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January 28, 2026

Electronically Filed in TPUC Docket Room
on January 28, 2026 at 3:42 p.m.

VIA ELECTRONIC FILING

Hon. David Jones, Chairman
c/o Ectory Lawless, Docket Manager
Tennessee Public Utility Commission
502 Deaderick Street, 4th Floor
Nashville, TN 37243
TPUC.DocketRoom@tn.gov

RE: ***Application of Two Rivers Utility, LLC for a Certificate of Public Convenience and Necessity*, TPUC Docket No. 25-00073**

Dear Chairman Jones:

Two Rivers Utility, LLC is submitting this filing in response to a recent request from the Consumer Advocate Division of the Office of the Tennessee Attorney General ("Consumer Advocate" or "CAD"). In Craig Chrestman's Pre-Filed Rebuttal Testimony, Mr. Chrestman testified as follows: "It is my understanding from the developer this this gravity system was successfully tested according to the Town of Arlington's sewer specifications."[1] Pursuant to the CAD's request, enclosed please find a letter from the developer regarding the completed testing of the gravity system.

As required, copies will follow. Should you have any questions concerning this filing or require additional information, please do not hesitate to contact me.

Very truly yours,

BUTLER SNOW LLP

Melvin J. Malone

Attachment
cc: Craig Chrestman, Two Rivers Utility
Joey Wimberley, Two Rivers Utility
Karen H. Stachowski, Esq., Consumer Advocate

[1] *Pre-Filed Rebuttal Testimony of Two Rivers Utility, LLC Witness Craig Chrestman*, pp. 3:22-4:2, TPUC Docket No. 25-00073 (Jan. 20, 2026).

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BUTLER SNOW LLP

Engineering | Planning | Surveying

January 28, 2026

Mr. Craig Chrestman
Joey Wimberly
Two Rivers Utility, LLC
673 West Main Street
Adamsville, TN 38310

RE: CANTERBURY MANOR PHASE 3
GRAVITY SEWER INSPECTION

Mr. Chrestman and Mr. Wimberly:

Crown Construction, LLC served as the contractor for the Canterbury Manor Phase 3 development and was responsible for installation of the gravity sewer system in accordance with the approved construction plans. The system consists of eight (8) 48-inch-diameter precast concrete manholes, approximately 1,980 linear feet of 8-inch gravity sewer main, and twenty-three (23) 6-inch sewer service laterals.

Renaissance Design Studio (RDS), LLC is the Engineer of Record and provided construction inspection services on behalf of Renaissance Development, the owner of the project.
Fayette County Public Works does not own or maintain a centralized sanitary sewer system and declined ownership of the Canterbury Manor Phase 3 sewer facilities. Fayette County also does not maintain separate sewer construction specifications and did not perform construction inspections for this project.

Following completion of construction, RDS collected field data and prepared record drawings for the gravity sewer system. The record drawings confirm that all pipe segments meet or exceed the design grades and the minimum slope requirements established by the Tennessee Department of Environment and Conservation (TDEC) for 8-inch gravity sewer. Manholes and piping were installed at or near their design locations and within acceptable construction tolerances.

Leakage testing of the manholes and sewer mains was performed in general conformance with the Town of Arlington Sewer Specifications, which were used as the governing municipal standard for this project due to the absence of Fayette County sewer requirements.
Manholes were vacuum tested by sealing the structure and drawing a vacuum to ten (10) inches of mercury. Each manhole successfully maintained the specified vacuum without loss to nine (9) inches of mercury within sixty (60) seconds, thereby meeting acceptance criteria on the initial test.

Gravity sewer pipe testing was conducted using low-pressure air testing procedures. While the Arlington specifications establish allowable pressure-loss criteria based on pipe diameter and test length, the contractor elected to perform a more conservative field test by pressurizing each pipe run to five (5) psi and requiring the pressure to be held for five (5) minutes.

All pipe segments except Runs 5-4 and 8-7 successfully passed the initial test.

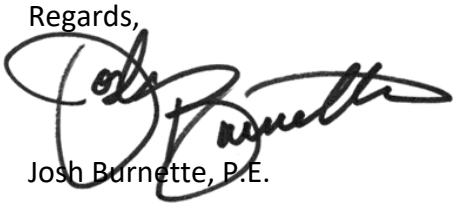
Pipe Run 5-4 failed the first test due to a rolled gasket at the manhole connection. The gasket was repaired, after which the line was retested and successfully passed.

Pipe Run 8-7 failed its initial test as a result of a cracked service connection wye. The defective fitting was removed and replaced, and the line passed retesting.

Based on construction observation, record drawing verification, and successful completion of all required leakage testing, RDS confirms that the Canterbury Manor Phase 3 gravity sewer system has been installed and tested in accordance with the approved construction plans, applicable TDEC requirements, and the Town of Arlington Sewer Specifications.

Should you require any additional documentation or have questions regarding this certification, please do not hesitate to contact me.

Regards,



Josh Burnette, P.E.

Town of Arlington

5854 Airline Road
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Arlington, TN 38002

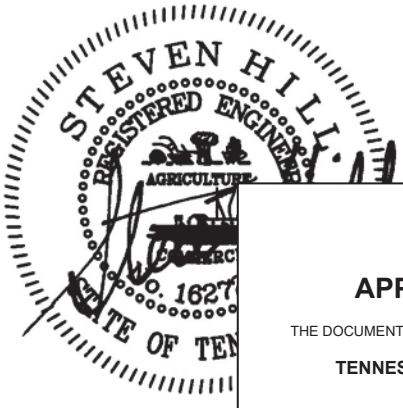
P: 901.867.2620
F: 901.867.2638

Standard Specifications

For

Sanitary Sewer Construction

June 24, 2019



Steven Hi
Town En

WPN 19.0366
Arlington Standard Specification
APPROVED FOR CONSTRUCTION

THE DOCUMENT BEARING THIS STAMP HAS BEEN RECEIVED AND REVIEWED BY THE

TENNESSEE DEPT. OF ENVIRONMENT & CONSERVATION

DIVISION OF WATER RESOURCES

AND IS HEREBY APPROVED FOR CONSTRUCTION BY THE COMMISSIONER

Julie A. Haase P.E.

June 24, 2019

THIS APPROVAL SHALL NOT BE CONSTRUED AS CREATING A PRESUMPTION OF CORRECT OPERATION OR AS WARRANTING BY THE COMMISSIONER THAT THE APPROVED FACILITIES WILL REACH THE DESIGNED GOALS.

APPROVAL EXPIRES FIVE YEARS FROM ABOVE DATE

TABLE OF CONTENTS

SECTION 02125

EROSION AND SEDIMENTATION CONTROL

PART 1 - GENERAL

1.1 SCOPE

A. The work specified in this Section consists of providing, maintaining, and removing temporary erosion and sedimentation controls as shown on the Drawings.

B. Temporary erosion controls include, but are not limited to, grassing, mulching, watering, and re-seeding on-site surfaces which will ensure that erosion during construction will be either eliminated, or maintained within acceptable limits as established by the Tennessee Department of Environment and Conservation Water Quality Act of 1977, as amended.

C. Temporary sedimentation controls include, but are not limited to, silt fences, sediment basin, wattle check dams, catch basin filter assemblies and construction exit pad which will ensure that sedimentation pollution will be either eliminated or maintained within acceptable limits as established by the Tennessee Department of Environment and Conservation Erosion and Sediment Control Handbook (latest edition).

D. Basic Principles:

1. The storm water management plan consists of controlling storm water around and within the site to keep it from entering the existing storm drainage system and away from undisturbed areas. In addition, vehicles hauling dirt and debris from the site will be kept clean to prevent deposition of sediment onto neighboring streets.
2. Conduct the construction activities in such a manner to minimize the disturbance of soil on the site.
3. Stabilize disturbed areas immediately.
4. Safely convey run-off from the site to an outlet such that erosion will not be increased off-site.
5. Retain sediment on-site that was generated on-site.

E. Temporary Erosion and Sedimentation Control: Temporary erosion and sedimentation control procedures shall be directed toward:

1. Preventing soil erosion at the source.
2. Preventing silt and sediment from entering any waterway if soil erosion cannot be prevented by capturing all runoff from disturbed areas.

1.2 QUALITY ASSURANCE

A. General: Perform all work under this Section in accordance with all pertinent rules and regulations.

B. Conflicts: Where provisions of pertinent rules and regulations conflict with these Specifications, the more stringent provisions shall govern.

PART 2 - PRODUCTS AND INSTALLATIONS

2.1 All products and installations shall conform to the requirements of the Tennessee Department of Environment and Conservation Erosion and Sediment Control Handbook.

2.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL MATERIALS

A. Silt Fences:

1. Silt fence shall be polymer type netting with a built-in cord running throughout the top edge of the fabric. Posts shall be either steel or pressure treated fir, southern pine or hemlock and shall be spaced not more then six feet on center. Silt fence shall be provided with netting to provide reinforcement. Silt fence shall have an Equivalent Opening Size (EOS) of 40 to 100. Silt fence fabric shall have a maximum permeability of 40 gallons per minute per square foot.
2. The Contractor shall indicate the proposed locations of erosion control fences on a drawing and submit the proposed locations to the Owner for review and approval.
3. Temporary silt fences shall be placed on the natural ground, at the bottom of fill slopes, in ditches, or other areas where siltation is a problem.
4. The Contractor shall be required to maintain the silt fence in a satisfactory condition for the duration of the project or until its removal is requested by the A/E. The silt accumulation at the fence may be left in place and seeded, removed, etc. at the direction of the A/E. The silt fence becomes the property of the Contractor whenever the fence is removed.

B. Wattle Check Dam:

1. Wattles and tubes consist of a mesh or netting material around an inner filter media material. Wattles shall be 8” diameter (minimum).
2. Wattle Check Dams shall be secured to the ground with stakes. Where necessary, remove existing parking lot pavement along the path of the wattle to enable staking.

2.3 CONCRETE

A. Concrete used on the project, if any, shall have a compressive strength of not less than 4,000 psi and a slump between 3 and 5 inches. Ready-mixed concrete shall be mixed and transported in accordance with ASTM C 94 (most current requirements*).* Reinforcing steel shall conform to the requirements of ASTM A 615 (most current requirements*),* Grade 60.

PART 3 - EXECUTION

3.1 GENERAL

A. Standards: Provide all materials and promptly take all actions to achieve effective erosion and sedimentation control in accordance with the Tennessee Department of Environment and Conservation Erosion and Sediment Control Handbook, local enforcing agency guidelines and these Specifications.

B. Implementation: The work shown on the approved plans shall be considered minimum requirements. What is shown shall not relieve the Contractor of the responsibility to actively take all steps to control soil erosion and sedimentation.

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

A. Silt fences, construction exit pad, appurtenances and temporary measures and devices shall be installed as indicated on the Drawings, shall be maintained until no longer needed, and shall then be removed.

B. All erosion and sedimentation control devices shall be inspected by the Contractor at least weekly and after each rainfall occurrence and cleaned out and repaired by the Contractor.

C. Temporary erosion and sedimentation control devices shall be installed and maintained from the initial land disturbance activity until the satisfactory completion and establishment of permanent erosion control measures. At that time, temporary devices shall be removed.

D. Contractor shall provide gravel construction exit pads where trucks exit in order to provide a wash area.

END OF SECTION

SECTION 02221

TRENCHING, BACKFILLING, AND COMPACTION

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Excavation for piped utility material.

B. Provide necessary sheeting, shoring, and bracing.

C. Prepare trench bottom with appropriate materials.

D. Dewater excavation as required.

E. Place and compact granular beds, as required, and backfill.

1.02 PRECAUTIONS

A. Notify utility companies when necessary to disturb existing facilities and abide by their requirements for repairing and replacing.

B. Protect all vegetation and other features to remain.

C. Protect all benchmarks and survey points.

PART 2 - PRODUCTS

2.01 BEDDING AND BACKFILL MATERIALS--SANITARY SEWERS

A. Class I Material: Angular, 1/4 to 1 inch graded stone including a number of fill materials that have regional significance such as crushed stone, cinders, slag, and crushed shells.

B. Class II Material: Coarse sands and gravels with a maximum particle dimension of 1-1/2 inches, including variously graded sands and gravels containing small percentages of fines, generally granular and non-cohesive, either wet or dry.

C. Class III Material: Fine sand and clayey gravels, including fine sands, sand-clay mixtures, and gravel-clay mixtures.

D. Class IV Material: Silt, silty clays, and clays, including inorganic clays and silts of medium to high plasticity and liquid limits.

E. Class V Material: Organic soils, as well as soil containing frozen earth, debris, rocks larger than 1-1/2 inches, and other foreign material.

2.02 BEDDING AND BACKFILL MATERIALS--STORM SEWERS

A. Class A Material: Continuous concrete cradle constructed in conformity with details shown on drawings, consisting of Class "B" concrete as specified in Section 03001.

B. Class B Material: Sand or a natural sandy soil, all passing a 3/8" sieve with not more than 10% passing a No. 200 sieve; or stone, gravel, chert, or slag of Graduation C or D of TDOT specifications.

C. Class C Material: Natural ground or compacted embankment at a depth of at least 10% of the outside vertical pipe diameter.

D. In rock cuts or other areas where free drainage bedding or backfill materials are required, use crushed stone, slag, or washed gravel of size 6, 7, 8, 57, or 78 of TDOT specifications.

E. For crushed stone pavement and shoulder replacement, use crushed stone meeting Type "A", Grading D, of TDOT specifications.

PART 3 - EXECUTION

3.01 PREPARATION

A. Install barriers and other devices to protect areas adjacent to construction.

B. Protect and maintain all benchmarks and other survey points.

3.02 EXCAVATION TRENCHES

A. Perform in such a manner as to form a suitable trench in which to place the pipe and so as to cause the least inconvenience to the public.

B. Maximum width at the crown of the pipe--2 feet plus the nominal diameter of the pipe.

C. Cut pavement along neat, straight lines with either a pavement breaker or pavement saw.

D. Trench depth: for waterlines--sufficient to provide minimum cover of 30 inches over the top of the pipe; for sewer lines--as shown on the Plans or as specified.

E. Align trench as shown on the Plans unless a change is necessary to miss an unforseen obstruction.

F. For water pipe, shape the bottom of the trench to provide uniform bearing of the pipe on undisturbed earth throughout its entire length. Dig bell holes to aid in securing uniform support of the pipe.

G. For sewer pipe, fill the bottom of the trench with granular material as specified herein.

H. When unstable soil is encountered at the trench bottom, remove it to a depth required to assure support of the pipeline and backfill to the proper grade with coarse aggregate AASHTO M-43, Size No. 2 or 3. This will be a pay item under crushed stone for undercutting material.

I. Remove rock encountered in trench excavation to a depth of 6 inches below the bottom of the pipe barrel, backfill with an approved material, and compact to uniformly support the pipe. In no case shall solid rock exist within six (6) inches of the finished pipeline.

J. When rock borings or soundings are provided, they are for information only and do not guarantee existing conditions. Make such investigations as deemed necessary to determine existing conditions.

3.03 SHEETING, SHORING, AND BRACING

A. When necessary or when directed by the Engineer, furnish, put in place, and maintain such sheeting, bracing, etc., as may be required to support the sides of the excavation and to prevent movement.

B. Take care to prevent voids outside the sheeting.

C. If voids are formed, immediately fill and ram to the satisfaction of the Engineer.

D. Devise plans for performing this work subject to the approval of the Engineer.

E. Unless adjacent facilities will be injured, remove all sheeting, shoring, and bracing after backfill has been placed to a depth of 18 inches over the pipeline.

F. Cut shoring off at the top of the pipe and leave the lower section in the trench.

3.04 USE OF EXPLOSIVES

A. Conduct all blasting operations in accordance with prevailing municipal, state or other agency regulations, codes, ordinances, or laws.

B. Exercise due caution when blasting adjacent to existing structures and pipelines.

C. If structures or pipelines are damaged, promptly replace or repair them at no expense to Owner.

D. Do not conduct blasting operations within 25 feet of water, sewer, gas or other utility lines, unless otherwise directed by the Engineer.

E. Cover all shots with blasting mats to prevent flying material.

3.05 DISPOSAL OF EXCAVATED MATERIAL

A. Satisfactorily dispose of all excess excavated material that cannot be used for or is not suitable for embankments.

3.06 UNAUTHORIZED EXCAVATION

A. Unauthorized Excavation will be defined as an excavation outside or below the proposed lines and grades shown on the Plans or directed by the Engineer.

B. Backfill areas of Unauthorized Excavation with the type material necessary (earth, rock, or concrete) to insure the stability of the structure of construction involved.

C. Unauthorized Excavation or backfill to replace same shall not be a pay item.

3.07 REMOVAL OF WATER

A. Keep excavated areas free of water while work is in progress.

B. Well-pointing shall be performed if required.

C. Take particular precautions to prevent the displacement of structures or pipelines as a result of accumulated water.

3.08 OBSTRUCTIONS

A. Obstructions shown on the Plans are for information only and do not guarantee their exact locations nor that other obstructions are not present.

B. When utilities or obstructions are not shown on the plans but are present off the roadway at the location of the proposed pipeline route, the Contractor may request to relocate the pipeline in the roadway if necessary to avoid disturbing the utility or obstructions.

C. If the relocation is approved, the Contractor shall receive compensation for additional granular backfill and pavement replacement as measured and paid for under Crushed Stone for Shoulder Repair and Pavement Maintenance.

D. Exercise due care in excavating adjacent to existing obstructions and do not disturb same unless absolutely necessary.

E. In the event obstructions are disturbed, repair or replace as quickly as possible to the condition existing prior to their disturbance. This repair or replacement will not be a pay item.

F. If desired by the utility company, pay for the repair or replacement work performed by the forces of the utility company or other appropriate party.

G. If replacement or repair of disturbed obstructions is not performed after a reasonable period of time, the Owner may have the necessary work done and deduct the cost of same from payments to the Contractor.

3.09 STORM SEWER BEDDING

A. Use Class A, B, or C bedding, whichever is shown on the Plans. If not shown, use Class C bedding.

B. Construct Class B bedding in a trench cut in natural ground or compacted embankment.

1. Bed pipe on 6" of Class B material and sufficient additional Class B material accurately shaped by a template to fit the lower part of the pipe exterior.

2. Ram and tamp in layers not over 6", in loose thickness, around the pipe to a minimum depth of that shown on the Plans.

3. When bell and spigot pipe is to be placed, dig recesses in the bedding material of sufficient width and depth to accommodate the bell.

C. Construct Class C bedding in a shallow trench.

1. Shape the bedding to fit the lower pipe exterior for the specified embedment.

2. When bell and spigot pipe is to be placed, dig recesses of sufficient width and depth to accommodate the bell.

3.10 SANITARY SEWER BEDDING

A. Always maintain proper grade and alignment during the bedding and tamping process.

1. Any pipe dislodged during this process shall be replaced by the Contractor at his expense.

2. Dig bell holes to assure uniform support of the pipe.

B. Bedding for PVC and RCP sewers.

1. Completely encapsulate each sewer pipe section with 6" of granular material on the top, both sides, and the bottom of the pipe.

2. For PVC sewer pipe, use Class I angular material.

3. Bedding for RCP sewer pipe may be rounded material where crushed material is not readily available.

C. Bedding for ductile iron pipe sewers.

1. Lay each sewer pipe section on a 6" bed of granular material and backfill to the springline of the pipe with granular material.

2. In unimproved areas, use Class I or II granular material.

3. In improved areas, use Class I angular material.

3.11 BEDDING FOR WATERLINES

A. Bed in a trench cut in natural ground.

B. Dig bell holes to assure uniform support throughout the entire length of pipe.

C. Excavate the trench in such a manner as to form a suitable bed on which to place the pipe.

3.12 INITIAL BACKFILLING

A. Do not begin backfilling before the Engineer has inspected the grade and alignment of the pipe, the bedding of the pipe, and the joints between the pipe. If backfill material is placed over the pipe before an inspection is made, reopen the trench in order for an inspection to be made.

B. Perform backfilling by hand, together with tamping, until fill has progressed to 18" above the top of the pipe.

1. Deposit Class I granular material (where required) or loose soil free from lumps, clods, frozen material, or stones in layers approximately 6" thick.

2. Compact by hand, or with manually operated machine tampers actuated by compressed air or other suitable means.

3. Use tamps and machines of a suitable type which do not crush or otherwise damage the pipe.

3.13 FINAL BACKFILLING

A. After the backfill has reached a point 18" or more above the top of the pipe, perform final backfilling depending upon the location of the work and danger from subsequent settlement.

B. Backfilling in unimproved areas.

1. Dispose of and replace all soft or yielding material which is unsuitable for trench backfilling with suitable material.

2. Deposit backfill to the surface of the ground by dragline, bulldozer, or other suitable equipment in such a manner so as not to disturb the pipe.

3. Neatly round sufficient surplus excavated material over the trench to compensate for after settlement.

4. Dispose of all surplus excavated material.

5. Prior to final acceptance, remove all mounds to the elevation of the surrounding terrain.

C. Backfilling beneath driveways and streets where non-rigid and rigid type surfacing is to be replaced.

1. Use Class I granular material of either crushed limestone or crushed gravel of high weight and density.

2. Carefully deposit in uniform layers, not to exceed 6" thick.

3. Compact each layer thoroughly by rolling, ramming, and tamping with tools suitable for that purpose in such a manner so as to not disturb the pipe.

D. Backfilling of shoulders along streets and highways.

1. Backfilling methods and materials for shoulders along streets and highways shall be in accordance with the requirements of governing local, county, or state departments maintaining the particular roadway or highway.

2. Replace with similar materials, all shoulders which may be damaged or destroyed as a result of pipe trenching.

3. Backfilling of shoulders shall not be directly measured for payment unless traffic whips out the shoulder material rather than settling it, then any additional crushed stone placed shall be paid for as crushed stone for shoulder replacement.

4. Where shoulders along state highways have seal coat surfaces, replace with double bituminous seal in accordance with Section 02573, part 2, paragraph 2.14.

5. Where the State Highway Department or local authority requires trenches to be backfilled entirely with granular material in the shoulder of roads, granular material so placed shall not be a pay item, but included in the prices per linear foot of pipe.

E. Crushed stone for pavement maintenance and shoulder replacement.

1. Where possible, salvage and reuse all base material that is removed during construction.

2. Wet and thoroughly compact crushed stone and blade to tie into the existing surface prior to final acceptance.

3. Base material placed as a portion of pavement replacing items will not be directly measured for payment unless traffic whips out the base material rather than settling it, then any additional base material placed shall be paid for as crushed stone for pavement maintenance.

3.14 MEASUREMENT AND PAYMENT - TRENCHING, BEDDING, AND BACKFILLING

A. Pipeline trenching, bedding, and backfilling including solid rock excavation, hauling, and placing, but excluding undercut bedding and crushed stone for payment maintenance and shoulder replacement will not be measured for payment.

B. Payment for trenching, bedding, and backfilling as stipulated above, will be included in the contract unit price for the items with which they are associated.

3.15 MEASUREMENT AND PAYMENT - UNDERCUT BEDDING

A. Crushed stone used for undercut bedding where unsuitable material is excavated, including hauling, placing, and compacting, will be measured for payment by the ton in place. This item does not include bedding on solid rock undercut which is not measured for payment.

B. Crushed stone for undercut bedding as above stipulated will be paid for at the contract unit price per tone as determined by weight tickets.

3.16 MEASUREMENT AND PAYMENT - CRUSHED STONE FOR PAVEMENT MAINTENANCE AND SHOULDER REPLACEMENT

A. Crushed stone for pavement maintenance and shoulder replacement including hauling, placing, blading, and compacting will be measured for payment by the ton in place.

B. Crushed stone for pavement maintenance and shoulder replacement as above stipulated will be paid for at the contract unit price per ton as determined by weight tickets.

SECTION 02536

FORCE MAINS & APPURTENANCES

PART 1 GENERAL

1.1 SUMMARY

A. General
1. Furnish all material, equipment, tools, and labor in connection with the sewage force main, complete and in accordance with the Drawings and these specifications.
2. An air release valve is required at high points in the force main to relieve air locking. Vacuum relief values may be necessary to relieve negative pressures on force mains to protect against pipe collapse.
3. It shall be the Contractor's responsibility to ensure that all necessary materials are furnished to him and that those found to be defective in manufacture are replaced at no extra cost to the Owner. Materials damaged in handling after being delivered by the manufacturer shall be replaced at the Contractor's own expense. If installed material is found to be defective before the final acceptance of the work, the cost of both the material and labor needed to replace it shall not be passed on to the Owner.
4. The Contractor shall be responsible for safely storing materials needed for the work that have been accepted by him until they have been incorporated into the completed project. Keep the interiors of all pipes, fittings, and other accessories free from dirt and foreign matter at all times.
5. Refer to other sections for work related to that specified by this section. Coordinate this work with that required by other sections for timely execution.

B. Section Includes:
1. Force mains.
2. Fittings.
3. Air release valves.
4. Valves.

C. Related Sections:
1. Section 02125 – Erosion and Sedimentation Control.
2. Section 02221 – Trenching, Backfilling and Compaction.
3. Section 02605 – Separation of Pipe Utilities.
4. Section 02722 – Sanitary Sewerage Systems.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Pipe and Fittings:
   1. Basis of Measurement: By linear foot.
   2. Basis of Payment: Includes excavation, backfill, bedding, thrust restraints, pipe, tracer tape, tracer wire and fittings.

B. Air Release Valves
   1. Basis of Measurement: By each.
   2. Basis of Payment: Includes air release valve, fittings, manhole, rim & cover.

C. Valves
   1. Basis of Measurement: By each.
   2. Basis of Payment: Includes valve, valve box and fittings.

1.3 REFERENCES

A. American Association of State Highway and Transportation Officials:
   1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

B. ASTM International:
   1. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
   2. ASTM D1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (6,000 ft-lbf/ft3 (2,700 kN-m/m3)).
   3. ASTM D1785 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
   4. ASTM D2241 - Standard Specification for Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series).
   5. ASTM D2466 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
   6. ASTM D2467 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
   7. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
   8. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

C. American Water Works Association:
   1. AWWA C104 - American National Standard for Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.

2. AWWA C110 - American National Standard for Ductile-Iron and Grey-Iron Fittings, 3 in. through 48 in. (75 mm through 1200 mm), for Water and Other Liquids.
3. AWWA C111 - American National Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
4. AWWA C151 - American National Standard for Ductile-Iron Pipe, Centrifugally Cast, for Water.

D. Ductile Iron Pipe Research Association:
1. DIPRA Section 1X, Thrust Restraint.

1.4 SUBMITTALS

A. Section 01330 - Submittal Procedures: Requirements for submittals.

B. Shop Drawings: Submit shop drawings for PVC pipe, valves and air release valves.

C. Product Data: Submit data indicating pipe material used and pipe accessories.

D. Manufacturer's Installation Instructions: Indicate special procedures required to install Products specified.

E. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.5 CLOSEOUT SUBMITTALS

A. Section 01700 - Execution Requirements: Requirements for submittals.

B. Project Record Documents: Record location of pipe runs, connections, and invert elevations.

C. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Section 01600 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Do not place materials on private property without written permission of property owner.

C. During loading, transporting and unloading, exercise care to prevent damage to materials.

D. Do not drop pipe or fittings.

E. Avoid shock or damage to pipe.

F. Take measures to prevent damage to exterior surface or internal lining of pipe.

G. Do not stack pipe higher than recommended by pipe manufacturer.

H. Store gaskets for mechanical and push-on joints in cool, dry location out of direct sunlight and not in contact with petroleum products.

I. Store valves and air release valves in original shipping containers until time for installation.

1.7 COORDINATION

A. Section 01300 - Administrative Requirements: Coordination and project conditions.

B. Coordinate the Work with connection to existing municipal sewer and trenching.

PART 2 PRODUCTS

2.1 POLYVINYL CHLORIDE (PVC) PIPE

A. All Class 200, 250, or 315 PVC pipe shall have NSF approval and be manufactured in accordance with ASTM D2241. The following tests shall be run for each machine on each size and type of pipe being produced, as specified below:

1. Flattening Test: once per shift in accordance with ASTM D2412. Upon completion of the test, the specimen shall not be split, cracked, or broken.
2. Acetone Test (Extrusion Quality Test): once per shift in accordance with ASTM D2152. There shall be no flaking, peeling, cracking, or visible deterioration on the inside or outside surface after completion of the tests.
3. Quick Burst Test: once per 24 hours in accordance with ASTM D1599.

SDR	PRESSURE RATING	MINIMUM BURSTING PRESSURE, PSI
13.5	315	1,200
17	250	1,000
21	200	800

4. Impact Tests: for 6 inches and larger, once per shift in accordance with ASTM D2444; for 4 inches and smaller, once each 2 hours in accordance with ASTM D2444.
5. Wall Thickness and Outside Dimensions Tests: once per hour in accordance with ASTM D2122.
6. Bell Dimensions Test: once per hour in accordance with ASTM D3139.

B. Furnish a certificate from the pipe manufacturer stating that he is fully competent to manufacture PVC pipe of uniform texture and strength and in full compliance with these specifications and further stating that he has manufactured such pipe and done so in sufficient quantities to be certain that it will meet all normal field conditions. In addition, the manufacturer's equipment and quality control facilities must be adequate to ensure that each extrusion of pipe is uniform in texture, dimensions, and strength. Also furnish a certificate from the manufacturer certifying that the pipe furnished for this project meets the requirements of these specifications.

C. All 4 inches and 6 inches pipe may be furnished in the manufacturer's standard laying lengths of 20 feet, 38 feet, or 40 feet. Pipe 8 inches and larger shall be furnished in 20 feet lengths. The Contractor's methods of storing and handling the pipe shall be approved by the A/E. All pipe shall be supported within 5 feet of each end; in between the end supports, there shall be additional supports at least every 15 feet. The pipe shall be stored away from heat or direct sunlight. The practice of stringing pipes out along the proposed water line routes will not be allowed.

D. Certain information shall be applied to each piece of pipe. At the least, this shall consist of:

(1) Nominal size
(2) Type of material
(3) SDR or class
(4) Manufacturer
(5) NSF Seal of Approval

E. Pipe that fails to comply with the requirements set forth in these specifications shall be rejected.

F. The pipe shall have push-on joints designed with grooves in which continuous molded rubber ring gaskets can be placed. Gaskets shall be made of vulcanized natural or synthetic rubber; no reclaimed rubber will be allowed. Gasket materials shall meet the requirements of ASTM F477. The gaskets shall be of the manufacturer's standard design dimensions and of such size and shape as to provide a positive seal under all combinations of joint and gasket tolerance. The gasket and annular groove shall be designed and shaped so that when the joint is assembled, the gasket will be radially compressed to the pipe and locked in place against displacement, thus forming a positive seal.

G. The spigot end of each pipe shall be beveled so that it can be easily inserted into the gasket joint, which in turn shall be designed so that the spigot end may move in the socket as the pipe expands or contracts. The spigot end shall be striped to indicate the distance into which it is to be inserted into the socket. Each joint shall be able to accommodate the thermal expansions and contractions experienced with a temperature shift of at least 75 degrees F.

H. Enough lubricant shall be furnished with each order to provide a coat on the spigot end of each pipe. This lubricant shall be nontoxic, impart no taste or smell to the water, have no harmful effect on the gasket or pipe material, and support or promote any bacterial growth. The lubricant containers shall be labeled with the manufacturer's name.

I. Joints shall be manufactured in accordance with ASTM D3139 except that the thickness of the bell shall be, as a minimum, equal to that of the barrel. Joints shall be either integral bell and ring joints with rubber compression gaskets as manufactured by the Clow Corporation, H&W, or Vulcan Plastic Corporation; twin gasket couplings as manufactured by the Certain-Teed Products Corporation; or equal. However, the pipe and bell must be made by the same manufacturer.

J. PVC Pressure Sewer Pipe (Forcemain) shall be SDR 21.

2.2 FITTINGS

A. Standard and special fittings shall be ductile iron. Use standard mechanical joint fittings. All fittings shall conform to the specifications of ANSI A21.10/AWWA C110, standard body. The gaskets shall be ducked tipped transition gaskets for use with PVC pipe.

B. Fittings shall be lined with enameline or a thin cement lining as specified in ANSI A21.4/AWWA C104. In addition, a bituminous seal coat or asphalt emulsion spray coat approximately 1 mil thick shall be applied to the cement lining in accordance with the pipe manufacturer's standard practices. A petroleum asphaltic coating approximately 1 mil thick shall be applied to the outside of the pipe.

C. Fitting laying lengths shall conform to ANSI A21.10/AWWA C110, standard body.

D. Fittings shall be in accordance with the standard mechanical joint fittings manufactured by the U.S. Pipe and Foundry Company, American Cast Iron Pipe Company, Clow Corporation, Griffin, McWane, or equal.

2.3 AIR RELEASE VALVES

A. Furnish materials according to the Town of Arlington standard detail. If recommended by the pump manufacturer based on the specific conditions, a combination air/vacuum release valve may be required.

B. Description:
   1. Body and cover: Cast iron.
   2. Stem and float: Stainless steel.
   3. Trim: Stainless steel.
   4. Orifice Seats: Buna-N.
   5. Backflushing and Cleaning Accessories:
      a. Shutoff valve at bottom inlet.
      b. Blow-off valve near bottom of valve body.
      c. Clear-water inlet valve with quick-disconnect coupling.
      d. Air inlet with quick-disconnect in valve cover.
      e. Hose with quick-disconnect couplings.

2.4 VALVES

A. All buried valves shall open counter-clockwise.

B. Valves shall be of the size shown on the Drawings or as noted and as far as possible equipment of the same type shall be identical and from one manufacturer.

C. Valves shall have the name of the maker, nominal size, flow directional arrows, working pressure for which they are designed and standard to which they are manufactured cast in raised letters on some appropriate part of the body.

D. Unless otherwise noted, valves shall have a minimum working pressure of 150 psi or be of the same working pressure as the pipe they connect to, whichever is higher, and suitable for the pressures noted where they are installed.

E. Valves shall be of the same nominal diameter as the pipe or fittings they are connected to. Except as otherwise noted, joints shall be mechanical joints, with joint restraint where the adjacent piping is required to be restrained.

F. Valves shall be especially constructed for buried service.

G. Valves shall be manufactured in accordance with AWWA C509 and as specified herein. Valves shall be Mueller Company of Decatur, Illinois; Clow Valve Company (A Division of McWane Inc.) of Oskaloosa, Iowa; Kennedy Valve Company (A Division of McWane Inc.) of Elmira, New York; M&H Valve Company of Anniston, Alabama; US Pipe, Valve & Hydrant Division of Mueller Company of Decatur, Illinois; or equal.

2.5 UNDERGROUND PIPE MARKERS

A. Detectable Tape: Foil backed, bright colored, continuously printed, minimum 6 inches wide by 4 mil thick, manufactured for direct burial service, imprinted with "Sewage Force Main" in large letters.

B. Trace Wire: Magnetic detectable conductor, #12 AWG, solid copper, brightly colored plastic covering.

C. Install detectable tape and tracer wire in all trenches above all nonmetallic pipe.

2.6 BEDDING AND COVER MATERIALS

A. Bedding and backfilling shall be done in accordance with Town of Arlington Department of Public Works standards, specifications and details.

2.7 CONCRETE

A. Concrete in accordance with Section 03300.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01300 - Administrative Requirements: Verification of existing conditions before starting work.

B. Verify excavation base is ready to receive work and excavations, dimensions, and elevations are as indicated on Drawings.

3.2 PREPARATION

A. Correct over excavation with coarse aggregate.

B. Remove large stones or other hard matter capable of damaging pipe or impeding consistent backfilling or compaction.

3.3 BEDDING

A. Excavate pipe trench in accordance with Section 02324.

B. Place bedding material at trench bottom, level materials in continuous layer from 6 inches below the pipe to 6 inches above the pipe.

C. Maintain optimum moisture content of bedding material to attain required compaction density.

3.4 INSTALLATION - PIPE

A. Install pipe, fittings, and accessories in accordance with Drawings.

B. Route piping in straight line.

C. Install tracer wire alongside pipe before final bedding is placed. Tape tracer wire to pipe as needed to prevent displacement.

D. Install bedding at sides and over top of pipe to minimum compacted thickness of 6 inches.

E. Refer to Town of Arlington standards, details and specifications for backfilling and compacting requirements. Do not displace or damage pipe when compacting.

F. Install detectable tape continuous over top of pipe buried 12 inches below finish grade.

3.5 INSTALLATION - THRUST RESTRAINT

A. Provide pressure pipeline with restrained joints or concrete thrust blocking at bends, tees, and changes in direction; construct concrete thrust blocking in accordance with Drawings.

3.6 INSTALLATION - CRADLES AND ENCASEMENT

A. Provide concrete cradles and encasement for pipeline where indicated on Drawings.

3.7 INSTALLATION – AIR RELEASE VALVES

A. Install at locations as indicated on Drawings and according to manufacturer instructions.

3.8 INSTALLATION – VALVES

A. Install at locations as indicated on Drawings and according to manufacturer instructions.

B. Buried valves shall be cleaned and manually operated before installation. Buried valves and valve boxes shall be set with the stem vertically aligned in the center of the valve box. Valves shall be set on a firm foundation and supported by tamping pipe bedding material under the sides of the valve. The valve box shall be supported during backfilling and maintained in vertical alignment with the top flush with finish grade. The valve box shall be set so as not to transmit traffic loads to the valve.

3.9 FIELD QUALITY CONTROL

A. Section 01400 - Quality Requirements: Field inspecting, testing, adjusting, and balancing.

3.10 HYDROSTATIC TESTS

A. Pressure Test
   1. After pipe has been laid and backfilled as specified above, subject all newly laid pipe or any valved section thereof to a pressure of 200 psi.
   2. The duration of each pressure test shall be at least one hour.
   3. Slowly fill each valved section of pipe with water, and apply the specified test pressure (based on the elevation of the lowest

point of the line or section under test and corrected to the elevation of the test gauge) with a pump connected to the pipe in a manner satisfactory to the A/E. Furnish the pump, pipe, connections, gauges, and all necessary apparatus.

4. Before applying the specified test pressure, expel all air from the pipe. If hydrants or blowoffs are not available at high places, make the necessary taps at the points of highest elevation before testing, and insert plugs after the test has been completed.
5. Carefully examine all exposed pipes, fittings, valves, and hydrants during the test. Remove any cracked or defective pipes, fittings, valves, or hydrants discovered in consequence of this pressure test, and replace with sound material in the manner specified. Repeat the test until the results are satisfactory to the A/E.

B. Leakage Test

1. Conduct the leakage test after the pressure test has been satisfactorily completed. Furnish the pump, pipe, connections, gauges, measuring devices, and all other necessary apparatus as well as all necessary assistance to conduct the test.
2. The duration of each leakage test shall be 2 hours; during the test, subject the main to a pressure of 150 psi.
3. Leakage is defined as the amount of water which must be supplied to the newly laid pipe or any valved section in order to maintain the specified leakage test pressure after the pipe has been filled with water and the air expelled.
4. No pipe installation will be accepted until the leakage is less than the number of gallons per 2 hour period listed below:

PIPE SIZES	GALLONS PER 1,000 FEET OF PIPE
2 inches - 2-1/4 inches	0.2
3 inches	0.5
4 inches	0.6
6 inches	0.9
8 inches	1.2
10 inches	1.5
12 inches	1.9
14 inches	2.2
16 inches	2.6
18 inches	2.9
20 inches	3.2
24 inches	3.8

5. Should any test of pipe laid disclose leakage greater than that specified, the Contractor shall, at his own expense, locate and repair the defective joints until the leakage is within the specified allowance.

3.11 PROTECTION OF FINISHED WORK

A. Section 01700 - Execution Requirements: Requirements for protecting finished Work.

B. Protect pipe and aggregate cover from damage or displacement until backfilling operation is in progress.

END OF SECTION

SECTION 02605

SEPARATION OF PIPE UTILITIES

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

A. Location of piped utilities to separate water mains from sewer facilities.

1.02 RELATED WORK

A. Section 02305: Boring and Jacking.
B. Appropriate Piped Utility Sections (02700 Numbers).

PART 2 - PRODUCTS

(Not Used)

PART 3 - EXECUTION

3.01 PARALLEL INSTALLATION

A. Separate water mains at least 10 feet horizontally, measured edge to edge, from any sewer facility whenever possible.
B. When local conditions prevent a horizontal separation of 10 feet, closer installations may be made if:
    1. The bottom of the water main is at least 18" above the top of the sewer facility; or
    2. The sewer is constructed of materials equivalent to water main standards and pressure tested to assure water tightness prior to backfilling.

3.02 CROSSINGS

A. Separate water mains crossing sewer facilities by at least 18" between the bottom of the water main and the top of the sewer facility whenever possible.
B. When local conditions prevent a vertical separation as described above, the following construction shall be used.
    1. Sewers passing over or under water mains should be constructed of materials equivalent to water main standards and pressure tested to assure water tightness prior to backfilling.
    2. Water mains passing under sewers shall, in addition, be protected by providing:

a. A vertical separation of at least 18" between the bottom of the sewer and the top of the water main.
b. Adequate structural support for the sewer to prevent excessive deflection of joints and settling on and breaking the water mains.
c. That the length of water pipe be centered at the point of crossing so that the joints will be equidistant and as far as possible from the sewer.

3.03 SEWER FACILITIES

A. Do not install water mains or sewer facilities which pass through or contact each other.

SECTION 02722

SANITARY SEWERAGE SYSTEMS

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Installation of sanitary sewerage systems.

1.02 RELATED WORK

A. Section 02221: Trenching, Backfilling, and Compaction.

B. Section 02305: Boring and Jacking.

C. Section 02605: Separation of Piped Utilities.

D. Section 03001: Concrete Work.

PART 2 - PRODUCTS

2.01 CONCRETE PIPE AND FITTINGS

A. Reinforced Concrete Sewer Pipe (RCP): conform to the permeability and hydrostatic requirements of ASTM C-497 with flexible gasket joints conforming to ASTM C-443.

B. Non-reinforced Concrete Sewer Pipe: ASTM C-14, except that the minimum content of cement shall be 940 pounds (10 bags) per cubic yard with flexible gasket joints conforming to ASTM C-443.

2.02 POLYVINYL CHLORIDE PIPE AND FITTINGS

A. Manufactured from virgin, National Sanitation Foundation (NSF) approved resin conforming to ASTM D-1784.

B. Unless otherwise specified, all PVC pipe and fittings shall conform to ASTM D-3034 and have a Standard Dimension Ratio (SDR) of 26.

C. The gaskets used for joining PVC sewer pipe shall conform to ASTM F-477.

D. All PVC gravity sewer pipe shall be clearly marked with the manufacturer's name, nominal diameter, SDR, ASTM D-3034, and NSF approved seal.

2.03 DUCTILE IRON PIPE AND FITTINGS

A. Pipe:

1. Manufactured in accordance with ANSI A-21.50 (AWWA C-151) and ANSI A-21.10 (AWWA C-110).

2. A cement lining meeting the requirements of ANSI 21.4 (AWWA C-104).

3. A minimum of 1 mil thick bituminous coating on the outside surface.

4. Clearly mark with manufacturer's name, DI or Ductile, weight, class or nominal thickness, and casting period.

5. Unless otherwise specified or shown on the Plans, ductile iron pipe shall be Class 50 for 200 psi working pressure.

B. Fittings:

1. Fittings 4" - 24": Pressure rated at 350 psi.

2. Fittings 30" - 36": Pressure rated at 250 psi.

3. Joints meeting the requirements of ANSI A-21.11 (AWWA C-111).

2.04 CONCRETE MATERIALS

A. Class "A" in accordance with Section 03001.

2.05 CASTINGS FOR FRAME AND COVERS

A. Gray iron, Class 30, unless otherwise specified, meeting AASHTO M-108.

B. Cleaned and coated with bituminous paint that will produce an acceptable finish that is not affected by exposure to hot or cold weather.

C. Rings and covers for use on watertight manholes shall be machined to a smooth uniform bearing that will provide a watertight seal.

2.06 PRE-CAST CONCRETE MANHOLES

A. AASHTO M-199 SR or ASTM C-478.

B. Flexible boots shall be cast in the manhole to provide for the required number and size pipes and shall be marked to insure installation at proper locations.

C. Use premolded rubber or approved bitumastic gaskets at all joints between sections in sanitary sewer manholes.

2.07 MANHOLE STEPS

A. ASTM C-478.

B. Cast Iron Steps: ASTM A-48, Class 30.

C. Aluminum Steps: fabricated from aluminum alloy 6061, T6.

D. Manhole steps shall be corrosion resistant, free from sharp edges, burrs, or other projections which may be a safety hazard and shall be of sufficient strength to be a live load of 300 pounds imposed at any point.

E. The minimum width of cleat shall be 10 inches.

F. The legs and struts shall be of sufficient length for the cleat to project a minimum clear distance of 4" from the wall when the step is securely imbedded in the manhole wall.

G. The top surface of the cleats shall be designed to prevent foot slippage.

2.08 PIPE ENTRANCE COUPLINGS FOR MANHOLES

Two types of flexible connections will be acceptable:

A. Compression type rubber with stainless steel internal korband and external pipe clamp, conforming to ASTM C923: Kor-N-Seal or approved equal.

B. Integrally cast into pipe opening with external stainless-steel pipe clamps conforming to ASTM C923: Z-Lok or approved equal.

PART 3 - EXECUTION

3.01 PREPARATION

A. Prior to laying pipe, prepare a suitable bedding according to Section 02221.

B. Before placing pipe in the trench, field inspect for cracks or other defects; remove defective pipe from the construction site.

C. Swab the interior of the pipe to remove all undesirable material.

D. Prepare the bell end and remove undesirable material from the gasket and gasket recess.

3.02 INSTALLING GRAVITY SANITARY SEWERS

A. Lay pipe true to the lines and grades from the grade and alignment stakes, or equally usable references.

1. Where laser equipment is used, provide offset hubs at every manhole location for purposes of checking grade between sections.

2. Where batter boards are used, furnish stakes at intervals of 50 feet along the route of the pipeline.

3. Set stakes at such distance from centerline of excavations as is suitable for the excavating method and machinery used.

4. Provide and use accurately set batter boards at each 50 foot interval in establishing the bottom invert of each pipe laid.

B. Accurately establish the centerline of each pipe using a string stretched between targets and a plumb line extended to the centerline of the pipe.

C. Carefully inspect all pipe and each fitting prior to its placement in the trench; reject and remove any defective pipe of fitting from the job site.

D. Lay pipe progressively upgrade, with bell upstream, in such a manner as to form close, concentric joints with smooth bottom inverts. Joining of all pipe shall be in accordance with manufacturer's specifications.

E. Bed each pipe section in accordance with Section 02221.

F. Unless otherwise specified, provide all gravity sewer lines with a minimum of 4 feet of cover in roadways and 2 1/2 feet of cover in open areas, unless ductile iron pipe or concrete encasement is used.

G. Do not allow walking on completed pipelines until backfill has been placed to a depth of at least 6 inches above the crown of the pipe.

H. Keep the interior of the pipe free of all unneeded material, and upon completion of a section between any two manholes it shall be possible to view a complete circle of light when looking through the pipe.

I. When laying pipe ceases, close the open ends of the pipe with a suitable plug for preventing the entrance of foreign materials.

J. Couplings and adapters used for joining dissimilar gravity pipe materials, for repairing and rejoining sections of gravity sewer, shall meet the requirements of ASTM C-594.

K. All couplings and adapters for gravity sewer pipe shall be of rubber, plastic, and metallic materials that will not be attacked by municipal wastewaters or aggressive elements in the soil and conform to ASTM C-425, Section 5.

3.03 SPECIAL CONSTRUCTION REQUIREMENTS

A. Where sanitary sewer lines are installed across streams, the sewer pipe shall be ductile iron pipe with concrete encasement per the standard stream crossing detail. The concrete encasement shall extend far enough beyond the stream bank to prevent stream flow from entering the sewer trench bedding and flowing within the sewer pipe trench.

3.04 INITIAL PROOF TESTING OF SANITARY SEWERS

A. It is the intent to specify a "test as you go" procedure in order to establish confidence in the installation and avoid the unnecessary delay of final acceptance.

B. Before a reach of pipeline is approved for payment, successfully proof test that reach for grade, alignment, cleanliness, and leakage.

C. In the event that four or more reaches fail to satisfactorily pass proof testing procedures, cease pipe laying until deficiencies are identified and corrected.

D. The basis for grade, alignment, and cleanliness testing will be visual inspection. Leakage testing will be by means of low-pressure air as specified hereinafter.

E. Proof test flexible pipeline installation for deflection by pulling a "go-no go" test mandrell through the line after the initial backfill is complete to avoid unnecessary dig-ups.

3.05 FINAL TESTING

A. Before the job is accepted, a final testing procedure is to be followed.

B. Perform a visual inspection when ground water levels are above the pipeline if possible. All visible leaks shall be repaired.

C. If there is evidence of infiltration, make measurement with suitable pipe weirs:

1. If the flow through the lower most manhole of a continuous section of sewer does not exceed 50 gallons day/inch/mile of pipeline and the groundwater level is representative of the highest annual level, the entire continuous section shall be approved for leakage.

2. The leakage test will be conducted with all lines connected (including service lines).

3. If the apparent infiltration rate exceeds 50 gallon/day/inch/mile, then take additional weir measurements to isolate those sections leaking.

4. Any single reach of pipeline which exhibits an apparent infiltration rate in excess 50 gallon/day/inch/mile will not be accepted and all leaks will be located and corrected.

D. If it is not practical to wait for groundwater levels that are representative of the highest annual level, the Contractor may request approval on the basis of a low-pressure air exfiltration test.

1. Such test, if approved by the Engineer, will be conducted in accordance with ASTM C-828.

2. When an exfiltration test is used as a substitute for infiltration testing, correct all conditions that are potential sources of infiltration.

E. If flexible pipe is used, pull an approved go-no go deflection mandrell of 95/100 pipe diameter through all reaches of gravity sewer main. No sections will be accepted that exhibit a deflection of more than 5%.

3.06 LOW PRESSURE AIR EXFILTRATION TEST

A. Calculate the pressure drop as the number of minutes for the air pressure to drop from a stabilized pressure of 3½ to 2½ psig.

B. Times for mixed pipe sizes of varying lengths should be calculated as described in ASTM, C-828-76T using formula t = k d/q (q = .0020).

C. The following times are for one pipe size only:

Pipe Size (inches)	Time, T (sec/100 ft)	Allowable Air Loss, Q (ft^3/min)
6	42	2.0
8	72	2.0
10	90	2.5
12	108	3.0
15	126	4.0
18	144	5.0
21	180	5.5
24	216	6.0
27	252	6.5
30	288	7.0

3.06 SEWER MANHOLES - GENERAL

A. Unless otherwise specified, all manholes shall have an inside diameter of not less than 4 feet and a vertical wall height of not less than 2.5 feet.

B. The clear opening in the manhole shall not be less than 2.0 feet.

C. Depth of the manhole shall be the vertical distance from the lowest invert in the manhole to the base of the ring.

D. Apply an application of bituminous material to the outside of each manhole section prior to backfilling and preferably when making the vacuum test.

E. Backfill manholes with the same material used for pipelines.

3.07 STANDARD PRE-CAST CONCRETE MANHOLES

A. ASTM C-478.

B. The base of the manhole shall be a pre-cast section with openings or flexible connections sized to accept the sewer pipe.

C. Shape manhole inverts from Class B concrete to be smooth, accurately shaped, and in accordance with the Plans.

D. Inlets and outlets from each manhole shall be finished smooth and flush with the sides of the manhole walls so as not to obstruct the flow of liquid through the manhole.

E. Provide a subbase with a minimum of 12" of Class I, granular material, well compacted with mechanical tamping equipment.

F. When completed, the manhole shall be free from channel obstructions and leakage.

G. Seal joints between sections with a rubber O-ring or "RAM-NEK" gasket as shown on the Plans.

3.08 "CAST-IN-PLACE" CONCRETE MANHOLES

A. Manholes shall conform to the dimensions outlined on the Plans.

B. The vertical forms, wall spacers, steps, and placing cone must be carefully positioned and firmly clamped in place before any placement is made.

C. The wall spacers must be located 90 degrees from each other.

D. Use Class "A" concrete with a maximum slump of 4" per Section 03001.

E. First place approximately 1/2 yard of concrete evenly around the walls and vibrate until there is a minimum slope of 60 degrees from the bottom of the forms to the bearing surface both inside and outside of the manhole.

F. When this is complete and before additional concrete is added, vibrate the concrete on each side of each pipe.

G. Deposit additional concrete in evenly distributed layers of about 18" with each layer vibrated to bond it to the preceding layer.

H. Raise the wall spacers as the placement are made, with the area from which the spacer is withdrawn being carefully vibrated.

I. Excessive vibration is to be avoided.

J. A maximum of 2% Calcium Chloride may be added to the concrete, at the Contractor's option, to speed the set.

K. Remove the forms as soon as the concrete has sufficiently set, but not within 6 hours of pouring and not without approval.

L. Excessive honeycombs will be cause for rejection of the manhole. Honeycombs and other imperfections shall be mortared as soon as possible after form removal so that a proper bond will take place.

M. Form marks and offsets of up to ½" will be permitted on the outside surface of the manhole.

N. Form marks and offsets up to ¼" will be permitted inside of the manhole.

O. All offsets on the inside surface of the manhole will be smoothed and plastered so there is no projection of irregularity capable of scratching a worker or catching and holding water or solid materials.

P. Honeycomb will be plastered with mortar, consisting of three parts of masonry sand to one part Portland cement, immediately upon removal of the forms.

3.09 MANHOLE STEPS

A. Set manhole steps at intervals of 15 inches along the wall of the manhole.

B. The treads of the steps shall be free from mortar or other material when the manhole is completed.

C. In pre-cast manholes, the holes left to receive the steps shall be mortared smooth following placement of the steps.

3.10 MANHOLE RINGS AND COVERS

A. Grout manhole rings and covers in place with cement mortar. Bricks may be used for adjustment of ring to match grade.

B. The bearing surfaces between cast rings and covers shall be machined, fitted together, and match marked to prevent rocking.

C. All castings shall be of the types, dimensions, and weights as shown on the Plans and shall be free of faults, cracks, blow-holes, or other defects.

3.11 DROP MANHOLE ASSEMBLIES

A. Drop manhole assemblies shall be constructed as outlined on the Plans.

B. The material used in the drop pipe construction shall be ductile iron and Class "B" concrete.

3.12 MANHOLE VACUUM TEST

A. All manholes shall be subjected to and shall pass a vacuum test of at least 10" Hg. prior to acceptance. The Contractor shall be responsible for providing the equipment required for the testing including the manhole sealing apparatus, gauges, pump, plugs, and operating personnel. The equipment shall be top quality, and in good condition and approved by the Engineer for use.

B. Each manhole shall be tested immediately after assembly and prior to backfilling. The lifting holes shall be plugged with an approved non-shrink grout. The pipes entering the manhole shall be plugged, taking care to securely brace the plugs to prevent them from being drawn into the manhole.

C. With the vacuum tester set in place on top of the cone section of the manhole:

1. Inflate the compression band seal in accordance with the manufacturer's recommendations.

2. Connect the vacuum pump to the outlet port with the valve open and draw a vacuum of 10 inches of mercury (Hg).

3. Close the valve and shut off vacuum pump.

4. Measure the time elapsed for the vacuum to drop to 9 inches Hg.

5. The manhole shall pass if the time is greater than 60 seconds for 48" diameter, 75 seconds for 60" diameter and 90 seconds for 72" diameter manholes.

D. If the manhole fails the vacuum test, necessary repairs shall be made with an approved non-shrink grout while the vacuum is being drawn. Retesting as outlined above shall proceed until a satisfactory test is obtained.

3.13 SEWER SERVICE ASSEMBLIES

A. Where shown on the plans or located in the field, install fittings for individual service assemblies.

1. The standard collector tap shall consist of a wye or tee connected with a service branch.

2. Use vertical risers when the depth of the collector line is greater than 8 feet or when their use will facilitate connection of individual services.

3. Plug the ends of tee branches not to be used immediately with stoppers of the same material and joints used on the collector lines.

B. Where shown on the plans or located in the field, install collector saddles by attaching to the sewer main by stainless steel bands secured by 2 bronze or stainless steel bolts, with a minimum diameter of 3/8".

C. Service pipe shall be 6" in diameter and shall be installed as shown in the Plans.

1. Plug the ends of service pipe and cover the same as for collectors and interceptors (where possible).

2. The minimum grade on service pipes shall be 2% or ¼ inch per foot for 4" and 1% or 1/8 inch per foot for 6".

3.14 MEASUREMENT AND PAYMENT - GRAVITY SEWER PIPE

A. Sewer pipe shall be measured by the linear foot of pipe installed, tested, and accepted without deduction for the trench, granular bed, and backfill, removal, and disposal of existing materials, inspection, internal testing, internal sealing or replacement of defective joints, fittings, and appurtenances.

B. Sewer pipe as above stipulated shall be paid for at the Contract unit price per linear foot for sewer pipe of the various sizes and material classifications.

3.15 MEASUREMENT AND PAYMENT - SEWER MANHOLES

A. Manholes shall be measured by the number installed, tested, and accepted including concrete base, granular sub-base, poured concrete invert, all brick work or pre-cast concrete sections, steps, and castings as shown on the Plans. Measurement of the depth to determine depth classification shall be the vertical distance from the lowest invert in the manhole to the base of the ring. (This item shall not include drop assemblies.)

B. Manholes as above stipulated shall be paid for at the Contract unit price per each for the various depth classifications.

3.16 MEASUREMENT - MANHOLE CASTINGS

A. Manhole castings, except the watertight and traffic type, shall not be measured for payment, but shall be included in the unit price per manhole.

B. As above stipulated, manhole castings shall not be measured for payment, but shall be included in the unit price per manhole.

3.17 MEASUREMENT AND PAYMENT - WATERTIGHT AND TRAFFIC MANHOLE CASTINGS

A. Watertight manhole castings shall be measured by the number installed and accepted.

B. Watertight manhole castings as above stipulated shall be paid for at the Contract unit price per each installed and accepted.

3.18 MEASUREMENT AND PAYMENT - MANHOLE DROP ASSEMBLIES

A. Drop assemblies shall be measured by the number installed, tested, and accepted, including drop pipes, fittings, Class "B" concrete and brickwork. Measurement of the depth to determine depth classification shall be the vertical distance from the lowest invert in the manhole to the invert of the Drop "Tee". (This item shall not include manhole construction.)

B. Drop assemblies as above stipulated shall be paid for at the Contract unit price per each for the various depth classifications.

3.19 MEASUREMENT AND PAYMENT - SEWER SERVICE ASSEMBLIES

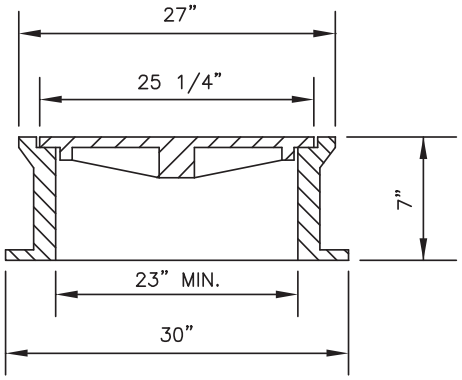
A. Service assemblies shall be measured by the number installed, tested, and accepted including tee branch collection line fittings and plugs. Service pipe shall be measured by the linear foot of pipe installed, tested, and accepted from the centerline of the collection line to the stopping point without deductions for fittings.

B. Service assemblies as above stipulated shall be paid for at the Contract unit price each. Service pipe as above stipulated shall be paid for at the Contract unit price per linear foot for service pipe.

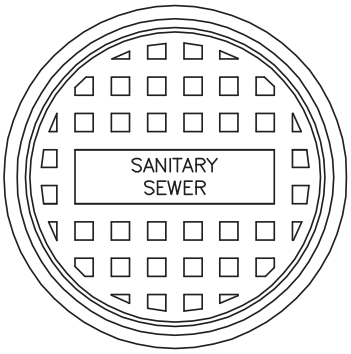
3.20 CONCRETE ENCASEMENT

A. Concrete for encasement of pipe shall be measured by the cubic yard actually specified or shown on the Plans, regardless of any excess placed by the Contractor.

B. Concrete as above stipulated shall be paid for at the Contract unit price per cubic yard, which payment shall be compensation in full for furnishing and placing concrete and for all equipment and incidentals necessary for performance of the work as herein specified or shown on the plans.



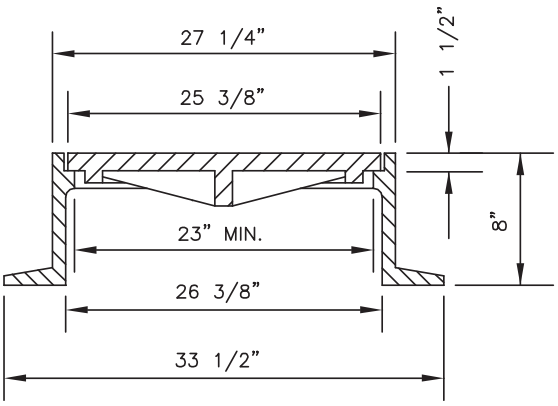
SECTION



TOP VIEW

NON–TRAFFIC

RING 105 lbs.
COVER 105 lbs.
TOTAL 210 lbs.



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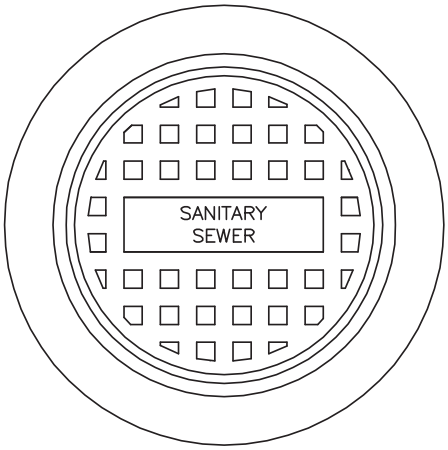
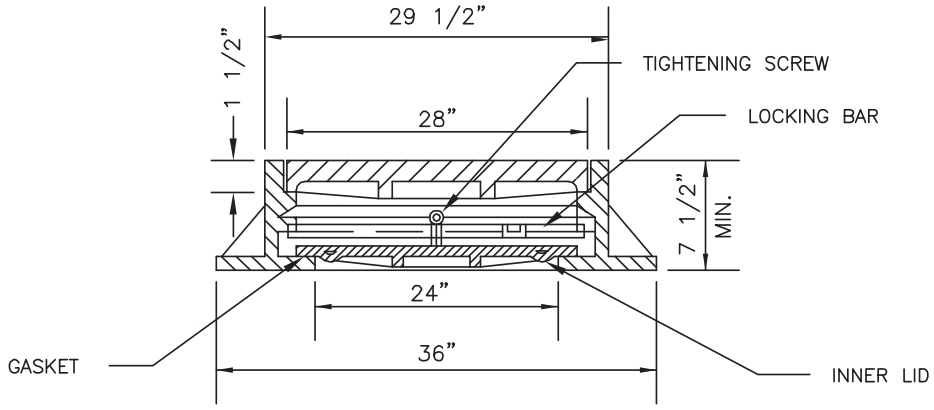


TOP VIEW

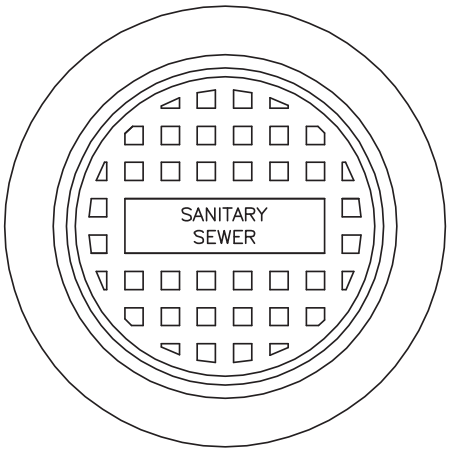
TRAFFIC

RING 190 lbs.
COVER 150 lbs.
TOTAL 340 lbs.

TENNESSEE PUBLIC WORKS CONSTRUCTION STANDARDS	REVISED:	TRAFFIC & NON–TRAFFIC MANHOLE FRAME & COVER	DRAWING NO. MH–FC 1



SECTION

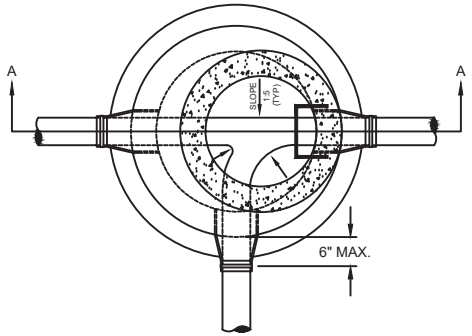


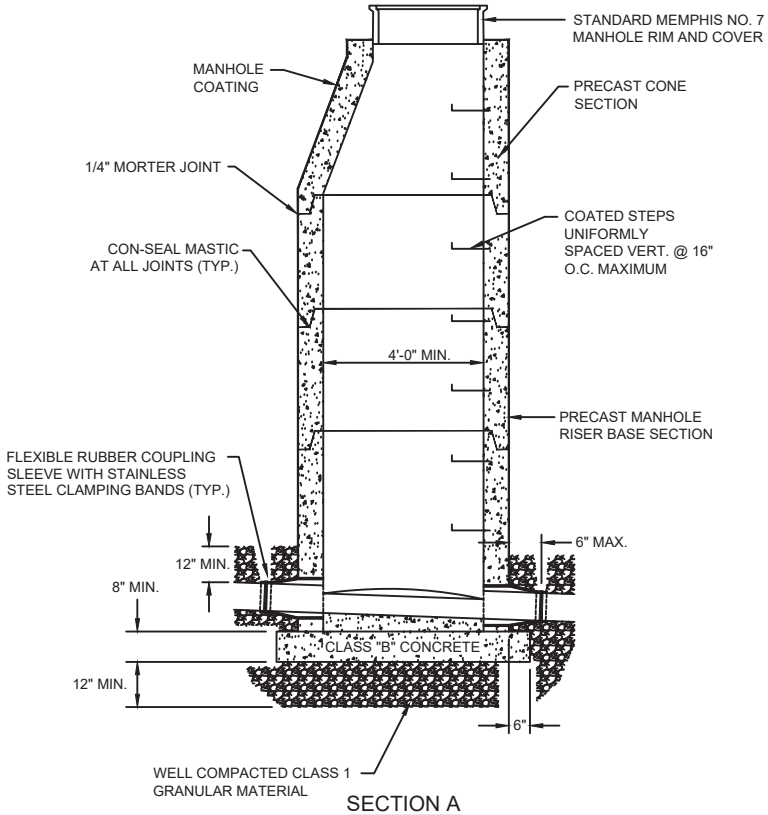
TOP VIEW

WATERTIGHT MANHOLE

TOTAL WEIGHT 500 lbs.

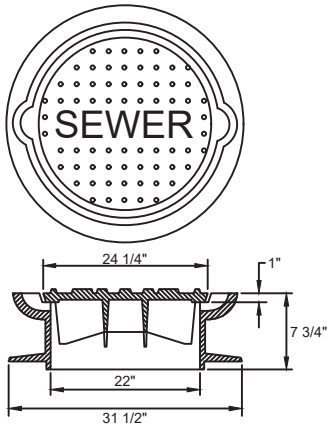
TENNESSEE PUBLIC WORKS CONSTRUCTION STANDARDS	REVISED:	WATERTIGHT MANHOLE FRAME & COVER	DRAWING NO.
			MH–FC 2





SECTION A

MEMPHIS NO. 7 MANHOLE RIM AND COVER, TENNESSEE NO. 3 MANHOLE CASTING WITH TYPE 'B' COVER.



STANDARD MEMPHIS NO. 7
MANHOLE RIM AND COVER

N.T.S.

NOTES:

1. VACUUM TESTING FOR SEWER MANHOLES IS REQUIRED IN ACCORDANCE WITH ASTM C1244–93 ON ALL NEW MANHOLES, AND ANY MANHOLES WITH NEW CONNECTION.
2. ALL CONNECTIONS TO EXISTING MANHOLES SHALL BE CORE DRILLED.
3. RIM AND COVER SEATS MACHINED TO PREVENT ROCKING.
4. COVER CAN BE SEATED WITH STAINLESS STEEL BOLTS AND NEOPRENE GASKETS.
5. MANHOLES LOCATED IN A YARD SHALL BE SET SUCH THAT THE RIM ELEVATION IS 0.5' ABOVE THE HIGHEST ADJACENT GRADE.
6. MANHOLES LOCATED IN A COMMON OPEN SPACE SHALL BE SET SUCH THAT THE RIM ELEVATION IS AT LEAST 1' ABOVE THE HIGHEST ADJACENT GRADE.
7. MANHOLES LOCATED WITHIN A FEMA SPECIAL FLOOD HAZARD AREA SHALL SET SUCH THAT THE RIM ELEVATION IS AT LEAST 1.5' ABOVE THE NEAREST BASE FLOOD ELEVATION INDICATED ON THE MOST CURRENT FEMA FIRM.

DRAWN		
ENGR.		
REV.	DATE	APPROVED

TOWN OF ARLINGTON
Public Works Standard Details

PRECAST SANITARY SEWER MANHOLE DETAIL

DATE
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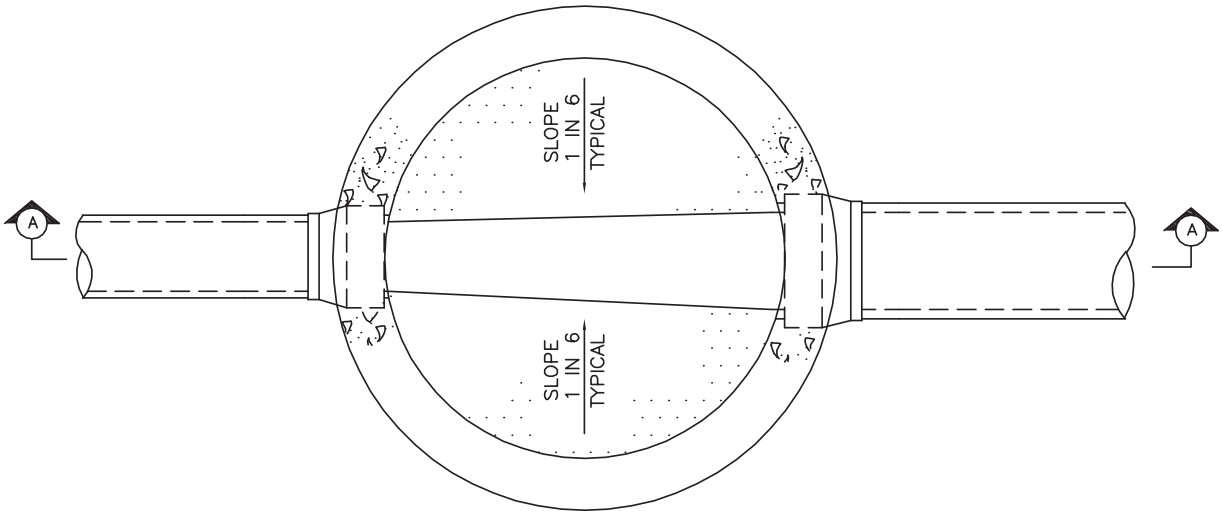
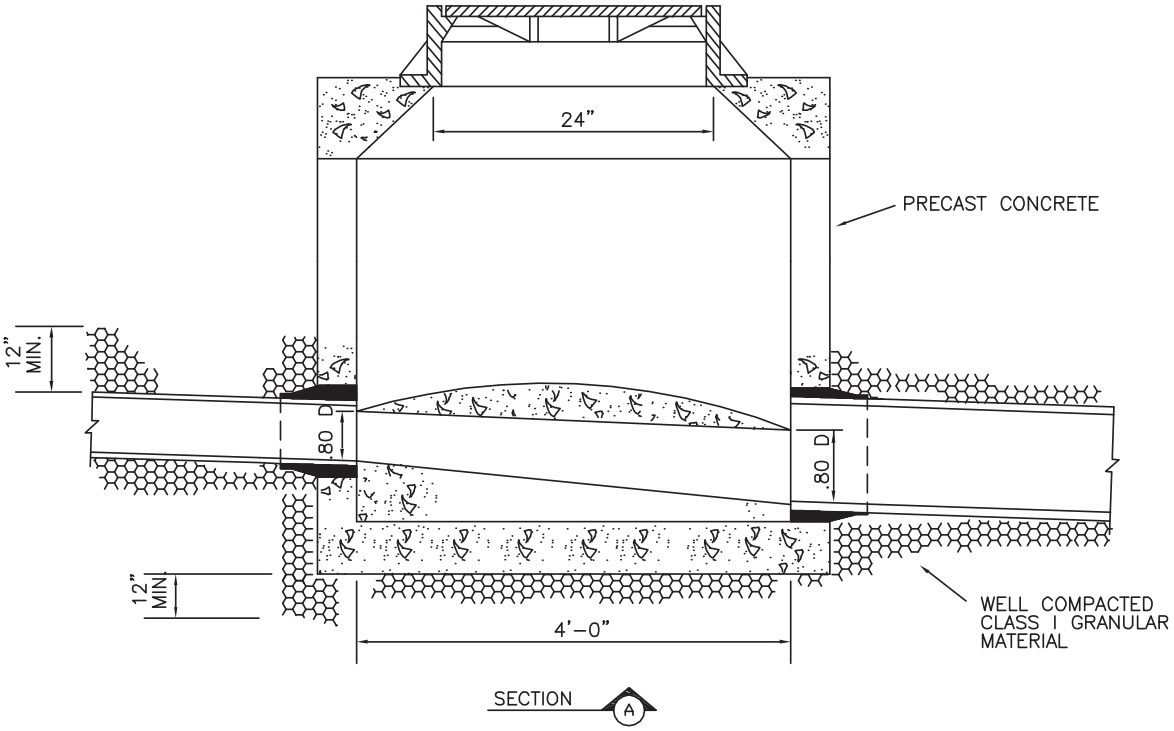
DWG. NO.

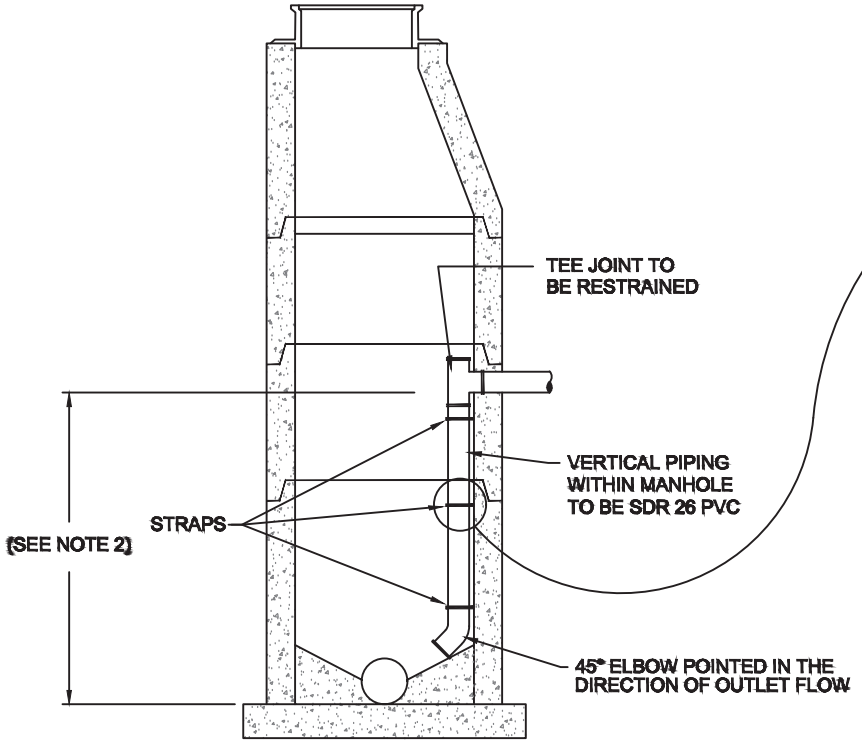


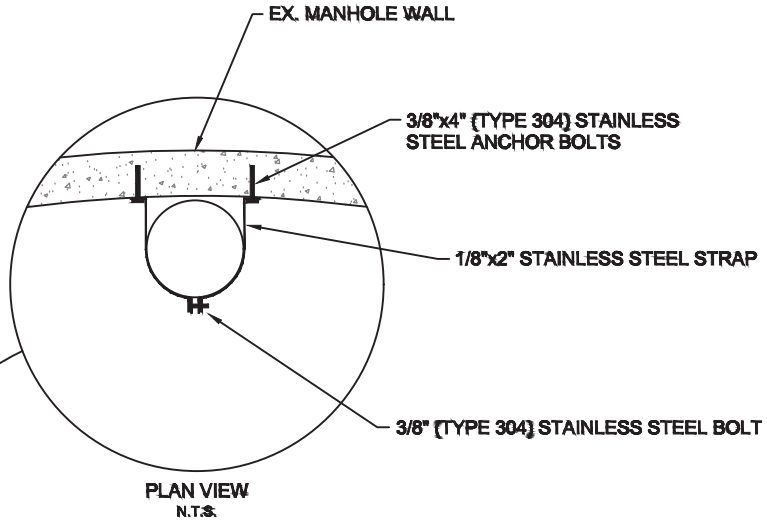
PLAN



SECTION A

TENNESSEE PUBLIC WORKS CONSTRUCTION STANDARDS	REVISED:	SHALLOW PRECAST CONCRETE MANHOLE	DRAWING NO. MH–PC 2





NOTES:

1. TO BE USED ON ALL MANHOLES REQUIRING A DROP CONNECTION.
2. A DROP CONNECTION IS REQUIRED ON ANY INFLUENT PIPE THAT THE INVERT IS 2' OR MORE HIGHER THAN THE EFFLUENT PIPE INVERT.
3. 3' MAXIMUM SPACING BETWEEN STRAPS.
4. A MINIMUM OF 2 STRAPS ARE REQUIRED.
5. INSURE THAT MANHOLE STEPS AND DROP CONSTRUCTION LOCATIONS DO NOT INTERFERE.
6. A FOUR FOOT DIAMETER MANHOLE SHALL BE USED WHEN INSIDE PIPE IS 8" OR LESS. IF PIPE IS LARGER THAN 8", MANHOLE DIAMETER SHALL BE INCREASED ACCORDINGLY.
7. SDR 26 PVC PIPE SHALL BE USED ON ALL DROP CONNECTIONS.
8. OPENING IN MANHOLE TO BE GROUTED WITH HIGH STRENGTH, QUICK SETTING, NON-SHRINK CEMENT GROUT.
9. CONCRETE MAY NEED TO BE POURED INSIDE THE MANHOLE IN ORDER TO PROVIDE A SMOOTH TRANSITION BETWEEN THE FLOWLINE OF THE INFLUENT PIPE AND THE FLOWLINE OF THE EFFLUENT PIPE.

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REV.	DATE	APPROVED

TOWN OF ARLINGTON
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SANITARY SEWER MANHOLE–INSIDE DROP CONSTRUCTION

DATE

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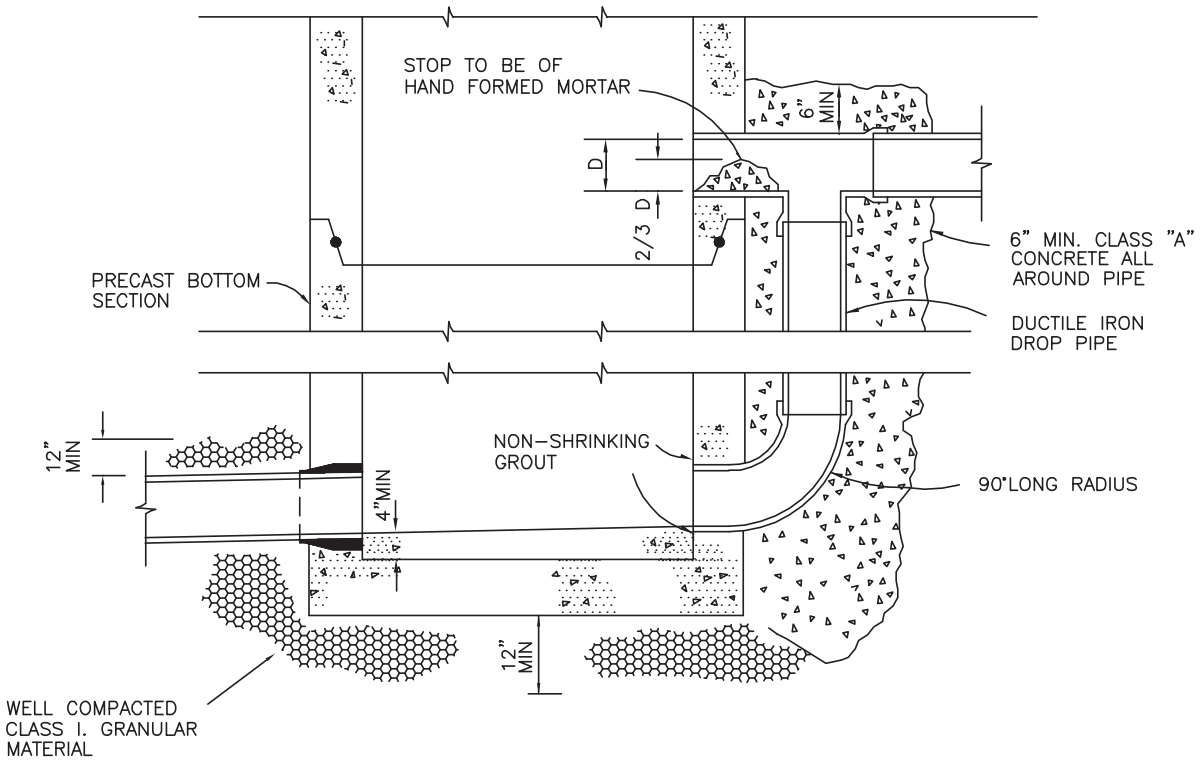
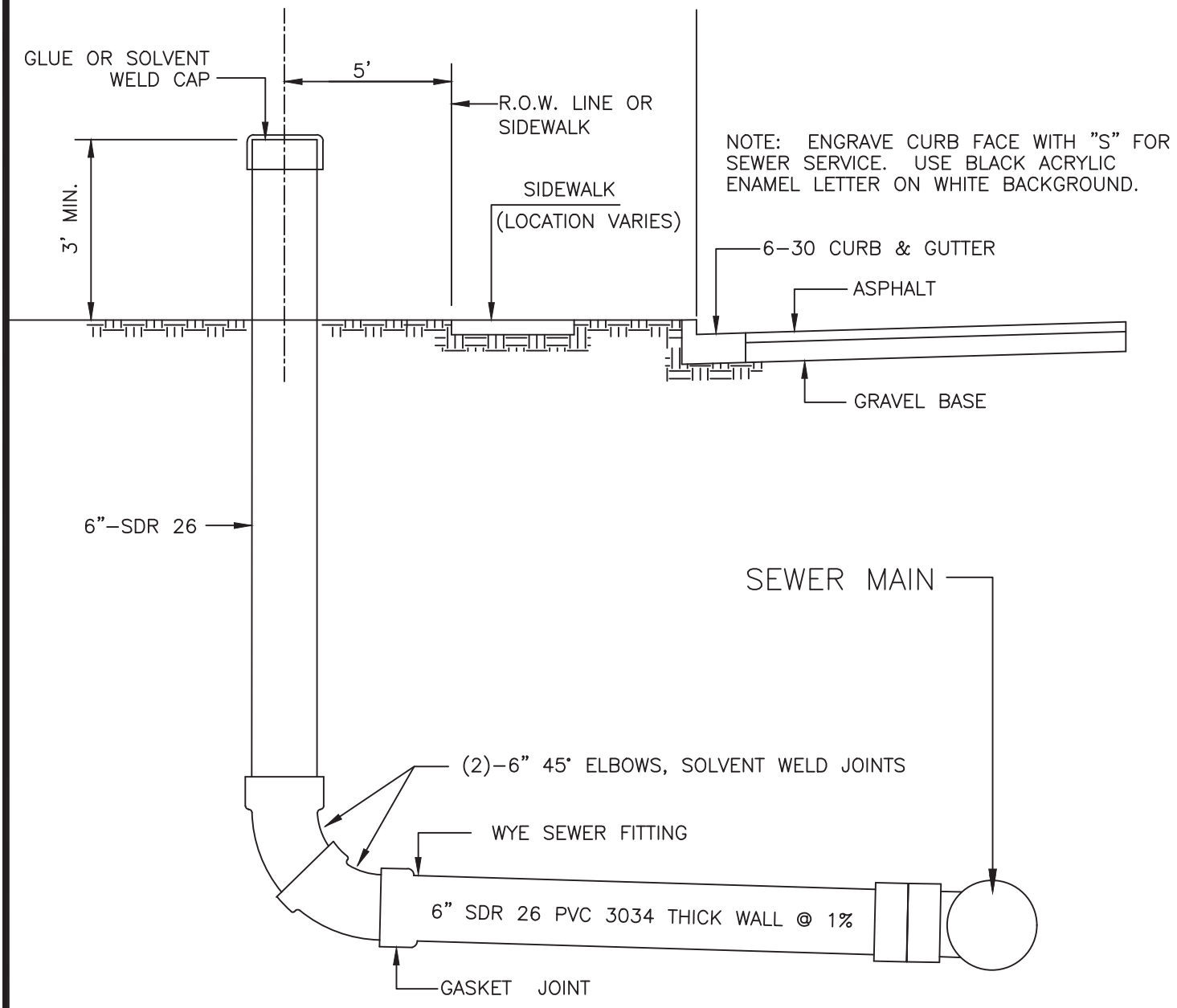
DWG. NO.



OUTSIDE
DROP MANHOLE

TENNESSEE PUBLIC WORKS CONSTRUCTION STANDARDS	REVISED:	OUTSIDE DROP MANHOLE	DRAWING NO.
			MH-D 1



TYPICAL HOUSE SERVICE

NTS

DRAWN			TOWN OF ARLINGTON Public Works Standard Details		DATE
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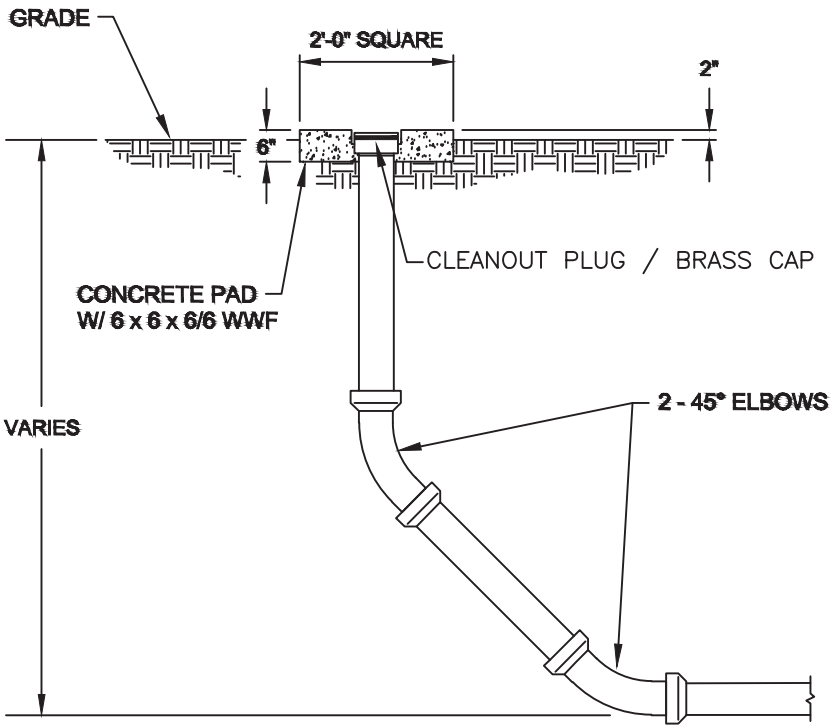
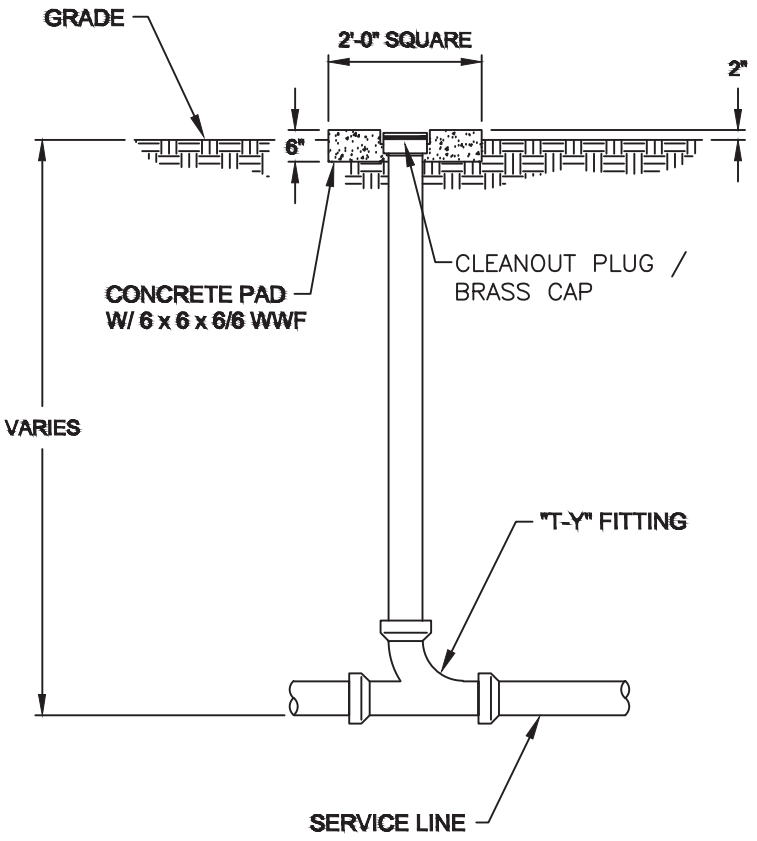
REV.	DATE	APPROVED	TYPICAL HOUSE SERVICE STANDARD		DWG. NO.



TYPE 1



TYPE 2

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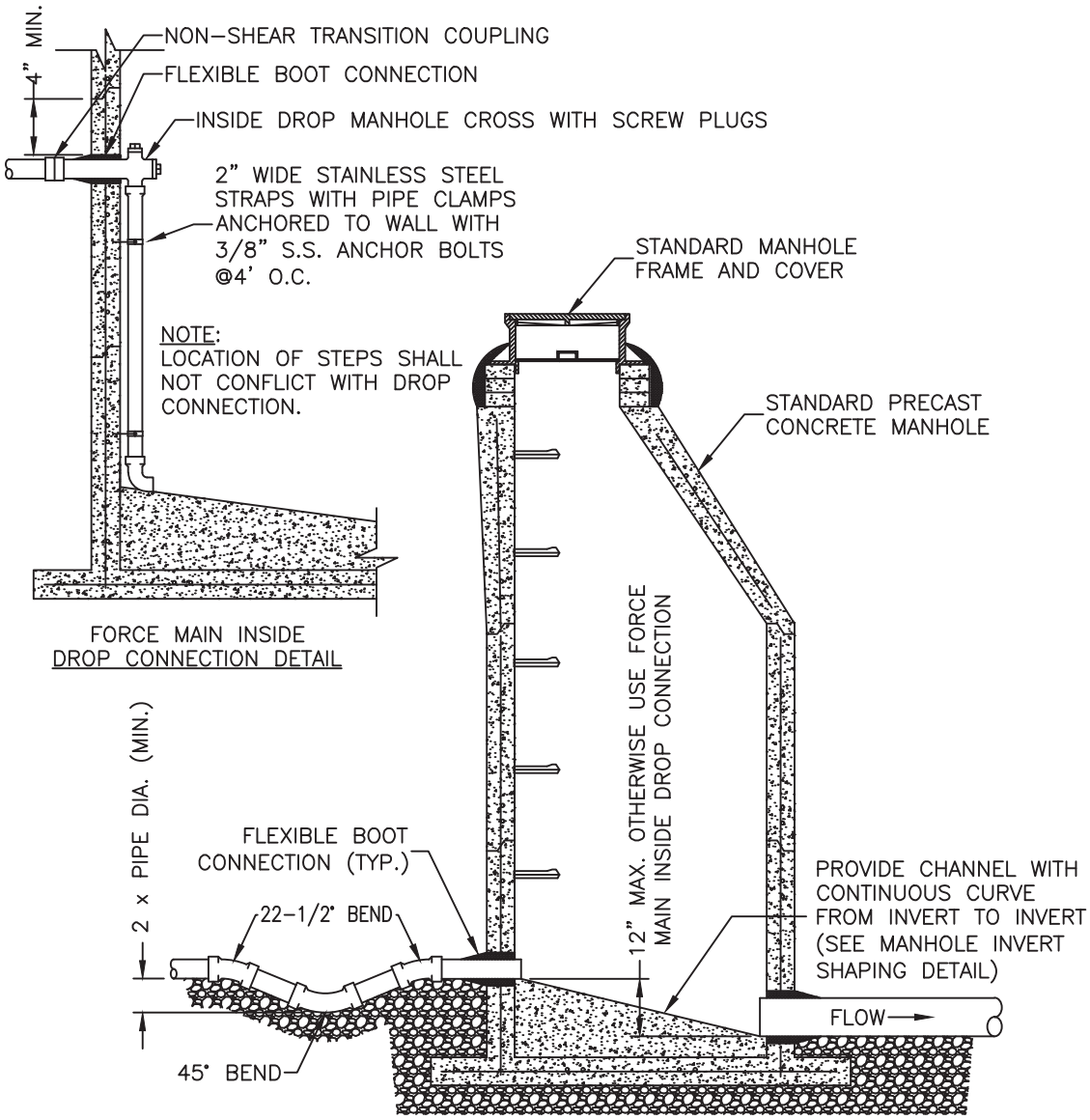
TOWN OF ARLINGTON
Public Works Standard Details

COMMERCIAL CLEAN-OUT DETAIL

DATE

APPR.

DWG. NO.



FORCE MAIN TO MANHOLE CONNECTION

N.T.S.

NOTES:

1. THE RECEIVING MANHOLE AND ALL DOWNSTREAM MANHOLES WITHIN 1000 FEET SHALL BE COATED WITH A 10 MIL THICKNESS OF AN ACID RESISTANT COATING.
2. ALL PIPING AND FITTINGS INSIDE THE MANHOLE SHALL BE SCHEDULE 80 PVC WITH SOLVENT WELD JOINTS WHICH CONFORMS TO ASTM D-1784 AND D-1785.

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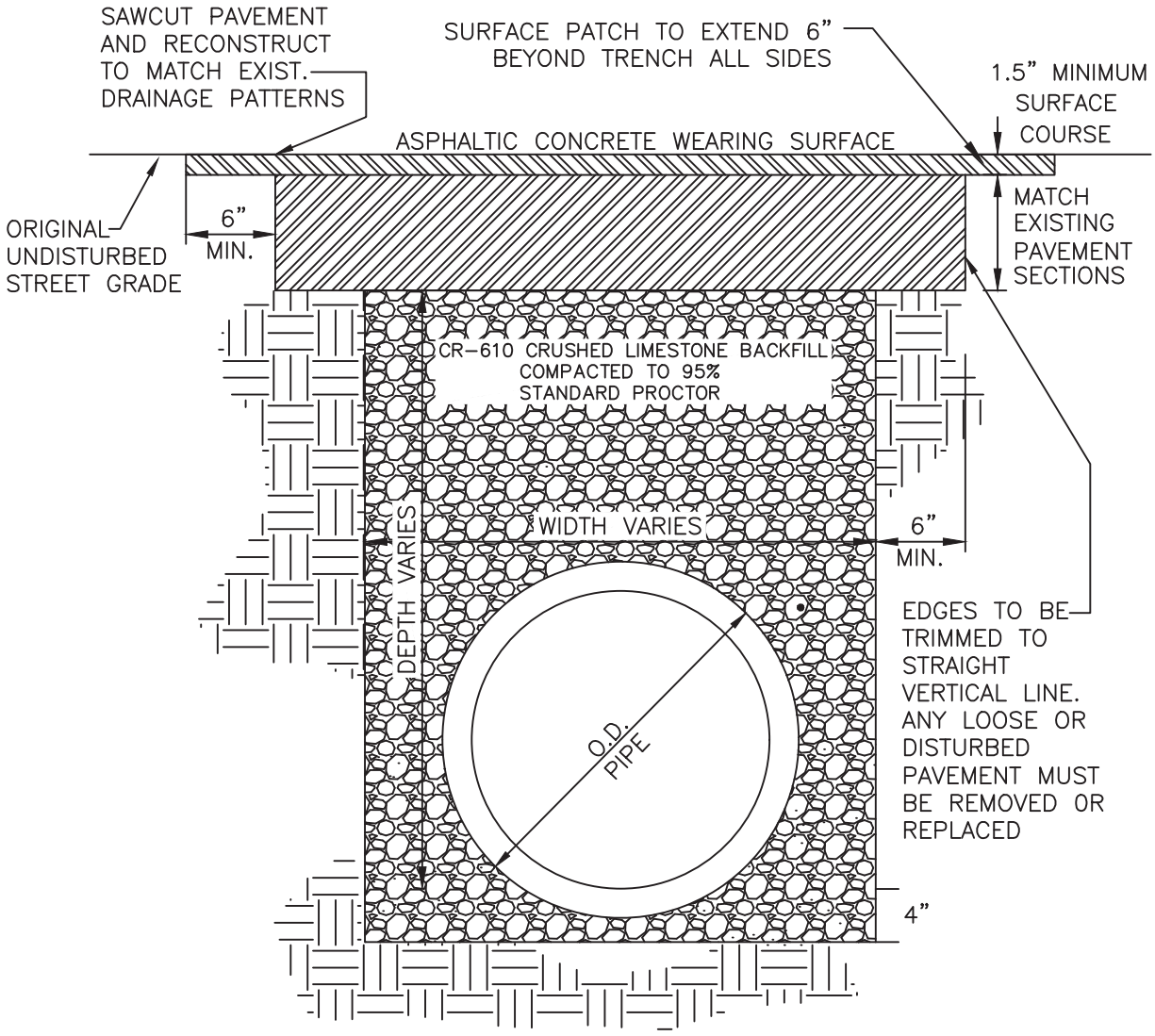
REV.	DATE	APPROVED	MANHOLE CONNECTION STANDARD		APPR.
					DWG. NO.



PATCH FOR ASPHALTIC CONCRETE OR SURFACE TREATED STREETS ON ALL TYPES OF BASE

N.T.S

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REV.	DATE	APPROVED

TOWN OF ARLINGTON
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ASPHALTIC CONCRETE PIPE TRENCH PATCH

DATE

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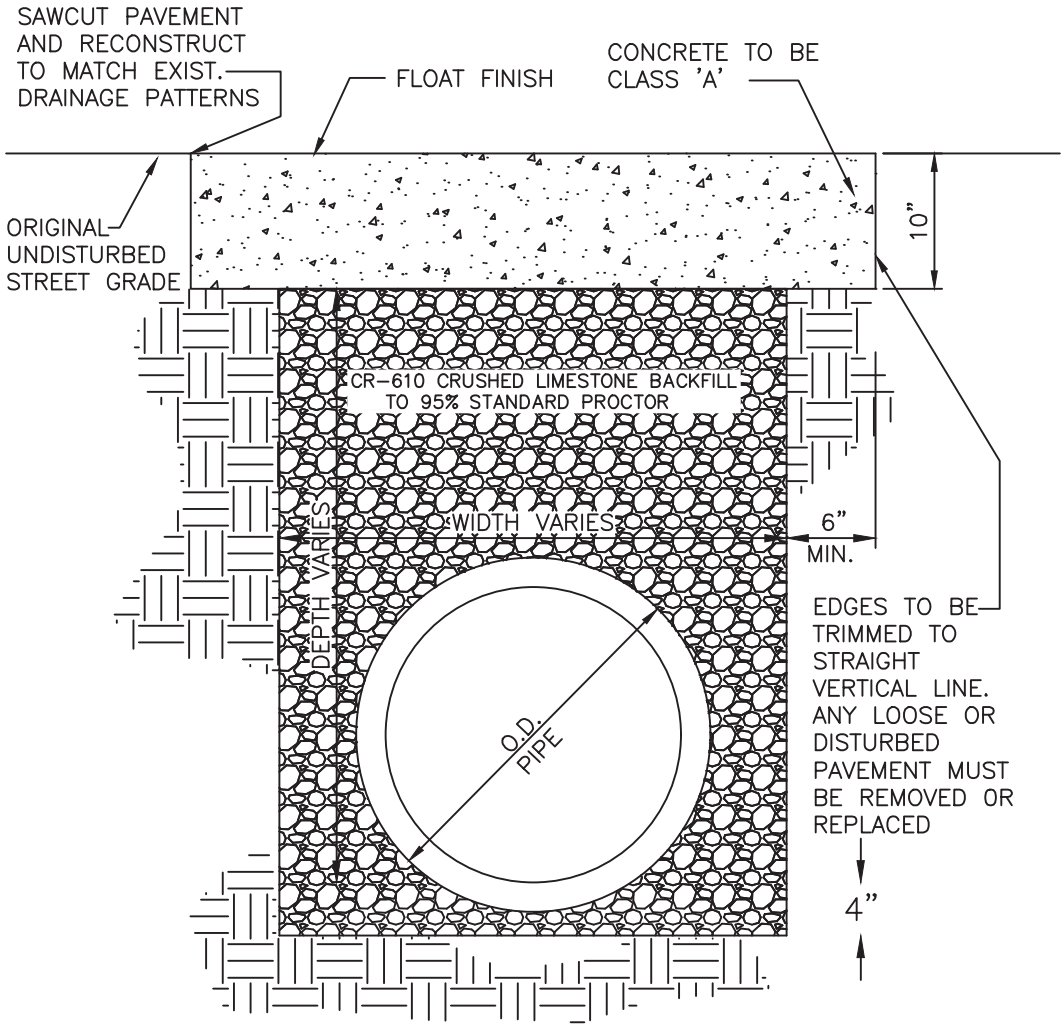

CONCRETE PAVEMENT PATCH

N.T.S

DRAWN			TOWN OF ARLINGTON Public Works Standard Details		DATE
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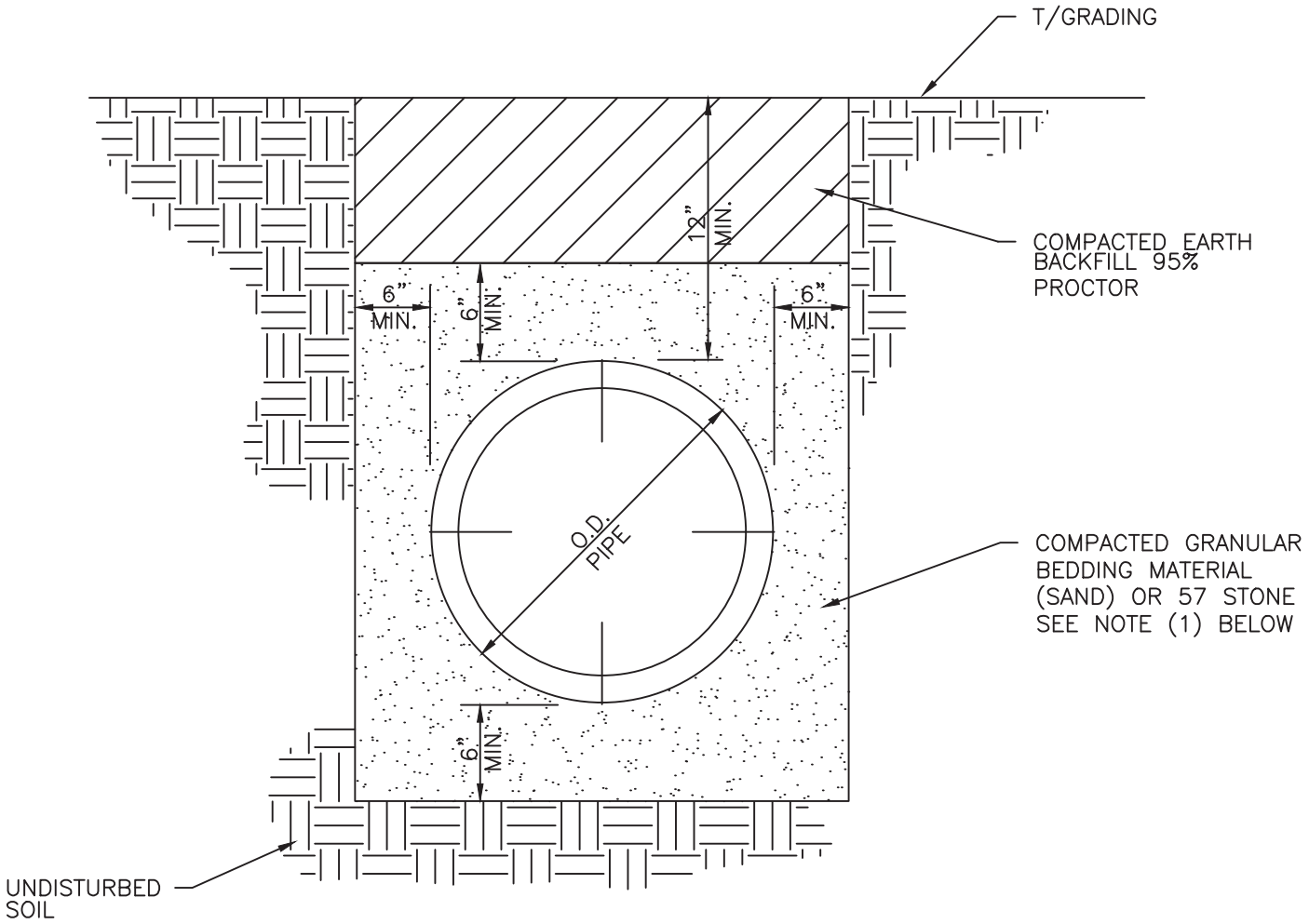
REV.	DATE	APPROVED	CONCRETE PAVEMENT PATCH STANDARD		DWG. NO.



PIPE BEDDING DETAIL FLEXIBLE PIPE (PVC S.D.R. 26 SANITARY SEWER PIPES)

N.T.S

(1) WHEN GROUND WATER IS PRESENT, 57 STONE WITH A GEOFABRIC FILTER CLOTH ENVELOPE SHALL BE USED IN LIEU OF SAND.

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FLEXIBLE PIPE BEDDING STANDARD DETAIL

DATE

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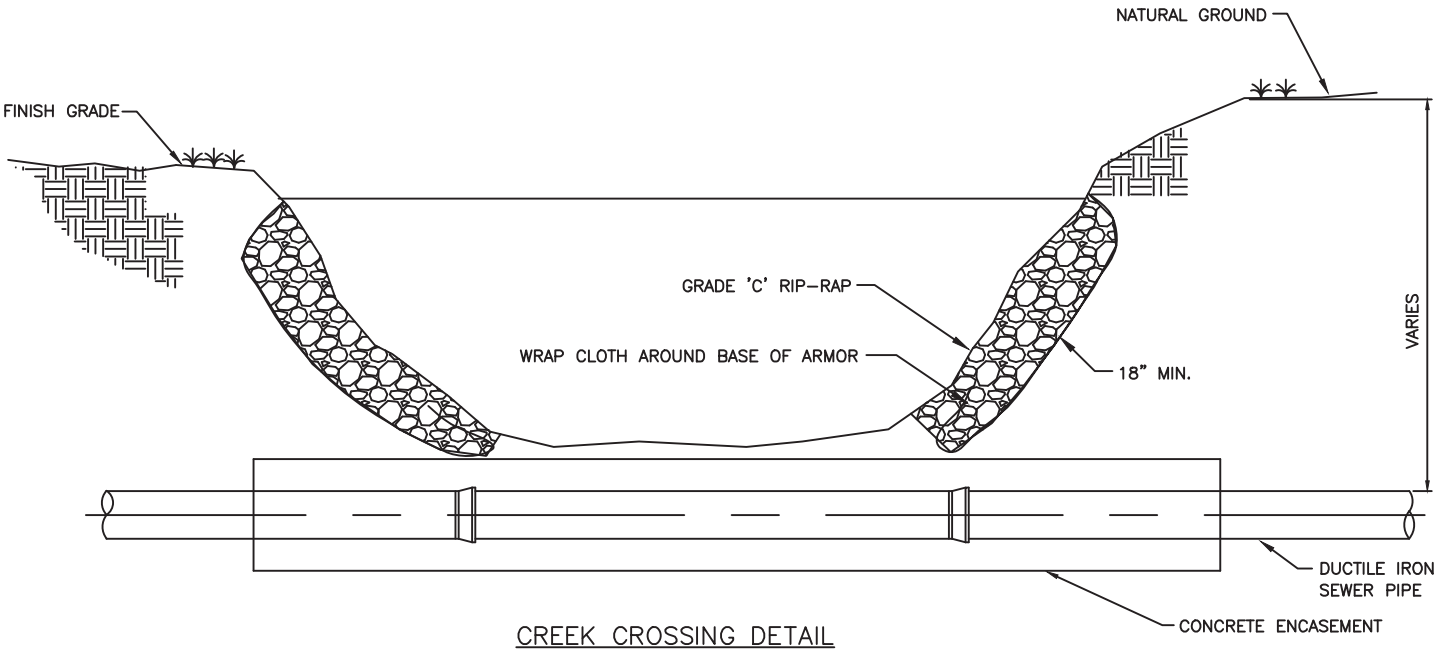
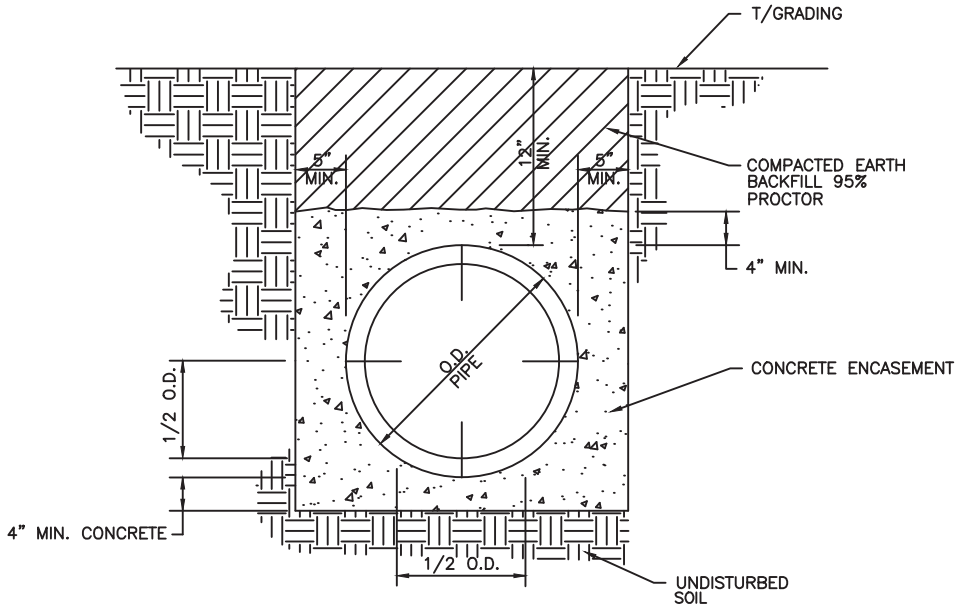


CREEK CROSSING DETAIL
N.T.S.



PIPE ENCASEMENT DETAIL
SANITARY SEWER PIPES
N.T.S

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REV.	DATE	APPROVED

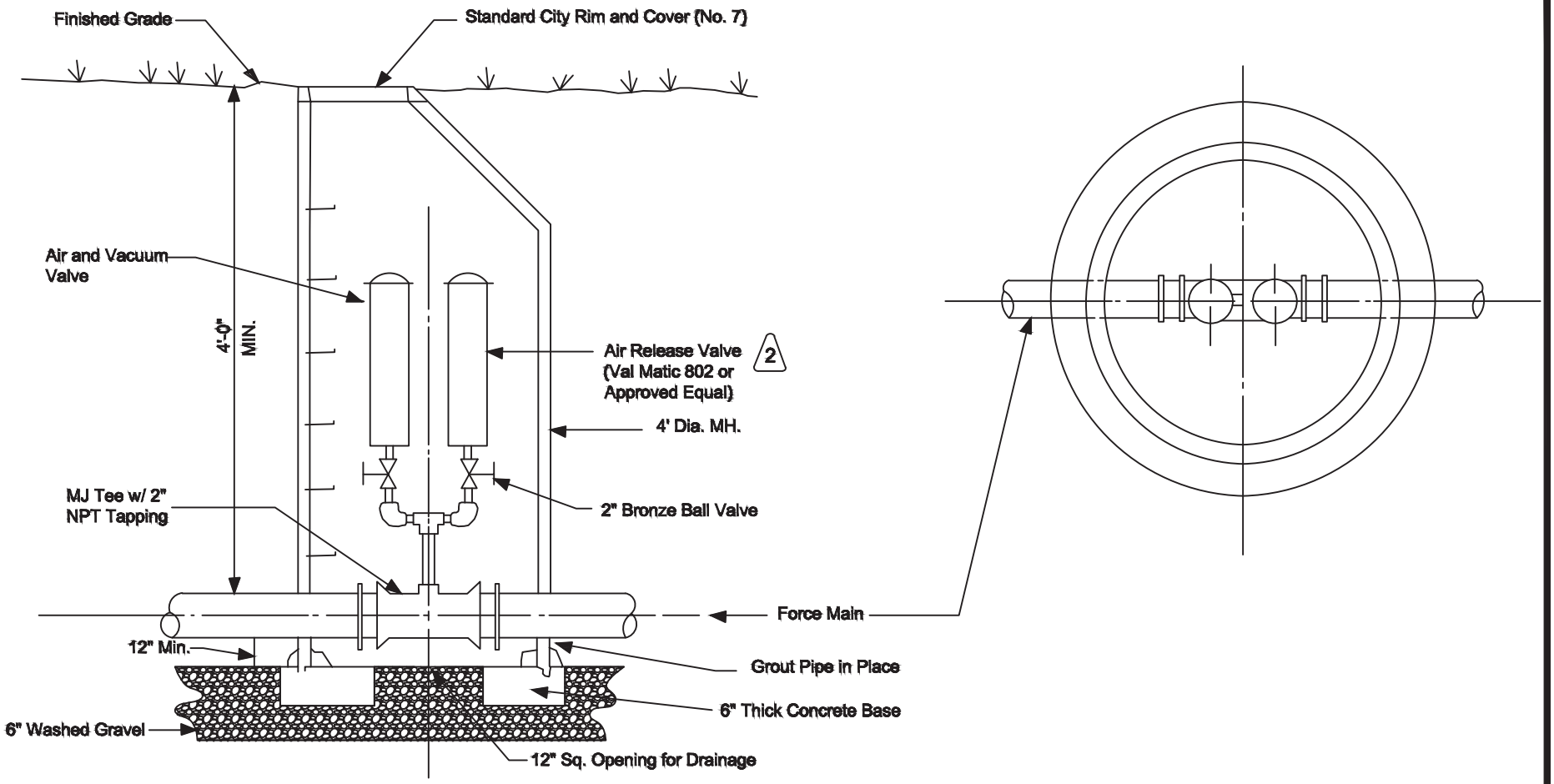
TOWN OF ARLINGTON
Public Works Standard Details

GRAVITY SEWER
STREAM CROSSING

DATE

APPR.

DWG. NO.



Note:
All Pipe Fittings Shall Be 304 Stainless Steel

2 Air B Vacuum Valve maybe deleted at the Direction of the Engineer.

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REV.	DATE	APPROVED

TOWN OF ARLINGTON
Public Works Standard Details

COMBINATION AIR RELEASE VALVE

DATE

APPR.

DWG. NO.

CERTIFICATE OF SERVICE

I hereby certify that a true and correct copy of the foregoing was served via U.S. Mail or electronic mail upon:

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This the 28th day of January 2026.

Melvin Malone