS SEED

Comply with State Department of Agriculture requirements. Obtain seed from most recent crop.

G. SOD

Provide Certified or Approved Turfgrass sod so labeled.

H. PLANT MATERIALS

1. Plants shall conform to applicable sections of ANSI-Z60.1 and to any more stringent requirements which may be stated herein or on the Drawings.

2. Plants shall be true to type and name; typical of their species or variety; densely foliated when in leaf, with a normal well-developed branch structure and a fibrous root system; possess a normal balance between height and spread; be free from defects, disfiguring knots, sun scald, injuries, abrasions of the bark, plant diseases and insect eggs, borers or infestations and of acceptable appearance.

3. Plants shall have been nursery grown under climatic conditions similar to the location of this project, for at least one growing season prior to this work.

4. Perennial: dense, well-rooted, type as indicated (bare-root, cell-pack, pot or container #).

5. Bulbs

   a. Definitions

      i. "Bulb" is used below as a generic term to describe true bulbs, bulbets, corms, cormels, tuberous root and rhizomes.

      ii. "Bulb size" is a measurement of circumference in centimeters.

      iii. "Top size" is a trade term used to indicate the largest size available for a specific variety during the present growing season.

   b. There is no bulb trade standard. Buy from a reputable dealer.

   c. Bulb quality will be approved by the Designer prior to planting. Bulb quality will be judged by the following characteristics;

      i. Firm and free from deep blemishes, cuts or soft spots.

      ii. Heavy for their size.

      iii. Have a solid and firm basal plate.

6. The greater quantity shall take precedence if discrepancies occur between the quantities designated on the materials list and those indicated on the drawings.

7. Nomenclature shall conform to "Hortus III".

8. At least 10% of each species delivered to the site shall bear a tag showing the genus, species, and variety of the plant.

9. Substitutions will be allowed only on the basis or prior written approval by the Town and may be granted if the installer can demonstrate that plants of a specific type, size or quality are not available within a 200-mile radius of the site.

10. Plants larger than those specified on the plant list may be used, but use of such plants shall not increase the contract price.

I. MATERIALS FOR PLANTING TREES

1. Tree wrap: 4" wide corrugated or crepe paper tape, specifically manufactured for tree trunk wrapping, and weather proof twine.

2. Guy wire encasement trunk protection: 2-ply fabric-bearing rubber hose having an inside diameter of not less than 1/2".

3. Stakes: 2"x 2"x8'-0" lumber capable of withstanding above ground and underground conditions during the guarantee period.

4. Guy wire: malleable, single strand, galvanized iron wire 12-gauge minimum.

5. Manufactured guying system may be used in lieu of the above if they provide adequate stability for the trees.

J. MULCH MATERIALS FOR PLANTS

1. Hardwood bark: Shredded long fibers, free of extraneous and harmful matter.

K. MULCH FOR SEEDED AREAS

1. Straw: Most recent crop of rye, oats or wheat.

2. Wood Fiber: Moisture content of 10% (±2%); organic Matter 99.4% (±0.2%); ash content 0.6% (±0.2%) water holding capacity of 1050 grams water/100 grams dry fiber.

L. HERBICIDES

1. To selectively eradicate existing vegetation choose an herbicide which will not be toxic to vegetation to be saved or to new landscaping.

2. For pre-emergence vegetation control choose an herbicide which will not harm plants to be saved on new landscaping.

## PART 3: EXECUTION

### 3.01 PREPARATION

A. Layout individual tree and shrub locations with stakes or flags. Flag outlines of planting beds and secure landscape architect's approval prior to beginning soil preparation. Make adjustments as directed.

B. HERBICIDE APPLICATION

1. In the buffer planting area apply a minimum of three (3) applications of "Round-up" or other approved herbicide at two week intervals. Protect neighbor's proportion and vegetation to remain.

2. Use herbicides to eradicate vegetation before tilling plant seed and sod beds.

3. Use herbicides to control emerging weeds in shrub and ground cover beds and around trees

C. PREPARATION OF PLANTING BED SOIL

1. Excavate all planting beds to a depth of 12” minimum. Loosen subsoil to allow water to percolate freely. Stockpile excavated soil for landscape architect's approval for reuse.

2. Upon approval of excavated soil, prepare a mixture of two (2) parts excavated soil and one (1) part organic material. Replace the soil, till in additional soil amendments as required; lightly compact and rake out smooth. Dispose of extra soil offside or at an Town approved location on-site.

3. If excavated soil is not approved, bring in clean low clay content backfill and mix with organic matter as above.

D. SHRUB PLANTING

1. Scoop out a shallow hole for each plant root ball. Set balled and burlapped (B&B) or container stock on layer of compacted planting soil mixture, plumb and in center of pit with top of ball approximately 1”-2” above adjacent finished landscape grades. Remove burlap from top 2/3 of ball. When set, place additional backfill around base and sides of ball, and work each layer to settle backfill and eliminate voids and air pockets. When excavation is approximately 2/3 full, water thoroughly before placing remainder of

backfill. Repeat watering until no more is absorbed. Water again after placing final layer of backfill.

2. Set container grown stock as specified for balled burlapped stock. Split the sides of the root ball prior to planting.

3. Mulch pits, and planted areas. Provide not less than a 4" thickness of mulch and work into top of backfill and finish level with adjacent finish grades.

4. Apply anti-desiccant, if required, using power spray to provide an adequate film over trunks, branches, stems, twigs and foliage.

5. Prune, thin out and shape shrubs in accordance with standard horticultural practice. Prune shrubs to retain natural character.

E. PREPARATION OF LAWN AND SOD AREAS OF SLOPES 3:1 OR LESS

1. Thoroughly and uniformly till the soil amendments into the subsoil to a depth of 6" below finished grade.

2. Rake stones and other debris out of the top 3" of the amended soil and smooth it to remove ridges and fill depressions as required to meet finished grades.

3. Roll the area with a lawn roller half filled with water ballast.

4. Verify that all areas have positive drainage and that there is no ponding.

F. PREPARATION OF SLOPES IN EXCESS OF 3H:1V

1. Scarify slope to 4" depth with a chain harrow, grader or dozer with chisels attached or by hand so that pitting or trenching will be approximately 4" apart for seeds to lodge within and germinate.

2. Remove stones and other debris from the slope surface.

## 3.02 INSTALLATION

A. TREE PLANTING

1. Till and loosen to a depth of 12", an area four times the diameter of the root ball. Organic matter may be added if it is mixed uniformly throughout the loosened area

2. Scoop out a shallow hole in the middle of the loosened area for the root ball. Set the root ball on undisturbed or compacted soil, with the top of the ball 2”-4” above the finished grade.

3. Remove at least the top two-thirds of the wire basket and burlap. Remove all nylon straps or cords.

4. Place native soil backfill in 2”-3” layers. Work each layer by hand to compact backfill and eliminate voids. Maintain plant in a plumb position during backfilling.

5. When backfilling is approximately two-thirds complete, sprinkle evenly with 1/1 cup of superphosphate per inch of each per size. Saturate backfill with water and complete backfilling, then water and water again.

6. Once water has been absorbed, place not less than a 4” thickness of mulch and work into the top of the backfill. Finish level with adjacent finished grade.

B. TREE SUPPORT

1. Trees requiring support shall be staked or guyed on the same day as planting.

2. Do not support trees with a caliper less than 3/4”.

3. Staking for trees less than 3” caliper: Double stake each tree vertically with 180° stake separation and outside the root ball. Place stake and wires parallel to walks, drives and buildings. In open areas stakes perpendicular to the predominant wind direction. The top of each stake shall be driven to at least 3-1/2 feet below the tip of the plant's main leader. Tie the tree 36” from the top of the rootball. Protect the trunk with rubber hose encased wire and secure the rubber hose by twisting the wire back onto the stake.

C. PRUNING WOODY PLANTS

1. After planting, neatly prune plants to enhance their form and character.

2. Limit pruning to the minimum necessary such as to remove injured twigs and rubbing branches (NAAS Class I fine pruning).

D. PLANTING PERENNIAL

1. Soak bare-root plants in water for about one-half hour before planting them.

2. Soak the planting bed and let it drain prior to planting.

3. Set plants to the depth at which they were grown allowing the soil settlement.

4. Spread out bare roots, then firm backfill over them by hand.

5. If rootballs are very densely packed, slice the rootball across the bottom and spread out the halves firmly against the soil, then firm backfill around and over them leaving no air pockets.

E. BULBS AND BULB-LIKE PLANTS

1. Store bulbs in a cool place or in a refrigerator

2. Do not store bulbs in closed plastic bags.

3. Verify schedule for planting with supplier's instructions.

4. Late planting: If planting must be delayed until late in the season mulch the planting bed well in advance of planting time in order to protect it from freezing. If the soil under the mulch is not frozen, plant the bulbs and replace the mulch.

5. Bulbs, except iris, are normally planted in a depth equal to three times their diameter at the widest point. Verify with the suppliers instructions.

6. For large planting beds excavate the entire bed to the required depth.

7. For smaller plantings dig individual holes to the required depth, at the required spacing, with a special bulb planting tool or mattock. Incorporate bonemeal or superphosphate in accordance with the manufacturer's instructions. Place the bulb upon firm soil and avoid creating an air pocket beneath the bulb. Cover each bulb with soil and compact it by hand.

8. Water the planted area thoroughly after the covering bulbs, unless ground is rain soaked.

F. FERTILIZING PLANTS

1. Trees: 1/2 cup superphosphate per inch of caliper size.

2. Shrubs: 1/4 cup superphosphate per gallon size of container.

3. Groundcover and Perennial: Broadcast 4-8-6 fertilizer at rate of 2 lb. per 100 SF.

G. MULCHING PLANTS

1. Mulch planting areas promptly after planting.

2. Trees and shrubs: 4" depth of bark mulch. Do not allow mulch to be in contact with tree trunks.

3. Groundcover and Perennial Beds: 1" depth of bark mulch.

4. Bulb Beds: 2" depth of bark mulch.

H. SEEDING AND MULCHING - GENERAL

1. Verify that graded areas to be seeded are acceptable. Beginning seeding signifies acceptance of the grading by the seeding installer.

2. Refer to the schedule for mixtures, types and application rates.

3. Apply seed uniformly by hand, cyclone seeder, drill, cultipacker seeder or hydraulically (slurry may include fertilizer, seed and cellulose fiber mulch). On sloping land, seeding operation should be performed across the slope.

4. Cover seed with soil 1/8" to 1/4" deep, except when hydro-seeder is used.

5. When a hydro-seeder or cultipacker type seeder is not used, firm the seedbed following seeding using such equipment as a cultipacker, roller, or light drag spread spenitred mulch to form a continuous blanket of not less than 1-1/2" loose measurement overseeded areas.

I. SODDING

1. Do not lay dried or broken sod. Use only fresh, properly protected sod.

2. Lightly moisten the soil bed prior to laying the sod.

3. Lay first and subsequent rows parallel and in a straight line with sides and ends tightly butted together. Do not overlap ends or leave voids.

4. As sodding is completed in any one section of the work, the entire area shall be lightly rolled and then thoroughly watered to a depth sufficient that the underside of the sod pad itself and the soil underneath are thoroughly wet.

J. CLEANING

1. Restore damaged, soiled or stained improvements to acceptable condition.

2. Remove excess and waste materials from the site.

K. PROTECTION

1. Protect buildings and other improvements from damage which could result from landscape work.

2. Protect landscape work from damage by erecting and maintaining suitable signs and/or barricades.

## 3.03 MAINTENANCE

A. MAINTENANCE OF PLANTS

1. Completely maintain plantings from time of installation until time of acceptance; thereafter the Town will provide maintenance during the warranty period.

2. To be acceptable each plant shall be in apparent good health and condition. This means that any plant which is not acceptable shall be replaced prior to acceptance, and such replacement does not diminish warranty requirements.

B. MAINTENANCE OF SEEDED AREAS

1. Protect seeded areas against disturbance immediately after seeding has been completed by placing warning signs and barricades.

2. Take sufficient precautions to prevent mulch from entering drainage structures and promptly remove any blockage which occurs.

3. The first two mowings of lawn areas shall be provided as part of maintenance; thereafter, the Town will perform mowing.

   a. Maintenance also includes all necessary watering, erosion repair, mulching, reseeding and weeding to produce uniform coverage of seeded areas.

   b. Interim maintenance shall be terminated upon final inspection and approval of the work by the landscape architect.

4. Requests for inspection of individual sections will be allowed provided that the section is substantial in size relative to the entire job and has clearly defined boundaries.

5. To be acceptable:

   a. Total lawn grass coverage shall uniformly well established and in control of erosion within the seeded area.

   b. Total vegetative cover on slopes shall be uniformly well established and in control of erosion.

C. MAINTENANCE OF SODDED AREAS

1. During the first week, soil on sod pads shall be kept moist at all times. In the absence of adequate rainfall, maintain soil moisture to a depth of 4” by daily watering.

2. During the second week, maintain adequate moisture in the upper 4” of soil necessary for the promotion of deep root growth.

3. Do not mow until the sod is firmly rooted and securely in place. No more than 40% of the grass blade shall be removed by the initial and subsequent mowings.

4. Maintenance shall continue for at least 30 days or until final acceptance.

## 3.04 INSPECTION AND ACCEPTANCE

A. INSPECTION AND ACCEPTANCE

1. When landscape work is completed, Town will, upon request, make an inspection to determine acceptability.

2. Landscape work may be inspected for acceptance in parts agreeable to Town, provided work offered for inspection is complete.

3. When inspected landscape work does not comply with requirements, replace rejected work and schedule a reinspection by Town. Remove rejected plants and materials promptly from project site.

4. Warranty period will begin on date when work is accepted.

5. A warranty inspection will be made 365 days after final acceptance. Plant replacements will be made as soon as the next planting season allows.

## END OF SECTION

# SECTION 02905 RESTORATION OF SURFACES

## PART 1: GENERAL

### 1.01 SCOPE OF WORK

A. This section covers the furnishing of all labor, equipment and materials necessary for the proper restoration of existing surfaces disturbed or damaged as a result of construction operations which are not specifically scheduled or specified for topsoil and seeding, paving, landscaping or other surfacing.

B. In general, the types of replacement included in this section are seeding along pipelines, concrete sidewalks, driveways, roadways, ditches, lawns and landscaped areas, curb and gutter.

C. Any damage to existing structures shall be repaired using materials and workmanship equal to those of original construction.

## PART 2: NOT USED

## PART 3: EXECUTION

### 3.01 RESTORATION OF SURFACES

A. SEEDING ALONG PIPELINES

1. All ground surfaces along pipelines, which are not classified as lawns, landscaped areas, or pavement areas, but would be classified as open fields, shall be raked smooth and seeded in accordance with the section entitled Seeding, Fertilizing and Mulching. Large rocks, clumps of earth and excessive spoil material shall be removed from the area prior to seeding.

2. Shoulders of all roads shall be restored as specific for lawns and landscaped areas.

3. Wooded areas, not classified as lawns shall be restored to as near their original condition as possible.

B. CONCRETE SIDEWALKS

1. Concrete walks removed in connection with, or damaged as a result of, construction operations under the Contract shall be replaced with new construction. Such walks shall be constructed of Class B concrete on a thoroughly compacted subgrade, shall have a vertical thickness, unless otherwise noted, of not less than 4" or the thickness of the replaced walk where greater than 4".

2. Walks shall be float finished, edged with an edging tool, and grooved at intermediate intervals not in excess of the width of the walk, uniform throughout the length of the walk in any one direction.

C. DRIVEWAYS

1. Unless otherwise noted, unpaved driveways shall be surfaced with not less than 4" of CABC, topped with 4" of stone, gravel, or other materials equal to that found in the original driveway. Driveways shall be left in a condition better than their original condition.

2. Concrete drives shall be replaced with Class B concrete and shall have equal thickness and reinforcing steel to that of the original drive. Prior to placing the concrete a 6" aggregate base course shall be placed in the drive area.

3. Unless otherwise noted, bituminous or Asphaltic concrete drives shall be restored to original base and asphalt thicknesses or a minimum of 6" aggregate base course and a 2" surface course, whichever is greater. Base material shall be compacted in 3-inch lifts and type I-2 asphalt compacted in 2-inch lifts to match existing pavement section. All work shall be in accordance with the section entitled Bituminous Pavement Repairs.

D. ROADWAY REPLACEMENT

1. Bituminous or Asphaltic pavements shall include all areas paved with blacktop; built-up pavements or oil and stone, tar and stone and similar pavements constructed with a bituminous or asphalt and stone materials.

2. Immediately upon completion of installation of underground piping and structures, the trench shall be backfilled and the roadway shall be repaired. Provide materials as specified in the Contract Drawings. If, in the opinion of the Town, the area adjacent to the excavation has not been damaged to the extent that the base

course need to be replaced, restoration may consist of a surface course of sufficient thickness to meet the existing pavement.

3. Portland cement concrete roadways shall be replaced with Class B Concrete and shall have equal thickness and reinforcing steel as the original roadway. An aggregate of 6" shall be placed prior to the placing of concrete.

4. Differential settlement of restored pavements shall be corrected immediately.

5. The Contractor shall repair and restripe any traffic markings that were damaged, removed or covered during construction. All work shall be done in accordance with NCDOT requirements and specifications.

6. All existing manhole and valve covers shall be raised as required by the Contractor prior to paving. The cost of this work shall be included in the unit bid prices for other related work and no additional payment shall be made.

E. DITCHES

Ditches shall be regraded to the original grade and line. The surface of all ditches shall be returned to the same condition as found before commencing work.

F. LAWNS AND LANDSCAPED AREAS

1. Lawns and landscaped areas shall be regraded and replaced as follows:

   a. Grading shall be to the grade existing before construction of the work under this Contract.

   b. Lawn replacement shall be in accordance with the section entitled Landscaping. Topsoiled areas shall be replaced with topsoil of equal quality and quantity.

2. Landscaped areas shall be replaced with shrubs, hedges, ornamental trees, flowers, or other items to original condition.

G. CURB AND GUTTER

Curb and gutter removed with, or damaged as a result of construction operations, injured or disturbed by the Contractor, his agents, or employees, shall be replaced with new construction to a condition similar and equal to that existing before damage was incurred. Class B Concrete shall be used in curb and gutter replacement.

H. DAMAGE TO STRUCTURES

Any damage to existing structures shall be repaired of materials and workmanship equal to those of original construction. Extensively damaged structures, where the structural stability has been affected or which cannot be repaired in a suitable fashion shall be replaced entirely. Replacement shall not commence until approval of the plan of replacement has been given by the Town. Replacement costs shall be responsibility of the Contractor.

**END OF SECTION**

# SECTION 02931 SEEDING, FERTILIZING AND MULCHING

## PART 1: GENERAL

### 1.01 SCOPE OF WORK

A. This section covers the furnishing of all labor, equipment and materials necessary for the landscaping of all areas of the site disturbed by construction operations and all earth surfaces of embankments including rough and fine grading, topsoil if required, fertilizer, lime, seeding and mulching. The Contractor shall adapt his operations to variations in weather or soil conditions as necessary for the successful establishment and growth of the grasses or legumes.

## PART 2: PRODUCTS

### 2.01 MATERIALS

A. FERTILIZER

1. The quality of fertilizer and all operations in connection with the furnishing of this material shall comply with the requirements of the North Carolina Fertilizer Law and regulations adopted by the North Carolina Board of Agriculture.

2. Fertilizer shall be 10-10-10 grade. Upon written approval of the Town a different grade of fertilizer may be used, provided the rate of application is adjusted to provide the same amounts of plant food.

3. During handling and storing, the fertilizer shall be cared for in such a manner that it will be protected against hardening, caking, or loss of plant food values. Any hardened or caked fertilizer shall be pulverized to its original conditions before being used.

B. LIME

1. The quality of lime and all operations in connection with the furnishing of this material shall comply with the requirements of the North Carolina Lime Law and regulations adopted by the North Carolina Board of Agriculture.

2. During the handling and storing, the lime shall be cared for in such a manner that it will be protected against hardening and caking.

Any hardened or caked lime shall be pulverized to its original condition before being used.

3. Lime shall be agriculture grade ground dolomitic limestone. It shall contain not less than 85% of the calcium and magnesium carbonates and shall be of such fineness that at least 90% will pass a No. 10 sieve and at least 50% will pass a No. 100 sieve.

C. SEED

1. The quality of seed and all operations in connection with the furnishing of this material shall comply with the requirements of the North Carolina Seed Law and regulations adopted by the North Carolina Board of Agriculture.

2. Seed shall have been approved by the North Carolina Department of Agriculture or any agency approved by the Town before being sown, and no seed will be accepted with a date of test more than nine (9) months prior to the date of sowing. Such testing however, will not relieve the Contractor from responsibility for furnishing and sowing seed that meets these specifications at the time of sowing. When a low percentage of germination causes the quality of the seed to fall below the minimum pure live seed specified, the Contractor may elect, subject to the approval of the Town, to increase the rate of seeding sufficiently to obtain the minimum pure live seed contents specified, provided that such an increase in seeding does not cause the quantity of noxious weed seed per square yard to exceed the quantity that would be allowable at the regular rate of seed.

3. During handling and storing, the seed shall be cared for in such a manner that it will be protected from damage by heat, moisture, rodents, or other causes.

4. Seed shall be entirely free from bulblets or seed of Johnson Grass, Nutgrass, Sandbur, Wild Onion, Wild Garlic, and Bermuda Grass. The specifications for restricted noxious weed seed refers to the number per pound, singly or collectively, of Blessed Thistle, Wild Radish, Canada Thistle, Corncockle, Field Bindweed, Quackgrass, Dodders, Dock, Horsenettle, Bracted Plantain, Buckhorn or Wild Mustard; but in no case shall the number of Blessed Thistle or Wild Radish exceed 27 seeds of each per pound. No tolerance on weed seed will be allowed.

D. MULCH

Straw mulch shall be threshed straw of oats, rye or wheat free from matured seed of obnoxious weeds or other species which would grow and be detrimental to the specified grass.

E. TACKIFIER

Emulsified asphalt or organic tackifier such as Reclamare R2400 shall be sprayed uniformly on mulch as it is ejected from blower or immediately thereafter. Tackifier shall be applied evenly over area creating uniform appearance. Rates of application will vary with conditions. Asphalt shall not be used in freezing weather.

## PART 3: EXECUTION

### 3.01 PREPARATION

A. PROTECTION OF EXISTING TREES AND VEGETATION

1. Protect existing trees and other vegetation indicated to remain in place against unnecessary cutting, breaking or skinning of roots, skinning and bruising of bark, smothering of trees by stockpiling construction materials or excavated materials within drip line, excess foot or vehicular traffic, or parking of vehicles within drip line. Provide temporary guards to protect trees and vegetation to be left standing.

2. Provide protection for roots over 1-1/2" diameter cut during construction operations. Coat cut faces with an emulsified asphalt, or other acceptable coating, formulated for use on damaged plant tissues. Temporarily cover exposed roots with wet burlap to prevent roots from drying out and cover with earth as soon as possible.

3. The Contractor shall not remove or damage trees and shrubs which are outside the Clearing Limits established by the Town or those within the Clearing Limits designated to remain.

4. Repair trees scheduled to remain and damaged by construction operations in a manner acceptable to the Town. Repair damaged trees promptly to prevent progressive deterioration caused by damage.

5. Replace trees scheduled to remain and damaged beyond repair by construction operations, as determined by the Town with trees of similar size and species. Repair and replacement of trees scheduled to remain and damaged by construction operations or lack of adequate protection during construction operations shall be at the Contractor's expense.

B. GRADING

1. Rough grading shall be done as soon as all excavation required in the area has been backfilled. The necessary earthwork shall be accomplished to bring the existing ground to the desired finish elevations as shown on the Contract Drawings or otherwise directed.

2. Fine grading shall consist of shaping the final contours for drainage and removing all large rock, clumps of earth, roots and waste construction materials. It shall also include thorough loosening of the soil to a depth of 6” by plowing, discing, harrowing or other approved methods until the area is acceptable as suitable for subsequent landscaping operations. The work of landscaping shall be performed on a section by section basis immediately upon completion of earthwork.

3. Upon failure or neglect on the part of the Contractor to coordinate his grading with seeding and mulching operations and diligently pursue the control of erosion and siltation, the Town may suspend the Contractor's grading operations until such time as the work is coordinated in a manner acceptable to the Town.

C. SEEDBED PREPARATION

1. The Contractor shall cut and satisfactorily dispose of weeds or other unacceptable growth on the areas to be seeded. Uneven and rough areas outside of the graded section, such as crop rows, farm contours, ditches and ditch spoil banks, fence line and hedgerow soil accumulations, and other minor irregularities which cannot be obliterated by normal seedbed preparation operations, shall be shaped and smoothed as directed by the Town to provide for more effective seeding and for ease of subsequent mowing operations.

2. The soil shall then be scarified or otherwise loosened to a depth of not less than 6” except as otherwise provided below or otherwise directed by the Town. Clods shall be broken and the top 2” to 3” of soil shall be worked into an acceptable seedbed by the use of soil

pulverizers, drags, or harrows; or by other methods approved by the Town.

3. On 2:1 slopes a seedbed preparation will be required that is the same depth as that required on flatter areas, although the degree of smoothness may be reduced from that required on the flatter areas if so permitted by the Town.

4. On cut slopes that are steeper than 2:1, both the depth of preparation and the degree of smoothness of the seedbed may be reduced as permitted by the Town, but in all cases the slope surface shall be scarified, grooved, trenched, or punctured so as to provide pockets, ridges, or trenches in which the seeding materials can lodge.

5. On cut slopes that are either 2:1 or steeper, the Town may permit the preparation of a partial or complete seedbed during the grading of the slope. If at the time of seeding and mulching operations such preparation is still in a condition acceptable to the Town, additional seedbed preparation may be reduced or eliminated.

6. The preparation of seedbeds shall not be done when the soil is frozen, extremely wet, or when the Town determines that it is in an otherwise unfavorable working condition.

D. APPLICATION RATES

Seed shall be applied by means of a hydro-seeder or other approved methods. The rates of application of seed, fertilizer and limestone shall be as stated below.

1. Lime and Fertilizer

In the absence of a soil test, the following rates of application of limestone and fertilizer shall be:

a. 4,000 pounds limestone per acre

b. 1000 pounds 10-10-10 ($N\text{-}P_2 0_5\text{-}K_2 0$) fertilizer per acre and the remaining quantity applied when vegetation is three inches in height or 45 days after seeding, whichever comes first.

2. Mulch

Mulch shall be applied at the following rates per acre:

a. 3,000-4,000 pounds straw mulch, or

b. 1,500-2,000 pounds wood cellulose fiber.

c. 35-40 cubic yards of shredded or hammermilled hardwood bark

d. 1,200-1,400 pounds of fiberglass roving

3. Seed

The kinds of seed and the rates of application shall be as contained in this table. All rates are in pounds per acre. *See Notes 1 and 2*.

a. Fall and Winter (Normally August 1 to June 1)

80 pounds of Ky-31 tall fescue and 15 pounds of rye grain

b. Summer (Normally May 1 to September 1)

100 pounds of Ky-31 tall fescue

**NOTE:**

1. On cut and fill slopes having 2:1 or steeper slopes, add 40 pounds of sericea lespedeza per acre to the planned seeding (hulled in spring and summer unhulled in fall and winter) plus 15 pounds of sudangrass in summer seeding or 25 pounds of rye cereal per acre in fall and winter seeding, if seeded September to February.

2. These seeding rates are prescribed for all sites with less than 50% ground cover and for sites with more than 50% ground cover where complete seeding is necessary to establish effective erosion control vegetative cover. On sites having 50% to 80% ground cover where complete seeding is not necessary to establish vegetative cover, reduce the seeding rate at least one-half the normal rate.

E. APPLICATION

1. Equipment to be used for the application, covering or compaction of limestone, fertilizer, and seed shall have been approved by the Town before being used on the project. Approval may be revoked at any time if equipment is not maintained in satisfactory working condition, or if the equipment operation damages the seed.

2. Limestone, fertilizer, and seed shall be applied within 24 hours after completion of seedbed preparation unless otherwise permitted by

the Town, but no limestone or fertilizer shall be distributed and no seed shall be sown when the Town determines that weather and soil conditions are unfavorable for such operations.

3. Limestone may be applied as a part of the seedbed preparation, provided it is immediately worked into the soil. If not so applied, limestone and fertilizer shall be distributed uniformly over the prepared seedbed at the specific rate of application and then harrowed, raked, or otherwise thoroughly worked or mixed into the seedbed.

4. Seed shall be distributed uniformly over the seedbed at the required rate of application, and immediately harrowed, dragged, raked, or otherwise worked so as to cover the seed with a layer of soil. The depth of covering shall be as directed by the Town. If two kinds of seed are to be used which require different depths of covering, they shall be sown separately.

5. When a combination seed and fertilizer drill is used, fertilizer may be drilled in with the seed after limestone has been applied and worked into the soil. If two kinds of seed are being used which require different depths of covering, the seed requiring the lighter covering may be sown broadcast or with a special attachment to the drill, or drilled lightly following the initial drilling operation.

6. When a hydraulic seeder is used for application of seed and fertilizer, the seed shall not remain in water containing fertilizer for more than 30 minutes prior to application unless otherwise permitted by the Town.

7. Immediately after seed has been properly covered the seedbed shall be compacted in the manner and degree approved by the Town.

8. When adverse seeding conditions are encountered due to steepness of slope, height of slope, or soil conditions, the Town may direct or permit that modifications be made in the above requirements which pertain to incorporating limestone into the seedbed; covering limestone, seed, and fertilizer; and compaction of the seedbed.

9. Such modifications may include but not be limited to the following:

   a. The incorporation of limestone into the seedbed may be omitted on

      i. cut slopes steeper than 2:1;

      ii. on 2:1 cut slopes when a seedbed has been prepared during the excavation of the cut and is still in an acceptable condition; or

      iii. on areas of slopes where the surface of the area is too rocky to permit the incorporation of the limestone.

   b. The rates of application of limestone, fertilizer, and seed on slopes 2:1 or steeper or on rocky surfaces may be reduced or eliminated.

   c. Compaction after seeding may be reduced or eliminated on slopes 2:1 or steeper, on rocky surfaces, or on other areas where soil conditions would make compaction undesirable.

F. MULCHING

1. All seeded areas shall be mulched unless otherwise indicated in the special provisions or directed by the Town.

2. It shall be spread uniformly at a rate of two tons per acre in a continuous blanket over the areas specified.

3. Before mulch is applied on cut or fill slopes which are 3:1 or flatter, and ditch slopes, the Contractor shall remove and dispose of all exposed stones in excess of 3” in diameter and all roots or other debris which will prevent proper contact of the mulch with the soil.

4. Mulch shall be applied within 24 hours after the completion of the seeding unless otherwise permitted by the Town. Care shall be exercised to prevent displacement of soil or seed or other damage to the seeded area during the mulching operations.

5. Mulch shall be uniformly spread by hand or by approved mechanical spreaders or blowers which will provide an acceptable application. An acceptable application will be that which will allow some sunlight to penetrate and air to circulate but also partially shade the ground, reduce erosion, and conserve soil moisture.

6. Mulch shall be held in place by applying a sufficient amount of asphalt or other approved binding material to assure that the mulch is properly held in place. The rate and method of application of binding material shall meet the approval of the Town. Where the binding material is not applied directly with the mulch it shall be applied immediately following the mulch operation.

7. The Contractor shall take sufficient precautions to prevent mulch from entering drainage structures through displacement by wind, water, or other causes and shall promptly remove any blockage to drainage facilities which may occur.

G. MAINTENANCE

1. The Contractor shall keep all seeded areas in good condition, reseeding and mowing if and when necessary as directed by the Town, until a good lawn is established over the entire area seeded and shall maintain these areas in an approved condition until final acceptance of the Contract.

2. Grassed areas will be accepted when a 95% cover by permanent grasses is obtained and weeds are not dominant. On slopes, the Contractor shall provide against washouts by an approved method. Any washouts which occur shall be regraded and reseeded until a good sod is established.

3. Areas of damage or failure due to any cause shall be corrected by being repaired or by being completely redone as may be directed by the Town. Areas of damage or failure resulting either from negligence on the part of the Contractor in performing subsequent construction operations or from not taking adequate precautions to control erosion and siltation as required throughout the various sections of the specifications, shall be repaired by the Contractor as directed by the Town at no cost to the Town.

## END OF SECTION

# SECTION 03301 MISCELLANEOUS CONCRETE CONSTRUCTION

## PART 1: GENERAL

### 1.01 SCOPE OF WORK

A. This section covers concrete construction, complete, including reinforcement therefore.

## PART 2: PRODUCTS

### 2.01 MATERIALS

A. REINFORCING

Bar reinforcement shall be intermediate grade new billet steel conforming to the requirements of ASTM A-615. Unless otherwise noted, all reinforcing bars shall be grade 60. Wire fabric reinforcement shall consist of steel wire conforming to the requirements of ASTM A-185, latest revision.

B. CONCRETE

All concrete shall be equivalent to ready mix concrete manufactured and delivered in accordance with the requirements of ASTM C-94, latest revision and having a compressive strength at 28 days of 4000 psi, except as noted herein. The concrete manufacturer shall assume the responsibility of the design of the concrete mix in accordance with Alternate No. 2 of ASTM C-94. Air entrained concrete shall be used for all concrete exposed to the elements.

a. Cement shall be Type 1 or Type 1A "Portland" cement conforming to ASTM C-150, latest revision or ASTM C-175, latest revision respectively.

b. Aggregates shall conform to ASTM C-33, latest revision. Coarse aggregate shall be crushed rock or gravel and graded from 3/4" to #4 sieve for walls and slabs and from 2" to #4 sieve for mass or foundation concrete. Fine aggregate shall be natural sand.

c. Mixing water shall be proportioned so that slump when measured with standard slump cone does not exceed the following:

i. Slabs in grade ..... Max. 4", Min. 3"

ii. Footings..... Max. 5", Min. 3"

iii. All others ..... Max. 6", Min. 3"

d. Premolded joint filler strips shall be resilient compressive, bituminous and fiber material saturated, with at least 35% and not over 50% by weight of asphalt. Poured type joint composition for expansion joints shall be elastic compound made up of asphalt and colloidal mineral fillers.

## PART 3: EXECUTION

### 3.01 FORMS

A. Forms shall be wood, metal, structural hardboard or other suitable material that will produce the required surface finish. Forms placed for successive pours for continuous surfaces shall be fitted to accurate alignment to assure a smooth completed surface free from irregularities, and shall be sufficiently tight to prevent the loss of mortar. No forms shall be left permanently in place without approval of the Town. Holes resulting from removal of form ties shall be filled solid within 12 hours after removal of forms with cement mortar.

### 3.02 PLACEMENT

A. Concrete shall be placed as nearly as possible in its final position. Runways for wheeled equipment shall not be supported on the reinforcement. Concrete shall be placed and compacted in layers not over 18 inches deep. Vibrators may be used provided they are used under experienced supervision and the mixture is dry enough to prevent segregation. Form vibrators shall not be used. Vibration shall not be used for transporting or moving concrete inside the forms. No more concrete shall be placed than can be consolidated and finished the same day as placed. Free fall of concrete shall be limited so that no segregation of materials occurs.

### 3.03 JOINTS

A. Joints in foundation walls shall be keyed. Before depositing of concrete is resumed, the hardened surface shall be roughened, cleaned and wetted surfaces shall be slushed with a coating of neat cement grout against which the new concrete shall be placed before the new grout has attained its set.

## 3.03 FINISHING

A. After stripping forms, all voids and honeycombs shall be patched by chipping and scarifying the defective area and treating it with an approved bonding tended that all such voids be patched, not merely plastered. Grout mixture shall consist of one part Portland cement and one part sand. Immediately following removal of forms, all fins and irregular projections shall be removed from all surfaces except from those which are not to be exposed or waterproofed.

B. Slabs shall be struck off and consolidated by approved machine or hand methods, so that upon completion, the surface shall be true to grade as shown on drawings and free of surface voids. All floors shall have monolithic steel trowel finish unless otherwise indicated on the drawings. Exterior walks shall be compacted, screeded and floated to a true even surface with wood floats and then broomed.

## END OF SECTION

# SECTION 11312 SUBMERSIBLE SEWAGE PUMPS

## PART 1: GENERAL

### 1.01 SCOPE OF WORK

A. The work covered by this section consists of furnishing and installing non-clog submersible sewage pumps, controls and accessories in duplex pump stations.

B. Pump stations shall include duplex submersible pumps with motors installed on lift-out rail systems, access hatch, controls, piping, valves and other necessary appurtenances as shown on the approved drawings and in accordance with the specifications herein stated.

C. All materials and equipment supplied under this Section shall be new, of good quality, and in good condition.

### 1.02 SYSTEM DESCRIPTION

A. PUMP DESIGN

Each pump shall be of the submersible non-clog type with 2-vane enclosed impeller and submersible motor. Pump shall be designed for automatic connection to the discharge connection elbow, guided by no less than two guide bars extending from the top of the station to the discharge elbow.

Pumping conditions shall be as shown on the approved plans

### 1.03 QUALITY ASSURANCE

A. MANUFACTURER

The pumps and all appurtenances shall be supplied by reputable manufacturers with at least ten (10) years of experience.

B. FACTORY TESTS

1. General

The pumps shall be tested at the factory under simulated field conditions for excessive vibration, leaks, and operation of all automatic systems. The controls shall be adjusted to start and stop the pumps to satisfy field conditions. For each unit, a pump performance curve shall be produced from the factory testing. Its

veracity shall be certified and the curves shall be identifiable by serial numbers of pumps and motors.

2. Pump Test

The pump manufacturer shall perform the following inspections and tests on each pump before shipment from factory:

a. Impeller, motor rating and electrical connections shall first be checked for compliance to the customer's purchase order.

b. A motor and cable insulation test for moisture content or insulation defects shall be made.

c. Prior to submergence, the pump shall be run dry to establish correct rotation and mechanical integrity.

d. The pump shall be run submerged in water to a minimum of six (6) feet.

e. After operational test No. 4, the insulation test (No. 2) is to be performed again.

## 1.04 DELIVERY, STORAGE AND HANDLING

A. The equipment and materials shall be delivered, stored and handled in strict accordance with the manufacturer's recommendations.

## 1.08 MANUFACTURER AND SUPPLIER INFORMATION

A. MANUFACTURER NAMEPLATE

A manufacturer's nameplate shall be securely and permanently mounted to each individual piece of equipment furnished under this Section. The nameplate shall be constructed of a durable, non-corrosive material. Critical information shall be clearly engraved or otherwise permanently stamped on the nameplate, and shall be fully legible. The information contained on the manufacturer nameplate shall include at least the following:

- Manufacturer's Serial Number
- Name, address and telephone number of equipment manufacturer
- Model and/or Part Number, including pump impeller sizes, when applicable

- Performance Criteria (i.e., capacity, design point, etc.)
- Motor size, speed and voltage
- Enclosure Type or Rating
- Any other pertinent information

Note: All equipment shall include a nameplate with a manufacturer serial number validating the equipment as new. Failure to meet these requirements will be cause for rejection of the equipment.

B. SUPPLIER AND SERVICE INFORMATION

A durable nameplate, stamp or sticker shall be adhered to each individual piece of equipment containing the name, address, and telephone number of the local business that supplied the equipment, and the name, address and telephone number of the local business that can provide service and replacement parts for the equipment. A 24-hour emergency service telephone number should also be included.

## PART 2: PRODUCTS

### 2.01 EQUIPMENT

A. PUMPS

Pumps shall be installed in such a way that solids are fed in an upflow direction to the impeller with no feet, rails or other obstructions below inlet. All openings in pump impeller and volute case shall be large enough to pass a 3" diameter sphere. Impeller shall be of the 2 vane non-clog enclosed type to provide an unobstructed passage through the volute and shall be cast iron and shall be driven by a stainless steel shaft key. Impeller shall be locked with a screw and washer.

B. MOTOR DESIGN

1. Motor shall be sealed, submersible type.

2. Stator winding shall be of the open type with insulation good for 180$^{o}$ C (356$^{o}$ F). Winding shall operate in clean high dielectric oil that lubricates bearings and seals and transfers heat from windings to outer shell. Motor shall be heat shrunk into housing for proper alignment and superior heat transfer.

3. Motor shall have two heavy duty ball bearings to support pump shaft and take radial and thrust loads and a sleeve guide bushing directly above the lower seal to take radial load and act as a flame path for

seal chamber. Ball bearings shall be designed for a minimum B10 life of 30,000 hours.

4. A heat sensor thermostat shall be imbedded in top of winding and be connected in series with the motor starter coil in control box to stop motor if temperature rises in motor to over 220° F for any reason. Thermostat to reset automatically when temperature drops to a safe limit. Motors shall also be equipped with a moisture sensor which signals an alarm if moisture is present between the two seals.

5. Pump motor cables shall be suitable for submersible pump applications. Cable sizing shall conform to NEC requirements for the full load currents of the motors.

C. LIFT-OUT RAIL SYSTEM

1. Rail system shall consist of a seal fitting that mounts vertically into a stationary discharge casting. A simple downward motion shall connect pump and seal fitting to the stationary discharge casting. Seal fitting shall seal with two "O" rings and a tapered rubber seal ring into funnel of discharge case. Discharge casting shall be furnished with flanged discharge pipe connections for a duplex system. Valve casting and discharge casting shall be painted with a high quality, lead free, alkyd enamel finish. An upper guide plate shall be attached to pump to support life-out fitting and guide pump on rails. Lifting lugs shall be cast into the motor housing and a stainless steel chain and clevice shall be furnished for lifting pump.

2. Two hold down brackets shall be provided to prevent pump and seal fitting from rising on rails. Guide rails shall be 1-1/2" stainless steel pipe.

3. Rail support and mounting bushing shall be mounted to basin wall and shall not be attached to basin cover or cover frame.

4. Guide rail support shall be adjustable so that perfect vertical alignment of the rails can be obtained. Pump hatch shall have minimum dimensions shown on the drawings. Hatch cover shall be of the water tight, diamond pattern, no-skid type and shall be provided with lock hasp and hold open arm. Hatch shall be made of aluminum. Aluminum hatch frame to be cast-in-place into concrete top slab.

D. CONTROLS

1. For each pump station, furnish and install one (1) duplex automatic pump control center, in a NEMA 4X stainless steel enclosure with interior swing-out panel for the appropriate power supply. For each pump motor, there shall be included: a combination circuit breaker/overload unit providing overload protection, short-circuit protection, reset and disconnect for all phases; NEMA rated across-the-line magnetic contactors; hand/off/automatic pump operations selector switch; elapsed time meters; lightning protection overload device to be precalibrated to match motor characteristics, and factory sealed to insure trip setting is tamper proof; four (4) float level sensors shall be provided for pump operation; 120 volt single phase control panel pilot circuitry. A control circuit transformer of adequate voltage with disconnect circuit breaker and overload protection, for external pilot circuitry shall be included with an automatic electric alternator for two pumps. Terminal board for connection of line, pump and level sensors shall be provided. Pump casing moisture and high temperature indicator alarms and reset push buttons shall be provided. An audible and visual high water alarm shall be provided. A 110-volt convenience outlet shall be provided at the control center.

2. The control panel shall include a battery backed telephone alarm dialer. The dialer shall be four-point with alarms input as follows:

   a. Alarm No. 1 – Power Failure
   b. Alarm No. 2 – High Wet Well Level
   c. Alarm No. 3 – Pump Failure
   d. Alarm No. 4 – Spare

3. Provide a main circuit breaker with external operating handle.

4. Control Panel shall be UL labeled as an “Enclosed Industrial Control Panel.”

E. ACCESS FRAME AND COVER

Furnish and install one (1) water tight access door with frame in aluminum material, complete with hinged and flush locking mechanism, upper guide holder and level sensor(s) cable holder. Frame shall be securely placed, mounted above the pump(s). Frame shall be provided with sliding nut rails to attach the accessories required. Doors shall be of skid proof design.

## PART 3: EXECUTION

### 3.01 INSTALLATION

A. All equipment and materials shall be installed in strict accordance with the manufacturer's recommendations.

### 3.02 QUALITY CONTROL AND FIELD TESTING

A. QUALITY CONTROL

The pump supplier shall furnish the services of a technical representative for two (2) days to inspect the installation and provide start-up and operator training.

B. FIELD TESTING

1. Each pump shall be field tested by the manufacturer's technical representative to demonstrate that the pump performance meets the requirements of the approved drawings and specifications. The manufacturer shall provide and install any gauges, meters or other devices needed for the field tests.

2. Pump start-up and testing shall be done in the presence of the Town or its Engineer and shall demonstrate conformance to the conditions shown on the contract drawings.

### 3.03 SPARE PARTS

The Contractor shall furnish one (1) complete set of spare parts as detailed below for each pump supplied. Spare parts shall be conveyed to the Town.

Upper and Lower Mechanical Seal
Motor Cable
Cable Grommet
Inspection Plug Washer
Upper Bearing
Lower Bearing
Wear Ring
Cable Entry Washer
O-Ring Kit
Impeller Bolt
Impeller Key

## END OF SECTION

# SECTION 16620 DIESEL ENGINE GENERATOR

## PART 1: GENERAL

### 1.01 SCOPE OF WORK

A. It is the intent and purpose of these specifications to describe the materials and labor required for the installation of one or more standby electric power generating sets and necessary auxiliary equipment. These specifications describe the performance, functions, and quality standards required in the installation, equipment, material, and workmanship which are to be furnished.

B. These specifications cover engine and generator complete, including engine, batteries, chargers, radiator, fan, silencer, air and fuel filters, generator, exciter, and vibration isolators as specified herein. These specifications also include switchgear, piping and wiring external to manufactured units, fuel storage tanks, fuel supply and return lines, and installation.

C. The installation shall include the labor, equipment, tools, supplies and materials, and performance of all operations necessary for the installation of the engine-generator set, switchgear, and auxiliary equipment as specified.

D. Unless otherwise noted, all materials and equipment supplied under this Section shall be new, of good quality, and in good condition.

### 1.02 SYSTEM DESCRIPTION

A. Rating: These specifications cover engine-generator sets ready for installation, with the necessary switchgear, controls, and auxiliary equipment and shall include a diesel engine coupled to a generator of the specified rating.

B. Operation: Operation shall be fully automatic.

C. Connection: It is intended that the equipment specified herein shall be electrically separate from the utility source.

## 1.03 REFERENCES

A. All equipment covered by these specifications shall be new and shall conform to the latest applicable standards of ANSI and NEMA, except where the standards conflict with the requirements of these specifications. All electrical equipment shall require UL approval for the intended use.

## 1.04 QUALITY ASSURANCE

A. The standby diesel generator shall be supplied by a reputable manufacturer with at least ten (10) years of experience in the manufacture of similar types of diesel engine generators. Generators shall be manufactured by Kohler, Caterpillar, Onan or approved equal.

## 1.05 MANUFACTURER AND SUPPLIER INFORMATION

A. Manufacturer Nameplate: A manufacturer's nameplate shall be securely and permanently mounted to each individual piece of equipment furnished under this Section. The nameplate shall be constructed of a durable, non-corrosive material. Critical information shall be clearly engraved or otherwise permanently stamped on the nameplate, and shall be fully legible. The information contained on the manufacturer nameplate shall include at least the following:

1. Manufacturer's Serial Number
2. Name, address and telephone number of equipment manufacturer
3. Model and/or Part Number, including pump impeller sizes, when applicable
4. Performance Criteria (i.e., capacity, design point, etc.)
5. Motor size, speed and voltage
6. Enclosure Type or Rating
7. Any other pertinent information

Note: All equipment shall include a nameplate with a manufacturer serial number validating the equipment as new. Failure to meet these requirements will be cause for rejection of the equipment.

B. Supplier and Service Information: A durable nameplate, stamp or sticker shall be adhered to each individual piece of equipment containing the name, address, and telephone number of the local business that supplied the equipment, and the name, address and telephone number of the local business that can provide service and replacement parts for the equipment. A 24-hour emergency service telephone number should also be included.

## PART 2: PRODUCTS

### 2.01 MATERIALS

A. Miscellaneous Material: Miscellaneous materials shall include all material and equipment necessary to allow fully automatic operation of the units at the completion of the project. Miscellaneous materials shall include, but shall not be limited to necessary fuel supply and return lines and control valves, conduit and wiring for control and connection to the facility electric supply.

### 2.02 EQUIPMENT

A. Engine: These specifications cover diesel fueled, compression-ignition engine, four-stroke, 1800 RPM, turbo charged, liquid cooled, suitable for operation of the attached electric generator for continuous standby duty at an ambient temperature of 110° F. The engine shall be rated not less than 1.5 brake horsepower per KW at SAE standard rating conditions in addition to the power required for operation of the radiator fan, oil pump, battery charging alternator, and water pump.

B. Enclosure: If the Contract drawings show the standby generator to be installed outdoors, the Supplier shall provide a weatherproof enclosure.

C. Fuel Supply System:

1. A complete fuel supply system shall be furnished and installed as an integral part of the generator set.

2. The fuel storage tank shall be furnished and installed for receiving, storing, filtering and delivering fuel to the diesel engine as herein specified. Unless otherwise shown on the approved drawings, the main fuel storage tank shall be skid mounted located beneath the engine.

3. The tank shall each be equipped with an air vent with rain shield, screen, and an external liquid level gauge. Level gauge shall be vapor tight and shall consist of a float inside the tank connected to

an indicating dial outside the tank. Gauge shall be Murphy or approved equal.

4. A fuel supply and return line shall be installed from the tank to the engine. A manual shutoff valve shall be provided at each connection to the tank. Connections between fuel lines and engine shall be of a flexible type.

D. Exhaust System: The Contractor shall furnish and install all exhaust piping, thimbles, and silencer as a part of these specifications. Exhaust piping shall be schedule 40 seamless black iron, sized as required.

E. Grounding: The generator and all other metallic equipment shall be bonded and grounded as required by the National Electrical Code and local codes. Grounding conductors shall be soft-drawn stranded copper sized in accordance with the applicable codes and shall be enclosed in PVC conduit in poured concrete.

F. Electrical System: All electrical installations shall comply with the latest edition of the National Electrical Code, and local codes.

## PART 3: EXECUTION

### 3.01 INSTALLATION

A. All equipment and materials shall be installed in strict accordance with the manufacturer's recommendations and as shown on the approved Drawings.

## END OF SECTION

# SECTION "M"
# APPROVED MATERIALS

**NOTE** - Any materials **not** listed herein will require specific approval by the Town of Franklin prior to installation.

## WATER LINE MATERIALS

| | |
|---|---|
| **DUCTILE IRON WATER LINE**<br>PIPE, or approved equal | ATLANTIC STATES, GRIFFIN PIPE PRODUCTS, CO., US<br>TYTON JOINT CLASS 350 |
| **PVC PIPE (To be used in locations with 150 P.S.I. or less ONLY)** | SDR-14 or Ultra Blue w/ copper tracing wire<br>2" PVC to be iron pipe OD size |
| **GATE VALVES** | |
| IN GROUND | |
| 3 " – 12 " | MUELLER A-2360 RESILIENT WEDGE – M.J. x M.J. |
| 2 " | MUELLER A-2360 RESILIENT WEDGE – THD x THD |
| TAPPING 2" – 12 " | MUELLER T-2360 RESILIENT WEDGE – M.J. x FL. |
| IN BUILDINGS & VAULTS | |
| 3" – 12" | MUELLER 2360 SERIES OS&Y RESILIENT WEDGE<br>FLANGED ENDS |
| 1" – 2" | CRANE FIG. 459 OR JENKINS FIG. 820J RISING STEM THREADED ENDS |
| **FIRE HYDRANT** | MUELLER SUPER CENTURION 3-WAY A-423, 4½" or 5¼"<br>MAIN VALVE (see specifications section 02660,<br>MECHANICAL JOINT CONNECTION,<br>COLOR = MFR. STANDARD YELLOW |
| **MECHANICAL JOINT FITTINGS** | TYLER /UNION C153 DUCTILE IRON COMPACT FITTINGS OR TYLER/UNION SSB DUCTILE IRON CLASS 350 |
| **MECHANICAL JOINT RESTRAINTS** | FORD UNIFLANG SERIES 1400 OR<br>EBBA IRON SALES SERIES 1100 MEGALUG |
| **FLANGED FITTINGS** | TYLER UNION C110 FLANGED FITTINGS |
| **TYTON JOINT (SLIP JOINT) RESTRAINTS** | U.S. PIPE FIELD LOK 350 GASKET INSTANT JOINT RESTRAINT |
| **AIR RELEASE VALVE** | GA INDUSTRIES FIGURE 910, 1" NPT INLET |
| **MANHOLE COVER – AIR VALVES** | U.S. FOUNDRY USF 668 RING AND KL COVER, MARKED "AIR VALVE" OR "AIR RELEASE VALVE" |
| **TAPPING SADDLES**<br>THREAD | FORD STYLE F202B, SMITH BLAIR, MUELLER with IP TAP |
| **WATER SERVICE PIPING** | CTS POLY SERVICE TUBING<br>with COPPER TRACING WIRE |

| | |
|---|---|
| **VALVE BOXES** | FASTECH ADJUSTABLE SCREW TYPE, SERIES 3102 -3103<br>MARKED “WATER” |
| **METER BOX** | PLASTIC METER BOX TYPE OR<br>DEXOL PLASTICS DX1015-18CIR, W/ CI LID<br>OR MID STATE PLASTICS BC101518 W/ DI LID |
| **METER BOX RING AND LID** | FASTECH “5/8-INCH” WATER METER BOX RING AND COVER (CAST IRON) |
| **CORPORATION STOP** | MUELLER |
| **FLUSHING HYDRANT** | GIL MODEL GP40 |
| **TAPPING SLEEVE** | SMITH BLAIR, FORD, OR APPROVED EQUAL<br>FULL CIRCLE STYLE STAINLESS STEEL |

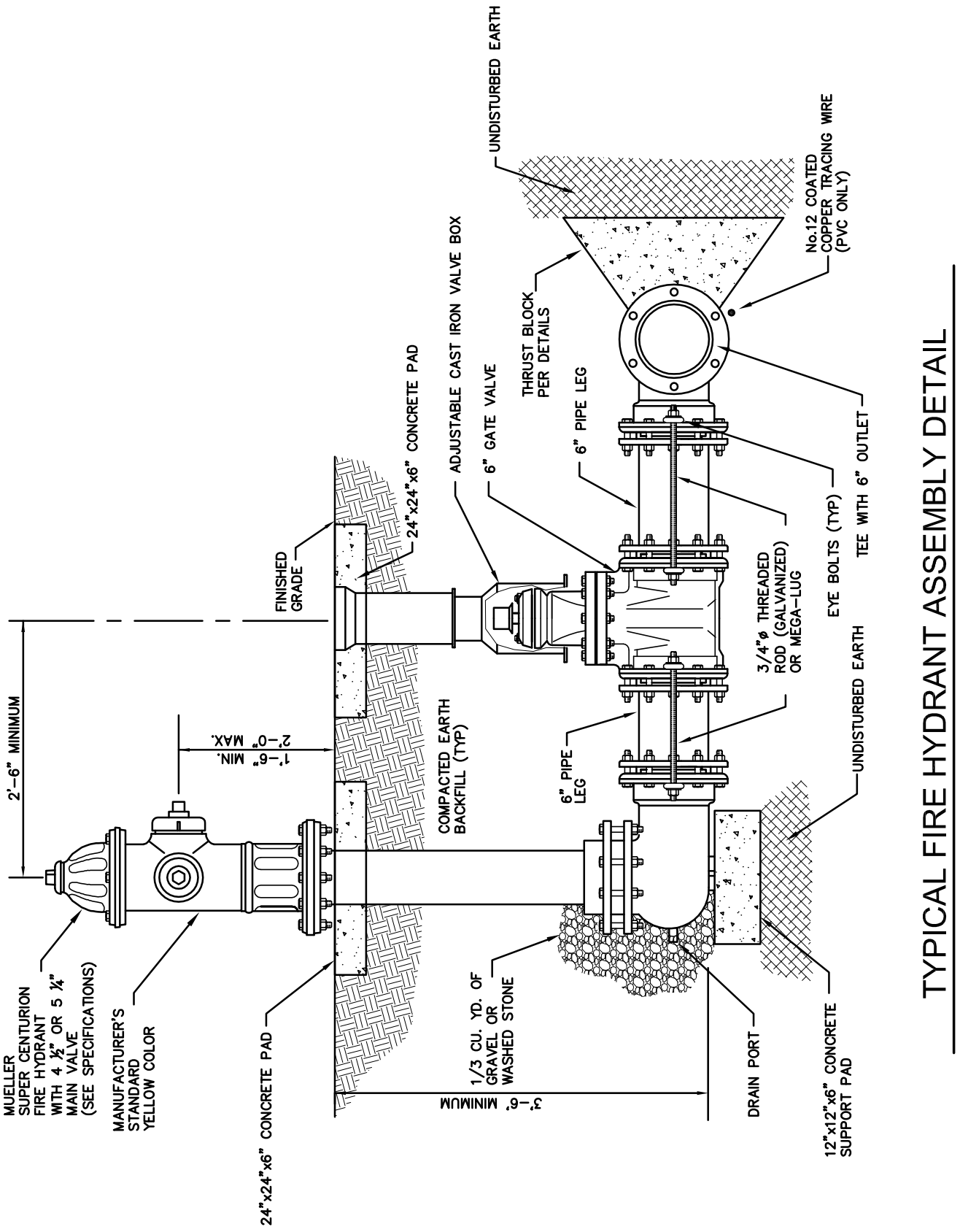
## SEWER LINE MATERIALS

| | |
|---|---|
| **PVC PIPE** | SDR 35 WITH CRUSHED STONE BEDDING, 0-5 FEET<br>PVC PIPE BETWEEN 5 AND 8 FEET TO BE FULLY ENCASED WITH CRUSHED STONE |
| **DUCTILE IRON PIPE** | TO BE USED IN ALL AREAS WITH MORE THAN 8 FEET OF DEPTH |
| **SEWER SERVICE PIPE & FITTINGS** | 4-INCH SCH. 40 |
| **PRECAST CONCRETE MANHOLES** | TINDALL STRUCTURES OR APPROVED EQUAL |
| **MANHOLE RING AND COVER** | U.S. FOUNDRY & MFG. 669KL |

# SECTION "W"

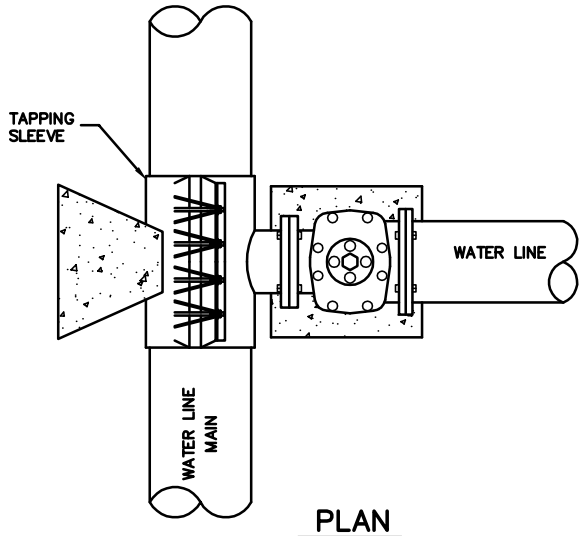
# WATER AND SEWER LINE DETAILS

| | |
|---|---|
| **W1** | **Fire Hydrant** |
| **W2** | **Tapping Sleeve and Valve** |
| **W3** | **Typical Deadman** |
| **W4.1** | **Thrust Blocks for Bends and Reducers** |
| **W4.2** | **Thrust Blocks for Plugs and Tees** |
| **W4.3** | **Thrust Block Dimension "A"** |
| **W5** | **Not Used** |
| **W6** | **Not Used** |
| **W7** | **Typical Trench Details** |
| **W8** | **Gate Valve Installation** |
| **W9** | **2" Gate Valve Installation** |
| **W10** | **Not Used** |
| **W11** | **Air Release Valve Installation** |
| **W12** | **Offset Air Release Valve Installation** |
| **W13** | **2" Blow-Off for PVC SDR-21 Water Line** |
| **W14** | **5/8" Water Meter Box Detail** |
| **W15** | **Not Used** |
| **W16** | **Water Line Creek Crossing** |
| **W16.1** | **Creek or River Crossing** |
| **W17** | **Encasement Detail** |
| **W18** | **Not Used** |
| **W19.1** | **Fire Sprinkler System Backflow Preventer Vault** |
| **W19.2** | **Fire Sprinkler System Backflow Preventer Vault – Section A-A** |
| **W20** | **Not Used** |
| **W21.1** | **Meter, By-Pass and Vault** |
| **W21.2** | **Meter, By-Pass and Vault – Section A-A** |
| **W22** | **Not Used** |
| **W23** | **Not used** |
| **W24** | **Not Used** |
| **W25** | **Cleanout Detail** |
| **W26** | **Elevated Crossing** |
| **W27** | **Sewage Forcemain Air Release Valve** |
| **W28** | **Manhole Demolition and Abandonment** |
| **W29** | **Manhole Forcemain Connection** |
| **W30** | **Not Used** |

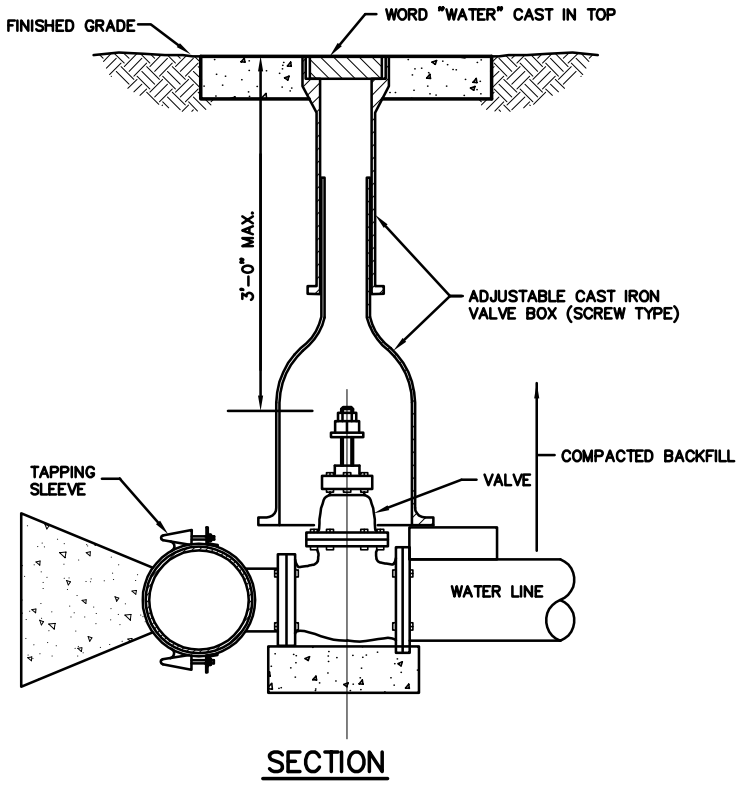



TYPICAL FIRE HYDRANT ASSEMBLY DETAIL

# FIRE HYDRANT




PLAN




SECTION

NOTES

1 – TAPPING SLEEVE SHALL BE MUELLER OR SMITH BLAIR
2 – TAPPING VALVE SHALL BE MUELLER
3 – SOLID CONCRETE OR BRICK BLOCKING SHALL BE USED AS FOOTING FOR DUCTILE IRON PIPE, PVC PIPE SHALL REQUIRE A 3000 PSI FOOTING.
4 – CONCRETE SHALL NOT CONTACT BOLTS OR ENDS OF MECHANICAL JOINT FITTINGS
5 – SEE APPROPRIATE STANDARD DETAIL FOR THRUST BLOCK DIMENSIONS.
6 – COVER FITTINGS WITH POLYETHYLENE PLASTIC PRIOR TO POURING THURST BLOCKS

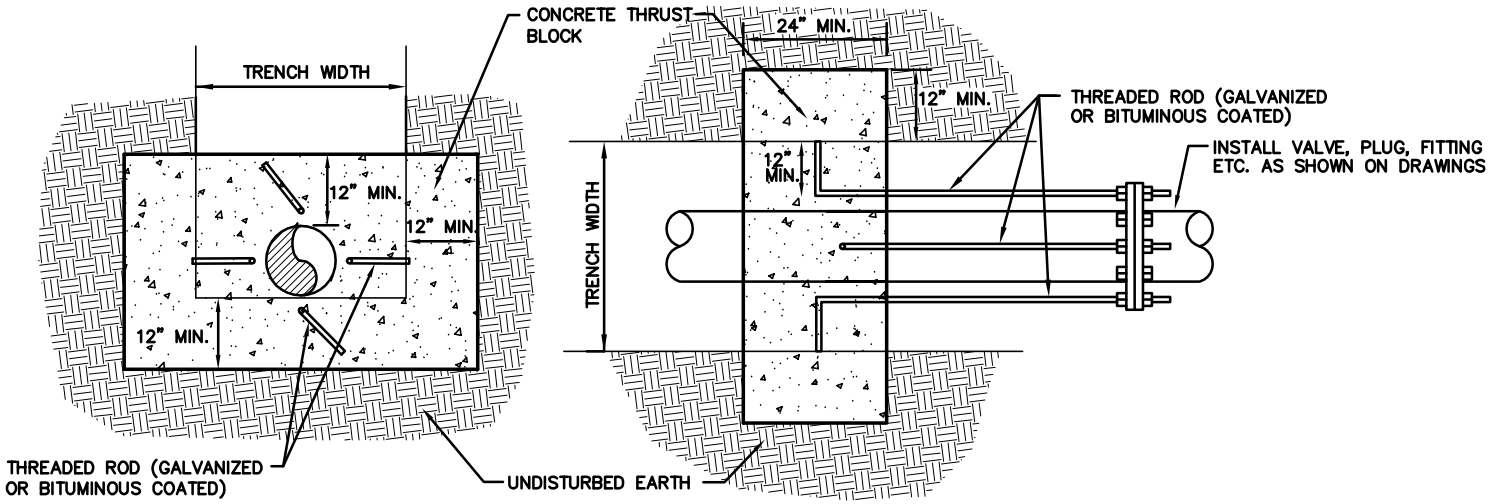
# TAPPING SLEEVE AND VALVE

TOWN OF FRANKLIN STANDARD DETAIL - W2

TOWN OF FRANKLIN

STANDARD DETAIL - W3

TYPICAL DEADMAN



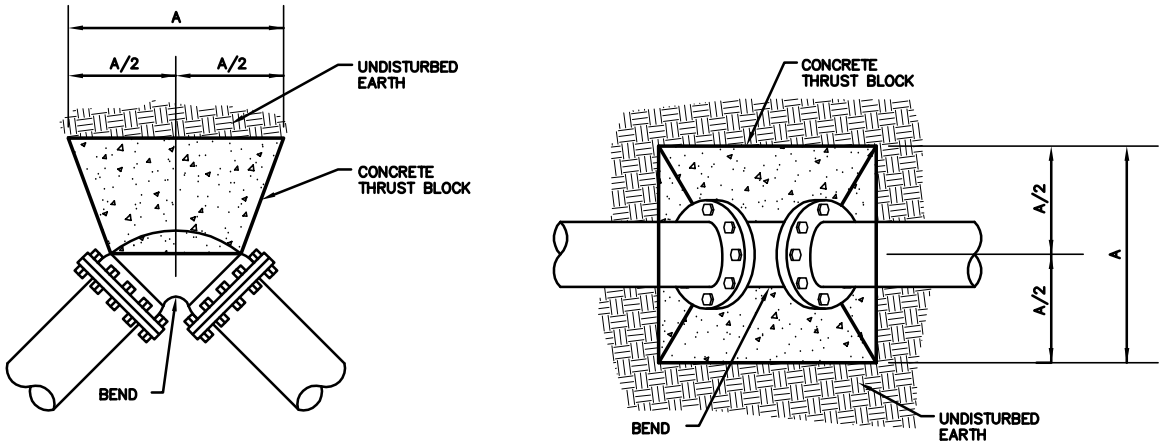

NOTES:
1. FITTING JOINTS SHALL NOT BE POURED IN CONCRETE OR HAVE CONCRETE SPILLED ON THE BOLTS OR NUTS. THE FITTING SHALL BE WRAPPED IN A LAYER OF POLYETHYLENE PLASTIC PRIOR TO POURING THE THRUST BLOCK.
2. ROD AND EYE BOLT DIAMETER SHALL BE A MINIMUM OF 3/4" AND SHALL MATCH THE SIZE OF THE BOLT PROVIDED WITH THE FITTING.
3. CONTRACTOR SHALL REPLACE FITTING BOLTS WITH THREADED ROD FOR 1/2 OF THE BOLTS SUPPLIED WITH EACH FITTING. RODS SHALL BE EQUALLY SPACED.

# TYPICAL DEADMAN

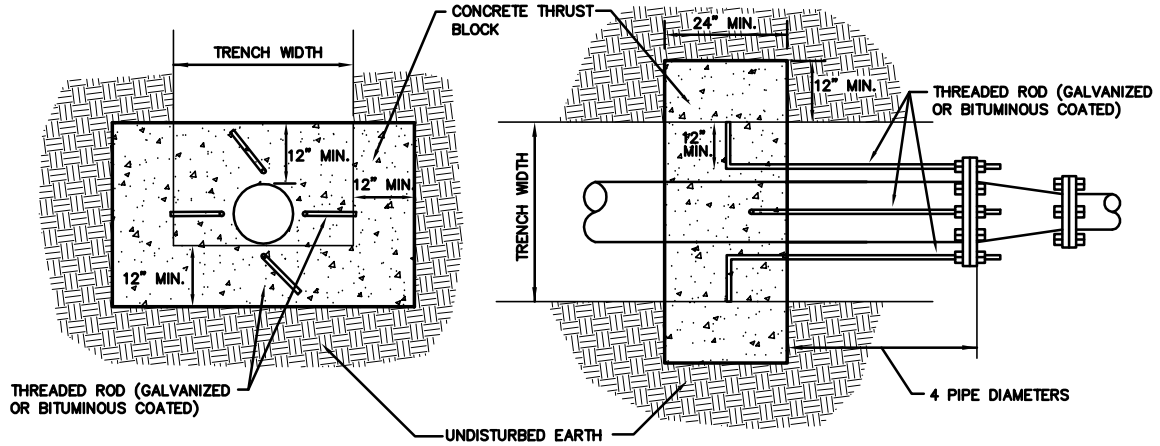
TOWN OF FRANKLIN

STANDARD DETAIL - W4.1

# THURST BLOCKS FOR BENDS AND REDUCERS




## TYPICAL THRUST BLOCKS FOR BENDS




NOTES:

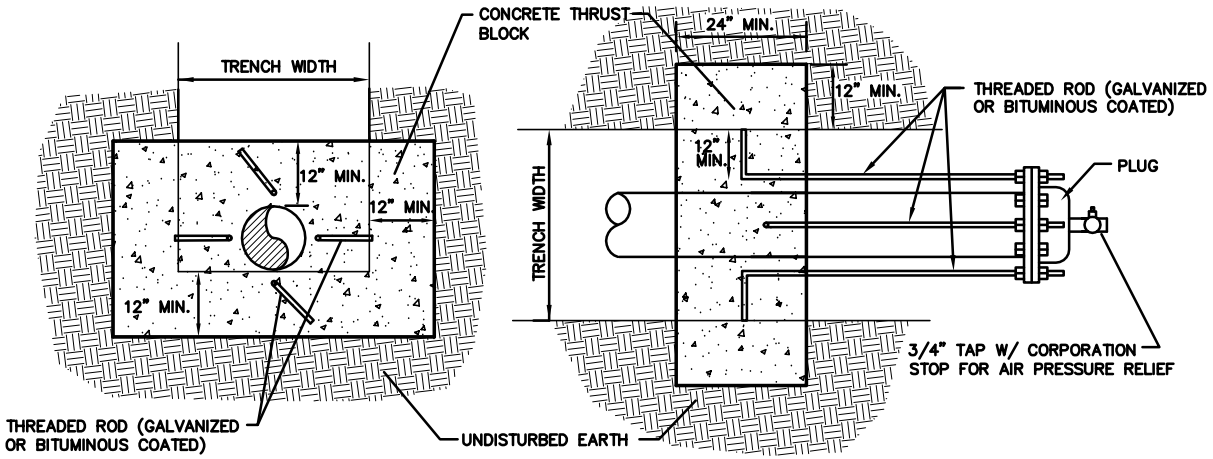
1. FITTING JOINTS SHALL NOT BE POURED IN CONCRETE OR HAVE CONCRETE SPILLED ON THE BOLTS OR NUTS. THE FITTING SHALL BE WRAPPED IN A LAYER OF POLYETHYLENE PLASTIC PRIOR TO POURING THE THRUST BLOCK.
2. ROD AND EYE BOLT DIAMETER SHALL BE A MINIMUM OF 3/4" AND SHALL MATCH THE SIZE OF THE BOLT PROVIDED WITH THE FITTING.
3. CONTRACTOR SHALL REPLACE FITTING BOLTS WITH THREADED ROD FOR 1/2 OF THE BOLTS SUPPLIED WITH EACH FITTING. RODS SHALL BE EQUALLY SPACED.

## TYPICAL THRUST BLOCK FOR REDUCERS

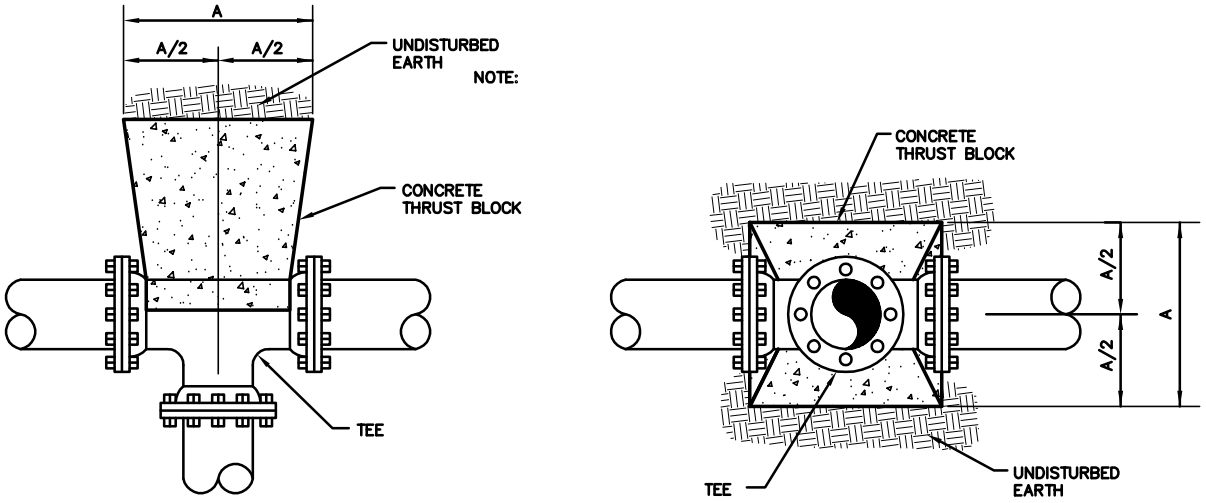
TOWN OF FRANKLIN

STANDARD DETAIL - W4.2

# THRUST BLOCKS FOR PLUGS AND TEES




## TYPICAL THRUST BLOCK FOR PLUGS




NOTES:

1. FITTING JOINTS SHALL NOT BE POURED IN CONCRETE OR HAVE CONCRETE SPILLED ON THE BOLTS OR NUTS. THE FITTING SHALL BE WRAPPED IN A LAYER OF POLYETHYLENE PLASTIC PRIOR TO POURING THE THRUST BLOCK.
2. ROD AND EYE BOLT DIAMETER SHALL BE A MINIMUM OF 3/4" AND SHALL MATCH THE SIZE OF THE BOLT PROVIDED WITH THE FITTING.
3. CONTRACTOR SHALL REPLACE FITTING BOLTS WITH THREADED ROD FOR 1/2 OF THE BOLTS SUPPLIED WITH EACH FITTING. RODS SHALL BE EQUALLY SPACED.

## TYPICAL THRUST BLOCKS FOR PLUGS AND TEES

TOWN OF FRANKLIN STANDARD DETAIL - W4.3

THRUST BLOCK DIMENSION "A"

NOTES:
1. FITTING JOINTS SHALL NOT BE POURED IN CONCRETE OR HAVE CONCRETE SPILLED ON THE BOLTS OR NUTS. THE FITTING SHALL BE WRAPPED IN A LAYER OF POLYETHYLENE PLASTIC PRIOR TO POURING THE THRUST BLOCK.
2. ROD AND EYE BOLT DIAMETER SHALL BE A MINIMUM OF 3/4" AND SHALL MATCH THE SIZE OF THE BOLT PROVIDED WITH THE FITTING.
3. CONTRACTOR SHALL REPLACE FITTING BOLTS WITH THREADED ROD FOR 1/2 OF THE BOLTS SUPPLIED WITH EACH FITTING. RODS SHALL BE EQUALLY SPACED.

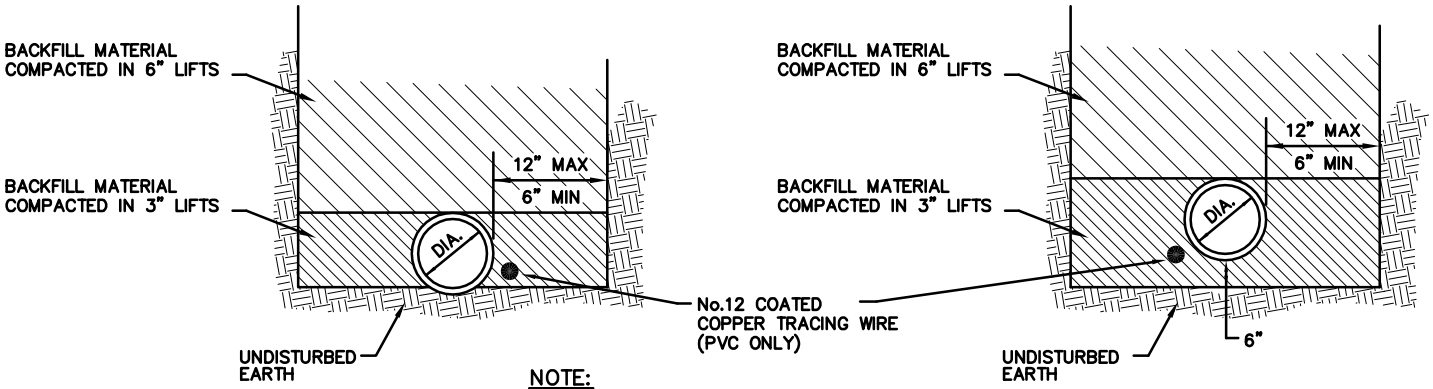
| | TYPE | | | | | |
|---|---|---|---|---|---|---|
| SIZE | 11–1/4° BEND | 22–1/2° BEND | 45° BEND | 90° BEND | TEE | PLUG |
| 2–6 | 12 | 12 | 12 | 16 | 16 | 14 |
| 8 | 12 | 12 | 16 | 22 | 22 | 18 |
| 10 | 12 | 14 | 20 | 28 | 28 | 22 |
| 12 | 12 | 18 | 24 | 32 | 32 | 28 |
| 14 | 14 | 20 | 28 | 38 | 38 | 32 |
| 16 | 16 | 22 | 32 | 42 | 42 | 36 |
| 18 | 18 | 26 | 36 | 48 | 48 | 40 |
| 20 | 20 | 28 | 40 | 52 | 52 | 44 |
| 24 | 24 | 34 | 46 | 64 | 64 | 54 |
| 30 | 30 | 42 | 58 | 78 | 78 | 66 |
| 36 | 36 | 50 | 70 | 94 | 94 | 80 |
| 42 | 40 | 58 | 80 | 108 | 108 | 92 |
| 48 | 46 | 66 | 90 | 124 | 124 | 104 |

# THRUST BLOCK DIMENSION "A"

TOWN OF FRANKLIN

STANDARD DETAIL - W7

TYPICAL TRENCH DETAILS




NOTE:
BELL HOLES NOT SHOWN

STANDARD EXCAVATION

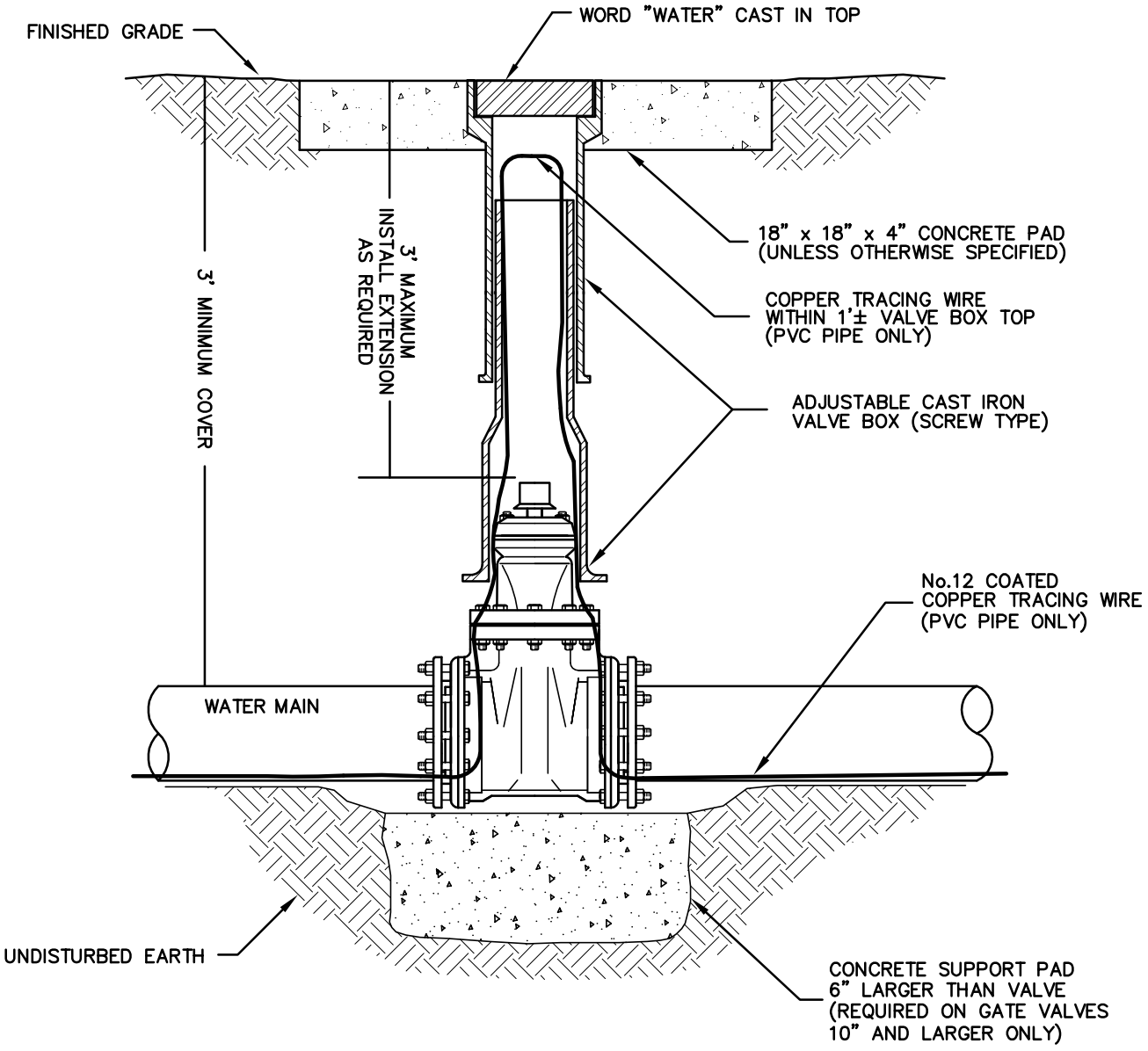
OVERCUT EXCAVATION

NOTE: 1. CONSTRUCTION OF TRENCHES SHALL COMPLY WITH ALL FEDERAL, STATE AND LOCAL SAFETY AND HEALTH REGULATIONS WHICH HAVE JURISDICTION AT THE PROJECT SITE. IT IS THE CONTRACTOR'S RESPONSIBILITY TO BE FAMILIAR WITH THE APPLICABLE REGULATIONS AND FOLLOW THEM ACCORDINGLY.

2. PAYMENT FOR ROCK EXCAVATION AND SELECT BACKFILL IN TRENCH SHALL BE FOR ACTUAL QUANTITIES AND SHALL NOT EXCEED THE WIDTH OF TRENCH SHOWN ON THIS DETAIL.

# TYPICAL TRENCHING DETAILS

## WATER LINES



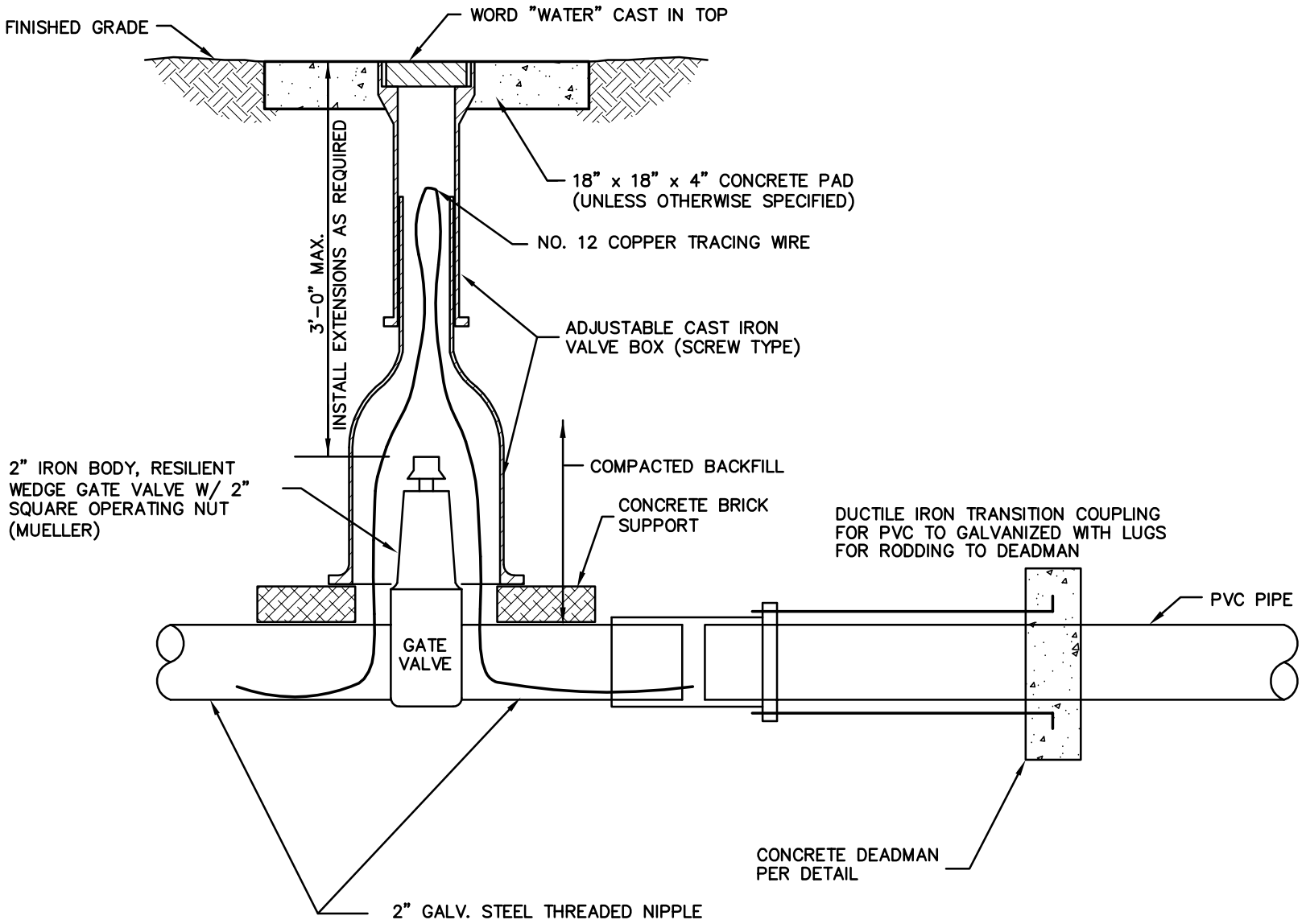

# GATE VALVE INSTALLATION

TOWN OF FRANKLIN STANDARD DETAIL - W8

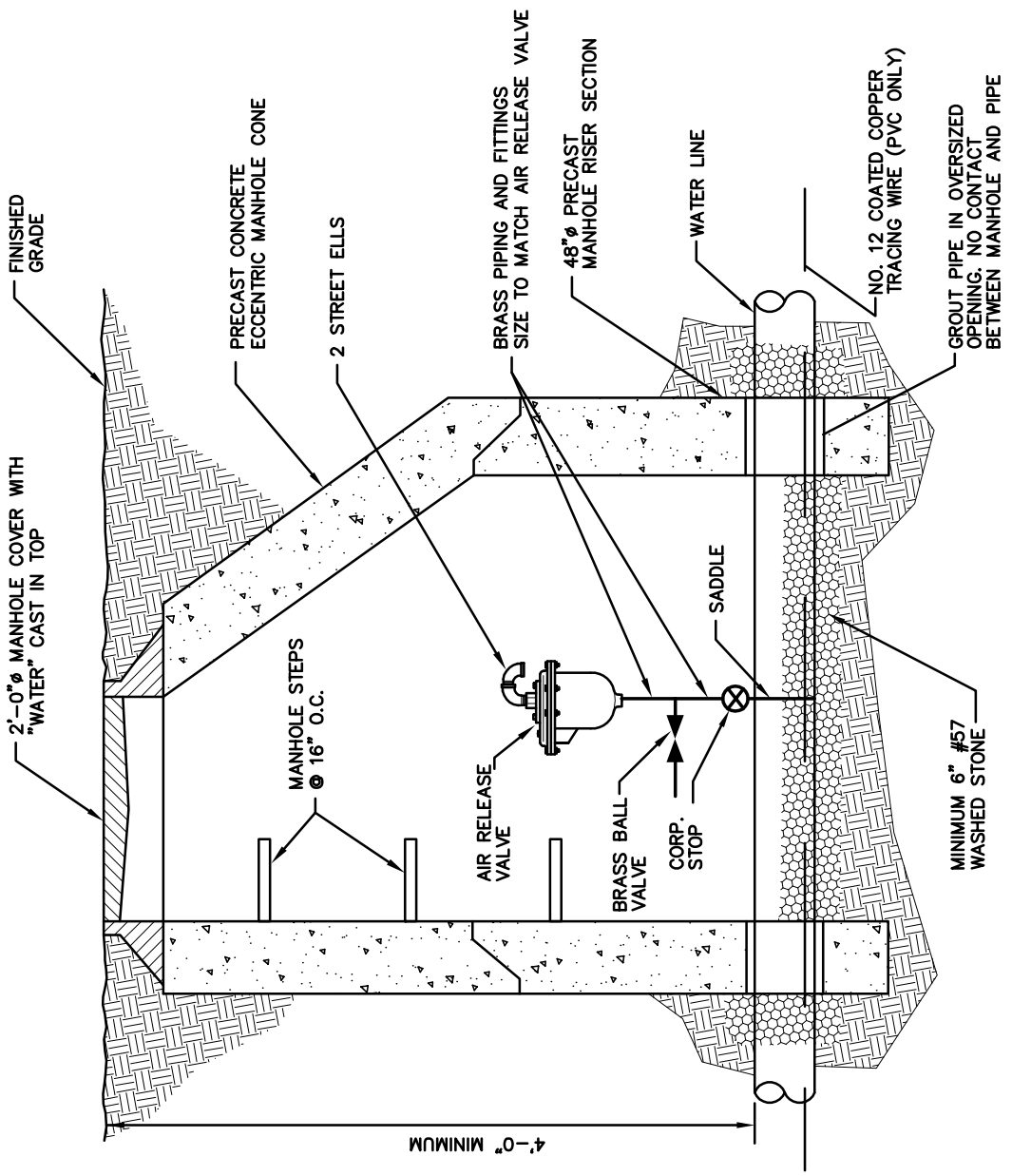
TOWN OF FRANKLIN

STANDARD DETAIL - W9

2" GATE VAVLE INSTALLATION



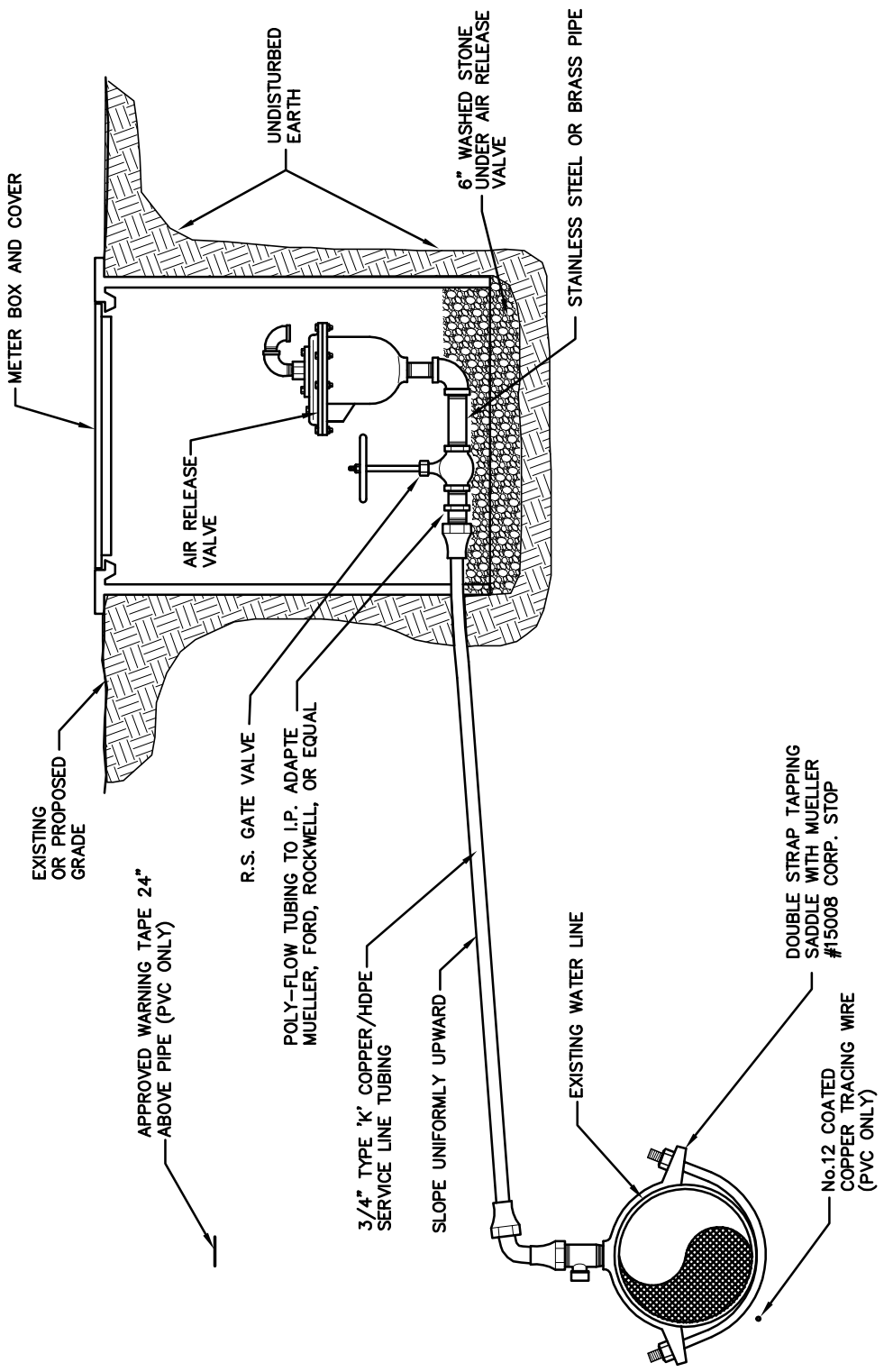

# 2" GATE VALVE INSTALLATION




TYPICAL AIR RELEASE VALVE INSTALLATION

# AIR RELEASE VALVE INSTALLATION

TOWN OF FRANKLIN STANDARD DETAIL - W11




OFFSET AIR RELEASE VALVE INSTALLATION

NOT TO SCALE

# OFFSET AIR RELEASE VALVE INSTALLATION

TOWN OF FRANKLIN STANDARD DETAIL - W12

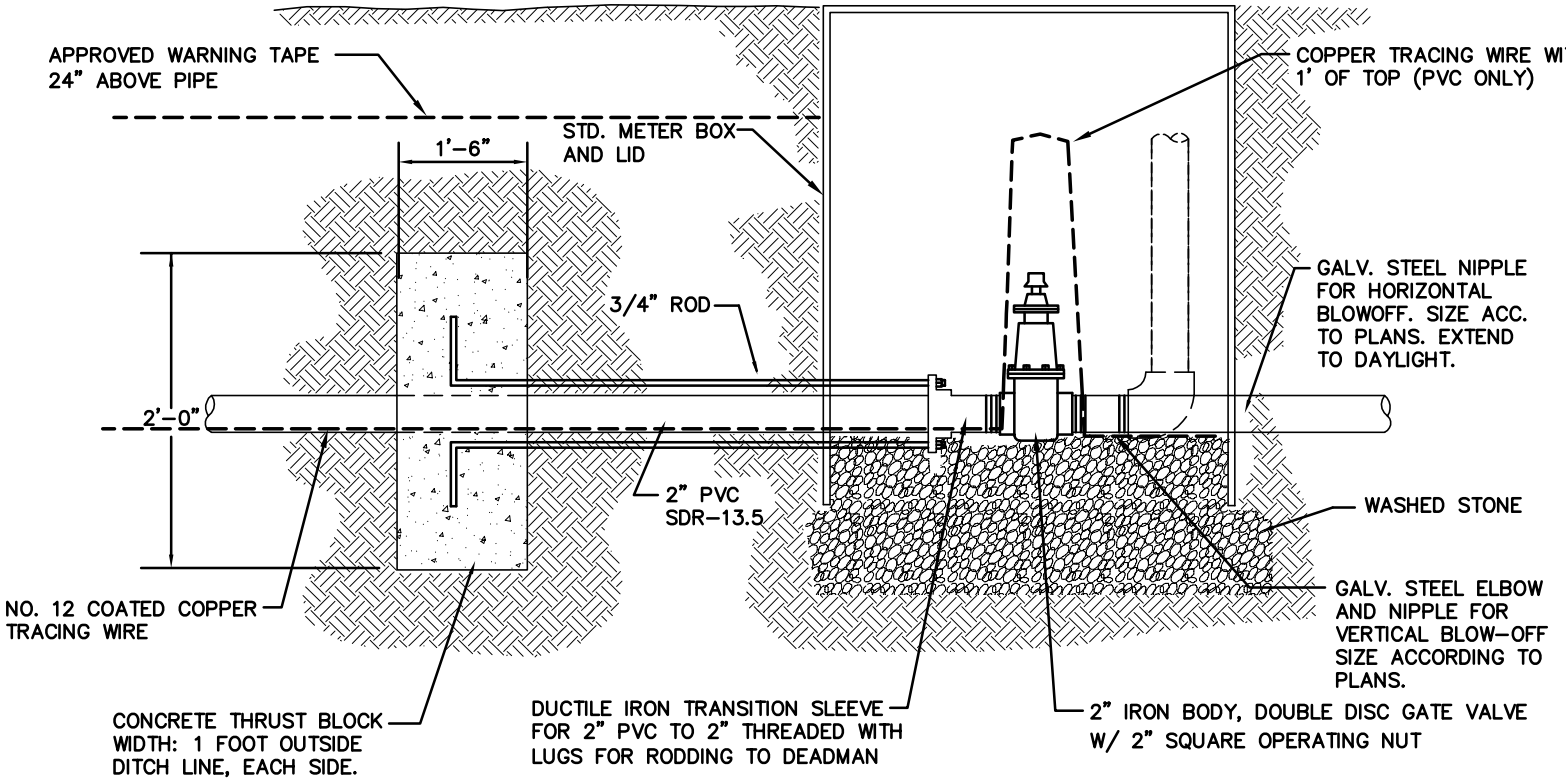
TOWN OF LAKE LURE

STANDARD DETAIL - W13

2" BLOW-OFF FOR PVC SDR-21 WATER LINE

NOTE:

1. GLUED JOINTS WILL NOT BE PERMITTED.
2. VERTICAL BLOW–OFF ARRANGEMENT TO BE USED ONLY WHEN HORIZONTAL BLOW–OFF IS NOT POSSIBLE.



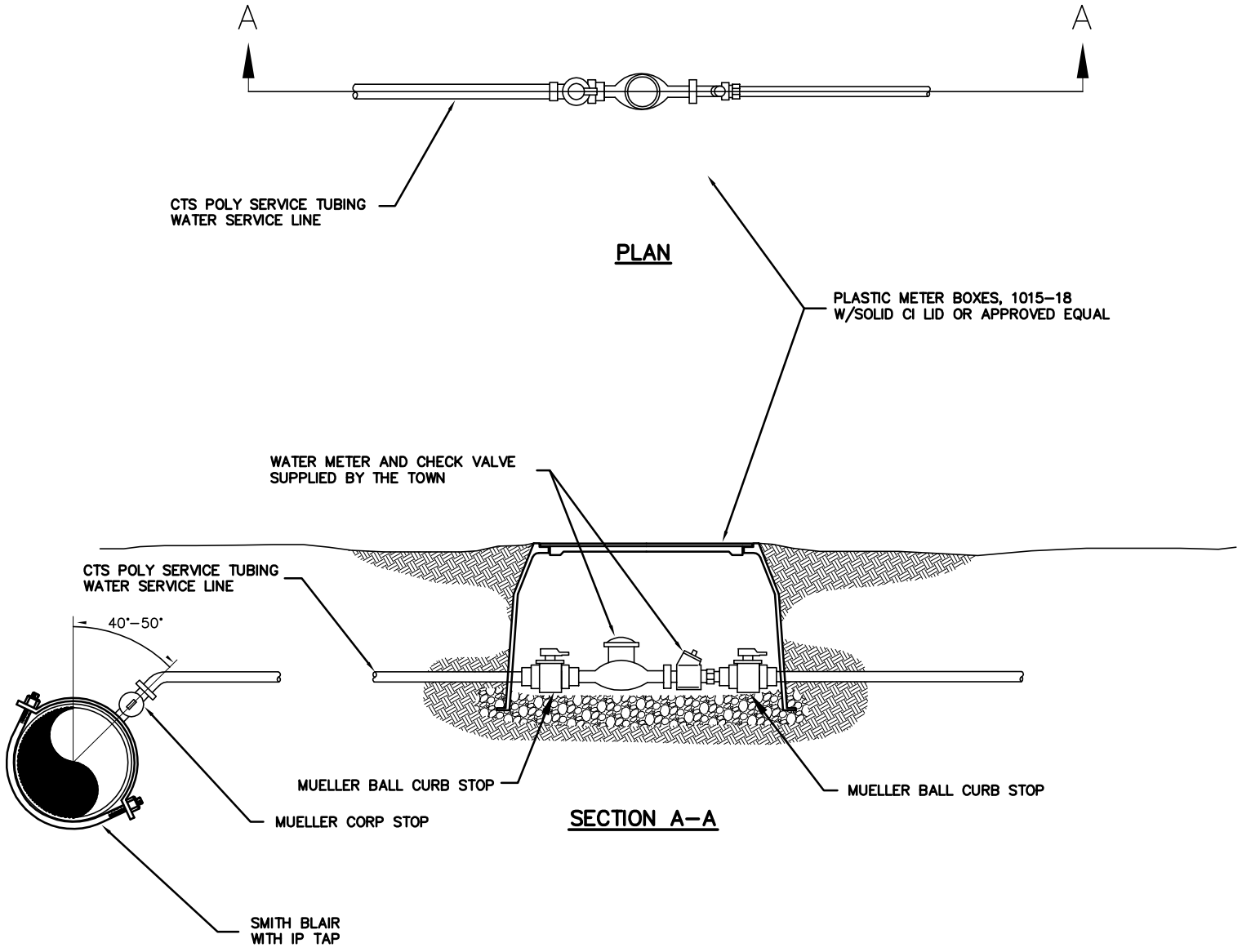

# BLOW-OFF DETAIL (PVC WATER LINE)

NOT TO SCALE

TOWN OF FRANKLIN

STANDARD DETAIL - W14

5/8" WATER METER BOX DETAIL

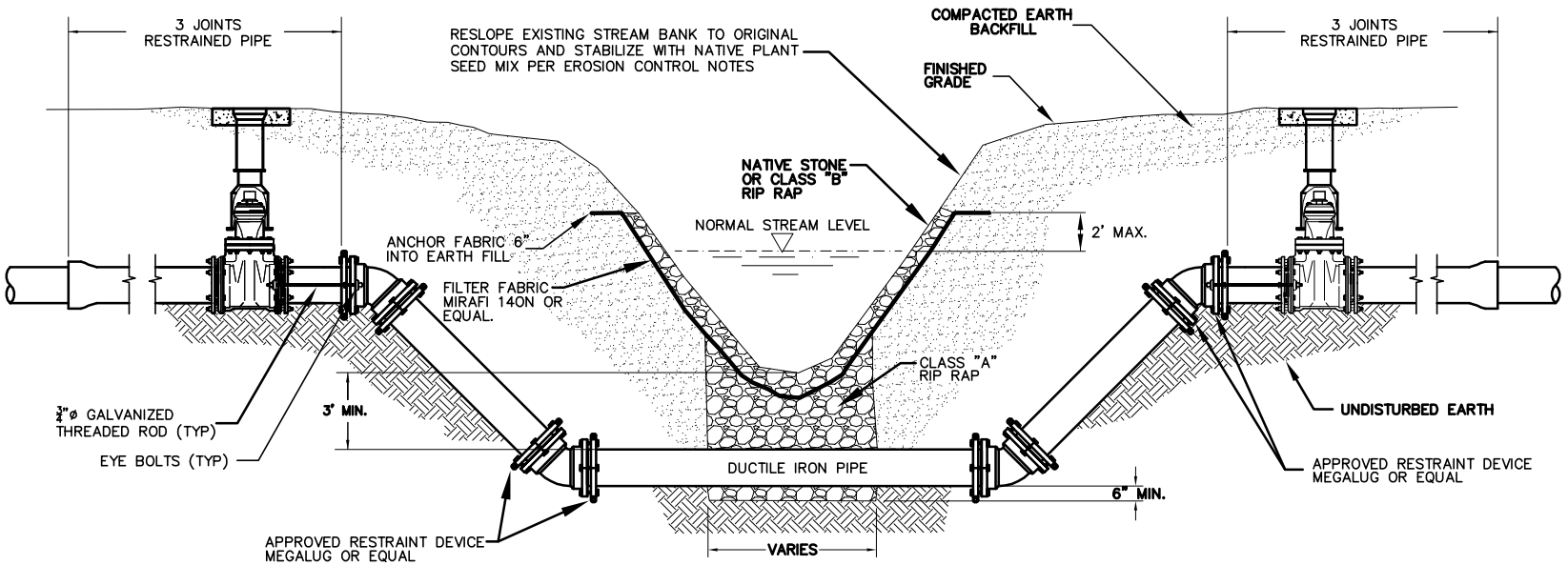


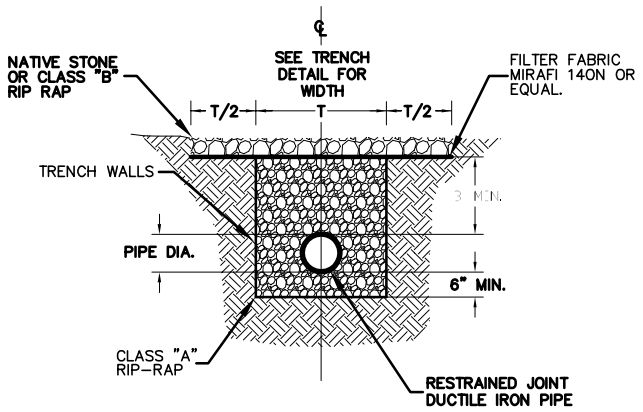

# 5/8" WATER METER BOX DETAIL

TOWN OF FRANKLIN

STANDARD DETAIL - W16

WATER LINE CREEK CROSSING




NOTES:

1. CONTRACTOR SHALL RESTRAIN 3 JOINTS PAST THE LAST FITTING AT THE TOP OF THE BANK OR AS SPECIFIED BY THE TOWN.
2. APPROVED RESTRAINING DEVICES INCLUDE RETAINING GLANDS (MEGALUGS), FIELD LOCK GASKETS AND RESTRAINT SYSTEMS SHALL BE PROVIDED BY APPROVED PIPE MANUFACTURERS.
3. SEE TRENCH DETAIL FOR ACTUAL TRENCH WIDTH.

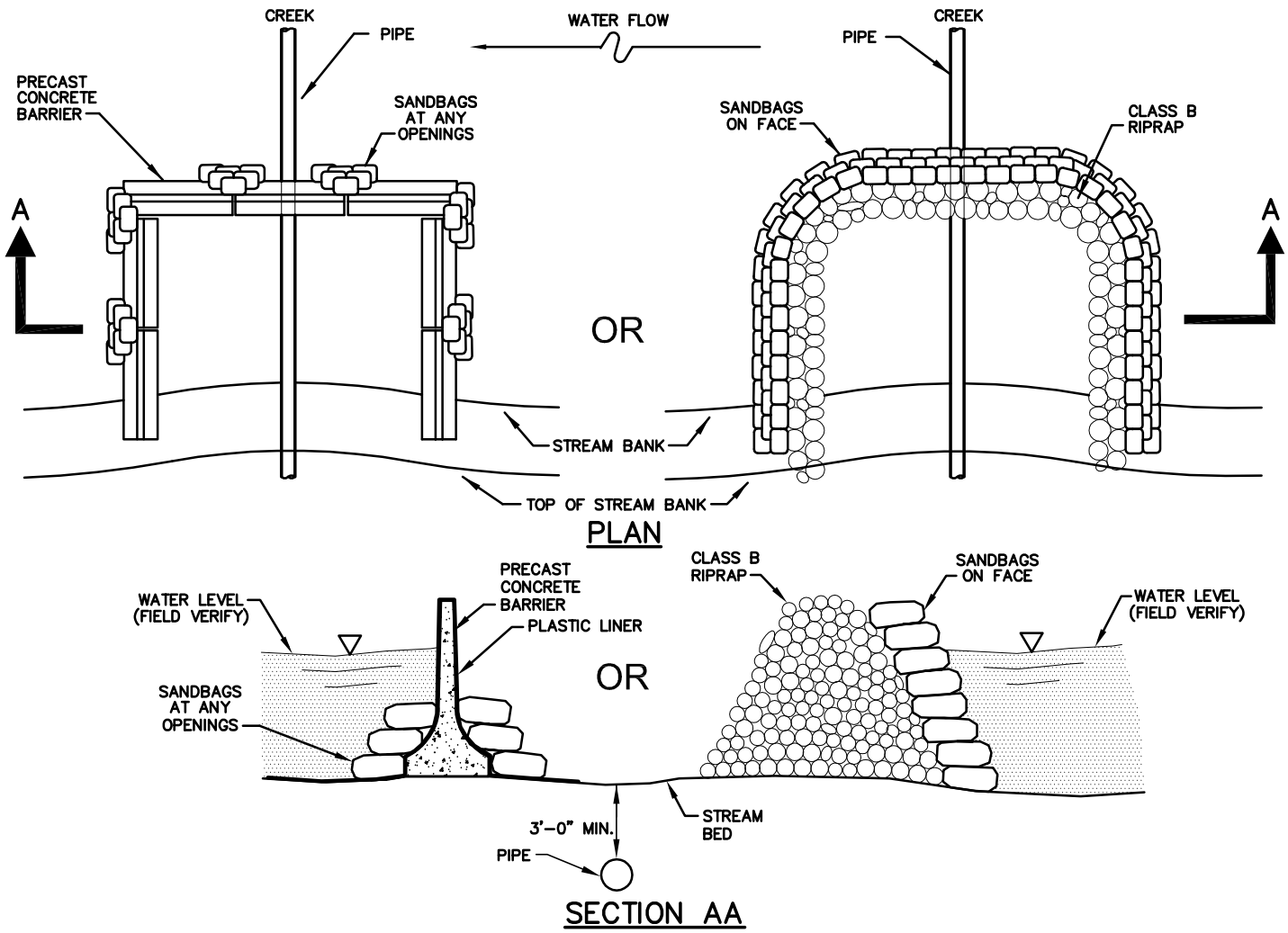
## WATER LINE CREEK CROSSING

(NO FERTILIZER TO BE USED WITHIN 10' OF BANK)

TOWN OF FRANKLIN

STANDARD DETAIL - W16.1

CREEK OR RIVER CROSSING

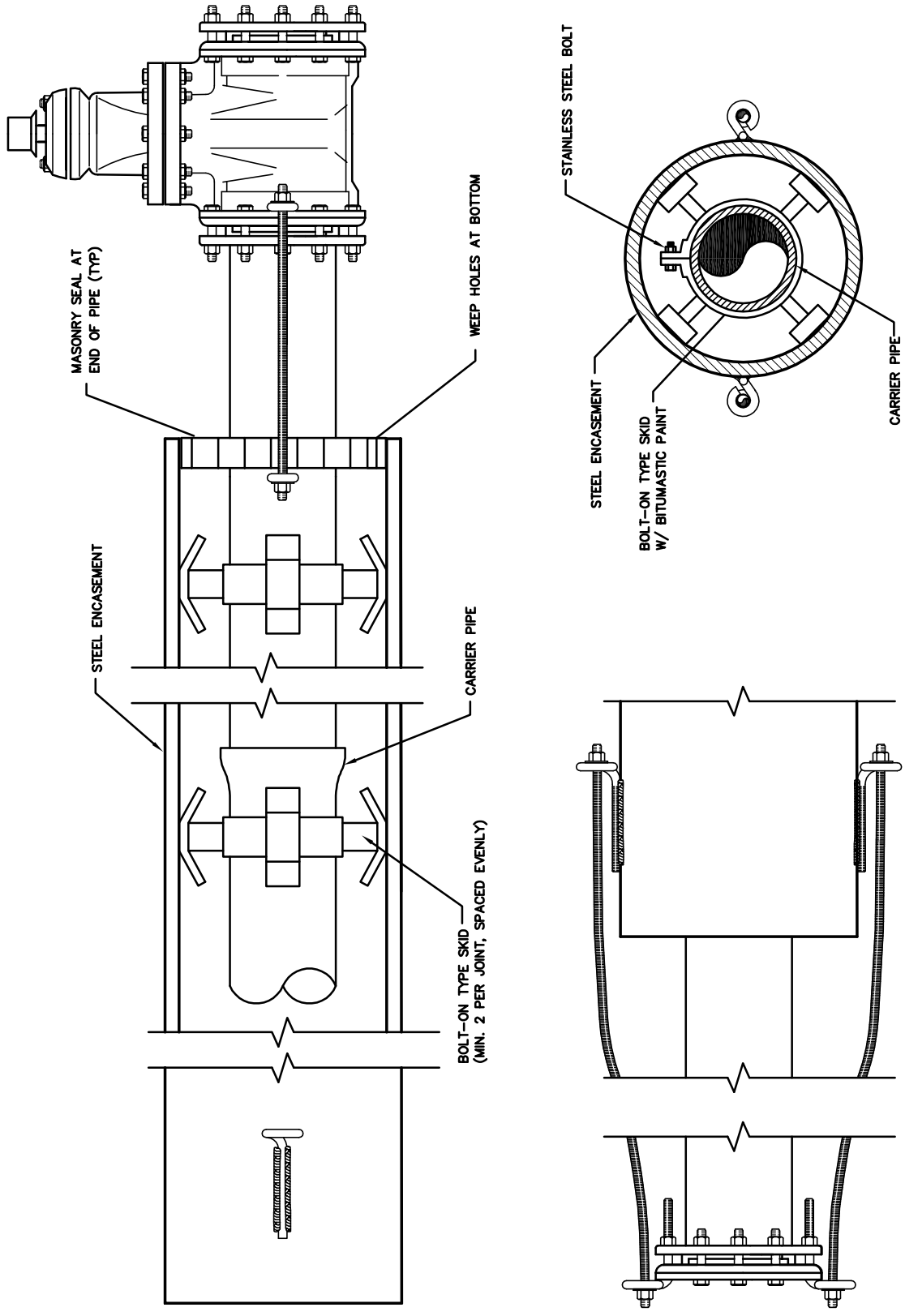



NOTES:

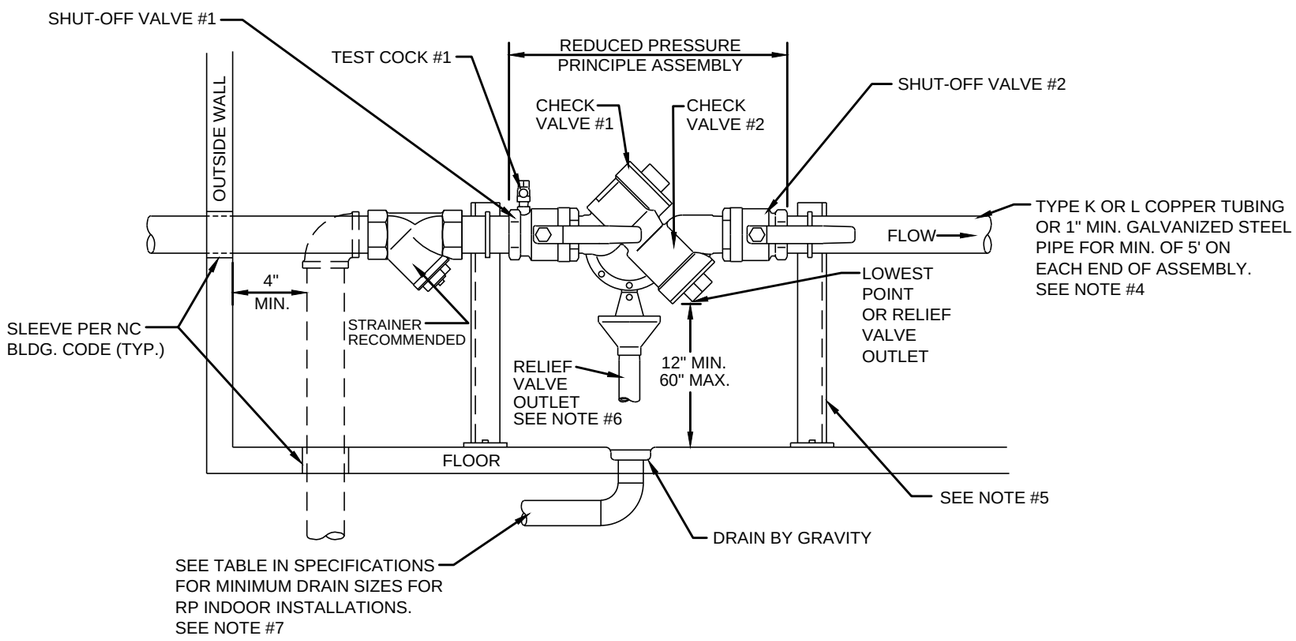
1. COFFER DAM WILL BE BUILT SO THAT APPROXIMATELY ONE-HALF (1/2) OF THE STREAM CHANNEL IS OPEN AT ALL TIMES.
2. MATERIAL FROM THE STREAM BED SHALL NOT BE USED FOR COFFER DAM.
3. NO EARTHEN MATERIAL SHALL BE USED FOR COFFER DAM OR PLACED IN STREAM FOR ANY REASON.
4. STREAM BED SHALL BE DISTURBED THE MINIMUM REQUIRED FOR CONSTRUCTION OF PIPE LINE AND WILL BE RESTORED TO ORIGINAL CONTOURS WHEN WORK IS COMPLETE.
5. ALTERNATIVE COFFER DAM MATERIAL IS ACCEPTABLE BUT SHALL BE APPROVED BY THE TOWN.

# CREEK OR RIVER CROSSING

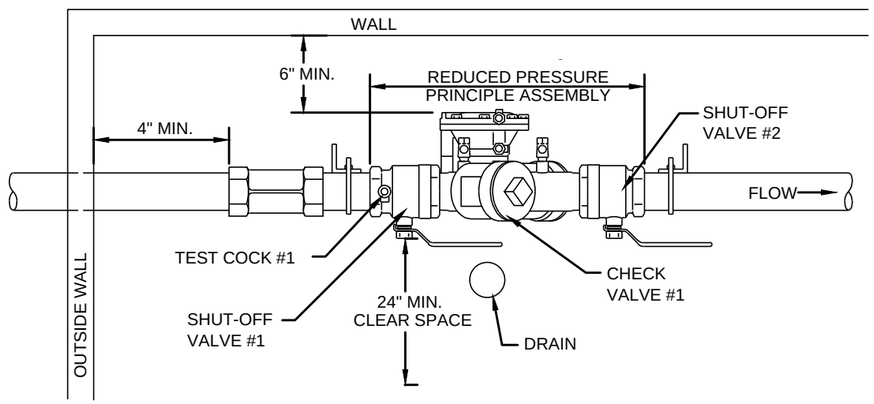
(LARGE CREEKS AND RIVER)




# ENCASEMENT DETAIL




ELEVATION VIEW




PLAN VIEW

NOTES:

1. INDOOR INSTALLATION SHALL ONLY BE PERMITTED IN CASES WHERE ADEQUATE SPACE FOR THE BACKFLOW ASSEMBLEY IS NOT AVAILABLE OUTSIDE. THE TOWN OF FRANKLIN WILL REVIEW ON A CASE BY CASE BASIC.
2. BACKFLOW PREVENTION ASSEMBLIES (BPA's) SHALL CONFORM TO THE TOWN OF FRANKLIN SPECIFICATIONS. SHUT-OFF VALVES ARE SPECIFIC TO EACH APPROVED BPA AND NO SUBSTITUTIONS OF SHUT-OFF VALVES ARE PERMITTED.
3. ASSEMBLIES SHALL BE INSTALLED UPRIGHT AND IN THE HORIZONTAL POSITION.
4. PIPE MATERIAL AND FITTINGS SHALL BE AS SPECIFIED IN THE TOWN OF FRANKLIN SPECIFICATIONS, UNLESS OTHERWISE APPROVED.
5. SUPPORT FOR ASSEMBLY SHALL BE DESIGNED BY OWNER AS REQUIRED.
6. AN AIR GAP DRAIN IS RECOMMENDED TO REDUCE SPLASHING OF MINOR DISCHARGES FROM THE RELIEF VALVE DRAIN PORT.
7. INDOOR INSTALLATION OF RP'S SHOULD PROVIDE FOR DRAINAGE CAPABLE OF HANDLING IN EXCESS OF THE MAXIMUM DISCHARGE RATE EXPECTED BY THE BACKFLOW ASSEMBLY MANUFACTURER.
8. ALL LOCATIONS FOR BPA's REQUIRE THE TOWNS APPROVAL.
9. THERE SHALL BE NO TAPS, PIPING BRANCHES, UNAPPROVED BYPASS PIPING, HYDRANTS, FIRE DEPT. CONNECTION POINTS, OR OTHER WATER-USING APPURATENANCES CONNECTED TO THE SUPPLY LINE BETWEEN ANY WATER METER AND THE REQUIRED BACKFLOW.
10. **EACH REQUIRED BACKFLOW IS TO BE TESTED BY A CERTIFIED TESTER PRIOR TO PLACING THE WATER SYSTEM IN SERVICE. TEST RESULTS SHALL BE SUBMITTED TO THE CROSS-CONNECTION DEPARTMENT WITHIN 30 DAYS AND TESTED ANNUALLY THEREAFTER SUBMITTING RESULTS TO THE CROSS-CONNECTION DEPARTMENT.**
11. ALL INSTALLATIONS OF A BPA, REQUIRE PRIOR APROVAL FROM THE TOWN OF FRANKLIN CROSS-CONNECTION ORC.

NO SCALE

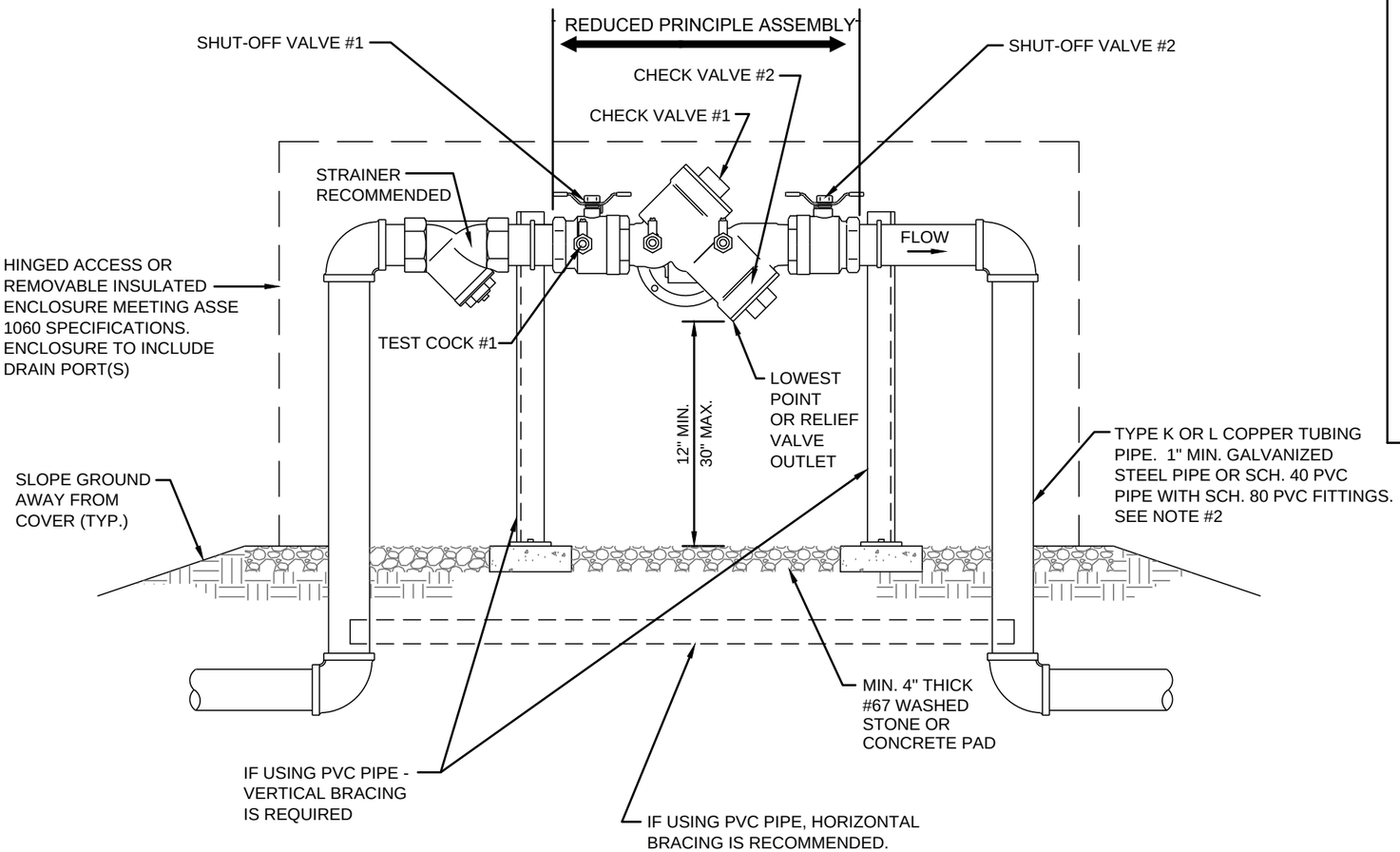
VERSION DATE
1-3-2022

# REDUCED PRESSURE PRINCIPLE ASSEMBLY (RP) INDOOR

TOWN OF FRANKLIN

STANDARD DETAILS

BACKFLOW PREVENTION




NOTES:

1. BACKFLOW PREVENTION ASSEMBLIES (BPA's) SHALL CONFORM TO THE TOWN OF FRANKLIN SPECIFICATIONS. SHUT-OFF VALVES ARE SPECIFIC TO EACH APPROVED BPA AND NO SUBSTITUTIONS OF SHUT-OFF VALVES ARE PERMITTED.
2. PIPE MATERIAL AND FITTINGS SHALL BE AS SPECIFIED IN THE TOWN OF FRANKLIN SPECIFICATIONS.
3. INSULATED ENCLOSURES ARE REQUIRED BY THE TOWN OF FRANKLIN. HEATED INSULATED ENCLOSURE IS RECOMMENDED. NO INSULATION SHALL BE WRAPPED AROUND BPA.
4. ALL LOCATIONS FOR BPA'S REQUIRE THE TOWNS APPROVAL.
5. THERE SHALL BE NO TAPS, PIPING BRANCH, UNAPPROVED BYPASS PIPING, HYDRANTS, FIRE DEPT. CONNECTION POINTS, OR OTHER WATER -USING APPURTENANCES CONNECTED TO THE SUPPLY LINE BETWEEN ANY WATER METER AND THE REQUIRED BACKFLOW.
6. **EACH REQUIRED BACKFLOW IS TO BE TESTED BY A CERTIFIED TESTER PRIOR TO PLACING THE WATER SYSTEM IN SERVICE. TEST RESULTS SHALL BE SUBMITTED TO THE CROSS-CONNECTION DEPARTMENT WITHIN 30 DAYS AND TESTED ANNUALLY THEREAFTER SUBMITTING RESULTS TO THE CROSS-CONNECTION DEPARTMENT.**
7. ALL INSTALLATIONS OF A BPA, REQUIRES PRIOR APPROVAL FROM THE TOWN OF FRANKLIN CROSS-CONNECTION ORC.

NO SCALE

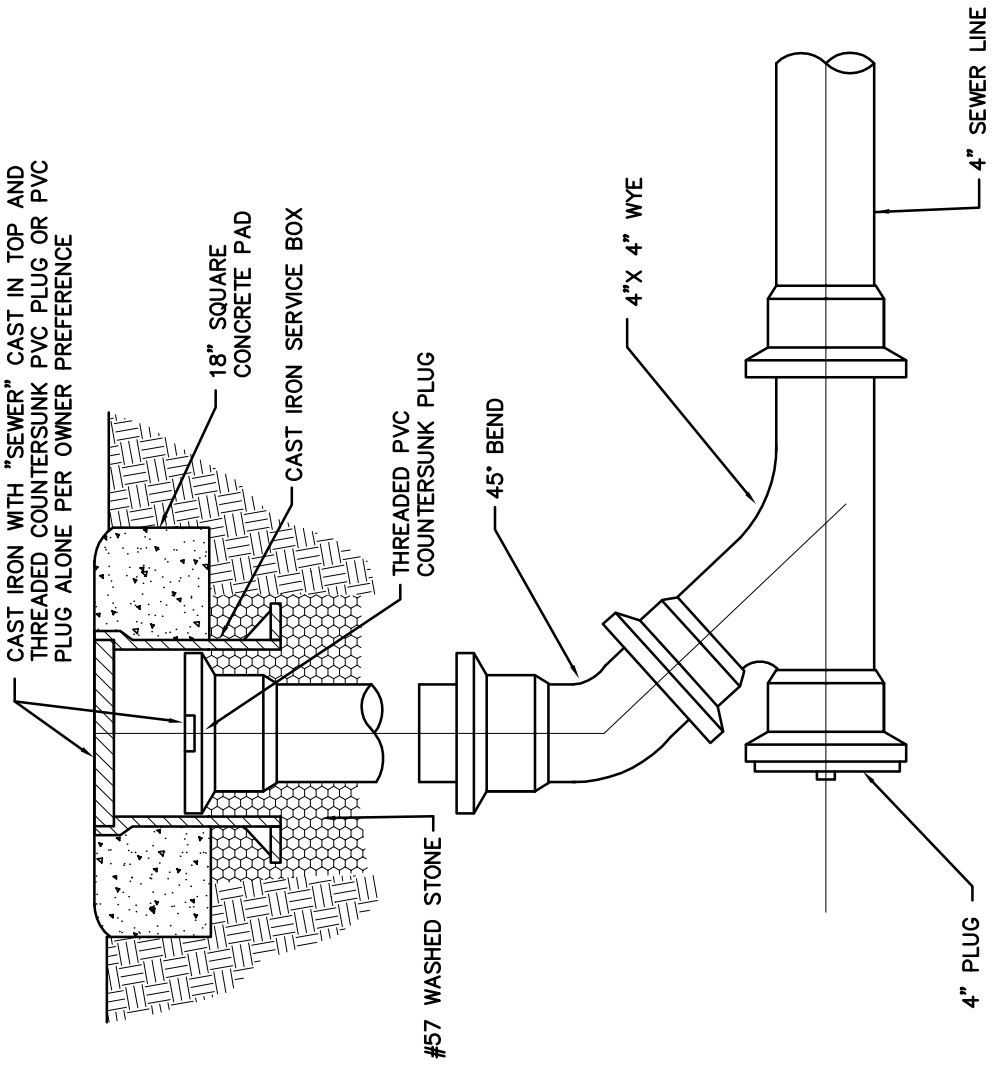
1-3-2022

# REDUCED PRESSURE PRINCIPLE ASSEMBLY (RP) ABOVE GROUND

TOWN OF FRANKLIN

STANDARD DETAILS

BACKFLOW PREVENTION



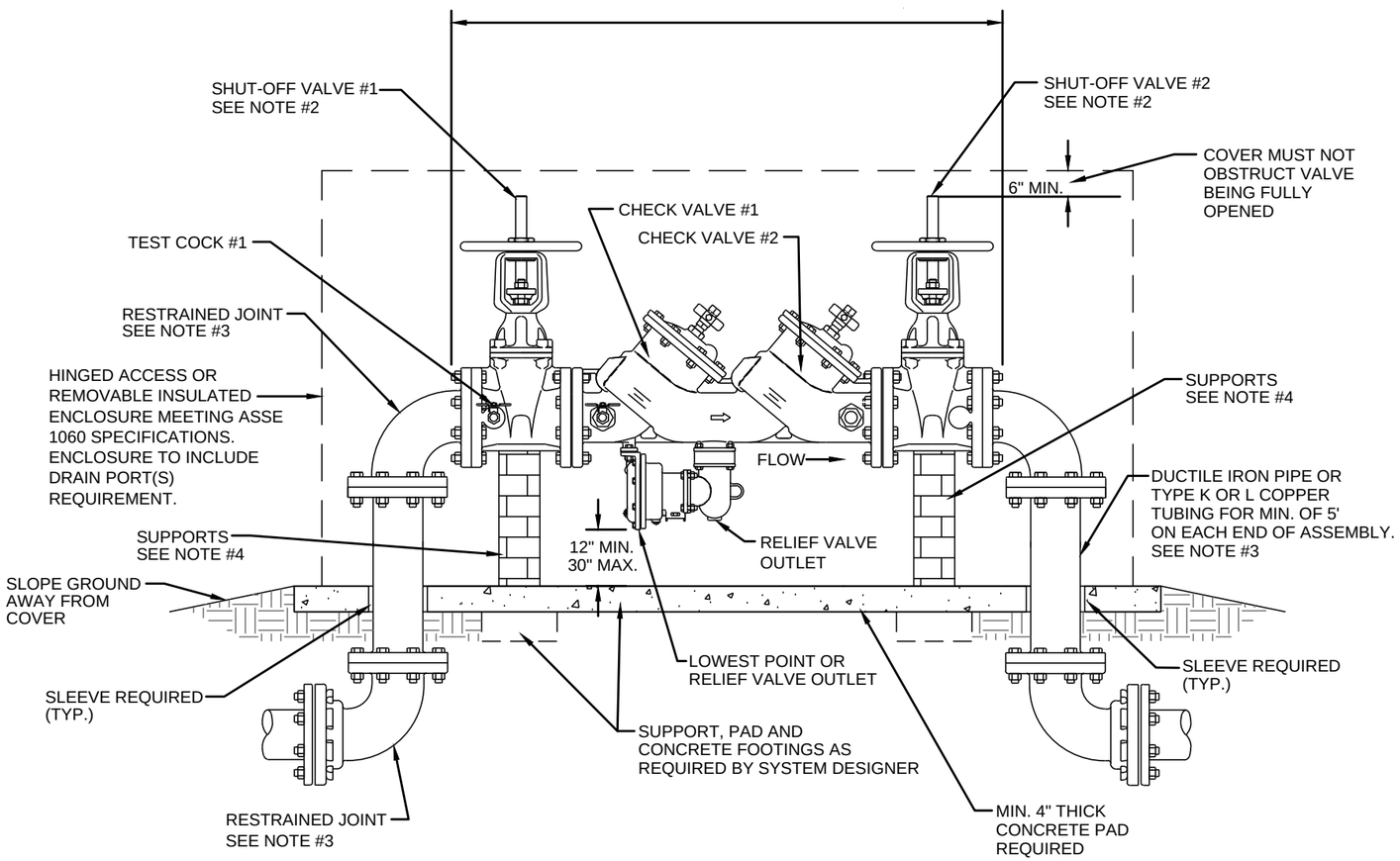

CLEANOUT DETAIL

N.T.S.

# CLEANOUT DETAIL

TOWN OF FRANKLIN STANDARD DETAIL - W25

REDUCED PRESSURE DETECTOR ASSEMBLY




NOTES:

1. BACKFLOW PREVENTION ASSEMBLIES (BPA's). SHALL CONFORM TO THE TOWN OF FRANKLIN SPECIFICATIONS. SHUT-OFF VALVES ARE SPECIFIC TO EACH APPROVED BPA AND NO SUBSTITUTIONS OF SHUT-OFF VALVES ARE PERMITTED.
2. FIRE LINE SERVICES SHALL HAVE OUTSIDE STEM AND YOKE (OS & Y) HANDWHEEL OPERATORS OR BUTTERFLY VALVES, AND LISTED ON APPROVED LIST AS FIRE APPROVED. IF SERVING FIRE SPRINKLERS, TAMPER SWITCHES ARE REQUIRED.
3. PIPE MATERIAL AND FITTINGS SHALL BE AS SPECIFIED BY THE TOWN OF FRANKLIN. ALL JOINTS SHALL BE RESTRAINED WITH MEGALUG RESTRAINTS OR APPROVED EQUAL.
4. SUPPORT OF ASSEMBLY SHALL BE DESIGNED BY OWNER, 8" - 12" SHALL BE SUPPORTED AT EACH VALVE AND SHALL NOT BLOCK RELIEF VALVE ON DRAIN PORT.
5. INSULATED ENCLOSURES ARE REQUIRED BY THE TOWN OF FRANKLIN. HEATED INSULATED ENCLOSURES ARE REQUIRED FOR FIRE LINE SERVICES. NO INSULATION SHALL BE WRAPPED AROUND BPA.
6. ALL LOCATIONS FOR BPA's REQUIRE THE TOWNS APPROVAL.
7. THERE SHALL BE NO TAPS, PIPING BRANCHES, UNAPPROVED BYPASS PIPING, HYDRANTS, FIRE DEPT. CONNECTION POINTS, OR OTHER WATER - USING APPURTENANCES CONNECTED TO THE SUPPLY LINE BETWEEN ANY WATER METER AND THE REQUIRED BACKFLOW.
8. **EACH REQUIRED BACKFLOW IS TO BE TESTED BY A CERTIFIED TESTER PRIOR TO PLACING THE WATER SYSTEM IN SERVICE. TEST RESULTS SHALL BE SUBMITTED TO THE CROSS-CONNECTION DEPARTMENT WITHIN 30 DAYS AND TESTED ANNUALLY THEREAFTER SUBMITTING RESULTS TO THE CROSS-CONNECTION DEPARTMENT.**
9. ALL INSTALLATIONS OF A BPA, REQUIRES PRIOR APPROVAL FROM THE TOWN OF FRANKLIN CROSS-CONNECTION ORC.

NO SCALE

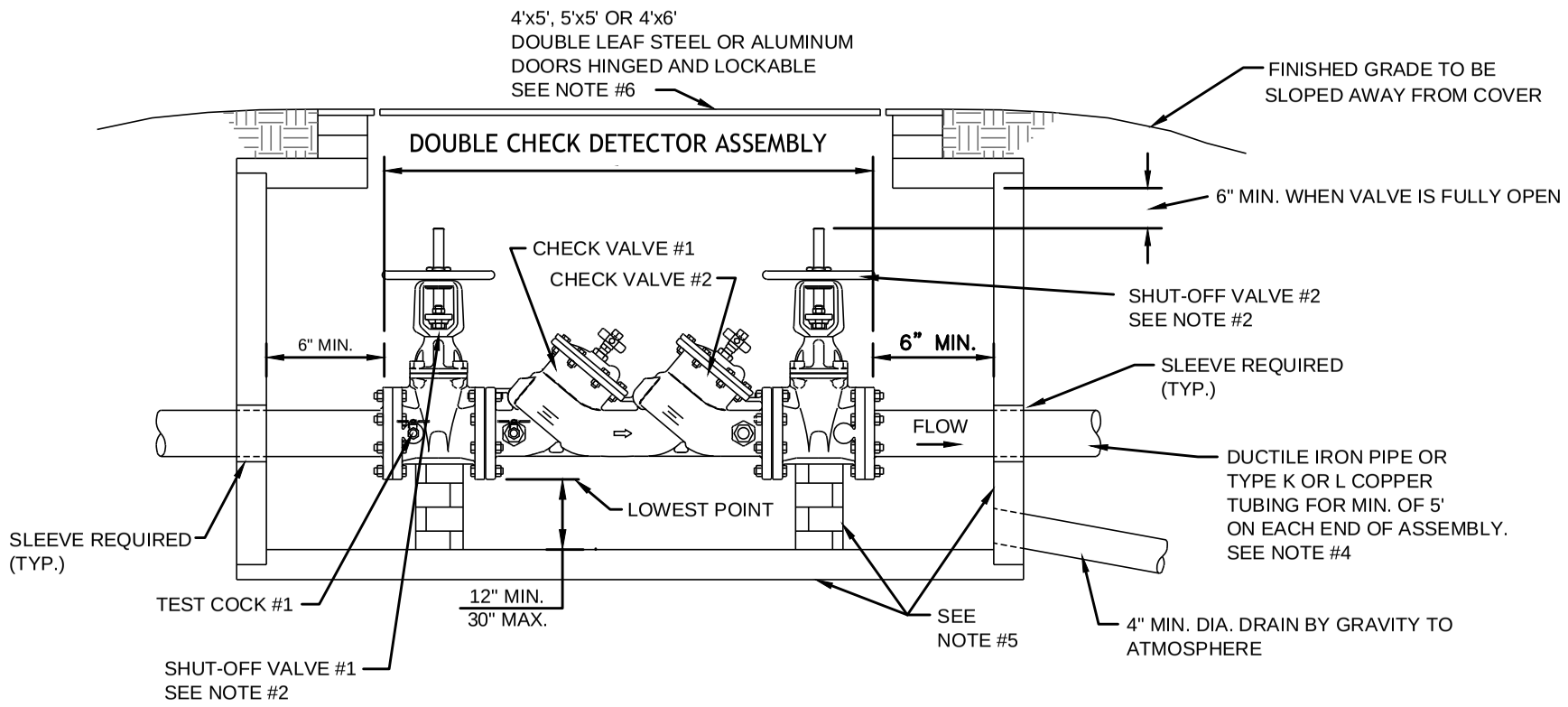
1-3-2022

# FIRE LINE REDUCED PRESSURE DETECTOR ASSEMBLEY - ABOVE GROUND

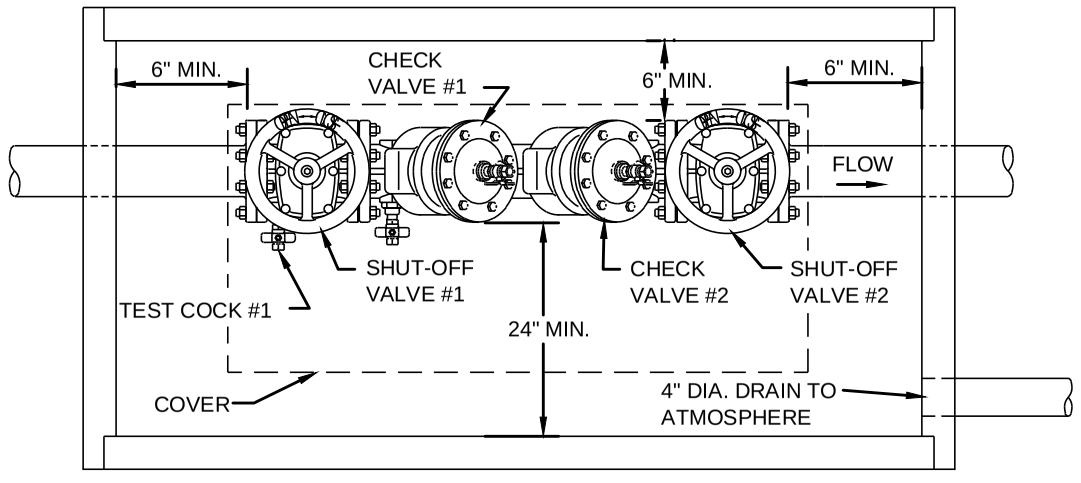
TOWN OF FRANKLIN

STANDARD DETAILS

BACKFLOW PREVENTION




ELEVATION VIEW




PLAN VIEW

NOTES:

1. BACKFLOW PREVENTION ASSEMBLIES (BPA's). SHALL CONFORM TO THE TOWN OF FRANKLIN SPECIFICATIONS. SHUT-OFF VALVES ARE SPECIFIC TO EACH APPROVED BPA AND NO SUBSTITUTIONS OF SHUT-OFF VALVES ARE PERMITTED.
2. FIRE LINE SERVICES SHALL HAVE OUTSIDE STEM AND YOKE (OS & Y) HANDWHEEL OPERATORS OR BUTTERFLY VALVES, AND LISTED ON APPROVED LIST AS FIRE APPROVED. IF SERVING FIRE SPRINKLERS, TAMPER SWITCHES ARE REQUIRED.
3. ASSEMBLIES SHALL BE INSTALLED UPRIGHT AND IN THE HORIZONTAL POSITION.
4. PIPE MATERIAL AND FITTINGS SHALL BE AS SPECIFIED BY THE TOWN OF FRANKLIN.
5. VAULT AND SUPPORT OF ASSEMBLY SHALL BE DESIGNED BY OWNER, 8" - 12" SHALL BE SUPPORTED AT EACH VALVE.
6. ACCESS DOORS SHALL BE AS SPECIFIED BY THE TOWN OF FRANKLIN
7. DRAINAGE INLET MAY BE PROVIDED AS SHOWN OR AS FLOOR DRAIN.
8. ALL LOCATIONS FOR BPA's REQUIRE THE TOWNS APPROVAL.
9. THERE SHALL BE NO TAPS, PIPING BRANCHES, UNAPPROVED BYPASS PIPING, HYDRANTS, FIRE DEPT. CONNECTION POINTS, OR OTHER WATER-USING APPURRTENANCES CONNECTED TO THE SUPPLY LINE BETWEEN ANY WATER METER AND THE REQUIRED BACKFLOW.
10. **EACH REQUIRED BACKFLOW IS TO BE TESTED BY A CERTIFIED TESTER PRIOR TO PLACING THE WATER SYSTEM IN SERVICE. TEST RESULTS SHALL BE SUBMITTED TO THE CROSS-CONNECTION DEPARTMENT WITHIN 30 DAYS AND TESTED ANNUALLY THEREAFTER SUBMITTING RESULTS TO THE CROSS-CONNECTION DEPARTMENT.**
11. ALL INSTALLATIONS OF A BPA, REQUIRES PRIOR APPROVAL FROM THE TOWN OF FRANKLIN CROSS-CONNECTION ORC.

NO SCALE

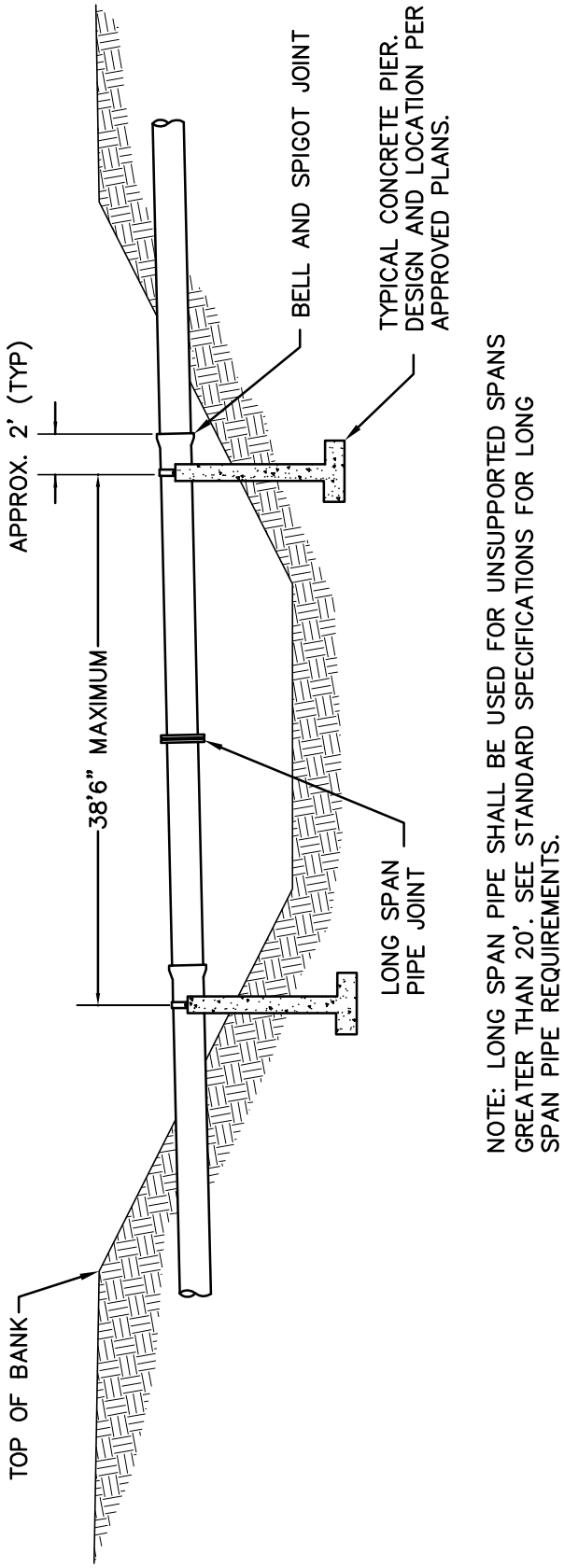
VERSION DATE
1-3-2022

# FIRE LINE DOUBLE CHECK DETECTOR ASSEMBLEY - BELOW GROUND VAULT

TOWN OF FRANKLIN

STANDARD DETAILS

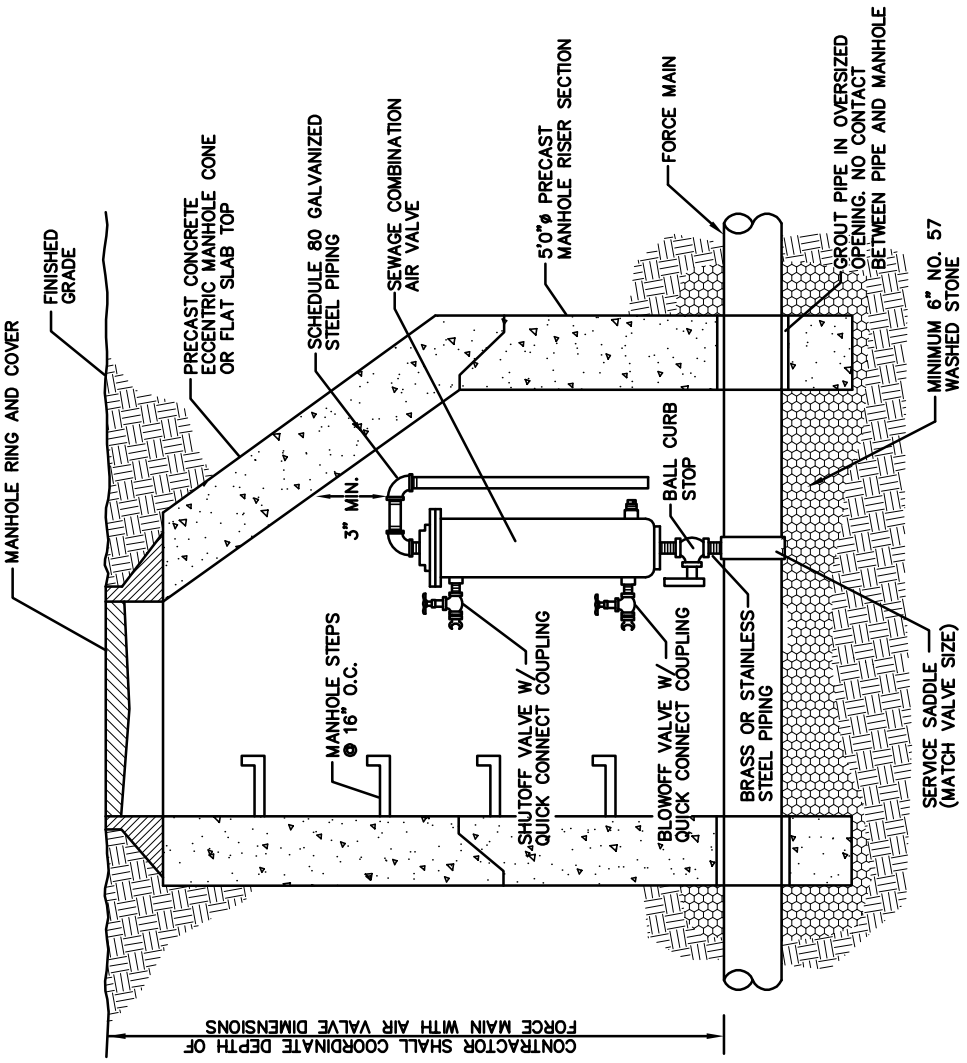
BACKFLOW PREVENTION




NOTE: LONG SPAN PIPE SHALL BE USED FOR UNSUPPORTED SPANS GREATER THAN 20'. SEE STANDARD SPECIFICATIONS FOR LONG SPAN PIPE REQUIREMENTS.

## TYPICAL ELEVATED CROSSING

# ELEVATED CROSSING

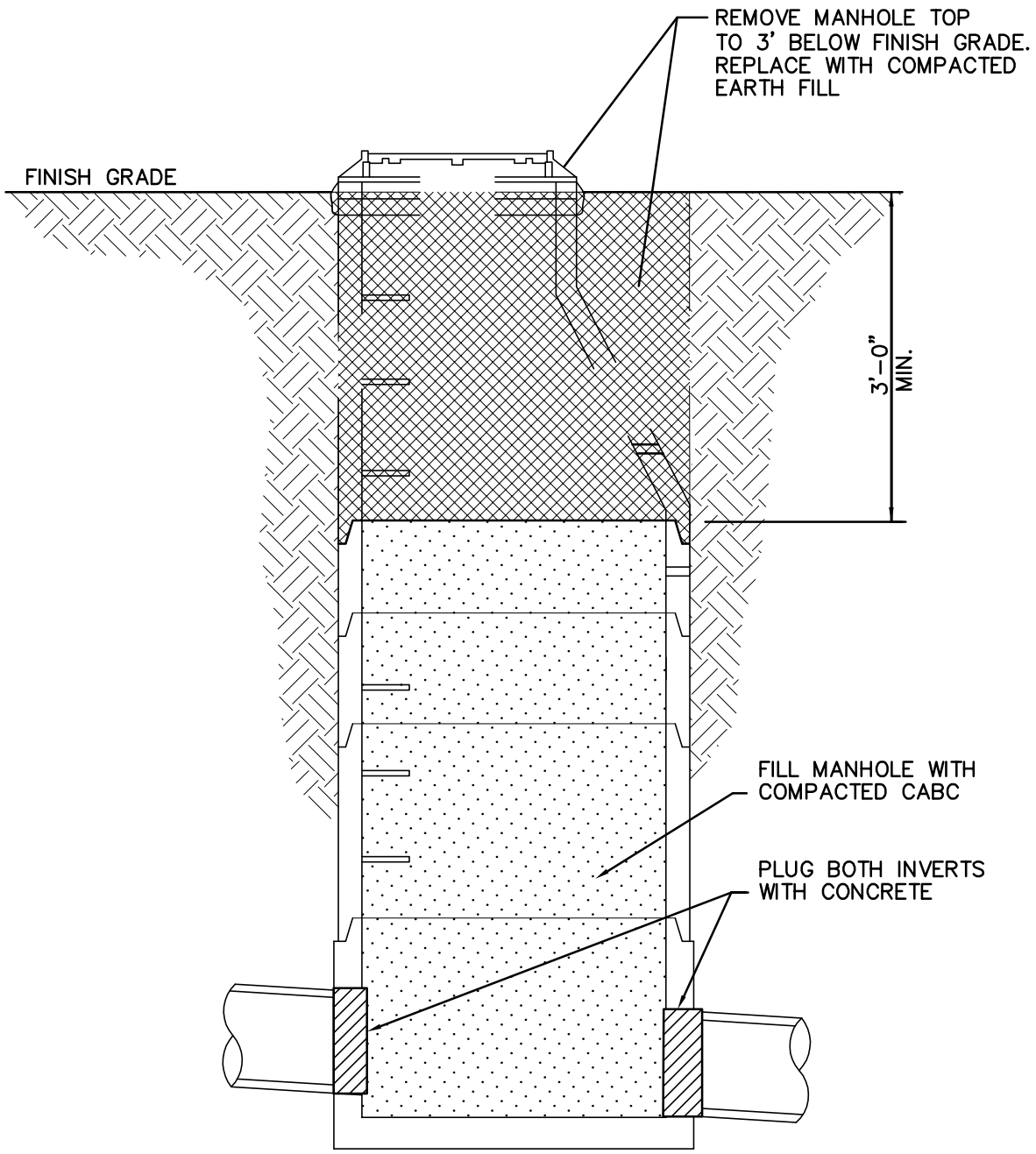



NOTES:
1. COMBINATION AIR VALVE TO BE INSTALLED AT ACTUAL HIGH POINT OF LINE.
2. COMBINATION AIR VALVE SHALL BE OFFSET IN MANHOLE TO PROVIDE ACCESS.
3. VALVE SIZE AS SHOWN ON DRAWINGS OR DETAILED IN THE SPECIFICATIONS.
4. ALL PIPING FOR COMBINATION AIR VALVE SHALL BE BRASS OR STAINLESS STEEL.
5. CONTRACTOR SHALL ADJUST THE DEPTH OF THE FORCE MAIN AT ALL HIGH POINTS TO ACCOMODATE THE INSTALLATION OF THE COMBINATION AIR VALVE.

## SEWAGE FORCE MAIN COMBINATION AIR VALVE

NOT TO SCALE

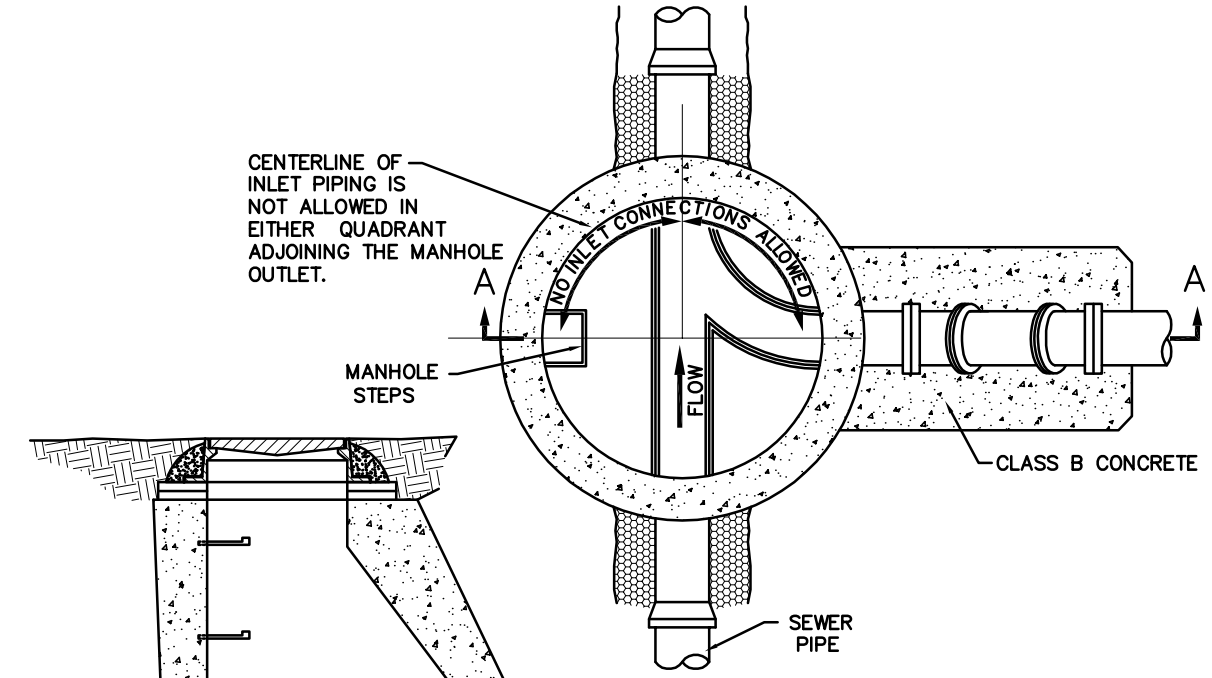
# SEWAGE FORCEMAIN AIR RELEASE VALVE



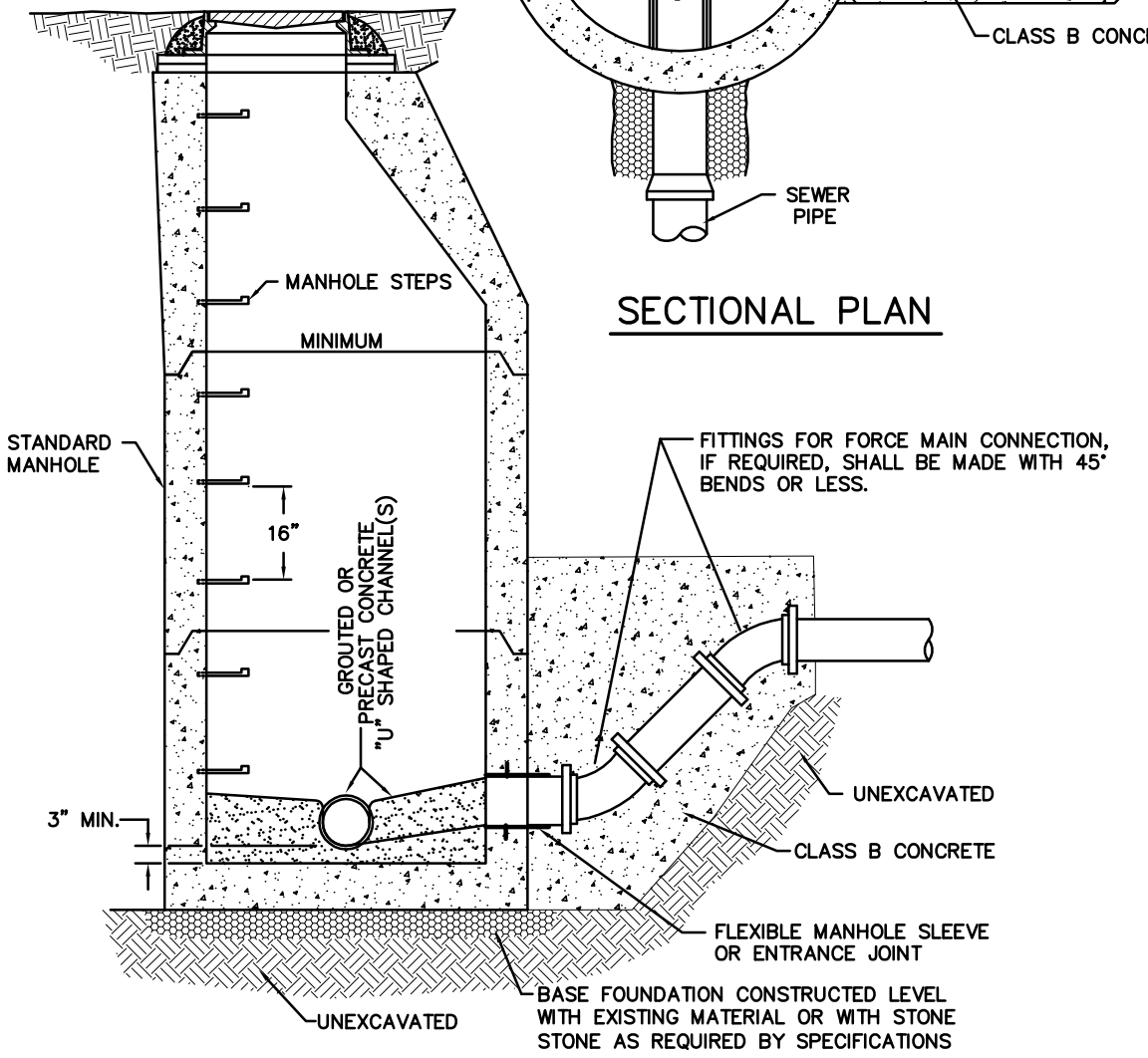

ELEVATION VIEW

# MANHOLE DEMOLITION AND ABANDONMENT

TOWN OF FRANKLIN STANDARD DETAIL - W28



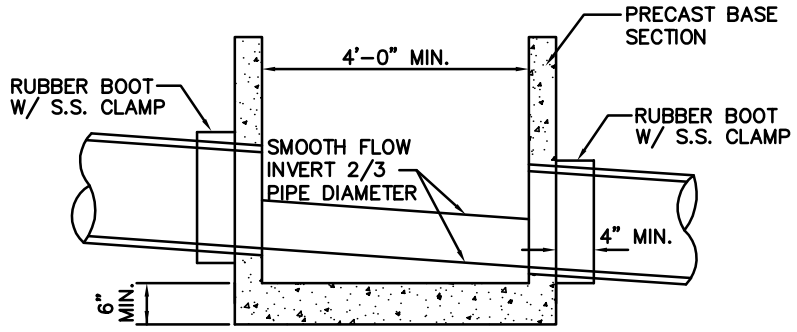

SECTIONAL PLAN



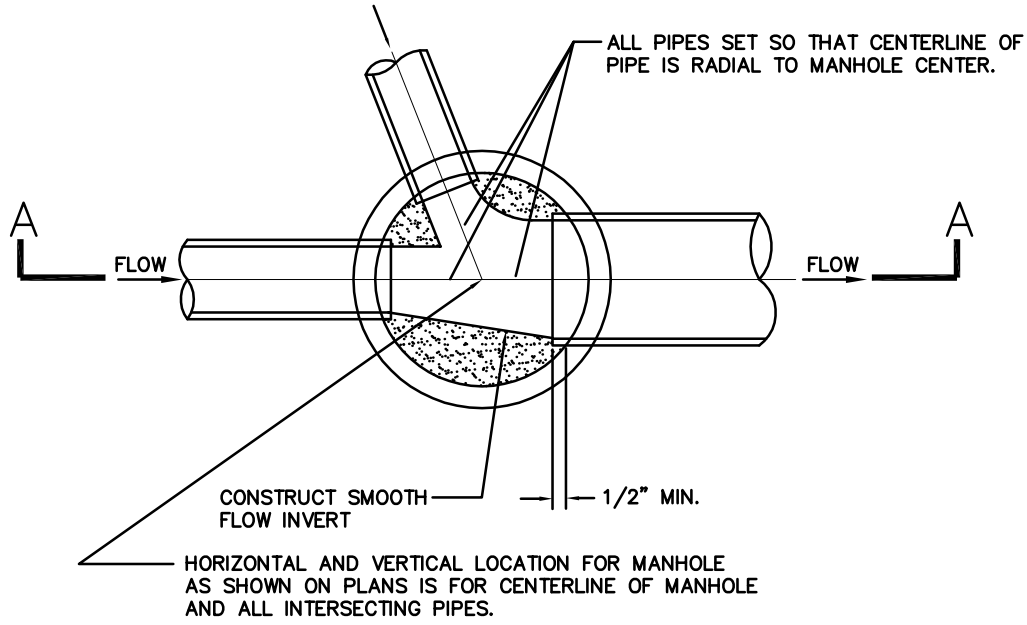

NOTE: IF FORCE MAIN CONNECTION IS MADE TO EXISTING MANHOLE, INVERT FOR FORCE MAIN SHALL BE CONSTRUCTED ON TOP OF EXISTING INVERT BENCH

SECTION A–A

# MANHOLE FORCEMAIN CONNECTION



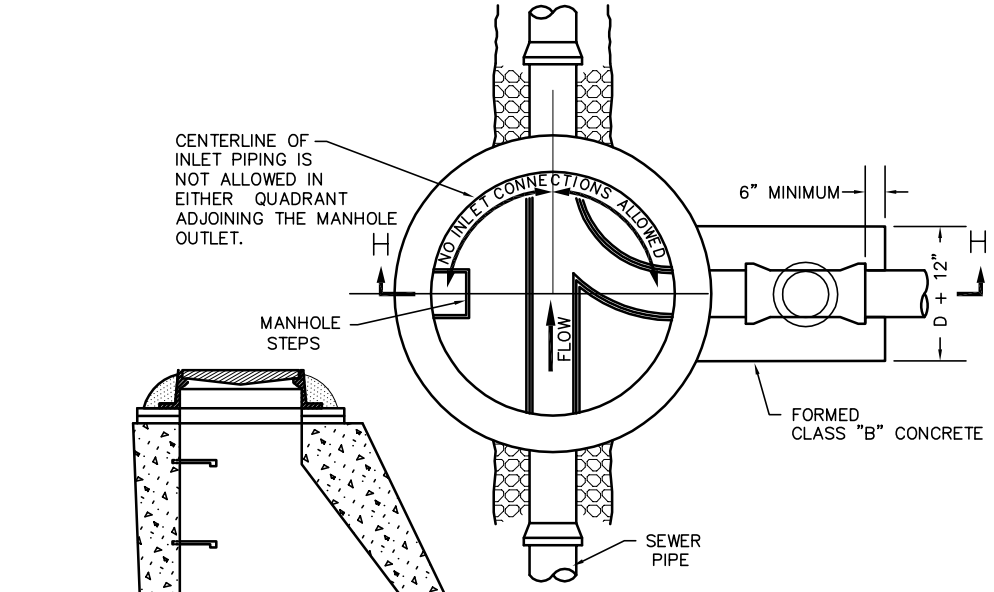

## SECTION A-A



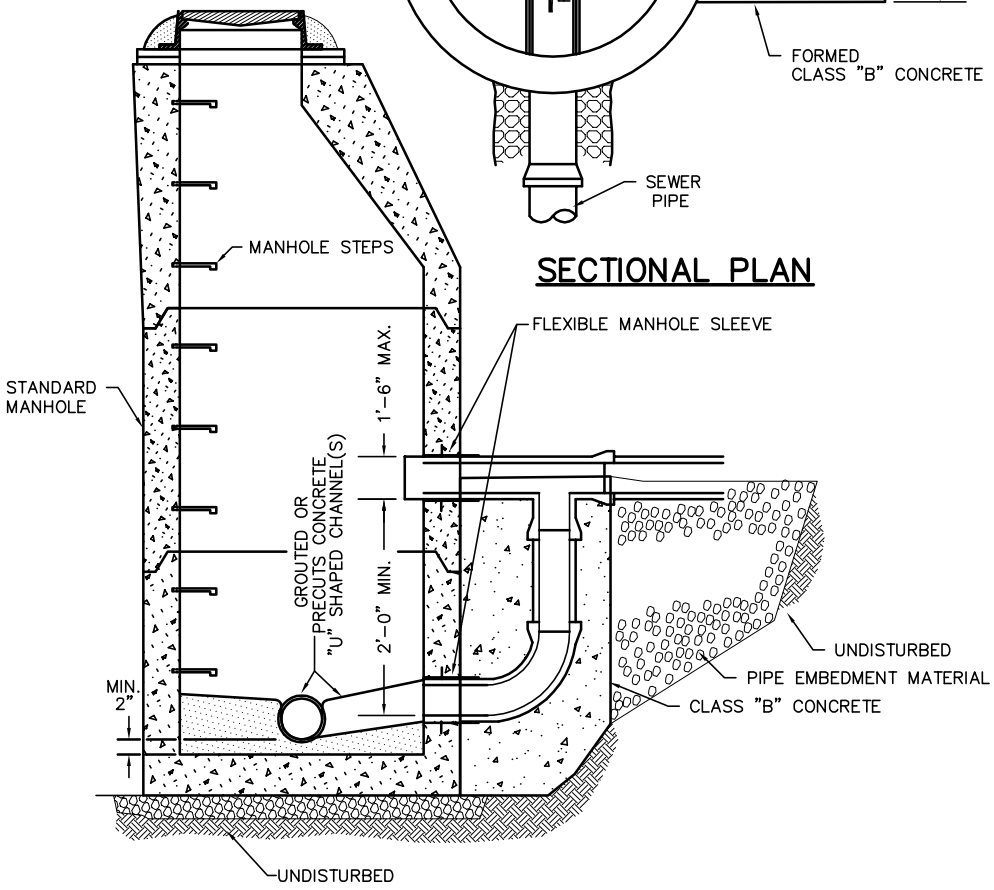

## PLAN

NOTE: MANHOLES ON PLANS NOTED AS HIGH VELOCITY MANHOLES SHALL RECEIVE TWO COATS OF SIKAGARD 62, HIGH-BUILD, EPOXY RESIN COATING OR APPROVED EQUAL ON INVERT CHANNEL.

# MANHOLE INVERTS




## SECTIONAL PLAN




## SECTION H–H

**NOTE:**

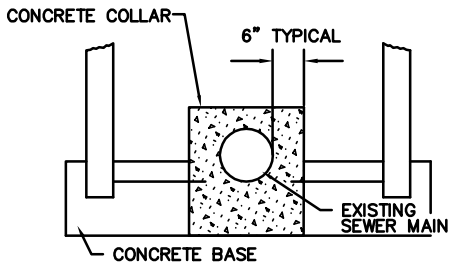
1. DROP CONNECTION IS NOT PERMITTED FOR HIGH VELOCITY SEWER MAINS MAINTAIN MINIMUM OF 8" OF CLEARANCE BETWEEN DROP CONNECTION AND MANHOLE STEPS.
2. BASE FOUNDATION TO CONSTRUCTED LEVEL WITH EXISTING MATERIAL OR CONDITIONED WITH STONE AS REQUIRED BY SPECIFICATIONS

# DROP MANHOLE

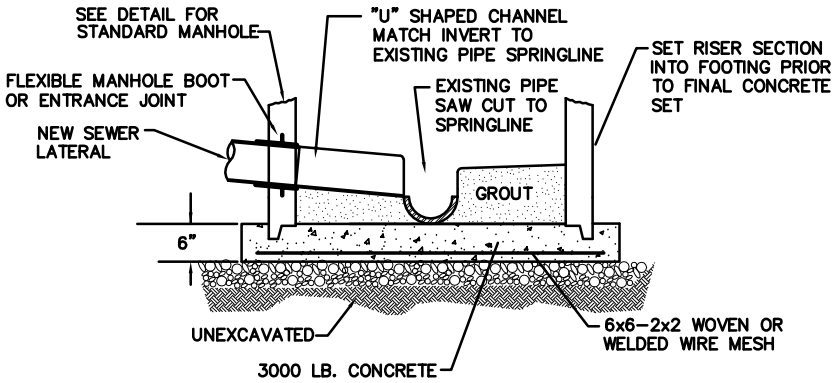
TOWN OF FRANKLIN

STANDARD DETAIL - W33

# NEW MANHOLE OVER EXISTING SEWER LINE

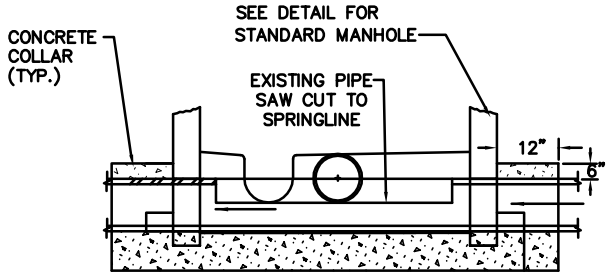



## SECTION "C – C"



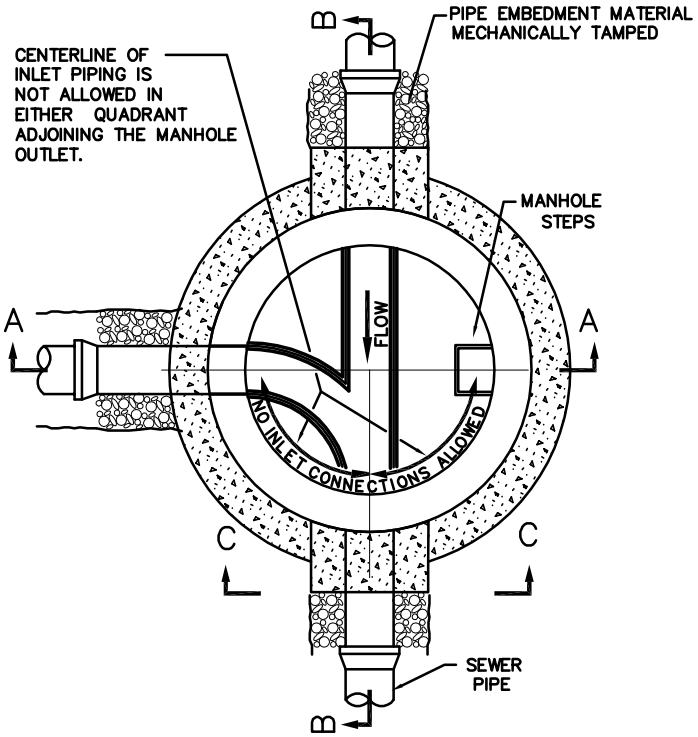

BASE FOUNDATION CONSTRUCTED LEVEL WITH EXISTING MATERIAL OR WITH STONE AS REQUIRED BY SPECIFICATIONS

## SECTION "A – A"

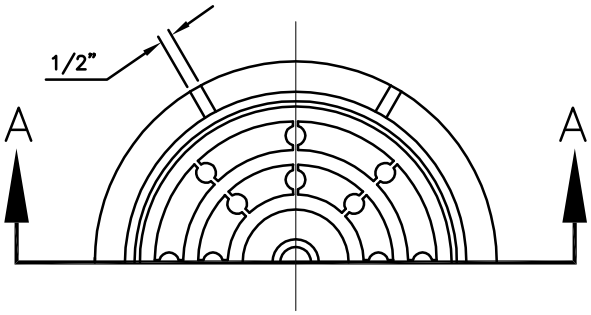



## SECTION "B – B"

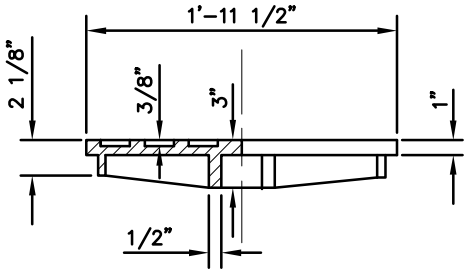
NOTES:
1. THIS DETAIL MUST BE USED FOR CONSTRUCTION OF ALL MANHOLES OVER EXISTING SEWER MAINS.
2. LATERALS 6" AND LARGER SHALL BE CONNECTED AT MANHOLES ONLY.
3. FLOW SHALL BE MAINTAINED DURING CONSTRUCTION.
4. MANHOLE BASE SHALL BE CAST IN PLACE.



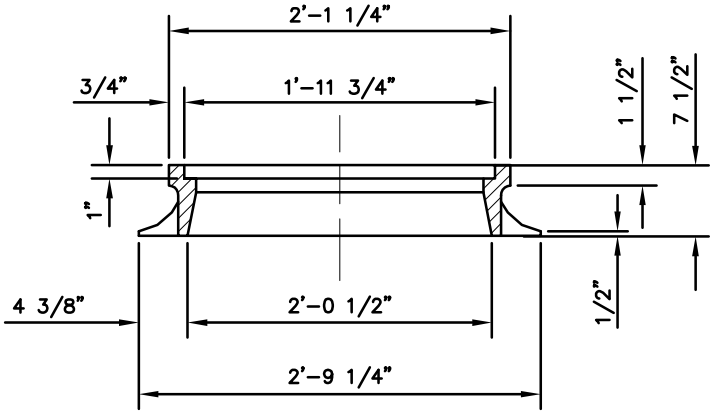

## SECTIONAL PLAN




HALF PLAN OF MANHOLE
RING & COVER




SECTION A–A
MANHOLE COVER




SECTION A–A
MANHOLE RING

NOTE: TRAFFIC BEARING RING AND COVER.
MINIMUM WEIGHT 315 POUNDS

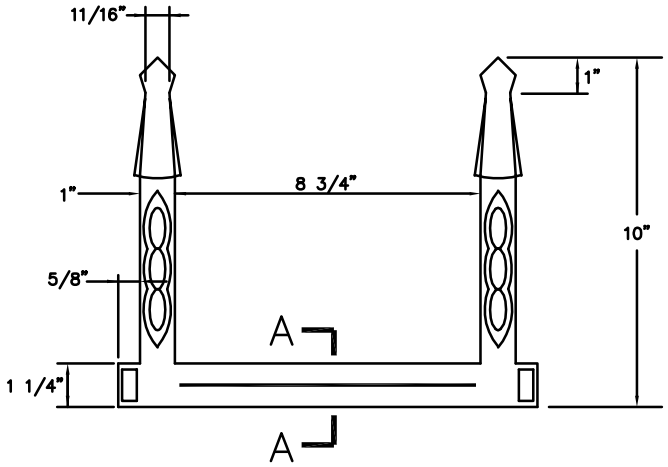
# MANHOLE RING AND COVER

TOWN OF FRANKLIN STANDARD DETAIL - W34

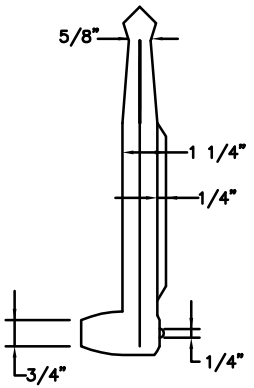
TOWN OF FRANKLIN

STANDARD DETAIL - W35

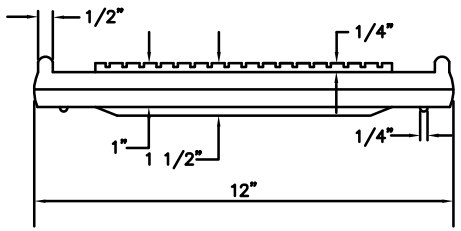
# MANHOLE STEPS



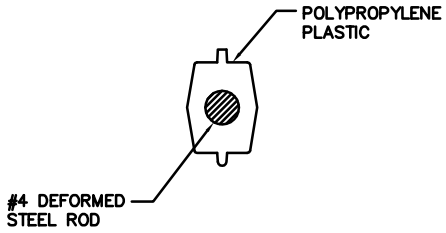

PLAN




SIDE ELEVATION




ELEVATION

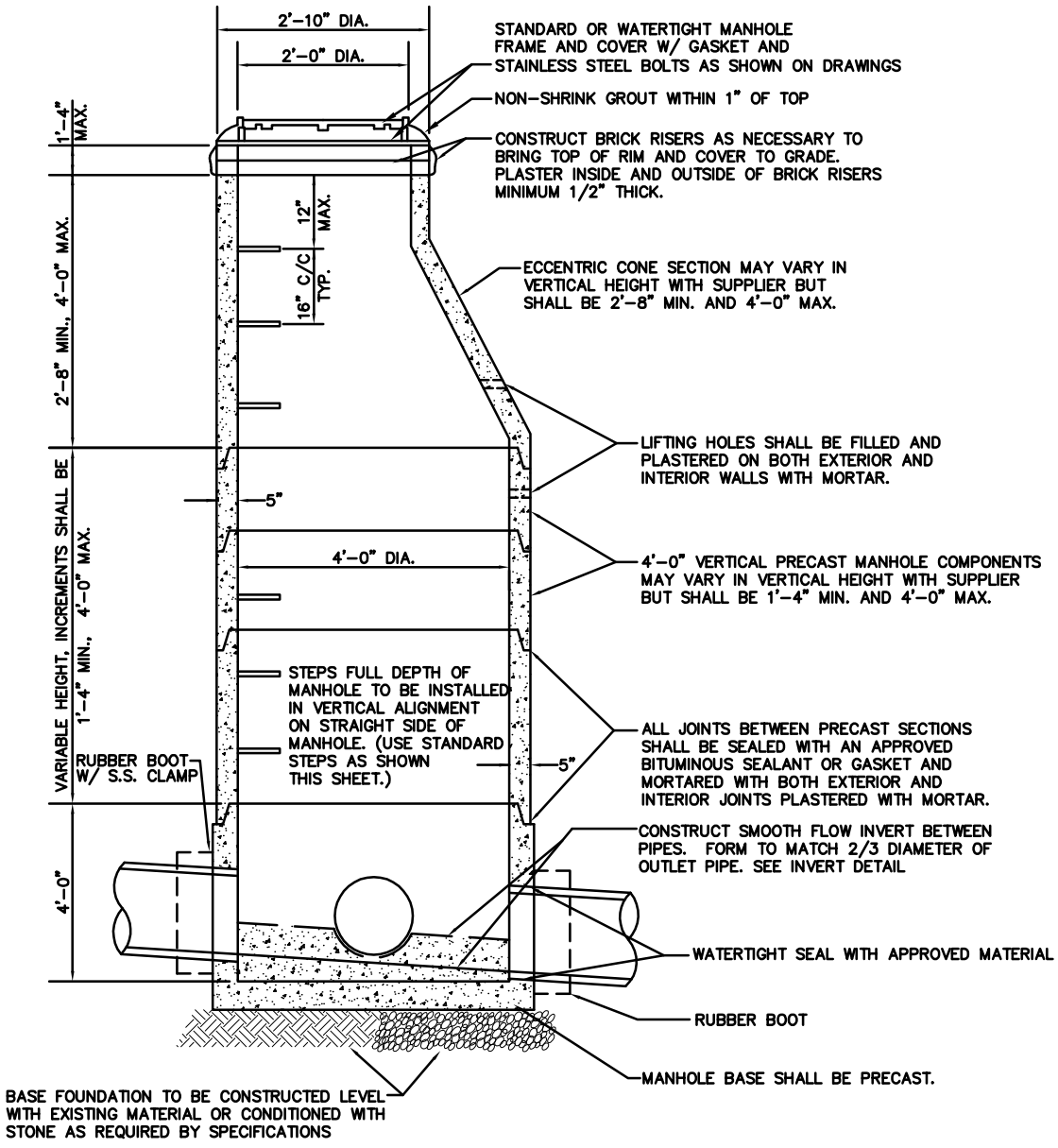



SECTION A–A

CONSTRUCTION NOTES

1. ALL STEPS SHALL PROTRUDE A MINIMUM OF 5" AND A MAXIMUM OF 7" FROM INSIDE FACE OF STRUCTURE WALL.

2. STEPS DIFFERING IN DIMENSIONS, CONFIGURATION, OR MATERIALS FROM THOSE SHOWN MAY ALSO BE USED PROVIDED THE CONTRACTOR HAS FURNISHED THE TOWN WITH DETAILS OF THE PROPOSED STEPS AND HAS RECEIVED PRIOR WRITTEN APPROVAL FROM THE TOWN FOR THE USE OF SAID STEPS.

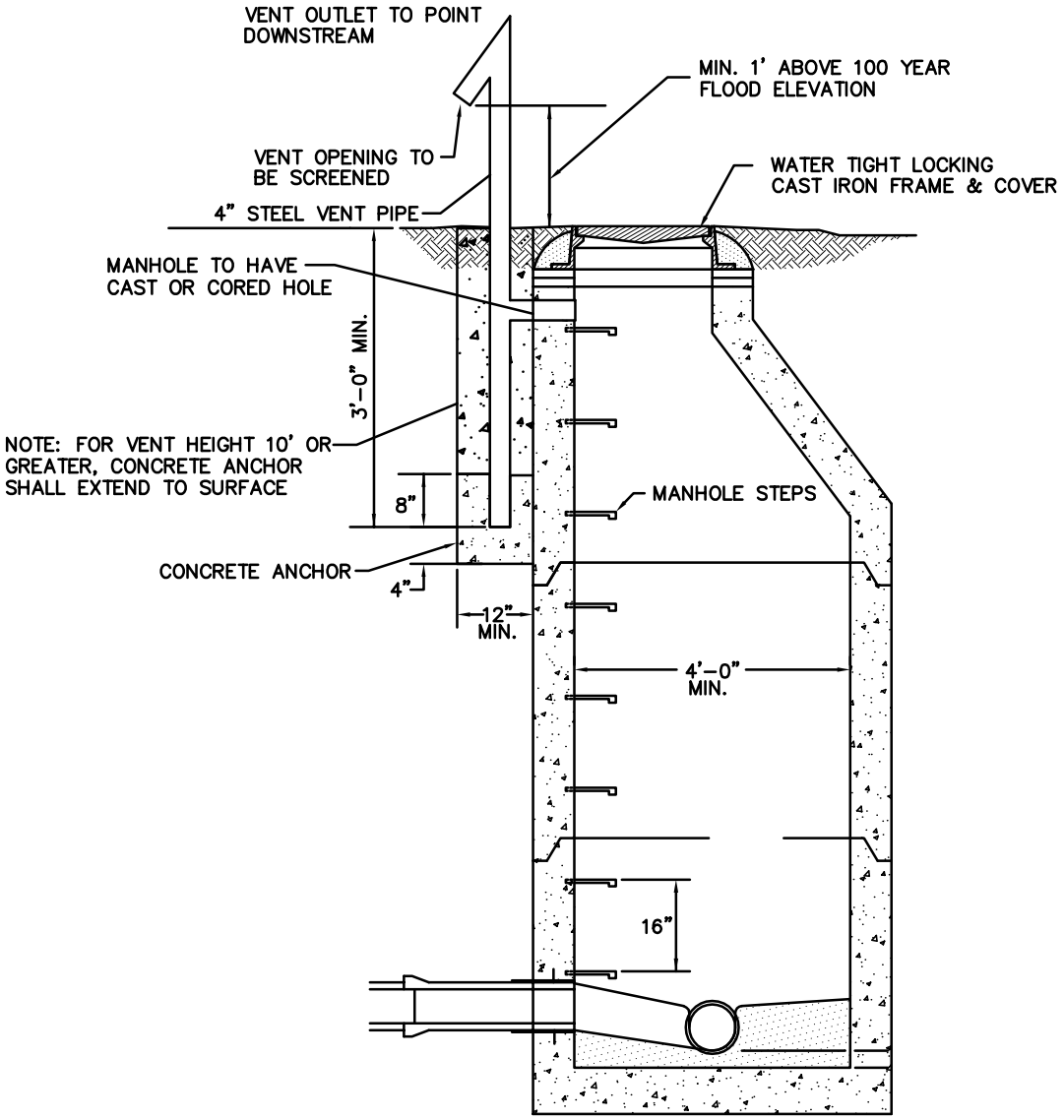



## ELEVATION VIEW

### PRECAST MANHOLE NOTES:

1. ALL PRECAST MANHOLE COMPONENTS SHALL MEET REQUIREMENTS OF ASTM C-478, LATEST REVISION.
2. ALL MANHOLES SHALL BE CONSTRUCTED PLUMB
3. ALL MANHOLE GRADES SHOWN ON THE PLANS ARE FOR THE INVERT OF THE MANHOLE CENTER.
4. IF MANHOLE IS SET IN LOCATION OF HIGH WATER TABLE OR UNDERGROUND WATER IS ENCOUNTERED, THE CONTRACTOR SHALL INSTALL UNDERDRAINS AND STONE AS DIRECTED IN THE FIELD BY THE ENGINEER.
5. STEPS SHALL BE INSTALLED ON STRAIGHT SIDE OF MANHOLE.

# PRECASET CONCRETE MANHOLE

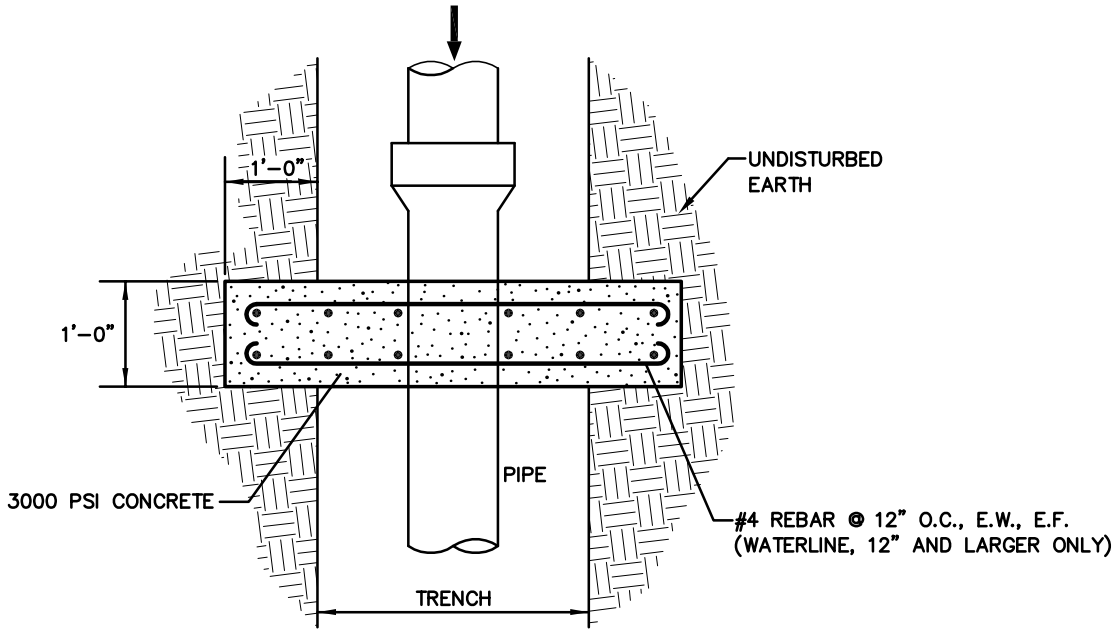



NOTES: NOT TO SCALE

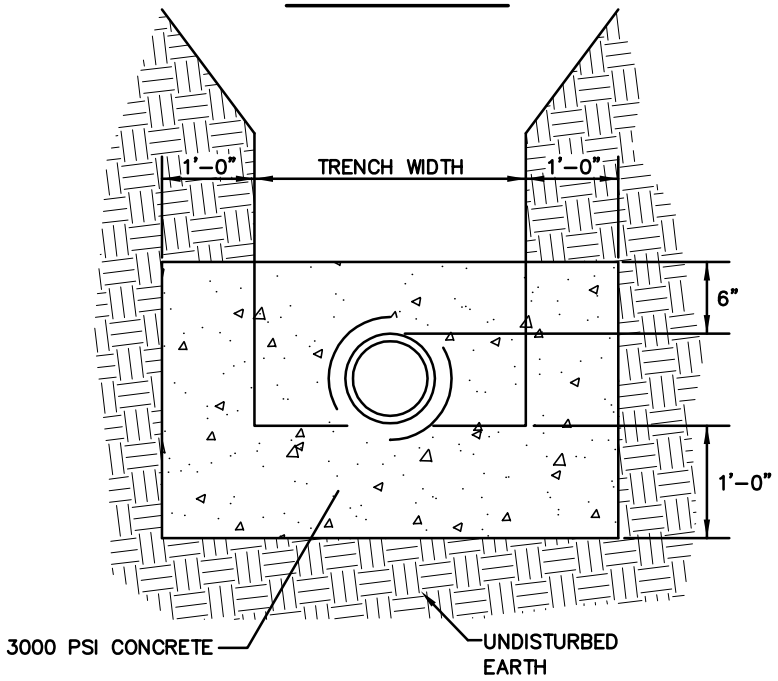
1. VENT PIPE SHALL BE 4" SCHEDULE 40 STEEL PIPE.
2. INSIDE OF VENT PIPE SHALL HAVE A 3/32 INCH COAL TAR LINING ACCORDING TO AWWA 203.
3. OUTSIDE OF VENT PIPE SHALL BE SAND BLASTED TO COMMERICIAL STANDARDS AND HAVE ONE COAT OF ZINC CHROMATE PRIMER APPLIED ACCORDING TO FEDERAL SPECIFICATION TT-86A OR LATEST REVISION. THEN VENT PIPE SHALL HAVE TWO EVENLY APPLIED COATS OF RUST INHIBITING ENAMEL PAINT, EITHER KOPPERS GLAMORTEX NO.501 ENAMEL (OLIVE GREEN), SOUTHERN COATINGS RUSTALOY NO.0537 ENAMEL (GARDEN GREEN), OR APPROVED EQUAL.

# VENTED MANHOLE

TOWN OF FRANKLIN STANDARD DETAIL - W37




PLAN VIEW



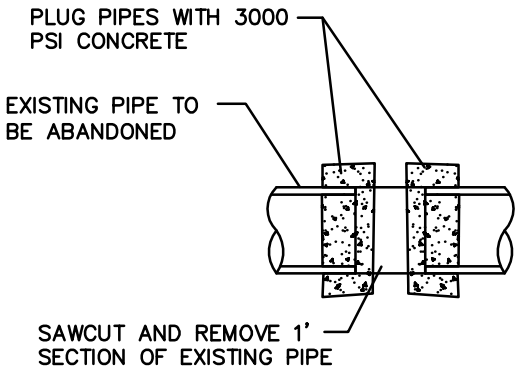

ELEVATION

NOTES:

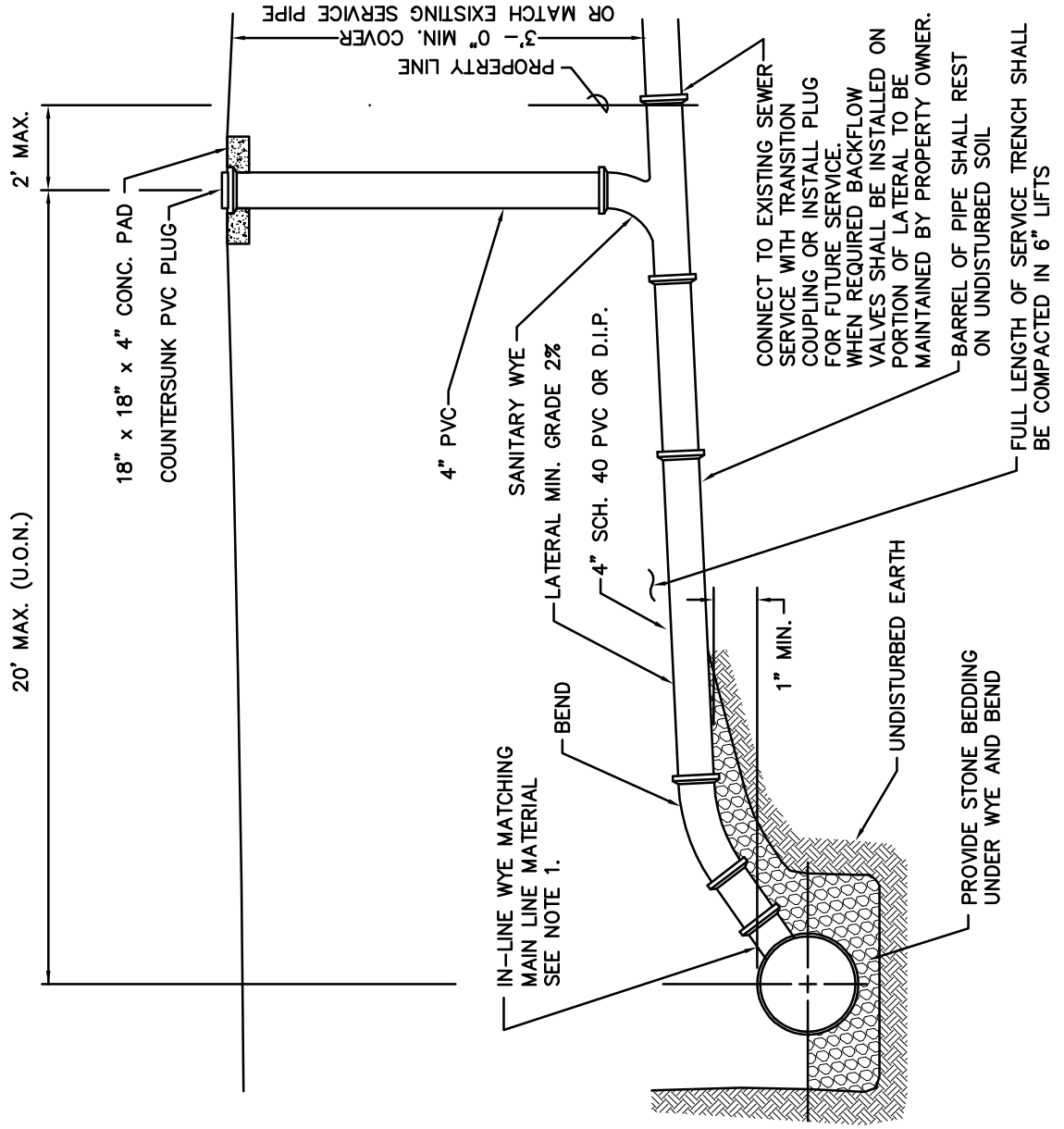
1. KEYS FOR SLOPES EQUAL TO OR GREATER THAN 20% ONLY.
2. INSTALL AT DISTANCE SHOWN ON PLANS.

# KEYING PIPES ON SLOPES

TOWN OF FRANKLIN STANDARD DETAIL - W38




# SEWER LINE ABANDONMENT

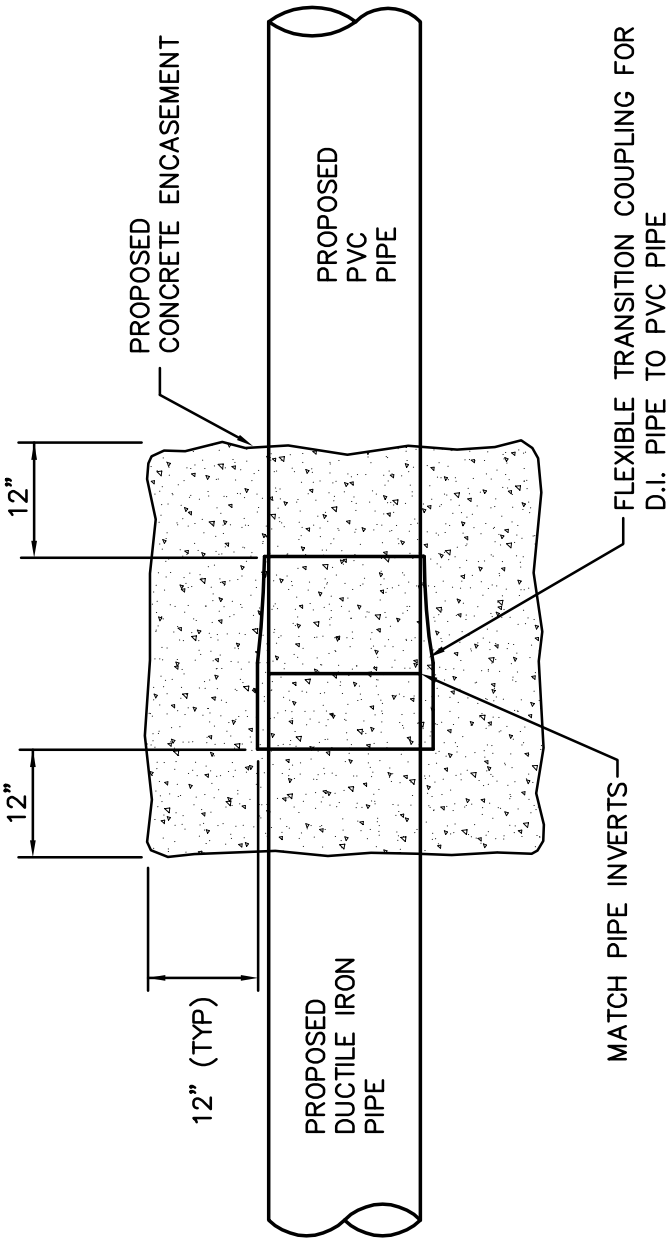



NOT TO SCALE

NOTE:
1. TAPPING SADDLES ARE APPROVED FOR CONNECTIONS TO EXISTING SEWER LINES ONLY

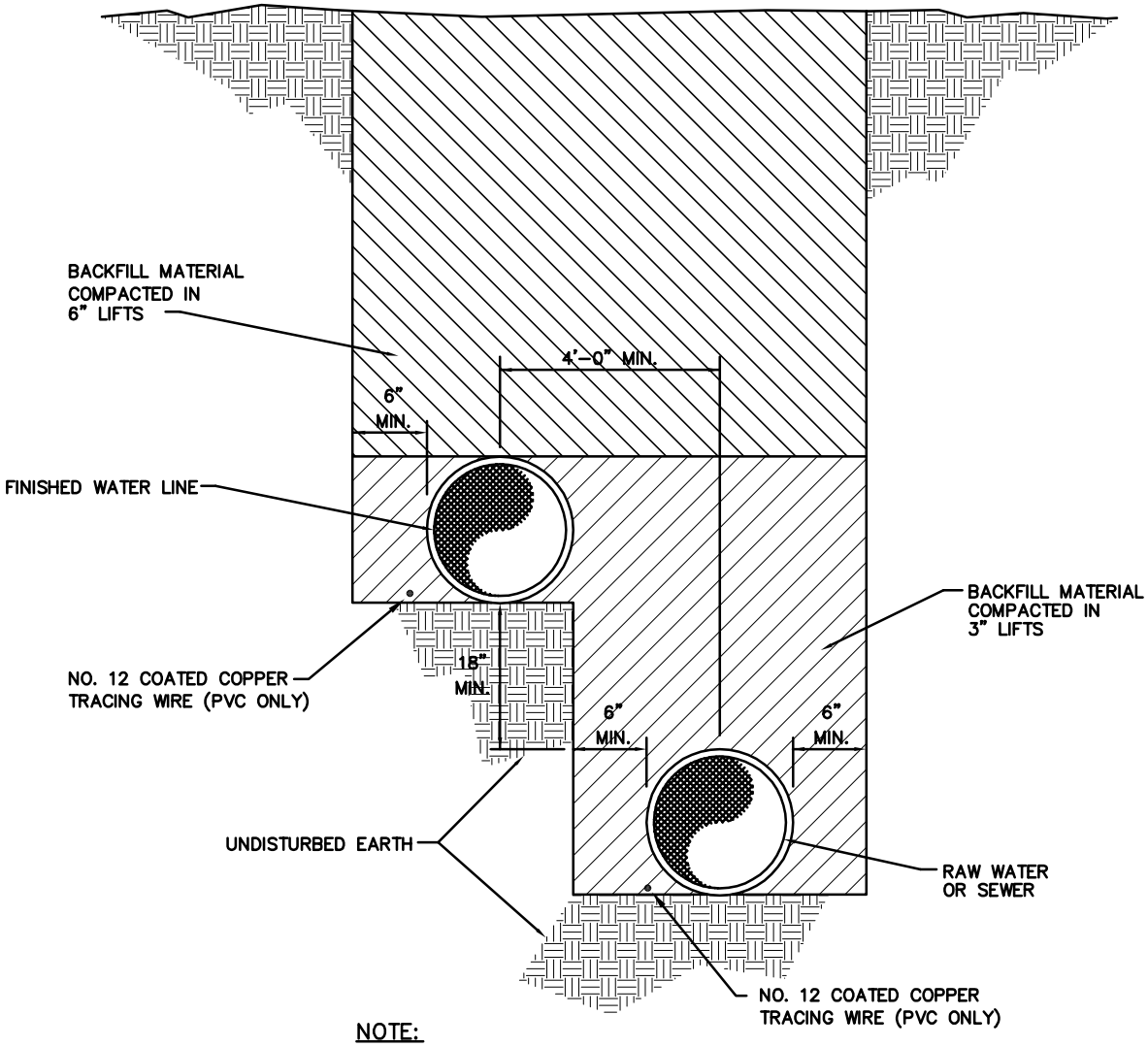
# SANITARY SEWER SERVICE

TOWN OF FRANKLIN STANDARD DETAIL - W40




# TRANSITION COUPLING
# DISSIMILAR MATERIAL PIPES

## TRANSITION COUPLING
## DISSIMILAR MATERIAL PIPES




NOTE:

CONTRACTOR SHALL FURNISH AND INSTALL METALLIC WARNING TAPE 24" ABOVE THE PIPE AND COPPER TRACING WIRE FOR PVC PIPE INSTALLATION ONLY.

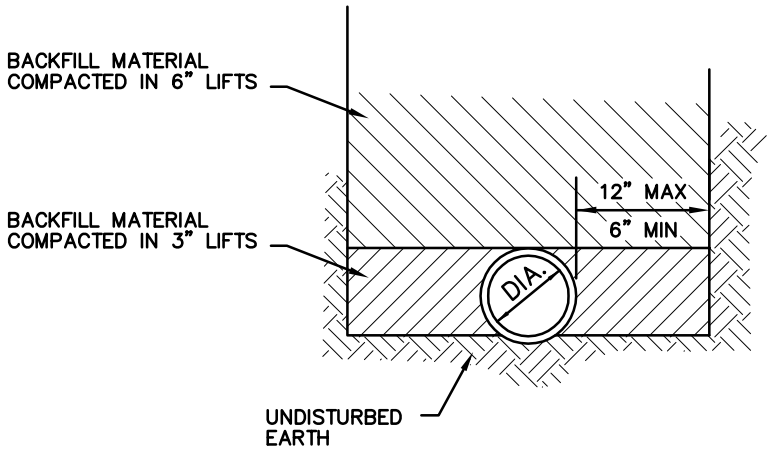
NOTE: 1. CONSTRUCTION OF TRENCHES SHALL COMPLY WITH ALL FEDERAL, STATE AND LOCAL SAFETY AND HEALTH REGULATIONS WHICH HAVE JURISDICTION AT THE PROJECT SITE. IT IS THE CONTRACTOR'S RESPONSIBILITY TO BE FAMILIAR WITH THE APPLICABLE REGULATIONS AND FOLLOW THEM ACCORDINGLY.

# TWO PIPES IN SAME TRENCH
# TRENCH DETAIL

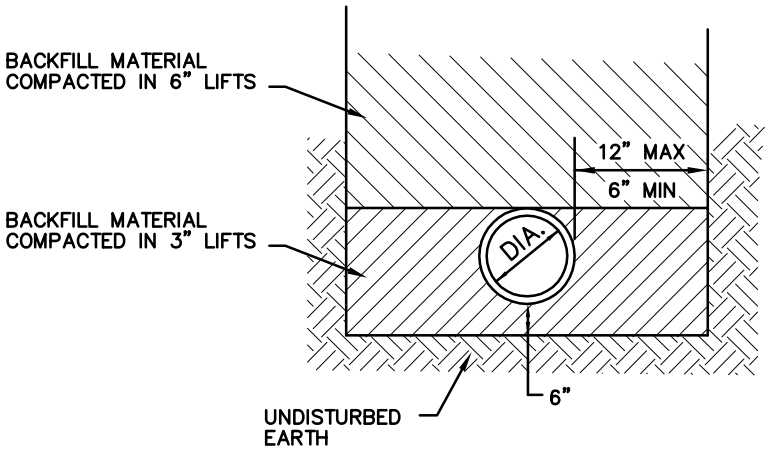
TOWN OF FRANKLIN

STANDARD DETAIL - W43.1

# TYPICAL TRENCH DETAILS - 1 OF 2

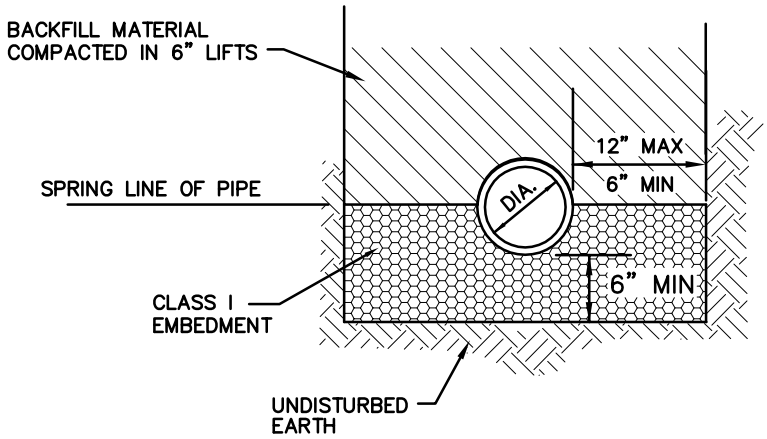



STANDARD EXCAVATION




OVERCUT EXCAVATION

## DUCTILE IRON GRAVITY SEWER



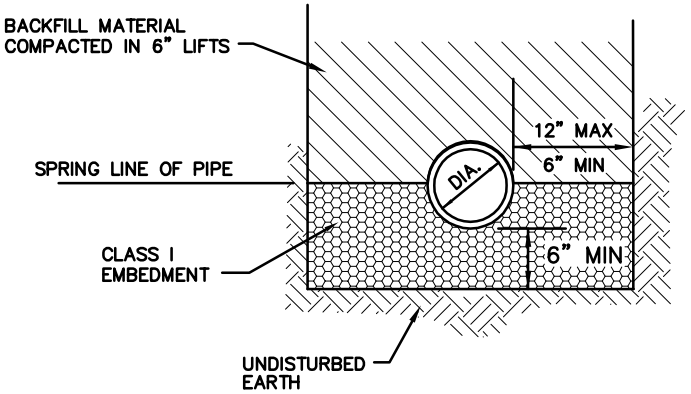

STANDARD EXCAVATION

## PVC GRAVITY SEWER

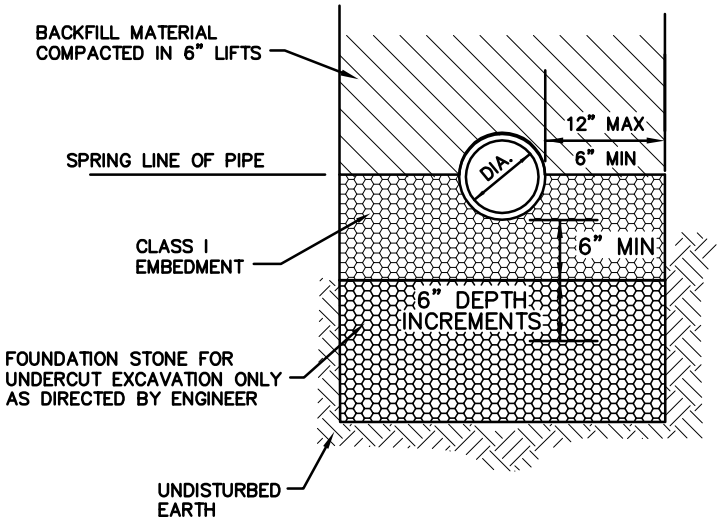
TOWN OF FRANKLIN

STANDARD DETAIL - W43.2

TYPICAL TRENCH DETAILS - 2 OF 2




STANDARD EXCAVATION
IN WET CONDITIONS




UNDERCUT EXCAVATION
IN UNSTABLE SOILS TYPES

PIPE IN WET OR UNSTABLE CONDITIONS

ALL PIPE TYPES

(AS DIRECTED BY TOWN)

NOTE: 1. CONSTRUCTION OF TRENCHES SHALL COMPLY WITH ALL FEDERAL, STATE AND LOCAL SAFETY AND HEALTH REGULATIONS WHICH HAVE JURISDICTION AT THE PROJECT SITE. IT IS THE CONTRACTOR'S RESPONSIBILITY TO BE FAMILIAR WITH THE APPLICABLE REGULATIONS AND FOLLOW THEM ACCORDINGLY.

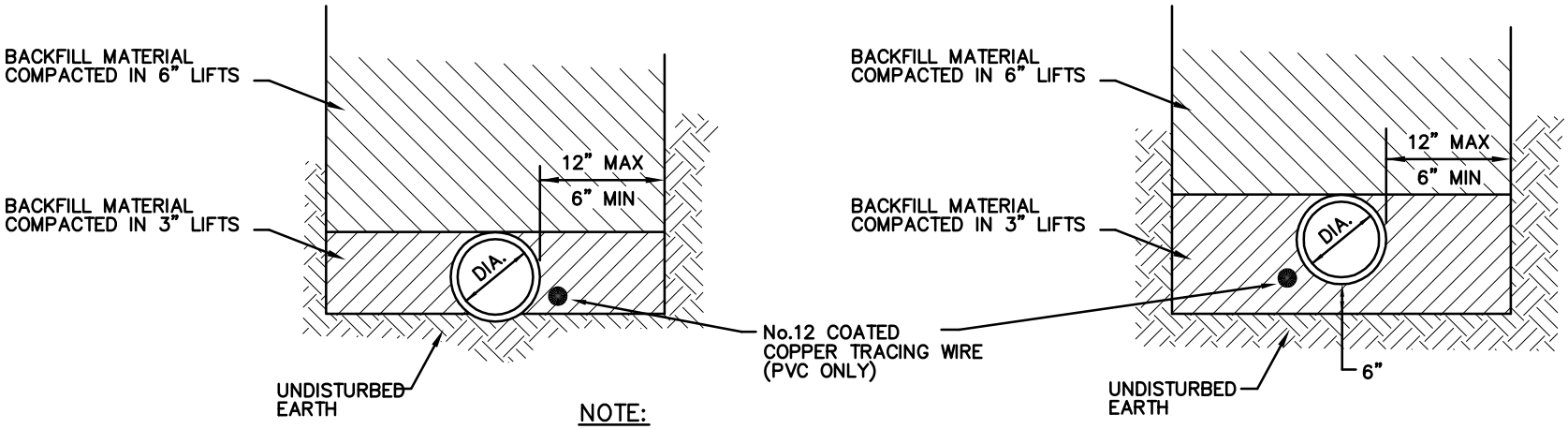
2. CLASS I EMBEDMENT SHALL BE NCDOT STANDARD # 57 STONE OR APPROVED EQUAL. FOUNDATION STONE SHALL BE NCDOT STANDARD # 57

# TYPICAL GRAVITY SEWER TRENCHING DETAILS

TOWN OF FRANKLIN

STANDARD DETAIL - W45

TYPICAL TRENCH DETAILS - FORCEMAIN




NOTE:
BELL HOLES NOT SHOWN

STANDARD EXCAVATION

OVERCUT EXCAVATION

NOTE: 1. CONSTRUCTION OF TRENCHES SHALL COMPLY WITH ALL FEDERAL, STATE AND LOCAL SAFETY AND HEALTH REGULATIONS WHICH HAVE JURISDICTION AT THE PROJECT SITE. IT IS THE CONTRACTOR'S RESPONSIBILITY TO BE FAMILIAR WITH THE APPLICABLE REGULATIONS AND FOLLOW THEM ACCORDINGLY.

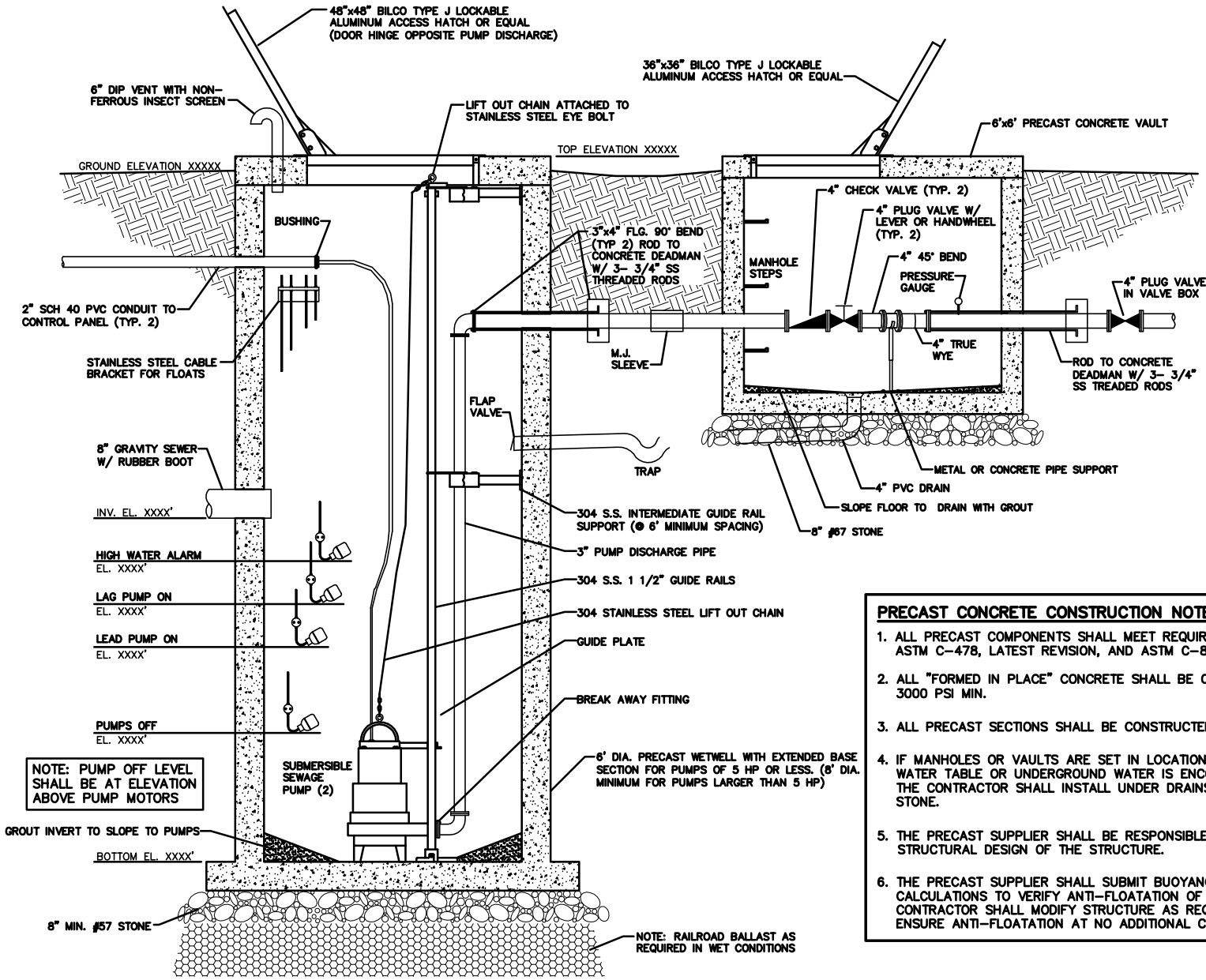
# TYPICAL TRENCHING DETAILS

## SEWER FORCE MAIN

TOWN OF FRANKLIN

STANDARD DETAIL - W46.1

# SUBMERSIBLE PUMP STATION
## SECTION VIEW




### PRECAST CONCRETE CONSTRUCTION NOTES

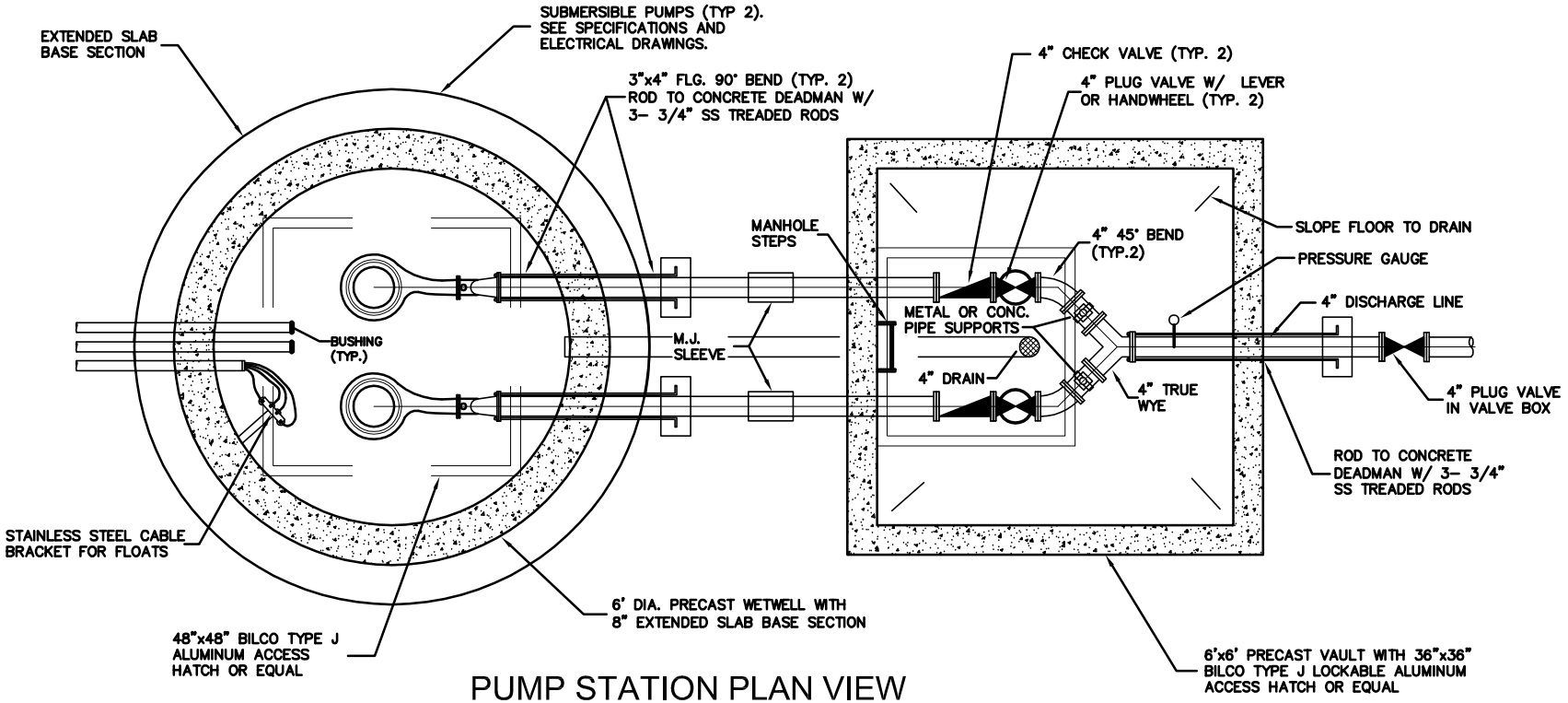
1. ALL PRECAST COMPONENTS SHALL MEET REQUIREMENTS ASTM C-478, LATEST REVISION, AND ASTM C-890.
2. ALL "FORMED IN PLACE" CONCRETE SHALL BE CLASS "B", 3000 PSI MIN.
3. ALL PRECAST SECTIONS SHALL BE CONSTRUCTED PLUMB.
4. IF MANHOLES OR VAULTS ARE SET IN LOCATION OF HIGH WATER TABLE OR UNDERGROUND WATER IS ENCOUNTERED, THE CONTRACTOR SHALL INSTALL UNDER DRAINS AND STONE.
5. THE PRECAST SUPPLIER SHALL BE RESPONSIBLE FOR THE STRUCTURAL DESIGN OF THE STRUCTURE.
6. THE PRECAST SUPPLIER SHALL SUBMIT BUOYANCY CALCULATIONS TO VERIFY ANTI-FLOATATION OF WET WELL. CONTRACTOR SHALL MODIFY STRUCTURE AS REQUIRED TO ENSURE ANTI-FLOATATION AT NO ADDITIONAL COST TO TOWN.

TOWN OF FRANKLIN

STANDARD DETAIL - W46.2

# SUBMERSIBLE PUMP STATION

## PLAN VIEW




PUMP STATION PLAN VIEW

NOTES:
1. SUBMERSIBLE PUMPS SHALL BE REMOVABLE FROM TOP OF STATION THROUGH ACCESS DOORS. CONTRACTOR RESPONSIBLE FOR DIMENSION REVISIONS AS REQUIRED IF FINAL PUMP LAYOUT FROM PUMP SUPPLIER IS DIFFERENT FROM APPROVED DRAWINGS.

2. CONTRACTOR TO PROVIDE ALUMINUM LADDER OF SUFFICIENT HEIGHT FOR ACCESS INTO PUMP STATION DURING CONSTRUCTION AND INSPECTION.