

TOWN OF HAW RIVER NORTH CAROLINA



STANDARD SPECIFICATIONS

AND

DETAILS

FOR

WATER, SEWER AND STREET IMPROVEMENTS



July 2026

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INTRODUCTION

The purpose of these standards is to serve as a guide in the preparation and submittal of plans and for the construction of roadway, utility, and development projects in the Town of Haw River. These guidelines meet the current design standards and ensure more uniformity in the design of those projects. Engineers are encouraged to use these standards in their design process. It is not the intent of this manual to provide an explanation for every design problem encountered, nor, as a substitute for experience, sound judgment, and engineering knowledge.

The Town of Haw River will use these standards and requirements along with sound engineering principles to review the detailed engineering drawings. These standards shall apply to all roadway and utility improvements and developments within the Town of Haw River. In addition, these standards apply to areas outside the Town Limits that are under the jurisdiction of the Town.

The Town of Haw River has the right of final approval over all construction work done under these guidelines and no work will be accepted until approval is made by the Town.

Note: Shop drawings for water, sewer, & storm drainage related materials are to be submitted to the Town for review approval prior to installation. Additional material specifications may be required at times.

TOWN OF HAW RIVER

Revised July, 2026

MATERIAL SPECIFICATIONS

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Note: Shop drawings for water, sewer, & storm drainage related materials are to be submitted to the Town for review approval prior to installation. Additional material specifications may be required at times.

1. General Conditions. The following Specifications cover the material under the applicable documents. Unless otherwise specified, all materials used in the work under this contract shall conform to the requirements of the current specifications of the American Society for Testing Materials, and shall be tested in accordance with the current specifications or current methods of testing of ASTM, where specifications and methods of testing have been adopted, revised, or proposed for such materials. No materials shall be used on the work until accepted by the Engineer, and all materials rejected by the Engineer as unsuitable, or not in conformity with the Plans or Specifications, or failing to pass the required tests, shall be removed immediately from the work at no expense to the Town. Failure to condemn materials on preliminary inspection shall not be grounds for acceptance if future defects are found. All materials and equipment shall be new and free from all flaws or defects.

2. Cement. All cement used in mortar, or concrete shall conform to Specifications for Portland Cement of ASTM C-150. Brand of cement proposed for use by the Contractor will be subject to the approval of the Engineer. Type II shall be used in all work unless approved by the Engineer.

3. Sand. All sand used in mortar or concrete shall be clean, sharp, practically free from loam, clay or organic matter, and so graded as to ensure workability and water tightness when mixed with other ingredients. Sand will conform to ASTM Specifications C-33 and when made into mortar will have a compressive strength at 7 and 28 days of not less than 100% of mortar made with standard sands.

4. Coarse Aggregate. Coarse aggregate will consist of broken stone, sound, hard and tough, and will conform to the specifications of coarse aggregate given in ASTM Specification C-33. Stone will be broken to the sizes hereinafter specified under "Concrete" for the various classes of concrete, and grading will be well within the limits specified.

5. Water. Water used for mixing concrete and mortar will be clean, and free from deleterious amounts of acids, alkalis, and organic materials.

6. Concrete. All concrete shall be made of Portland cement, water and aggregates as hereinbefore specified, and shall further be in accordance with the following definite requirements for the various classes.

A design of the mix made by an independent laboratory, approved by the Engineer, for each class of concrete, shall be submitted for approval before concreting is started.

During progress of the work, standard compressive strength test specimens shall be made and cured by the Contractor in accordance with ASTM Standard Method, Designation C-31, and tested - by an independent testing laboratory in accordance with ASTM Standard Method, Designation C-39. At least 3 cylinders will be made for each test. Tests results shall be submitted for each thirty- (30) cubic yards, or fraction thereof, for each class of concrete used. Should there be any evidence that concrete is not up to standard, a strength test may be required at any time and the cost paid by the contractor.

If 100 LF of sidewalk is poured, at least one (1) test must be performed with at least 3 cylinders made per test. Test on less than 100 ft. may be done at Engineer's request.

Class A concrete shall have a 28-day compressive strength of not less than 3,000 lbs. per square inch and a slump of from 3 to 5 inches and a maximum water-cement ratio of 0.48.

Coarse aggregate for all classes of concrete shall be commercial 1-inch stone, all of which shall pass a 1-1/2" screen.

All concrete used shall be "ready-mixed" concrete made in accordance with ASTM Standard Method Designation C-94. Cement, aggregate, water and design of mixes shall be as above specified. Elapsed time for placing concrete, between adding the mixing water to the mix and placing the concrete in the forms, shall not exceed that set forth in Table 1000-2.

TABLE 1000-2 ELAPSED TIME FOR PLACING CONCRETE		
Air or Concrete Temperature Whichever is Higher	Maximum Elapsed Time	
	No Retarding Admixture Used	Retarding Admixture Used
90°F or above	30 minutes	1 hour 15 minutes
80°F through 89°F	45 minutes	1 hour 30 minutes
79°F or below ^A	60 minutes	1 hour 45 minutes
70°F through 79°F ^B	60 minutes	1 hour 45 minutes
69°F or below ^B	1 hour 30 minutes	2 hour 15 minutes

^A Applicable to Class AA, A, and Drilled Pier Concrete

^B Applicable to Class B Concrete

The concrete temperature at the time of placing in the forms shall not be less than 50°F nor more than 95°F except where other temperatures are required by N.C. DOT "Standard Specifications for Roads and Structures", Latest edition as amended.

No concrete shall be placed when the air temperature is below 50°F and is falling. The placing of concrete shall be permitted with permission at air temperature between 40°F and 50°F when said air temperatures are rising.

Deliver concrete to any monolithic unit of a structure at a rate that will permit proper handling, placing, and finishing of the concrete. Regulate the delivery so that the maximum interval between the placing of batches at the work site does not exceed 20 minutes.

All concrete materials and installation shall comply with the N.C. DOT "Standard Specifications for Roads and Structures", Latest edition as amended.

7. Steel for Reinforcement. All reinforcement steel will fulfill the Standard Specifications for Billet Steel Concrete Reinforcement Bars, Designation A615 of ASTM. Intermediate Grade 60 will be used. Deformations shall be in accordance with ASTM Designation A-305.

All steel will be free from rust, scale, or other coatings which would reduce or destroy the bond when placed in forms and the Contractor will provide such protection as is necessary to ensure that the steel will not be injured during the construction period.

8. Joint Materials. Joint filler, hot applied joint sealer, low modulus silicone sealant, and bond breaker materials shall comply with Section 1028, Joint Materials of the N.C. DOT "Standard Specifications for Roads and Structures", Latest edition as amended.

All joint filler shall be sealed unless otherwise specified by the engineer.

9. Mortar. Unless otherwise provided, cement mortar will be Type M only. Type M mortar will consist of Portland cement and sand mixed in the proportion of one-part cement to two parts sand with not more than 6-1/2 gallons of water per bag of cement. This mixture may be varied to increase workability only by reducing the amount of sand or blending one or more sands. Mortar in which cement has been placed for more than one hour will not be used.

10. Brick. All brick used on the work will be hard, tough, sound clay or shale brick, of first-class quality, thoroughly vitrified and especially suitable to the class of work for which it is to be used. Brick used in manholes shall conform to ASTM Specifications C-216, grade SW.

11. Brick Masonry. All brick masonry will be constructed using Type M mortar and brick as specified.

12. Structural Steel.

a. General. The American Institute of Steel Construction's "Specifications for the Design, Fabrication and Erection of Structural Steel for Building", latest edition, and the American Institute of Steel Construction's "Code of Standard Practice for Steel Buildings and Bridges", latest edition, are hereby made a part of these Specifications to the same extent as if they were written herein, except that they may be amended or superseded by these Specifications or the Drawings.

b. Materials.

- (1) Structural steel shall conform to "Specifications for Structural Steel", ASTM A-36, latest edition.
- (2) Bolts, nuts, and circular washers - where required - shall conform to the requirements of the latest edition of "Specifications for High-Strength Carbon Steel Bolts for Structural Steel Joints: ASTM A-325 in exposed areas. For buried conditions or when used for sewer components, use 304 Stainless Steel.
- (3) Bolt and nut dimensions shall conform to the current requirements of the American National Standards Institute for heavy hex structural bolts and nuts, ANSI Standard B18.2.1.

13. Storm Sewers. Reinforced concrete pipe (RCP) shall conform to AASHTO Specifications M-170, Table III, Class III. High Density Polyethylene (HDPE) double wall corrugated smooth interior drainage pipe shall conform with NCDOT's current "Standard Specifications for Roads and Structures" and AASHTO M-294 Type S for sizes 15" through 48".

HDPE pipe in public applications shall only be used behind the curb and in areas with no vehicular traffic unless HP Storm or approved equal pipe is used.

Storm drain material and pipe class shall be listed on the pipe chart within the construction plans. Any private storm drain conveying water from the public roadway shall be built to Town Standards.

14. Catch Basin Frames and Covers. All catch basin frames and covers shall be of cast iron of superior quality, tough and of even grain, and shall possess a tensile strength of not less than 18,000 psi. Dimensions of the ring and cover shall conform to the Construction Details shown on the attached Drawings. All rings and covers shall be thoroughly cleaned and given two coats of an approved bituminous paint.

15. Water Main Materials. Water main materials shall be certified to meet the NSF/ANSI 61 Standard. All hardware to be stainless steel.

16. Ductile Iron Pipe and Fittings. Ductile Iron Pipe shall be manufactured in accordance with ANSI C151/A21.51 of the AWWA as amended and shall be designed for type 2 laying condition with the wall thickness determined by the depth of cover and a working pressure of 150 psi. Pipe wall thickness shall be calculated in accordance with ANSI C150/A21.50.

Joints for ductile iron pipe shall be manufactured in accordance with ANSI C111 or AWWA A21.11, push-on joint or mechanical joint. Flanges, where required shall be ANSI C110 or AWWA 21.10.

Ductile iron fittings through 12" shall be manufactured in accordance with ANSI Specification 21.10. Joints for fittings shall be mechanical joint conforming to ANSI Specification 21.11. Flanged fittings, where required, shall conform to ANSI Specification B16.1.

Pipe and fittings shall have a cement lining in accordance with ANSI Specification 21.4. All hardware to be stainless steel.

D.I. Pipe shall be a minimum Thickness Class 50, unless pressure or depth requires a higher class of pipe.

17. Gate Valves. Gate valves shall be of the resilient wedge type, iron body, bronze mounted, non-rising stem type designed to work equally well with pressure on either side of the gate. All valves shall conform to the requirements of the latest revision of AWWA Standard C-500 for "Gate Valves for Ordinary Water Works Service". The minimum designed working water pressure shall be 175 psi for valves with diameters of 12" or less.

All buried valves shall be supplied with a 2" square operating nut and shall be opened by turning the operating nut in a counterclockwise direction. Ends shall be mechanical joint.

All inside gate valves shall be hand wheel operated with flanged ends.

All gate valves 12" and smaller shall be supplied with double "O" ring seals in lieu of the conventional stuffing box.

Gate valves shall be manufactured by Mueller, Clow, Darling, or equal. All hardware to be stainless steel.

18. Swing Check Valves. Swing check valves shall have weight and lever. Check valves shall have an iron body with bronze seat and disc rings, and shall be approved by Underwriters Laboratories, Inc. Valves shall have a pressure rating of 175 psi and be American-Darling, Clow, or approved equal. All hardware to be stainless steel.

19. Tapping Sleeves. Tapping sleeves shall be of ductile iron, of the split sleeve type with mechanical joint ends, and with a Class 125 outlet flange. The end gaskets shall be Duck-Tipped Rubber Gaskets and all end and side gaskets shall be totally confined to eliminate cold flow. The tapping sleeves shall be as manufactured by American-Darling Valve Company; Clow or approved equal. All hardware to be stainless steel.

20. Tapping Valves. Tapping valves shall be equal in all respects to the gate valves hereinbefore specified except that they shall come equipped with one end having a Class 125 Flange and the other end having a mechanical joint. All hardware to be stainless steel.

21. Valve Boxes. Valve boxes shall be of cast iron conforming to ASTM Specification A048, Class 35. They shall be of the extension type of a pattern approved by the Engineer. Size of valve box shall be suitable for size valve it is to serve and it's bury. Valve boxes shall be as manufactured by James B. Clow Company, or equal, and shall have the word "WATER/SEWER" cast on the top of the lid.

22. Fire Hydrants. Fire hydrants shall be cast iron bodied, fully bronze mounted, suitable for a working pressure of 150 psi and shall conform to the requirements of the latest revision of AWWA Standard C-502 for "Fire Hydrants for Ordinary Water Works Service". Hydrants shall be constructed to permit withdrawal of internal working parts without disturbing the barrel or casing. Main valves, when closed, shall be reasonably tight when upper portion of the barrel is broken off. For water mains less than 12" in size, main valve opening shall be 4-1/2". For water mains 12" and greater in size fire hydrants shall have main valve opening of 5-1/4". The main valve facing shall be made of rubber. There shall be no chattering under any condition of operation. The hydrants shall be of the compression type, with main valve opening against the pressure and closing with the pressure.

Each hydrant shall be equipped with two (2) 2-1/2" hose connection and one (1) pumper connection. Hose nipples shall be bronze or non-corrosive metal. Threads shall be approved by the Town prior to placement of order for the hydrants.

Hydrants shall be Clow and painted to Town standard color scheme. All hardware to be stainless steel.

23. Mechanical Joint Restraint. Mechanical joint restraint shall be wedge style restraint manufactured of ductile iron conforming to ASTM A536-80 such that the device can be used with standardized mechanical joint pipe and conform to ANSI/AWWA A 21.531 C153 and shall be EBAA Iron, Inc., Megalug or Uni Flange Corporation. Mechanical joint restraints shall be installed on all fittings, valves, bends, plugs, and on all pipe sections on hydrant legs.

24. Manhole Rings and Covers. Manhole rings and covers shall be made of cast iron of superior quality, tough and of even grain, and will possess a tensile strength of not less than 18,000 psi. Rings and covers shall be manufactured in accordance with ASTM A-48 Class 30. Rings will weigh not less than 190 lbs., and covers will weigh not less than 120 lbs. The rings will be a maximum of 7 1/2" high and have a minimum opening of 1'-10". See Detail SS-4 for the wording that shall be cast in the covers. The finished rings and covers shall have the bearings surfaces machined or ground so that there will be no variation that will permit rocking or rattling, and the diameter of the covers shall be such as to fit the rings without wedging. All rings and covers will be thoroughly cleaned and given two coats of an approved bituminous paint. Rings shall have a solid cover on street work and perforated on outfalls.

25. Manholes Steps. Steps shall be constructed of a reinforced molded copolymer polypropylene plastic shell. Reinforcing shall be a single 1/2" steel bar ASTM designation A615 grade 60 and equal in all respects to step PS1-PF as manufactured by M.A. Ind., Inc.

26. Precast Manholes. Precast manholes shall be constructed of reinforced concrete and shall comply with the requirements of ASTM Designation C-478 "PRECAST REINFORCED CONCRETE MANHOLE SECTIONS".

Shop drawings shall be submitted for approval prior to manufacture. Manholes shall be constructed with a monolithic base with the side wall extending at least 48" above the base;

appropriate openings left in the side wall to receive the sewer pipe; barrel or riser sections with a 48" maximum length; and a conical top section having a 24" diameter opening offset in such a manner that the edge of the opening is on a vertical line with the edge of the barrel or riser section.

Manhole steps for precast manholes, unless otherwise approved by the Engineer, shall be as hereinbefore specified and shall be set at a spacing of 16" on centers.

Manhole rings and covers for precast manholes shall be as hereinbefore specified. Precast manholes shall be as constructed by N. C. Products Corporation, Raleigh, North Carolina, or approved equal.

Precast manholes shall be parged w/ non-shrink grout at every joint. Block manholes shall be parged from top to bottom.

27. Small Size Pipe. Small size of (2" to 4") pipe will be as follows: 3" or 4" pipe shall be D.I.P., Class 50 minimum. 2" pipe shall be Type "K", soft copper.

28. Air Release Valve. Air release valves shall be as manufactured in accordance with ANSI/AWWA C512 by G.A. Industries, Clow Corporation, or equal, of size, number, and location as shown on the Drawings depending on the type of service. All hardware to be stainless steel.

29. Steel Encasement Pipe. Wherever a line must be encased under a highway or railway, it must be encased in a steel pipe that has been manufactured in conformance with the standards of AWWA C-202. Joints, coatings, and method of installation shall be in conformance with the requirements of the N.C. DOT. In general, the encasement pipe will be installed by boring with an auger so as not to displace material on the outside of the casing.

Manufactured casing spaces shall be used in sufficient quantity to assure proper alignment of the carrier pipe within the encasement pipe. There shall be 3 spacers per joint of carrier pipe with spacing of these spaces not exceeding 9 feet on center. Spacers shall be stainless steel with stainless steel hardware and polymer skids. Spacers shall be Spider Supports and Spacers as manufactured by Spider Manufacturing Inc. or approved equal.

30. Carrier Pipe in Encasement. Wherever a water line or sewer line must be encased under a highway, it shall be of ductile iron as hereinbefore specified and all joints shall be restrained.

31. PVC Gravity Sewer Pipe. PVC (Poly Vinyl Chloride) Gravity Sewer pipe shall be made of PVC plastic conforming to ASTM D-3034 SDR35. Rubber gaskets shall comply in all respects with the physical requirements specified in ASTM D-3212. The bell shall be an integral part of the pipe and the spigot ends shall be supplied from factory with bevels. The Contractor shall furnish the Owner with an affidavit from the manufacturer that the materials furnished comply with these specifications.

32. Sewer Force Mains. Sewer Force Mains 3" or larger in size shall be of Ductile Iron Pipe, Class 50 as hereinbefore specified. For force mains less than 3" in size, the material shall be IPS Pressure rated PVC, minimum pressure Class 200. All hardware to be stainless steel.

33. Aggregate Base Course. The materials used in the construction of the aggregate base course shall comply with Section 520, Aggregate Base Course, of the N.C. DOT "Standard Specifications for Roads and Structures", Latest edition as amended.

34. Asphalt Concrete Binder Course. The materials used in the construction of the bituminous concrete base course shall comply with Section 610, Asphalt Concrete Binder Course - Type I 19.0, of the N.C. DOT "Standard Specifications for Roads and Structures", Latest edition as amended.

35. Asphalt Concrete Surface Course. The materials used in the construction of the bituminous concrete surface course shall comply with Section 610, Asphalt Concrete Surface Course – Type SF 9.5, of the N.C. DOT "Standard Specifications for Roads and Structures", Latest edition as amended.

36. Prime Coat. The prime coat shall comply with Section 600 of the N.C. DOT "Standard Specifications for Roads and Structures", Latest edition as amended.

37. Tack Coat. The tack coat shall comply with Section 605 of the N.C. DOT "Standard Specifications for Roads and Structures", Latest edition as amended.

38. Pavement Replacement.

a. Wherever asphalt type pavement has been ordered by the Engineer or the Owner to be cut and replaced, it shall be replaced with 6" Type I-190B, and 1" thick asphalt concrete surface course in conformance with N.C. DOT "Standard Specifications for Roads and Structures", Latest edition as amended. If existing asphalt is thicker than 7" then additional I19.0B shall be installed. Any tack coat used shall conform to same standards.

b. Wherever concrete type pavement has been ordered by the Engineer or Owner to be cut and replaced, it shall be replaced with Class A concrete poured 8" thick. All concrete shall be doweled into existing concrete using NCDOT approved epoxy coated dowels. If existing concrete is greater than 8" then match existing depth.

39. Stabilization Stone for Pavement Cuts. The stone used in stabilizing pavement cuts shall conform to the Aggregate Base Course as described in the N.C. DOT "Standard Specifications for Roads and Structures", Latest edition as amended.

40. Stabilization Stone for Ditches. The stone used in stabilizing ditch bottoms, prior to the installation of storm sewer pipe in the said ditch, shall conform to the requirements of Size No. 67 Aggregate as described in the N.C. DOT "Standard Specifications for Roads and Structures", Latest edition as amended.

41. Concrete Curb and Gutter. Concrete used in curb and gutter shall be 3,000 psi concrete as hereinbefore specified.

42. Rip Rap. Rip Rap shall be Class 1 quarry stone as described in Section 1042 of the N.C. DOT "Standard Specifications for Roads and Structures", Latest edition as amended. (Class A & B to be used where specified.)

43. Guarantee. The Contractor shall guarantee that if any materials, equipment or workmanship covered by these Specifications and the accompanying Drawings proves defective within one year after final acceptance, such defects shall be made good by him. The Engineer shall provide a letter to the Town indicating the start of the 12-month guarantee period. Provide State required certifications and "As Builts" with guarantee letter.

STREET AND SITE IMPROVEMENTS: DETAILED SPECIFICATIONS FOR INSTALLATION

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2. Scope of Work
3. Excavation for Storm Sewers
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5. Backfilling Trenches
6. Pipe Laying - General Provisions
7. Pipe Laying - Storm Sewers
8. Manholes
9. Catch Basins
10. Grading and Trenching
11. Adjusting Existing Manholes and Valve Boxes to Grade
12. Concrete Curb and Gutter
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18. Asphalt Concrete Surface Course
19. Stabilization Stone for Ditches
20. Erosion Control
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22. Existing Pipes, Conduits, and Cables – Care of
23. Responsibility for Damages
24. Signs and Barricades
25. Cleanup
26. Guarantee
27. Geotechnical Testing Requirements

1. General Provisions. The following Specifications cover work which is to be furnished and installed under STREET IMPROVEMENTS and SITE IMPROVEMENTS. Applicable subsections of MATERIAL SPECIFICATIONS apply to all work.

The alignment and grade shall be checked by the Town's representative prior to placement of ABC, curb and gutter, and pavement.

Shop drawings for water, sewer, & storm drainage related materials are to be submitted to the Town for review approval prior to installation. Additional material specifications may be required at times.

2. Scope of Work. The work to be performed under this document includes the Street Improvements.

3. Excavation for Storm Sewers. All trenches shall be excavated in open cut from the surface and in close conformity to the lines on approved plans.

In order that there be sufficient room for properly laying and jointing the pipe, trench widths shall be a minimum of 24" plus the outside pipe diameter. In order to safeguard the pipe, however, the maximum trench width shall not exceed 36" plus the outside pipe diameter. Trench widths shall be measured between faces of the cut at the top of the pipe.

All pipe shall be laid on a bedding of 6" of No. 67 stone. If HDPE Pipe is installed, provide bedding stone to spring line of pipe or as recommended by the manufacturer.

Length of trench open ahead of pipe laying shall be no more than 300 feet, and no less than 20 feet.

Wet trenches shall be stabilized by the use of No. 67 stone.

The Contractor shall keep all trenches free from water during excavation for pipelines. The water shall be pumped out of the ditch or dams built to keep it out of the ditch in such a manner as not to cause injury to the public health, private property, or the work in progress.

Portable bridges shall be erected across trenches to permit the passage of vehicular and/or pedestrian traffic.

The local Fire Department and 911 shall be notified at least 24 hours before any street is blocked by the opening of a trench. The Fire Department and 911 shall also be notified when the street is once again open to traffic.

Sheeting or bracing shall be used wherever necessary to prevent caving of the trench banks. The removal of sheeting shall be done in such a manner as to minimize the loss of friction between the trench walls and the backfill. Sheeting shall be cut off and left in place where its removal will adversely affect the pipeline installation.

4. Rock Excavation in Trenches. Should rock be encountered in the trenches, the excavation shall be carried to a depth of 6" below the body of the pipe and the trench shall be brought back to grade with No. 57 or 67 Stone properly compacted to a depth of 12" above the top of pipe. Suitable backfill material shall be defined as stabilization stone, sand, or native material free from rocks of optimum moisture content in order to obtain a compaction of 95%

standard proctor. The use of native material shall be subject to the sole approval of the Engineer or his representative.

Should rock be encountered in the trenches and blasting is required for its removal, then all blasting operations shall be conducted in strict accordance with existing ordinances and accepted safe practices relative to the storage and use of explosives.

No rock excavated from trenches larger than 3" diameter shall be used to backfill such trenches and no rock is allowed in the first 24" above the top of the pipe. The items named for the various sizes and classifications of pipe to be installed shall include the removal and disposal off site of such excavated rock material. The contractor shall secure, haul, and place in the trench sufficient suitable backfill material.

The use of native material shall be subject to the sole approval by the Engineer or his representative.

5. Backfilling Trenches. Trenches shall be filled in layers six inches (6") deep and thoroughly compacted with mechanical compactors to attain 95% standard proctor. Dry material used in refilling shall be sufficiently moistened so that after compacting future settlement will be at a minimum. Flooding will not be permitted and excess water from any cause shall be removed from the ditch. Material left over from the trench shall be hauled away and no extra compensation will be allowed for such disposal. If native soils from the trench are unsuitable to attain a stable, unyielding trench; the contractor shall provide suitable backfill material as defined in paragraph 4. Compaction testing of the backfill shall be provided by a certified testing firm and paid by the contractor. See additional requirements as indicated under Section 10 and 27 of the Street and Site Improvements specifications.

The top twelve inches (12") of all trenches where pavement has been cut, and where directed by the Town, shall be backfilled with crushed stone placed in layers six inches (6") deep and thoroughly compacted. This stone shall be Aggregate Base Course stone meeting the requirements of the NC DOT "Standard Specifications for Roads and Structures", latest version (as amended). It shall be the Contractor's responsibility to maintain all pavement cuts until paved or accepted by the Owner.

Wherever pipelines are laid in the shoulders of paved roads, backfilling shall be accomplished in the same manner as hereinbefore described for trenches in paved roads or streets except that the trench shall be filled to its full depth with earth.

6. Pipe Laying - General Provisions. The Contractor shall be responsible for all material which may become a part of the finished work until it is finally in place and accepted by the Town, and shall remove from the lines any cracked or defective pipe and shall replace them with new pipe without extra compensation.

Should any pipe be cracked or defective, the Contractor may cut off the cracked or defective portion and lay the remainder of the pipe if, in his opinion, the cutting off of the cracked or defective end will not injure the balance of the pipe. Permitting such cutting off of cracked or defective ends, however, shall not absolve the Contractor from any of his responsibility toward the work.

All pipe will be laid on lines and grades as shown on the approved Drawings. All pipe shall be placed on a firm foundation so as to prevent subsequent settlement.

Upon completion of the work, all lines shall present a clean and unbroken barrel, true to line and grade, and any defective lines shall be repaired, and any deposits removed by the Contractor.

The Contractor shall provide a video inspection of all sanitary and storm sewer pipes (public and private) at completion of construction and provide a copy of such to the Town in electronic format. Any defects detected by such video inspection shall be repaired by the contractor.

7. Pipe Laying - Storm Sewers. All materials for laying and jointing the pipe in the trench shall conform to the specifications for such materials hereinbefore given and shall be furnished by the Contractor.

Pipe shall have full bearing for its full length and be bedded in 6" of #57 stone. RCP Joints shall be sealed with a flexible joint sealant and wrapped with silt tight fabric. Except as modified herein, the installation of the storm sewers shall comply with the requirements of the Department of Transportation's "Standard Specifications for Roads and Structures". HPDE joints shall be silt free type and HPDE Pipe shall be installed in accordance with ASTM D 2321. RCP shall have the pipe classification stamped on the inside of the pipe such that the pipe classification can be included and identified during the final video inspection.

HDPE pipe in public applications shall only be used behind the curb and in areas with no vehicular traffic unless HP Storm or approved equal pipe is used. HP Storm to be installed using stone to a minimum of the top of the pipe.

8. Manholes. Manholes shall be made of precast concrete and shall conform to the Construction Details that are a part of the standard details.

Manholes shall be provided with plastic coated steps set in the walls 12" apart, and all manholes shall be capped with cast iron manhole frames and covers. The frames shall be furnished and set in mortar with even bearing.

Concrete precast manholes, as specified in material specifications, shall meet ASTM Designation C-478. Joints shall be sealed, parged with a non-shrink grout, and watertight at completion.

9. Catch Basins. Catch basins shall be built where shown on the approved Plans or where directed by the Engineer and shall conform to the Construction Details that are a part of the Plans. Precast reinforced concrete (4000 psi) structures of size equal to the built-in place basins shall be submitted for approval prior to manufacture.

Catch basins shall be constructed of concrete and brick masonry. Bottoms shall be constructed of Class B Concrete; the walls of brick masonry; and the reinforced concrete top shall be constructed of class A Concrete. The top may be precast or cast in place. Tops are to be smooth with no lift rings cast into the top of the lid. No patching will be allowed to achieve smoothness. Should precast concrete structures be used, no adjustment will be allowed for cutting or sawing the tops of the structures, but masonry can be used for adjustment if needed. Boxes are to have joints sealed with Conseal and parged with a non-shrink grout and bottoms are to be a minimum 6" thick.

10. Grading and Trenching. Scope: All areas designated on site to be either excavated or filled shall be included under this section, including all trench lines for all purposes.

Excavation. All areas shall be graded to subgrade elevations or finish grade (as appropriate) as shown on plans. All excess material shall be removed from the site unless areas for such disposal are designated on the plans.

Backfill and Fill Material. All backfill and fill material shall be suitable to acquire the following density:

Building Areas: ASTM-D-698 98.0% Standard Proctor
Density - minimum of 3,000 psf. (includes 5' outside building)
Road and Parking and trenches in Right of Way: ASTM-D-698 95.0% Standard Proctor
Density except top 12" – 100.0% Standard Proctor.
ASTM-D-698 100.0%. Stone base compacted to 100.0% Standard Proctor.
SF 9.5B shall be compacted to a minimum of 92.0% of maximum specific gravity (G_{mm})
S 4.75A shall be compacted to a minimum of 85.0% of maximum specific gravity (G_{mm})
All other asphalt mixes shall be compacted to a minimum of 92.0% specific gravity (G_{mm})
General Site Areas (non-structural): ASTM-D-698 90.0% Standard Proctor Density.

The Contractor will be responsible for testing of site during grading. All areas that do not meet the hereinbefore density test shall be removed and recompacted with acceptable materials at contractors' expense. Copies of compaction test reports shall be provided to the Town prior to placement of curb or stone base and prior to pavement placement. See compaction testing requirements under Section 27. Compaction reports should include density as well as moisture content being within +/- 3% of the Proctor.

Should any areas require excavation under subgrade as determined by the soil testing firm, the contractor shall undercut such areas to a depth or bearing determined by the soils engineer.

Clearing and Grubbing. All areas to be excavated or backfilled shall be completely cleared and grubbed of all shrubs, trees, stumps, etc. before excavating and backfilling begins. All debris shall be removed from site in accordance with local codes.

Topsoil. Topsoil shall be stripped from areas to be excavated or backfilled. Excess topsoil can be placed in the slopes outside the shoulders in non-structural areas.

Boulders and Rock Disposal. Boulders and rock, if encountered, will not be permitted to be buried on site unless locations for such disposal have been designated on the plans by the Engineer. All spoil area shall be covered with a minimum of two (2) feet of earth to grades as set by the engineer.

Embankment. Only suitable material approved by the Design Engineer shall be used in the formation of embankments. Prior to construction of embankments, all brush, roots, rubbish, sod, weeds, topsoil and other unsuitable material shall be removed from the natural ground within the limits of the fill. All surfaces upon which an embankment is to be placed shall be thoroughly scarified prior to its placement. Embankment materials shall be deposited and spread in uniform horizontal layers not more than 8" deep. Each layer shall be thoroughly compacted by rolling with approved equipment before starting the next layer. All embankments shall have 95% Standard Proctor compaction within the right of way unless shown otherwise on plans. All fill shall be track placed prior to seeding. All embankments shall be protected with temporary slope drains or diversions. Provide guard rails on all roadway embankments higher than 8' in height.

Proof Rolling. The subgrade shall be proofrolled with a 25-ton dual axle truck loaded to the 25-ton specified weight and verified by certified scale measurements. The contractor shall proof roll the subgrade and ABC in the presence of the testing firm and Town representative. Any soft areas shall be repaired by the contractor and reproof rolled once repair has been completed.

11. Adjusting Existing Manholes and Valve Boxes to Grade. All existing manholes and valve boxes within the project limits will be located by the Town and shown to the contractor. It shall be the Contractor's responsibility to preserve and protect all manhole tops and boxes. The tops and boxes shall be held in place by a concrete collar poured around the castings as detailed on plans

(18" from ring and 8" deep). For all projects where the final lift of asphalt is not anticipated prior to the onset of winter, all manholes and valve boxes are to be adjusted flush with the binder course. The final adjustment to finish grade will not be done until immediately prior to the placement of the final lift of surface course.

12. Concrete Curb and Gutter. All materials required in the construction of the concrete curb and gutter shall conform to the specifications for such materials as hereinbefore given. Class A concrete shall be used and shall be air entrained.

The dimensions and sizes of the concrete curb and gutter shall conform to the details shown in the Construction Details which are a part of the accompanying Plans. The curb and gutter shall be constructed where shown on the Plans. The contractor shall provide expansion joints, construction joints, and handicap access per Town requirements.

Except as herein modified, the methods used in the construction of the concrete curb and gutter shall comply with the N.C. DOT "Standard Specifications for Road Structures", latest version (as amended).

13. Concrete Driveway Entrances. All materials required in the construction of the concrete driveway entrances shall be the same as that specified for concrete curb and gutter.

14. Aggregate Base Course. All materials and methods of construction shall conform to Section 520 of the N.C. DOT Standard Specifications for Road Structures, latest version (as amended). The compacted thickness of the base course shall be 8" minimum (for residential streets only) unless shown otherwise or required by actual field conditions considering soil type and pavement design analysis prepared by a professional engineer. Copies of all base course delivery tickets shall be made available to the Town and the Contractor shall certify that the material has been used in the construction of this project.

All materials shall be as hereinbefore specified.

15. Prime Coat. All materials and methods of construction shall conform to Section 1020 of the N.C. DOT "Standard Specifications for Road Structures", latest version (as amended). The prime coat shall be applied at the rate of 0.18 - 0.45 gallons per square yard.

16. Tack Coat. All materials and methods of construction shall conform to Section 605 of the N.C. NCDOT "Standard Specifications for Road Structures", latest version (as amended). The tack coat shall be applied at the rate of 0.04 - 0.08 gallons per square yard. Tack shall be applied to existing asphalt or concrete surfaces prior to installation of all asphalt concrete courses.

17. Asphalt Concrete Intermediate Course. All materials and methods of construction shall conform to Section 663, Type I-190B of the N.C. DOT "Standard Specifications for Road Structures", latest version (as amended). The compacted thickness shall be as on approved plans.

Copies of all intermediate course delivery tickets shall be made available to the Town and the Contractor shall certify that the material has been used in the construction of this project.

Test cores shall be required at a rate of one core sample per 500 feet of roadway, or fraction thereof. A minimum of 2 core samples per roadway are required. Additional testing may be required at Engineer's request. Regardless of length, at least one random core sample shall be taken for each day of paving. Cores are to be taken in the presence of a Town representative. The Town is to be notified 48 hours in advance of cores being taken. The core report is to

include the thickness of the core at the time the core is taken and include the thickness of the core when it is tested. The core may be trimmed if required to achieve levelness and at a maximum of ¼ inch. Any core trimmed more than the maximum amount may be discarded by the Town resulting in the need for additional cores to be taken. Asphalt cores to be tested by an independent testing laboratory.

18. Asphalt Concrete Surface Course. All materials and methods of construction shall conform to Section 663, Type SF 9.5A of the N.C. DOT "Standard Specifications for Road Structures", latest version (as amended). The compacted thickness of the surface course shall be as shown on approved plans.

Copies of all surface course delivery tickets shall be made available to the Town and the Contractor shall certify that the material has been used in the construction of this project.

Prior to the construction of the surface course, a tack coat shall be applied to the binder course. This tack coat shall be applied at the rate of 0.04 to 0.07 gallons per square yard.

No test cores shall be taken on surface course, unless directed by the Engineer. Testing of the final surface course to be conducted by an independent testing company using a nuclear gauge.

19. Stabilization Stone for Ditches. The stone used for the stabilization of ditch bottoms shall be as hereinbefore specified. All storm sewers shall be laid on 6" of No. 67 Stone for the full trench width.

20. Erosion Control.

A. Reference to Other Documents. The General Conditions, Supplementary Conditions, Material Specifications, and Detailed Specifications for Installation contain requirements relevant to the work covered by this Section. Clearing and Grubbing, Site Grading, Clearing of rights of ways, excavating and backfilling, and Spoil Disposal will be subject to the applicable requirements of this Section.

B. General Requirements. Control of erosion and sedimentation resulting from land disturbing activities is subject to the requirements of the North Carolina Sedimentation Control Commission. Any authorized representative or agent of the commission shall be granted entry or access for purposes of inspection; he shall not be obstructed, hampered, or interfered with while he is in the process of carrying out his official duties. The requirements for erosion and sedimentation control apply to areas which are involved in borrow, waste disposal, and topsoil storage activities; and to areas which are directly involved with the construction of buildings, paving, curb, gutter, and to areas where storm drainage, water, and sewer lines and structures are installed. No Construction shall take place until erosion control permit is in hand and erosion control devices are installed.

Land disturbing activities shall be planned and carried out to achieve the following objectives:

- 1) Expose minimum sized areas at any one time
- 2) Limit exposures of areas to the shortest possible time
- 3) Control surface water run-off to reduce erosion and sediment loss
- 4) Hold off-site erosion and sedimentation damage to a minimum

With reference to requirement No. 2, portions of the site on which land disturbing activities have been undertaken, but upon which no further active construction takes place for a period of 15

working days, shall be planted or otherwise provided with a ground cover sufficient to restrain erosion.

The Contractor shall be responsible for maintaining all temporary and permanent erosion and sedimentation measures and facilities until the project is accepted by the Town, or until removal of facilities and cessation of control measures is authorized by the Engineer.

C. Work Included. This Section includes the labor, materials, equipment, and related services required for the installation of berms, drainage structures, storm water drains, straw barriers, vegetative covers, and other devices or methods for control of erosion and sedimentation shown on the Drawings or specified herein.

D. Facilities and Measures for Erosion and Sedimentation Control.

1) Phased Construction. The installation of improvements shall be done in phases as specified on the construction drawings.

This phasing of construction will help limit erosion caused during the installation of the improvements and will act as an erosion control measure.

2) Clearing and Grubbing. The Contractor is to clear the entire width of the permanent easement of trees, stumps, shrubs, and brush. The natural vegetative cover is to remain intact until the installation of the line begins, except that which has to be removed during the clearing and grubbing operation. Stumps, brush, and rubbish resulting from the clearing operation shall not be disposed of by placing on adjoining privately owned property unless the Contractor has a written instrument from the property owner. All other spoil is expected to be trucked off to the sanitary landfill for disposal.

3) Rip Rap. Rip Rap shall be installed at locations as shown on plans or as directed by the Engineer, per the NCDENR erosion control manual.

4) Berms. Drainage berms and ditches shall be installed as shown on the Drawings per the NCDENR erosion control manual.

5) Silt Fence. Silt fences shall be installed as shown on the Drawings or when directed by the Engineer, per the NCDENR erosion control manual.

6) Excelsior Matting. Matting shall be installed at location shown on the Drawings and shall be in compliance with "Standards and Specifications for Soil Erosion and Sediment Control" by the Land Quality Section of NCDENR, per the NCDENR erosion control manual.

7) Permanent Vegetative Cover. Prepare seedbed by ripping, chiseling, harrowing or plowing to depth of six inches so as to produce a loose, friable surface. Remove all stones, boulders, stumps or debris from the surface which would prohibit germination or plant growth, per the NCDENR erosion control manual.

Incorporated into the soil 800 to 1,000 pounds of 10-10-10 fertilizer plus 500 pounds of twenty percent (20%) Superphosphate per acre and two tons of dolomitic lime per acre unless soil tests indicate that a lower rate can be used.

Mulch after seeding with 2.0 tons of grain straw per acre and either crimp straw into soil or tack with liquid asphalt at 400 gallons per acre or emulsified asphalt at 300 gallons per acre.

PERMANENT SEEDINGS

<u>PLANTS & MIXTURE</u>	<u>PLANTING RATE/ACRE</u>	<u>PLANTING DATES</u>
TALL FESCUE (LOW MAINTENANCE)	100-150 LBS.	AUG. 15 - OCT. 15 FEB. 15 - MAY 1
TALL FESCUE WATERWAYS AND LAWNS (HIGH MAINTENANCE)	200-250 LBS.	AUG. 15 - OCT. 15 FEB. 15 - MAY 1
BLEND OF TWO TURF-TYPE TALL FESCUES (90%) AND TWO OR MORE IMPROVED KENTUCKY BLUEGRASS VARIETIES (10%) (HIGH MAINTENANCE)	200-250 LBS.	AUG. 15 - OCT. 15 FEB. 15 - MAY 1
TALL FESCUE AND KOBE OR KOREAN LESPEDEZA	100 LBS. & 20-25 LBS.	FEB. 15 - MAY 1 AUG. 15 - OCT. 15
TALL FESCUE AND SERICEA LESPEDEZA	50 LBS. 60 LBS./ACRE	NOV. 1 - FEB. 1 (UNSCARIFIED)
TALL FESCUE AND GERMAN MILLET OR SUNDANGRASS	70 LBS. AND 40 LBS.	JULY AND AUGUST
TALL FESCUE AND RYEGRAIN	70 LBS. AND 25 LBS.	NOV. 1 - JAN. 30
COMMON BERMUDAGRASS	8 LBS. (HULLED) 15-20 LBS. (UNHULLED)	APRIL 15 - JUNE 30 FEB. 1 - MARCH 30

Permanent Seeding Notes:

1. For spring seedlings, use scarified lespedeza seed. For late fall and winter seedings, use unscarified seed.
2. Annuals such as millet, sundangrass and ryegrain must be kept at 10-12" maximum height. The use of annual rye grass is not permitted.

The preceding permanent cover requirements pertain to all areas disturbed during the project construction including road shoulders, temporary access roads, spoil areas, building sites, rights-of-way, easements and line work.

21. Relocation of Hydrants, Water and Sewer Services. The Contractor shall be responsible for and shall move all hydrants, water services and sewer services that require relocation. All relocated utilities shall be inspected by the Engineer unless specified otherwise on plans.

22. Existing Pipes, Conduits, and Cables - Care of. Special care must be exercised by the Contractor, in the installation of all improvements and in passing under or over existing storm sewers, sanitary sewers, water lines, gas lines, and telephone or power conduits or cables. All

aforementioned pipes, cables, lines, or structures broken or ruptured by the Contractor must be immediately repaired or replaced by him. Contractor shall contact the appropriate utility locating service or personnel prior to initiating construction.

23. Responsibility for Damages. The Contractor shall be held responsible for all damages claimed, as a result of the installation of this project, to all utility poles, driveways, yards, shrubbery and plantings, drain ditches, and pipes, pavement, sidewalks, water lines, gas lines, telephone or power conduits or cables, buildings, fences, etc.

24. Signs and Barricades. The Contractor shall at his cost provide, erect, maintain, and illuminate, where necessary, all barricades, warning signs and local detour signs required.

25. Cleanup. Upon completion of the work the Contractor shall remove all excess materials, earth, debris, etc., along the line of his work and shall cleanup and leave, in its original condition, all affected private property.

26. Guarantee. The Contractor shall guarantee that if any materials, equipment or workmanship covered by these Specifications and the accompanying Drawings proves defective within one year after final acceptance, such defects shall be made good by him. The Engineer shall provide a letter to the Town indicating the start of the 12-month guarantee period. Provide State required certifications and "As Builts" with guarantee letter.

27. Geotechnical Testing Requirements. Section 10 provides the standards for compaction in all streets and trenches. Testing reports shall be submitted to the engineer prior to proceeding to the next phase of construction (i.e. Subgrade tests shall be submitted prior to curb or stone placement). The contractor is responsible for notifying the Town 48 hours prior to any testing to allow the Town the opportunity to be present during testing if desired. The following is the minimum testing schedule for compaction tests and each test shall be independent of other tests, additional testing may be required at Engineer's request:

A. Sanitary and Storm Sewer Line trenches

- i. If trench 0-8 ft. deep, provide one (1) test at half depth and at subgrade between each manhole.
- ii. If trench over 8 ft. deep, provide one (1) test for each 4 ft. and at subgrade excluding bottom of trench between each manhole. Tests shall be taken at the depths based on the trench depth divided by 4. As an example, for a 12 ft. trench, tests are required at the 4 ft. and 8 ft. depths plus at subgrade ($12/4 = 3$).
- iii. Services- provide one (1) compaction test for every 5 services.
- iv. Manholes or curb inlets-provide compaction tests for every 5th MH(CI) within 2 ft. of the manhole based on the trench depth as described above.

B. Water Line trenches

- i. One (1) compaction test for every 500 ft. of line at subgrade if water line is less than 4 ft. of cover.
- ii. Services- provide one (1) compaction test for every 5 services.

C. Street Compaction tests

- i. One per 500 ft. of street outside of trench lines. This includes the subgrade, stone testing, and asphalt testing.
- ii. Minimum 2 tests per roadway or one test per 500 ft. of street, whichever is greater.

D. Right of Way tests

- i. Any pit (Bore/Thump) within the Right of Way shall be required to be tested at depths described in A i, and A ii above.

Testing

Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2937, and ASTM D 6938, as applicable.

When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

Soil Types:

Suitable Soil Classification Groups: GC, ML, SC, CL, GW, GP, GM, SW, SP, and SM according to ASTM D 2487, or a combination of these groups; free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.

1. Liquid Limit: Less than 40, unless otherwise recommended in a site-specific geotechnical report.

2. PlastiTown Index: Less than 20, unless otherwise recommended in a site-specific geotechnical report.

Reporting

Testing Agency Qualifications: An agency with the experience and capability to conduct testing and inspecting indicated, as documented by ASTM E 548, and that specializes in types of tests and inspections to be performed.

Daily reports of work performed shall be provided. Reports should include the following:

1. Date of issue.
2. Project title and number.
3. Name, address, and telephone number of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Ambient conditions at time of sample taking and testing and inspecting.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspecting.

Testing agency will submit a certified written report of each test, inspection, and similar quality-control service to Owner with copy to Contractor and to authorities having jurisdiction. Reports and tests shall be submitted within 1 week of inspection or test.

WATER LINES: DETAILED SPECIFICATIONS FOR INSTALLATION

1. General Provisions
2. Scope of Work
3. Clearing of Rights-of-Way
4. Excavation for Pipelines
5. Rock Excavation in Trenches
6. Pavement Cutting and Removal
7. Backfilling Trenches
8. Pipe Laying - General Provisions
9. Pipelines Crossing Gravel Drives
10. Pipe Laying - Ductile Iron Water Main
11. Setting Valves and Valve Boxes
12. Setting Fire Hydrants
13. Setting Ductile Iron Fittings
14. Joint Restraint
15. Blowoffs
16. Testing Water Lines
17. Chlorination of Water Lines
18. Connections to Existing Water Mains
19. Pipelines Under State Highway Pavement
20. Pavement Replacement
21. Existing Pipes, Conduits, and Cables - Care of
22. Responsibility for Damages
23. Signs and Barricades
24. Cleanup
25. Erosion Control
26. Bonds and Permits Required by N.C.DOT
27. Guarantee
28. Testing Notice
29. Damaged Piping

1. General Provisions. The following Specifications cover work which is to be furnished and installed under the document containing water mains. Water main materials shall be certified to meet the NSF/ANSI 61.
2. Scope of Work. The work to be performed under this Contract includes the Water Mains shown on the Drawings complete with all appurtenant items, as shown on the accompanying Plans and as Described in these Specifications.
3. Clearing of Rights-of-Way. Where clearing and grubbing is required, the area to be cleared shall be grubbed of all stumps and shall be left free of all stumps, brush, roots and rubbish resulting from the clearing operation.
4. Excavation for Pipelines. All excavation shall be of one classification regardless of the material encountered, unless a rock clause is included in the supplemental conditions. All trenches shall be excavated in open cut from the surface, except as otherwise provided for herein, and in close conformity to the lines given by the engineer. The contractor shall be responsible for staking water line alignment in streets where curb and gutter will be installed to insure proper alignment and depth.

In order that there be sufficient room for properly laying and jointing the pipe, trench widths shall be a minimum of 24" plus the outside pipe diameter. In order to safeguard the pipe, however, the maximum trench width shall not exceed 36" plus the outside pipe diameter unless approval to the contrary is given by the Engineer. Trench widths will be measured between faces of the cut at the top of the pipe.

Where no special bedding is required, trench bottoms may be machine excavated to slightly above grade and cut down to pipe grade by hand in the fine-grading operation. Should the trench bottom be inadvertently cut below grade, it shall be filled to grade with #67 stone tamped.

Length of trench open ahead of pipe laying shall be no more than 300 feet, and no less than 20 feet unless approval is obtained from the Engineer. Contractor shall open no more trench than can be covered by end of working day.

Wet trenches or those of unstable subgrade shall be stabilized by the use of No. 67 stone.

The Contractor shall keep all trenches free from water during excavation for pipelines. The water shall be pumped out of the ditch or dams built to keep it out of the ditch in such a manner as not to cause injury to the public health, private property, or the work in progress.

Portable bridges shall be erected across trenches, wherever the Engineer deems them necessary to permit the passage of vehicular and/or pedestrian traffic.

The Local Fire Department and 911 shall be notified at least 24 hours before any street is blocked by the opening of a trench. The fire department and 911 shall also be notified when the street is once again open to traffic.

Sheeting or bracing shall be used wherever necessary to prevent caving of the trench banks. The removal of sheeting shall be done in such a manner as to minimize the loss of friction between the trench walls and the backfill. Sheeting shall be cut off and left in place where its removal will adversely affect the pipeline installation.

5. Rock Excavation in Trenches. Should rock be encountered in the trenches, the excavation shall be carried to a depth of 6" below the body of the pipe and the trench shall be brought back to grade with No. 57 or 67 stone properly compacted.

Should rock be encountered in the trenches and blasting is required for its removal, then all blasting operations shall be conducted in strict accordance with existing ordinances and accepted safe practices relative to the storage and use of explosives.

No rock excavated from trenches larger than 3" in diameter shall be used to backfill such trenches and no rock is allowed in the first 24" above the top of pipe. The Items named for the various sizes and classification of pipe to be installed shall include the removal and disposal of such excavated rock material. The Contractor shall secure, haul, and place in the trench sufficient suitable backfill material. Suitable backfill material is defined as stabilization stone, sand, or native material free from rocks and of optimum moisture content in order to compact to 95% of standard proctor. The use of native material shall be subject to the sole approval by the Engineer or his representative.

6. Pavement Cutting and Removal. Wherever it becomes necessary to cut pavement, the cuts shall be confined to a maximum width of the nominal pipe diameter plus 24". No pavement shall be cut wider than these Specifications without authorization from the Engineer. All pavement to be removed shall be marked for cutting by chalk line or other acceptable method. After marking, bituminous pavement shall be sawed to its full depth to a neat and true line along the mark. Concrete pavement shall be sawed to a minimum depth necessary for a smooth cut when broken out. All pavement cut shall be removed from the site of the work and shall not be used to backfill trenches.

7. Backfilling Trenches. Trenches shall be filled in layers six inches (6") deep and thoroughly compacted with mechanical compactors to attain 95.0% standard proctor. Dry material used in refilling shall be sufficiently moistened so that after compacting future settlement will be at a minimum. Flooding will not be permitted and excess water from any cause shall be removed from the ditch. Material left over from the trench shall be hauled away and no extra compensation will be allowed for such disposal. If native soils from the trench are unsuitable to attain a stable, unyielding trench; the contractor shall provide suitable backfill material as defined in paragraph 6. Compaction testing of the backfill shall be provided by a certified testing firm and paid by the contractor. See additional requirements as indicated under Section 10 and 27 of the Street and Site Improvements specifications.

The top twelve inches (12") of all trenches where pavement has been cut, and where directed by the Town, shall be backfilled with crushed stone placed in layers six inches (6") deep and thoroughly compacted. This stone shall be Aggregate Base Course stone

meeting the requirements of the N. C. DOT "Standard Specifications for Roads and Structures", latest edition (as amended). It shall be the Contractor's responsibility to maintain all pavement cuts until paved or accepted by the Owner.

Wherever pipelines are laid in the shoulders of paved roads, backfilling shall be accomplished in the same manner as hereinbefore described for trenches in paved roads or streets except that the trench shall be filled to its full depth with earth.

Rock excavated shall not be used to backfill such trenches.

8. Pipe Laying - General Provisions. The Contractor shall be responsible for all material which may become a part of the finished work until it is finally in place, tested and accepted by the Town, except as otherwise provided for herein, and shall remove from the lines any cracked or defective pipe or fittings and shall replace them with new pipe or fittings without extra compensation. Great care must be exercised by the Contractor in handling lined pipe so as not to injure the linings. A damaged lining in a piece of pipe or a fitting will be deemed sufficient reason for its rejection by the Town.

Should any pipe be cracked or defective, the Town may allow the Contractor to cut off the cracked or defective portion and lay the remainder of the pipe if, in the Town and the Contractor's opinion, the cutting off of the cracked or defective end will not injure the balance of the pipe. Permitting such cutting off of cracked or defective ends, however, will not absolve the Contractor from any of his responsibility toward the work. Cutting pipe will only be allowed at ends or with special permission of Town staff.

All pipe shall be thoroughly cleaned of earth and rubbish before being placed in the trench, and so kept until final completion and acceptance of the work. Every open end of the pipe shall be securely plugged when pipe laying is not in progress.

All pipe shall be laid on lines and grades as directed by the Engineer and as shown on the Drawings. All pipe shall be placed on a firm foundation so as to prevent subsequent settlement, and the trenches shall be carefully excavated to the proper grade, except where rock excavation is encountered, so that it will be unnecessary to fill in under the pipe. Bell holes shall be provided for all pipe laying modes and special care shall be exercised in obtaining full barrel support.

9. Pipelines Crossing Gravel Drives. Wherever a water line crosses a gravel drive, it shall be backfilled as hereinbefore described in backfilling trenches for crossing paved roads, except the top six inches (6") shall be filled with thoroughly compacted aggregate base course (ABC).

10. Pipe Laying - Ductile Iron Water Main. The installation of ductile iron pipe for water main shall be performed in accordance with the appropriate sections and subsections of AWWA C600. Minimum cover for water mains 8" diameter and smaller shall be 3 feet. Minimum cover for water mains 10" and larger shall be 4 feet. Pipe shall be installed as shown on the Plans and as directed by the Engineer.

Handling of pipe and accessories shall at all times be done in such a manner as to prevent damage to lining of body. All pipe, fittings, valves and hydrants shall be lowered into the trench by approved methods. Under no circumstances shall pipe or accessories be dropped or dumped into the trench.

Pipe shall be swabbed clean before it is laid and any pipe which cannot be cleaned with a swab shall be removed and cleaned with suitable apparatus. Any pipe showing evidence of oil, tar or grease shall be permanently marked and removed from the job and shall not be returned until it has been cleaned to the satisfaction of the Engineer.

Laying of pipe shall be done in accordance with section 7 of AWWA C600, with care being taken to provide uniform bearing for the pipe. The laying of pipe on wood or other blocking will not be permitted. Bell ends shall face direction of laying unless otherwise directed by the Engineer. For lines on an appreciable slope, the Engineer may require that bell ends face upgrade. Bell and spigot of pipe shall be thoroughly cleaned and properly lubricated where a mechanical joint or a "push on" type of joint is employed.

Open ends of pipe shall be plugged with a standard plug or cap at all times when pipe laying is not in progress. Trench water shall not be permitted to enter the pipe.

Pipe cutting, where required, shall be done in a neat and workmanlike manner without damage to the pipe. Pipe cutting shall be done only with equipment especially designed and fabricated for that purpose. The use of chisels and cleavers will not be permitted.

Water mains shall be installed at the locations shown on the Plans or as directed by the Engineer. Separation distances to be field verified prior to backfill.

11. Setting Valves and Valve Boxes. Gate valves shall be set at locations shown on the Plans or as directed by the Engineer. The installation shall be made in accordance with Section 10 of AWWA C600. Each valve shall be equipped with a valve box accurately positioned over the wrench nut. Each valve box shall have a 6" thick x 24" diameter - Class A Concrete collar.

12. Setting Fire Hydrants. Fire Hydrants shall be set at locations shown on the Plans or as directed by the Engineer. In general, hydrants shall be located in a manner to provide complete accessibility and to minimize possibility of damage from vehicles or injury to pedestrians. The installation shall be made in accordance with Section 11 and 12 of AWWA C600 except as amended herein.

Drainage for hydrants shall be in accordance with subsections 11.4 and 11.5 of AWWA C600.

Each hydrant shall be set plumb and shall be restrained from the hydrant tee through the gate valve to the hydrant using mega-lug mechanical joint restraints. All valves installed on hydrant legs shall be securely anchored to the main line tee with mega-lugs.

Before a hydrant is set, it shall be carefully examined, and all dirt and other foreign matter shall be removed from it.

Fire Hydrants installed on water mains less than 12" in size, main valve opening shall be 4-1/2" with 3-6" bury. For water mains 12" and greater in size fire hydrants shall have main valve opening of 5-1/4" with 4'-6" bury.

Fire hydrants shall be repainted after installation - using paint furnished by hydrant supplier, to the Town Standard colors.

13. Setting Ductile Iron Fittings. Ductile iron fittings shall be set at locations shown in the Plans or as directed by the Engineer. The installation of fittings shall be made in accordance with Section 10 of AWWA C600. Special care shall be taken to properly bell-up the joints and to support the body of the fitting. All fittings shall be restrained using mega-lug mechanical joint restraints.

14. Joint Restraint. All cast iron or ductile iron fittings, hydrants, valves, fittings, and other water main components subject to hydrostatic thrust shall be securely restrained by use of mega-lug mechanical joint restraints and appropriately sized concrete reaction blocking. Reaction blocking shall be 3,000 PSI ready mixed concrete. Sakrete type concrete is not allowed. Refer to detail W-26 for restraint distances. All hardware to be stainless steel.

15. Blowoffs. All dead-end water mains, not provided with hydrants reasonably close to such dead ends, shall be equipped with blowoff facilities as provided for in Section 10 of AWWA C-600. Blowoffs shall be installed per details.

16. Testing Water Mains. All utilities (Water, Sanitary Sewer & Storm Sewer) need to be installed, in their entirety, prior to testing. All water mains (including services), before final acceptance shall be tested by filling the main with water, care being taken to expel all air. As a part of this operation, the main to be tested shall be flushed by opening the terminal valve hydrant or blowoff. A temporary tail ditch shall be provided to carry the flushing water to the nearest drain ditch. A pressure of 150 psi shall be applied to the main at the test pump and shall be maintained at that pressure for a minimum period of 2 consecutive hours. All defective material found shall be replaced by the Contractor. All leaking joints shall be made tight. The pipe installation will not be accepted unless and until the leakage, evaluated on the pressure test of 150 psi for a minimum of 2 hours, does not exceed 10.0 gallons per day per mile of pipe per inch of nominal diameter. Test pump drawings shall be approved by Engineer.

In general, the pressure test and the leakage test shall be performed in the manner set forth in Section 13 of AWWA Standard C600, except that the Contractor shall furnish his own pressure gauges. The pressure test and the leakage test shall be performed by the Contractor and witnessed by the Town Engineer.

17. Chlorination of Water Mains. All additions to the water system shall be disinfected by chlorination in accordance with ANSI/AWWA C651. After disinfection the water supply shall not be placed into service until bacteriological test results of representative water samples are found to be satisfactory.

Such chlorination must be made under the observation of the Engineer. Chlorination of water mains and Dechlorination of water mains shall be carried out in the following manner:

a. Taps shall be made at the control valve at the upstream end of the line and at all extremities of the line. These taps shall be located in such a manner as to allow HTH solution to be fed into all parts of the main.

b. A solution of water containing high test hypochlorite (70% available chlorine) shall be introduced into the main by regulated pumping at the control valve tap. The solution shall be of such concentration that the water in the main will have at least 50 ppm total chlorine residual immediately after chlorination. The following chart shows the required quantity of 70% HTH compound to be contained in solution in each 1,000-foot section of pipe to produce the desired concentration of 50 ppm:

<u>Pipe Size</u>	<u>Pounds 70% HTH Per 1,000 Ft. of Pipe</u>
6"	0.88
8"	1.56
10"	2.42
12"	3.50

c. The HTH solution shall be circulated in the pipelines by opening the control valve and systematically manipulating hydrants and taps at the main extremities until a uniform concentration has been produced throughout the pipe.

d. The HTH solution shall remain in the main for not less than 24 hours. At the end of this time, the residual chlorine shall be at least 10 ppm. Should the chlorine residual be found to be less than 10 ppm, then the pipelines shall be rechlorinated.

e. Following satisfactory chlorination, the pipelines shall be flushed. Flushing shall continue until only a normal chlorine residual, as determined by the ortho-tolidine test, is present in the water.

f. The Contractor shall be responsible to dechloramine or dechlorinate any water before it is released to the ground. The Contractor shall use an apparatus that injects or mixes EPA approved chemicals containing one of the following chemicals (ascorbic acid, sodium sulfite or sodium thiosulfate) with the discharged water to neutralize the chloramine or chlorine before it is released to the ground. Approved chemicals for use are: (Vita-D-Chlor Tablets, D-Chlor Tablets, No-Chlor Dechlorination Grade Calcium Thiosulfate Solution, or pre-approved equivalent). Approved dechlorination units are: (Pollard Water LPD250 Diffuser with tablet screen, Dechlorination System and Combo Kit, the H2O Neutralizer manufactured by Measurement Technologies, Inc., or pre-approved equivalent), or as directed by the Engineer. Total chlorine residual levels shall be reduced and maintained between a minimum of 1.0 parts per million (1.0mg/l) to a maximum of 4.0 parts per million (4.0mg/l). The Contractor shall test the discharge at 15 minute intervals to insure that acceptable levels of neutralization are maintained. Discharge shall be stopped if chlorine levels exceed 4.0 parts per million (4.0mg/l). The

Contractor under the supervision of the Engineer shall perform the dechloramination and/or dechlorination.

All procedures shall be in accordance with manufacturers recommendations and as approved by the Engineer.

Only in cases where this method is not practical for unique reasons will the Town consider allowing the water to be released into the collections system. In those cases, the Contractor will need to make a request at least 48 hours in advance in order for the Town to determine the acceptability of the downstream collection facilities.

g. Following the disinfection and flushing of the pipelines, the Contractor shall coordinate with Town staff to obtain samples from the pipeline(s) and the samples shall be tested at a state-certified laboratory. Samples shall be taken at various points along the line as designated by Town for bacteriological analyses. If test results are satisfactory, the pipelines may be certified prior to being placed into service. If test results are not satisfactory, re-chlorination shall be undertaken at once.

All chlorination of the water system shall be witnessed by the Town or representative and performed by the Contractor at no cost to the Town. Copies of the test results shall be provided to the Town.

18. Connections to Existing Water Mains. Connections to existing water mains shall be made as detailed on the plans, using material hereinbefore specified or as shown on the Drawings. All water connections must be made while under pressure. No connection to existing water main without approval of the Town shall be made.

19. Pipelines Under State Highway Pavement. Where shown on the Plans, or as directed by the Engineer, ductile iron water mains shall be installed under State Highway pavement by encasing in a larger pipe. The carrier pipe shall be of restrained joint ductile iron and the encasement pipe shall be steel.

The encasement pipe shall be installed true to line and grade and in conformance with the requirements of the N.C. DOT. The size of the encasement and carrier pipes will be as shown on the Drawings.

Following the installation of the carrier pipe, the ends of the encasement pipe shall be suitably protected against the entrance of foreign material but shall not be tightly sealed. In general, this may be accomplished by the use of the same stone specified for trench stabilization. The ductile iron carrier pipe shall extend approximately 5.0 feet beyond each end of the encasement pipe.

Pipelines installed under this section shall not be undertaken without the express approval of the appropriate N.C. DOT Division Engineer.

20. Pavement Replacement. All pavement cut and removed from publicly maintained roads, streets, or highways as authorized by the Engineer, shall be replaced by the Contractor. Pavement cuts shall be maintained by the Contractor until such time as the

pavement has been replaced, but such replacement shall be done as promptly as weather permits. Pavement shall be replaced within 48 hours of being cut. No pavement cuts are allowed on Friday.

21. Existing Pipes, Conduits, and Cables - Care of. Special care must be exercised by the Contractor, in the installation of the lines and improvements, in passing under or over existing storm sewers, sanitary sewers, water lines, gas lines, and telephone or power conduits or cables. All aforementioned lines, cables, conduits, or structures broken or ruptured by the Contractor must be immediately repaired or replaced by him.

22. Responsibility for Damages. The Contractor shall be held responsible for all damages claimed, as a result of the installation of this project, to all utility poles, driveways, yards, shrubbery and plantings, drain ditches, and pipes, pavement, sidewalks, water lines, gas lines, telephone or power conduits or cables, buildings, fences, etc., and will be required to make satisfactory adjustment of all claims arising from the installation of the work contemplated.

23. Signs and Barricades. The Contractor shall provide, erect, maintain, and illuminate, where necessary, all barricades, warning signs and local detour signs required. The contractor shall be held responsible for all damages to the project due to the failure of the signs and barricades to properly protect the work from traffic, pedestrians, animals, and from all other sources.

24. Cleanup. Upon installation of the specified improvements, the Contractor shall remove all excess materials, earth, debris, etc., along the line of his work and shall cleanup and leave, in its original or better condition, all affected property. The contractor shall clean up all work to the point of construction activity not less than weekly.

25. Erosion Control.

A. Reference to Other Documents. The General Conditions, Supplementary Conditions, Material Specifications, and Detailed Specifications for Installation contain requirements relevant to the work covered by this Section. Clearing and Grubbing, Site Grading, Clearing of rights of ways, excavating and backfilling, and Spoil Disposal will be subject to the applicable requirements of this Section.

B. General Requirements. Control of erosion and sedimentation resulting from land disturbing activities is subject to the requirements of the North Carolina Sedimentation Control Commission. Any authorized representative or agent of the commission shall be granted entry or access for purposes of inspection; he shall not be obstructed, hampered, or interfered with while he is in the process of carrying out his official duties. The requirements for erosion and sedimentation control apply to areas which are involved in borrow, waste disposal, and topsoil storage activities; and to areas which are directly involved with the construction of buildings, paving, curb, gutter, and to areas where storm drainage, water, and sewer lines and structures are installed. No Construction shall take place until erosion control permit is in hand and erosion control devices are installed.

Land disturbing activities shall be planned and carried out to achieve the following objectives:

- 1) Expose minimum sized areas at any one time
- 2) Limit exposures of areas to the shortest possible time
- 3) Control surface water run-off to reduce erosion and sediment loss
- 4) Hold off-site erosion and sedimentation damage to a minimum

With reference to requirement No. 2, portions of the site on which land disturbing activities have been undertaken, but upon which no further active construction takes place for a period of 15 working days, shall be planted or otherwise provided with a ground cover sufficient to restrain erosion.

The Contractor shall be responsible for maintaining all temporary and permanent erosion and sedimentation measures and facilities until the project is accepted by the Town, or until removal of facilities and cessation of control measures is authorized by the Engineer.

C. Work Included. This Section includes the labor, materials, equipment, and related services required for the installation of berms, drainage structures, storm water drains, straw barriers, vegetative covers, and other devices or methods for control of erosion and sedimentation shown on the Drawings or specified herein.

D. Facilities and Measures for Erosion and Sedimentation Control.

- 1) Phased Construction. The installation of improvements shall be done in phases as specified on the construction drawings.

This phasing of construction will help limit erosion caused during the installation of the improvements and will act as an erosion control measure.

- 2) Clearing and Grubbing. The Contractor is to clear the entire width of the permanent easement of trees, stumps, shrubs, and brush. The natural vegetative cover is to remain intact until the installation of the line begins, except that which has to be removed during the clearing and grubbing operation. Stumps, brush, and rubbish resulting from the clearing operation shall not be disposed of by placing on adjoining privately owned property unless the Contractor has a written instrument from the property owner. All other spoil is expected to be trucked off to the sanitary landfill for disposal.

- 3) Rip Rap. Rip Rap shall be installed at locations as shown on plans or as directed by the Engineer per the NC DENR erosion control manual.

- 4) Berms. Drainage berms and ditches shall be installed as shown on the Drawings per the NC DENR erosion control manual.

- 5) Silt Fence. Silt fences shall be installed as shown on the Drawings or when directed by the Engineer per the NC DENR erosion control manual.

6) Excelsior Matting. Matting shall be installed at location shown on the Drawings and shall be in compliance with "Standards and Specifications for Soil Erosion and Sediment Control" by the Land Quality Section of NCDENR per the NC DENR erosion control manual.

7) Utility Line Installation. Soil resulting from trench excavation to be used as backfill material shall be placed on the uphill side of the trench. This will prohibit runoff directly into the creek. No excavation shall be placed in the creek or on the bank at any time. Rock encountered during excavation shall be removed from the site and shall not be disposed of by placing on adjoining privately owned property.

8) Creek Crossing. Where utility lines are installed across a creek, they shall be installed per approved buffer permit.

9) Permanent Vegetative Cover. Prepare seedbed by ripping, chiseling, harrowing or plowing to depth of six inches so as to produce a loose, friable surface. Remove all stones, boulders, stumps or debris from the surface which would prohibit germination or plant growth per the NC DENR erosion control manual.

Incorporated into the soil 800 to 1,000 pounds of 10-10-10 fertilizer plus 500 pounds of twenty percent (20%) Superphosphate per acre and two tons of dolomitic lime per acre unless soil tests indicate that a lower rate can be used.

Mulch after seeding with 2.0 tons of grain straw per acre and either crimp straw into soil or tack with liquid asphalt at 400 gallons per acre or emulsified asphalt at 300 gallons per acre.

<u>PERMANENT SEEDINGS</u>		
<u>PLANTS & MIXTURE</u>	<u>PLANTING RATE/ACRE</u>	<u>PLANTING DATES</u>
TALL FESCUE (LOW MAINTENANCE)	100-150 LBS.	AUG. 15 - OCT. 15 FEB. 15 - MAY 1
TALL FESCUE WATERWAYS AND LAWNS (HIGH MAINTENANCE)	200-250 LBS.	AUG. 15 - OCT. 15 FEB. 15 - MAY 1
BLEND OF TWO TURF-TYPE TALL FESCUES (90%) AND TWO OR MORE IMPROVED KENTUCKY BLUEGRASS VARIETIES (10%) (HIGH MAINTENANCE)	200-250 LBS.	AUG. 15 - OCT. 15 FEB. 15 - MAY 1
TALL FESCUE AND KOBE OR KOREAN LESPEDEZA	100 LBS. & 20-25 LBS.	FEB. 15 - MAY 1 AUG. 15 - OCT. 15
TALL FESCUE AND SERICEA LESPEDEZA	50 LBS. 60 LBS./ACRE	NOV. 1 - FEB. 1 (UNSCARIFIED)

TALL FESCUE AND
GERMAN MILLET OR
SUNDANGRASS

70 LBS. AND
40 LBS.

JULY AND AUGUST

TALL FESCUE AND RYEGRAIN

70 LBS. AND 25 LBS.

NOV. 1 - JAN. 30

COMMON BERMUDAGRASS

8 LBS. (HULLED)
15-20 LBS. (UNHULLED)

APRIL 15 - JUNE 30
FEB. 1 - MARCH 30

Permanent Seeding Notes:

1. For spring seedlings, use scarified lespedeza seed. For late fall and winter seedlings, use unscarified seed.
2. Annuals such as millet, sundangrass and ryegrain must be kept at 10-12" maximum height. The use of annual rye grass is not permitted.

The preceding permanent cover requirements pertain to all areas disturbed during the project construction including road shoulders, temporary access roads, spoil areas, building sites, rights-of-way, easements and line work.

26. Bonds and Permits Required by N.C. DOT. The Contractor, at his own expense, will secure from the N.C. DOT, the "Encroachment Agreement" required prior to the installation of that portion of this project that lies within the right-of way of the said Commission. Any or all other bonds and/or permits required by the said Commission in connection with this project shall be provided by the Contractor. This relates especially to the "Permit to Open Pavement" and the performance bond.

27. Guarantee. The Contractor shall guarantee that if any materials, equipment or workmanship covered by these Specifications and the accompanying Drawings proves defective within one year after final acceptance, such defects shall be made good by him. The Engineer shall provide a letter to the Town indicating the start of the 12-month guarantee period. Provide State required certifications and "As Builts" with guarantee letter.

28. Testing Notice. Notice to the Town, for any testing related to water line work, will be required of the Contractor 48-hours in advance of testing.

29. Damaged Piping. Should any piping be damaged prior to acceptance by the Town, the whole joint will be replaced.

SANITARY SEWER LINES: DETAILED SPECIFICATIONS FOR INSTALLATION

1. General Provisions
2. Scope of Work
3. Lines and Grades for Sanitary Sewer Lines
4. Clearing of Rights-of-Way
5. Excavation for Pipelines
6. Rock Excavation in Trenches
7. Pavement Cutting and Removal
8. Backfilling Trenches
9. Pipelines Crossing Gravel Drives
10. Pipe Laying - General Provisions
11. Pipe Laying - Vitrified Clay Pipe
12. Pipe Laying - PVC Sewer Pipe
13. Pipe Laying - Ductile Iron Pipe Sanitary Sewer Mains
14. Precast Concrete Manholes
15. Drop Manholes
16. Connections to Existing Sewage Collection System
17. Testing Sewer Lines and Force Mains
18. Setting Ductile Iron Fittings
19. Joint Restraint
20. Concrete Encasement
21. Cast Iron Soil Pipe Stacks
22. Pipelines Under State Highway Pavement
23. Pavement Replacement
24. Existing Pipes, Conduits, and Cables - Care of
25. Responsibility for Damages
26. Signs and Barricades
27. Cleanup
28. Erosion Control
29. Bonds and Permits Required by N. C. DOT
30. Guarantee
31. Manhole Testing
32. Video Inspection
33. Testing Notice
34. Damaged Piping

1. General Provisions. The following Specifications cover work which is to be furnished and installed under the document containing Sanitary Sewer Improvements.

2. Scope of Work. The work to be performed under this Contract includes the Sanitary Sewer Improvements shown on the Drawings, complete with all appurtenant items, as shown on the accompanying Plans and as described in these Specifications.

3. Lines and Grades for Sanitary Sewer Lines.

The Contractor shall furnish the following material, equipment, and services:

(a) All intermediate lines, grades, hubs, measurements, etc., required for the actual construction;

(b) Suitable laser equipment for installing the pipe at the indicated grade. Installation by batter boards will not be allowed;

(c) Both a transit and leveling instrument with appurtenances, all meeting the Engineer's approval, shall be kept on the construction site and a person skilled in their operation shall be employed or obtained whenever necessary to give or check elevations, levels, alignment, etc., in the work as the Contractor may need and as the Engineer may request;

(d) Two (2) copies of a daily record of the approximate lineal feet and depth of sewer trench opened per pipe size, the lineal feet of each size of pipe installed at the various incremental pay depths, the number and depth of manholes completed, and the completion of all other pay items. This daily record shall also record the time and location of any blasting. Locations of all work and blasting shown on the daily record shall be identified by station numbers;

4. Clearing of Rights-of-Way. The necessary rights-of-way for all lines crossing privately owned property will be secured by the owner. The permanent and temporary construction easements are of size and location as shown on the drawings. The entire width of the permanent right-of-way shall be cleared by the Contractor to its full width and will be left free of all stumps, brush, roots and rubbish. The temporary construction easement may be cleared in part to aid in the installation of the line.

All clearing operations conducted by the Contractor on the temporary construction easement shall be performed in exactly the same manner as that performed on the permanent easement.

Stumps, brush, roots and rubbish resulting from the clearing operation shall not be disposed of by placing on adjoining privately owned property unless the owner of the property in question approves of such disposal, and the Contractor furnishes the Engineer two (2) copies of a written instrument attesting to the said approval signed by the owner of the property.

5. Excavation for Pipelines. All trenches will be excavated in open cut from the surface, except as otherwise provided for herein, and in close conformity to the lines given by the Engineer.

In order that there be sufficient room for properly laying and jointing the pipe, trench widths shall be a minimum of 24" plus the outside pipe diameter. In order to safeguard the pipe, however, the maximum trench width shall not exceed 36" plus the outside pipe diameter unless approval to the contrary is given by the Engineer. Trench widths will be measured between faces of the cut at the top of the pipe.

Where no special bedding is required, trench bottoms may be machine excavated to slightly above grade and cut down to pipe grade by hand in the fine-grading operation. Should the trench bottom be inadvertently cut below grade, it shall be filled to grade with #67 washed stone tamped.

Length of trench open ahead of pipe laying shall be not more than 300 feet, and no less than 20 feet unless approval is obtained from the Town and Engineer. Contractor shall open no more trench than can be covered by end of working day.

Wet trenches or those with unstable subgrade shall be stabilized by the use of No. 67 stone.

The Contractor shall keep all trenches free from water during excavation for pipelines. The water shall be pumped out of the ditch or damps built to keep it out of the ditch in such a manner as not to cause injury to the public health, private property, or the work in progress.

Portable bridges shall be erected across trenches, wherever the Town deems them necessary to permit the passage of vehicular and/or pedestrian traffic.

The local Fire Department and 911 shall be notified at least 24 hours before any street is blocked by the opening of a trench. The Fire Department shall also be notified when the street is once again open to traffic. The contractor shall provide all temporary signage and barricades which may be required by the Fire Department or the Department of Transportation.

Sheeting or bracing shall be used wherever necessary to prevent caving of the trench banks. The removal of sheeting shall be done in such a manner as to minimize the loss of friction between the trench walls and the backfill. Sheeting shall be cut off and left in place where its removal will adversely affect the pipeline installation.

6. Rock Excavation in Trenches. Should rock be encountered in the trenches, the excavation shall be carried to a depth of 6" below the body of the pipe and the trench shall be brought back to grade with No. 57 or 67 Stone properly compacted. In rock excavation areas, the bedding must be #57 or 67 stone. Once bedded, pipe must have a minimum of 6" of #57 stone overtop of the pipe. Suitable backfill material shall be defined as stabilization stone, sand, or native material free from rocks of optimum moisture content in order to obtain a compaction of 95% standard proctor. The use of native material shall be subject to the sole approval of the Engineer or his representative.

Should rock be encountered in the trenches and blasting is required for its removal, then all blasting operations shall be conducted in strict accordance with existing ordinances and accepted safe practices relative to the storage and use of explosives.

No rock excavated from trenches larger than 3" diameter shall be used to backfill such trenches and no rock is allowed in the first 24" above the top of the pipe. The items named for the various sizes and classifications of pipe to be installed shall include the removal and disposal off site of such excavated rock material. The contractor shall secure, haul, and place in the trench sufficient suitable backfill material. Suitable backfill material is defined as stabilization stone, sand or native material free from rocks of optimum moisture content in order to compact to 95% of standard proctor.

The use of native material shall be subject to the sole approval by the Engineer or his representative.

7. Pavement Cutting and Removal. Wherever it becomes necessary to cut pavement, the cuts shall be confined to a maximum width of the nominal pipe diameter plus 24". No pavement shall be cut wider than the Specifications without authorization from the Town. All pavement to be removed shall be marked for cutting by chalk line or other acceptable method. After marking, bituminous pavement shall be sawed to its full depth to a neat and true line along the mark. Concrete pavement shall be sawed to a minimum depth necessary for the smooth cut when broken out. All pavement cut shall be removed from the site of the work and shall not be used to backfill trenches.

8. Backfilling Trenches. Trenches shall be filled in layers six inches (6") deep and thoroughly compacted with mechanical compactors to attain 95% standard proctor. Dry material used in refilling shall be sufficiently moistened so that after compacting future settlement will be at a minimum. Flooring will not be permitted and excess water from any cause shall be removed from the ditch. Material left over from the trench shall be hauled away and no extra compensation will be allowed for such disposal. If native soils from the trench are unsuitable to attain a stable, unyielding trench; the contractor shall provide suitable backfill material as defined in paragraph 6. Compaction testing of the backfill shall be provided by a certified testing firm and paid by the contractor. See additional requirements as indicated under Section 10 and 27 of the Street and Site Improvements specifications.

The top twelve inches (12") of all trenches where pavement has been cut, and where directed by the Town, shall be backfilled with crushed stone placed in layers six inches (6") deep and thoroughly compacted. This stone shall be Aggregate Base Course stone meeting the requirements of the N. C. DOT "Standard Specifications for Roads and Structures", latest edition (as amended). It shall be the Contractor's responsibility to maintain all pavement cuts until paved or accepted by the Owner.

Wherever pipelines are laid in the shoulders of paved roads, backfilling shall be accomplished in the same manner as hereinbefore described for trenches in paved roads or streets except that the trench shall be filled to its full depth with earth.

9. Pipelines Crossing Gravel Drives. Wherever a sewer line crosses a gravel drive, it shall be backfilled as hereinbefore described in backfilling trenches for crossing paved roads, except the top six inches (6") shall be filled with thoroughly compacted ABC Aggregate. It shall be the Contractor's responsibility to maintain all drives until accepted by the Town.

10. Pipe Laying - General Provisions. The Contractor shall be responsible for all material which may become a part of the finished work until it is finally in place, tested and accepted by the Town, except as otherwise provided for herein, and shall remove from the lines any cracked or defective pipe or fittings.

Great care must be exercised by the Contractor in handling lined pipe so as not to injure the linings. A damaged lining in a piece of pipe or a fitting will be deemed sufficient reason for its rejection by the Engineer.

Should any pipe be cracked or defective, the Town may allow the Contractor to cut off the cracked or defective portion and lay the remainder of the pipe if, in the Town and Engineer's opinion, the cutting of the cracked or defective end will not injure the balance of the pipe. Permitting such cutting off of cracked or defective ends, however, will not absolve the Contractor from any of his responsibility toward the work. Cutting of pipe shall only be done at the end of the pipe unless special permission is given by the Town.

Pipe must be of uniform material for gravity sewers between manholes. Change in material is only allowed at manholes.

All pipe shall be thoroughly cleaned of earth and rubbish before being placed in the trench and so kept until final completion and acceptance of the work. Every open end of the pipe shall be securely plugged when pipe laying is not in progress.

All pipe shall be thoroughly flushed and cleaned after installation but prior to acceptance. All connections to existing lines or manholes shall be plugged to prevent mud and water from entering the existing system during construction.

All pipe shall be laid on lines and grades as directed by the Engineer and as shown on the Drawings. All pipe shall be placed on a firm foundation so as to prevent subsequent settlement, and the trenches will be carefully excavated to the proper grade, except where rock excavation is encountered, so that it will be unnecessary to fill in under the pipe. Bell holes shall be provided for all pipe laying modes and special care shall be exercised in obtaining full barrel support.

Trace wire shall be installed on all gravity sewers, services, and force mains that are of material other than Ductile Iron. Trace wire shall be 12-gauge minimum solid copper with thermoplastic insulation recommended for direct burial. Trace wire shall be installed along the entire length of the sewer, service, or force main and should terminate in manholes, cleanouts, valve boxes, and/or in test boxes. Trace wire shall be tested by the contractor and witnessed by the Town after backfilling. Any areas that are not detectable shall be repaired at no cost to the Town.

11. Pipe Laying – Vitrified Clay Pipe. Vitrified clay pipe may only be installed with special permission of the Town. All materials for laying and jointing the pipe in the trench shall conform to the specifications for such materials hereinbefore given and will be furnished by the Contractor. Grade lines for aligning and grading the pipe in the trench will be established by the Engineer, and all material and labor required will be furnished by the Contractor.

Previous to being lowered into the trench, each pipe shall be inspected by the pipe foreman, and faulty pipe rejected and removed from the work. No pipe shall be laid in the trench until the Engineer has been notified of the intention of the Contractor to lay pipe, giving the Engineer sufficient time to check the lines and grades before pipe laying is begun. The Contractor shall notify the Engineer at least three days before work is to begin.

Extra strength Vitrified Clay Pipe, as hereinbefore specified, shall be used regardless of the depth of trench in which it is to be installed.

Class "B" Bedding shall be used in trench depths between 0 feet and 24 feet. All pipe installed in trenched greater than 24 feet shall be installed using Class "A" Bedding.

Upon completion of the work, all lines shall present a clean and unbroken barrel, true to line and grade, and any defective lines shall be repaired, and any deposits removed by the Contractor at his own expense.

12. Pipe Laying - PVC Sewer Pipe. PVC gravity sewer pipe shall be installed using a minimum Class "B" bedding as shown on the plans with a select backfill material to the springline of the pipe. Minimum cover over PVC sewer pipe shall be 3-feet to any subgrade elevation.

Select backfill material is defined as stabilization stone (Size No. 67)

PVC Sewer Pipe shall be installed in accordance with ASTM D2122 - Standard Recommended Practice for Underground Installation for Flexible Thermoplastic Sewer Pipe. PVC Sewer Pipe shall be tested by the contractor for deflection. The pipe shall be mandrelled with a rigid device sized to be cylindrical in shape and constructed with 9 to 10 evenly spaced arms. The mandrel shall be hand pulled by the contractor through all sewer lines. Any sections of sewer not passing the mandrel shall be uncovered and the contractor shall reround or replace the sewer and retest that section of line. The contractor shall submit mandrel drawings and testing schedule to the engineer for approval. The mandrel shall be sized for a 5% deflection allowance.

Prior to being lowered into the trench, each pipe shall be inspected by the pipe foreman, and faulty pipe rejected and removed from the work.

All PVC sanitary sewer services shall be placed in stone bedding.

13. Pipe Laying - Ductile Iron Pipe Sanitary Sewer Mains. Wherever, in the laying of sanitary sewer lines, the pipe must be supported on piers, where the pipe crosses surface waters, under a highway that cannot be open cut, in shallow trenches where insufficient cover conditions exist, or in deep trenches with excess of 12-feet of cover, the Sanitary sewer lines shall be of ductile iron pipe. The material for laying and jointing the pipe shall conform to the specifications hereinbefore given for Ductile Iron Pipe. The ductile iron will be paid for at the unit price bid for the different sizes of pipe installed in the various pipe laying conditions. Force mains shall be of size and type as shown on the drawings and shall be installed in conformance to "Pipe Laying - General Provisions".

Prior to being lowered into the trench, each pipe shall be inspected by the pipe foreman, and faulty pipe rejected and removed from the work.

All ductile iron pipe gravity sewer shall have a minimum of 4" of stone bedding placed under pipe.

14. Precast Concrete Manholes. Precast concrete manholes shall be built where shown on the plans or as directed by the Engineer. The inside diameter of the manholes shall be at least four feet (4'). Inverts to be installed by the precast manufacturer and will be built up to a depth of three-quarters (3/4) of the diameter of the pipeline as directed to properly take care of the flow through the manholes and to ease the drop from one pipe to the other. Benches shall be sloped for drainage, as shown on the Plans. Manholes shall be provided with flexible sleeves sealed with stainless steel bands at each pipe entering or exiting a manhole.

Joints between sections of the precast manhole shall be sealed with a Neophrene "O" Ring Gasket and bitumastic rope. Manholes shall be bedded on layer of crushed stone. The stone shall be the same as that specified for stabilizing ditches (Size No. 67) and shall be spread in a layer at least six inches (6") thick.

The manholes shall be capped with cast iron manhole frames and covers with the frames set in mortar with even bearing. The C.I. Frame shall be anchored to the manhole wall as shown on the plans. Manhole installed in asphalt will have 2' concrete collar surrounding cast-iron frame. After completion, all manholes will be cleaned out and left in a neat condition with all jointing material protruding from joints shall be removed. All riser joints shall be parged with non-shrink grout. Any infiltration into the manhole will not be allowed.

15. Drop Manholes. Drops in manholes greater than 6" but less than or equal to 30", shall have a concrete slide. If the drop exceeds 30" provide an outside drop manhole. The outside drop manhole shall have a special drop pipe built into the manhole. This drop shall consist of a T-

branch in the main sewer where it enters the manhole and a vertical drop pipe down the side of the manhole and supported therefrom and terminating at the bottom by a quarter bend into the manhole. All piping and fittings shall be of restrained joint ductile iron pipe with mega-lugs.

Drop pipe shall be Ductile Iron Pipe and fittings strapped to manhole wall with 1" stainless steel straps and masonry anchor bolts, placed at 24" maximum on center, vertically.

16. Connections to Existing Sewage Collection System. Connections to existing sewage collection systems shall be made where shown on the Plans or as directed by the Engineer. Where the connection is made at an existing manhole, it will be necessary to reconstruct the existing invert(s) to accommodate the new line.

In-line sewer service connections are to be made with Romac saddles or approved equal.

No connection to existing manholes or sewer lines shall be made until remaining project construction has been completed and tested.

17. Testing Sewer Lines and Force Mains. All utilities (Water – including services, Sanitary Sewer – including services & Storm Sewer) shall be installed prior to testing. After the sewer lines are completed, but prior to their acceptance and before any sewage is permitted to enter, the following test shall be made by the Contractor to determine the watertightness of the lines, including the manholes. The Engineer will determine whether the test to be made shall be for infiltration or exfiltration. If ground conditions are such that an infiltration test would give no significant results, then an exfiltration test shall be made in the manner hereinafter described. The sewer line shall be filled with water to a level equal to the top of the lowest manhole in the section to be tested. At no point in the sewer line shall the head of the pipe reach more than 10 feet of water. The test will not be deemed conclusive, however, unless the head on the pipe reaches at least 3 feet of water at the upper end of the section being tested. Tests shall be run on the lines in separate sections so that the head on the pipe is at least 3 feet of water but does not exceed 10 feet.

Under the exfiltration method the line shall be tested for six hours (6) after filling and the leakage will be carefully measured. Allowable leakage shall be 100 gallons per inch of internal diameter per mile of pipe per 24 hours. If the leakage exceeds this limit the line shall be drained, repaired, and retested. The manholes shall be included in the test.

In the event the Engineer elects to test the sewer line by the infiltration method, the allowable infiltration shall be 10 gallons per inch of internal diameter per mile of pipe per 24 hours. If the infiltration exceeds this limit, the line shall be repaired and retested.

All sewer lines must pass the test requirements prior to their acceptance by the Town. Excessive leakage or infiltration in any one section shall be corrected even through the total may come within the allowable limits.

Force mains shall be tested in the manner set forth in Section 13 of AWWA Standard C600, except the Contractor shall furnish his own gauges and perform the test at no cost to the Owner. Before final acceptance, the force main shall be filled with water, care being taken to expel all air.

A pressure test of 150 psi shall be applied to the line at the test pump and shall be maintained at that pressure for a minimum period of two consecutive hours.

All defective material found shall be replaced by the Contractor. All leaking joints shall be made tight. The pipe installation will not be accepted unless and until leakage, evaluated on the pressure test of 150 psi for 2 hours, does not exceed 10.0 gallons per day per mile of pipe per inch of nominal diameter. The contractor has the option of using an air test method in lieu of the exfiltration method in testing the sewer line. The following requirements apply.

Air Test:

Low-Pressure Air Test for Sanitary Sewers:

*Introduction - Numerous laboratory and field air tests have been devised over the years since the early 1960's. Much of the information contained in these tests was utilized by the American Society for Testing and Materials (ASTM) when preparing ASTM C828, a low-pressure air test for sanitary sewers.

Described below is the procedure for air testing sewer lines to demonstrate the integrity of the installed material and the construction methods.

*Summary of Method - The section of the sewer line to be tested is plugged. Low-pressure air is introduced into the plugged line. The amount and rate of air loss is used to determine the acceptability of the section being tested.

*Preparation of the Sewer Line - Flush and clean the sewer line prior to testing, thus serving to wet the pipe surface as well as clean out any debris. A wetted interior pipe surface will produce more consistent results. Plug all pipe outlets to resist the test pressure. Give special attention to stoppers and laterals. Testing to include all completed sewers including sewer services if included as a part of the work.

*Procedures - Determine the test duration for the section under test by computation from the applicable equations shown in ASTM C828, or from prepared air test tables. The pressure-holding time is based on an average holding pressure of 3 psi (21 kPa) gage or a drop from 3.5 psi (24 kPa) to 2.5 psi (17 kPa) gage.

Add air until the internal air pressure of the sewer line is raised to approximately 4.0 psi (28 kPa) gage. After an internal pressure of approximately 4.0 psig is obtained, allow time for the air pressure to stabilize. The pressure will normally show some drop until the temperature of the air in the test section stabilizes.

When the pressure has stabilized and is at or above the starting test pressure of 3.5 psi (24 kPa) gage, commence the test. Before starting the test, the pressure may be allowed to drop to 3.5 psig. Record the drop in pressure for the test period. If the pressure has dropped more than 1.0 psi (7 kPa) gage during the test period, the line is presumed to have failed. The test may be discontinued when the prescribed test time has been completed even though the 1.0 psig drop has not occurred.

*Safety - The air test may be dangerous if, because of lack of understanding or carelessness, a line is improperly prepared.

It is extremely important that the various plugs be installed and braced in such a way as to prevent blowouts. Inasmuch as a force of 250 lb. (1112N) is exerted on an 8-in. (203-mm) plug by an internal pipe pressure of 5 psi (34 kPa), it should be realized that sudden expulsion of a poorly installed plug or of a plug that is partially deflated before the pipe pressure is released can be dangerous.

As a safety precaution, pressurizing equipment may include a regulator or relief valve set at perhaps 10 psi (69 kPa) to avoid over-pressurizing and damaging an otherwise acceptable line. No one shall be allowed in the manholes during testing.

*Table - The air test table below has been prepared utilizing applicable equations from ASTM C828. It is based on an allowable air loss of $0.003 \text{ ft}^3/\text{min}\cdot\text{ft}^2$ of internal pipe surface, a maximum air loss per test section of $3.5 \text{ ft}^3/\text{min}$ and a minimum significant air loss per test section of $2.0 \text{ ft}^3/\text{min}$. (Test sections of such length that an air loss of $3.5 \text{ ft}^3/\text{min}$ would be exceeded using the allowable loss of air per square foot of internal pipe surface may be tested in segments where total air loss would be between 2.0 and $3.5 \text{ ft}^3/\text{min}$.) It applies when testing one pipe diameter only and for convenience ignores 4" and 6" lateral sewers, which in most instances create only insignificant differences in test time.

AIR TEST TABLE

Based on Equations from ASTM C828

SPECIFICATION TIME (min:sec) REQUIRED FOR PRESSURE DROP FROM 3-1/2 TO 2-1/2 PSIG

WHEN TESTING ONE PIPE DIAMETER ONLY

PIPE DIAMETER, INCHES

LENGTH OF LINE, FEET	4	6	8	10	12	15	18	21	24
25	0:04	0:10	0:18	0:28	0:40	1:02	1:20	2:01	2:38
50	0:09	0:20	0:35	0:55	1:19	2:04	2:58	4:03	5:17
75	0:13	0:30	0:53	1:23	1:59	3:06	4:27	6:04	7:55
100	0:18	0:40	1:10	1:50	2:38	4:08	5:56	8:05	10:34
125	0:22	0:50	1:28	2:18	3:18	5:09	7:26	9:55	11:20
150	0:26	0:59	1:46	2:45	3:58	6:11	8:30	-	-
175	0:31	1:09	2:03	3:13	4:37	7:05	-	-	-
200	0:35	1:19	2:21	3:40	5:17	-	-	-	12:06
225	0:40	1:29	2:38	4:08	5:40	-	-	10:25	13:36
250	0:44	1:39	2:56	4:35	-	-	8:31	11:35	15:07
275	0:48	1:49	3:14	4:43	-	-	9:21	12:44	16:38
300	0:53	1:59	3:31	-	-	-	10:12	13:53	18:09
350	1:02	2:19	3:47	-	-	8:16	11:54	6:12	21:10
400	1:10	2:38	-	-	6:03	9:27	13:36	18:31	24:12
450	1:19	2:50	-	-	6:48	10:38	15:19	20:50	27:13
500	1:28	-	-	5:14	7:34	11:49	17:01	23:09	30:14

18. Setting Ductile Iron Fittings. Ductile iron fittings shall be set at locations shown in the Plans or as directed by the Engineer. The installation of fittings shall be made in accordance with Section 10 of AWWA C600. Special care shall be taken to properly bell-up the joints and to support the body of the fitting. All fittings shall be restrained using mega-lug mechanical joint restraints.

19. Joint Restraint. All cast iron or ductile iron fittings, valves, and other sewer main components subject to hydrostatic thrust shall be securely restrained by use of mega-lug mechanical joint restraints and appropriately sized concrete reaction blocking. Reaction blocking shall be 3,000 PSI ready mixed concrete. Sakrete type may be used when thoroughly mixes and with approval of the Town Engineer when in small quantities.

20. Concrete Encasement. Wherever in the laying of the sanitary sewer line the pipe is in a shallow trench where insufficient cover conditions exist, or where shown on the Drawings, or as directed by the Engineer, the pipe shall be completely encased in excavatable flowable fill. This encasement shall conform to the typical section shown on the drawings. Delivery tickets on the concrete thus shall be turned in to the Engineer no later than the following working day after delivery was made.

21. Service Connections. Service connections shall be installed where shown on the Drawings and to material specifications as hereinbefore specified.

The stack shall be installed as detailed on the Drawings. Care must be taken to properly tamp the earth around stack as the pipe is laid.

22. Pipelines Under State Highway Pavement. Where shown on the Plans, or as directed by the Engineer, ductile iron sewer mains shall be installed under State Highway pavement by encasing in a larger pipe. The carrier pipe shall be of restrained joint ductile iron and the encasement pipe shall be of steel.

The encasement pipe shall be installed true to line and grade and in conformance with the requirements of the N. C. DOT. The size of the encasement and carrier pipes shall be as shown on the Drawings.

Following the installation of the carrier pipe, the ends of the encasement pipe shall be suitably protected against the entrance of foreign material but shall not be tightly sealed. In general, this may be accomplished by the use of the same stone specified for trench stabilization. The ductile iron carrier pipe shall extend approximately 5.0 feet beyond each end of the encasement pipe.

Pipelines installed under this Section shall not be undertaken without the express approval of the appropriate N. C. DOT Division Engineer.

23. Pavement Replacement. All pavement cut and removed from publicly maintained roads, streets or highways as authorized by the Engineer, shall be replaced by the Contractor. Pavement cuts shall be maintained by the Contractor until such time as the pavement has been replaced, but such replacement shall be done as promptly as weather permits. Pavement shall be replaced within 48 hours after being cut. No pavement cuts are allowed on Friday.

24. Existing Pipes, Conduits and Cables - Care of. Special care must be exercised by the Contractor, in the installation of all utilities and services, in passing under or over existing storm sewers, sanitary sewers, water lines, gas lines and telephone or power conduits or cables. All aforementioned structures broken or ruptured by the Contractor must be immediately repaired or replaced by him. It shall be the contractor's responsibility to verify the location of all underground lines before construction.

25. Responsibility for Damages. The Contractor shall be held responsible for all damages claimed, as a result of the installation of this project, to all utility poles, driveways, yards,

shrubbery and planting, drain ditches and pipes, pavement, sidewalks, water lines, gas lines, telephone or power conduits or cables, buildings, fences, etc., and will be required to make satisfactory adjustment of all claims arising from the installation of the work contemplated in this contract prior to final settlement.

26. Signs and Barricades. The Contractor shall provide, erect, maintain and illuminate, where necessary, all barricades, warning signs and local detour signs required. The Contractor shall be held responsible for all damages to the project due to the failure of the signs and barricades to properly protect the work from traffic, pedestrians, animals, and from all other sources. Signs and barricades shall comply with Manual on Uniform Traffic Control Devices for Streets and Highways as amended by the N. C. Department of Transportation.

27. Cleanup. Upon installation of the specified improvements, the Contractor shall remove all excess materials, earth, debris, etc., along the line of his work and shall cleanup and leave, in its original or better condition, all affected property. The contractor shall clean up all work to the point of construction activity not less than weekly.

28. Erosion Control.

A. Reference to Other Documents. The General Conditions, Supplementary Conditions, Material Specifications, and Detailed Specifications for Installation contain requirements relevant to the work covered by this Section. Clearing and Grubbing, Site Grading, Clearing of rights of ways, excavating and backfilling, and Spoil Disposal will be subject to the applicable requirements of this Section.

B. General Requirements. Control of erosion and sedimentation resulting from land disturbing activities is subject to the requirements of the North Carolina Sedimentation Control Commission. Any authorized representative or agent of the commission shall be granted entry or access for purposes of inspection; he shall not be obstructed, hampered, or interfered with while he is in the process of carrying out his official duties. The requirements for erosion and sedimentation control apply to areas which are involved in borrow, waste disposal, and topsoil storage activities; and to areas which are directly involved with the construction of buildings, paving, curb, gutter, and to areas where storm drainage, water, and sewer lines and structures are installed. No Construction shall take place until erosion control permit has been issued and a copy provided to the Town.

Land disturbing activities shall be planned and carried out to achieve the following objectives:

- 1) Expose minimum sized areas at any one time
- 2) Limit exposures of areas to the shortest possible time
- 3) Control surface water run-off to reduce erosion and sediment loss
- 4) Hold off-site erosion and sedimentation damage to a minimum

With reference to requirement No. 2, portions of the site on which land disturbing activities have been undertaken, but upon which no further active construction takes place for a period of 15 working days, shall be planted or otherwise provided with a ground cover sufficient to restrain erosion.

The Contractor shall be responsible for maintaining all temporary and permanent erosion and sedimentation measures and facilities until the project is accepted by the Town, or until removal of facilities and cessation of control measures is authorized by the Engineer.

C. Work Included. This Section includes the labor, materials, equipment, and related services required for the installation of berms, drainage structures, storm water drains, straw barriers,

vegetative covers, and other devices or methods for control of erosion and sedimentation shown on the Drawings or specified herein.

D. Facilities and Measures for Erosion and Sedimentation Control.

1) Phased Construction. The installation of improvements shall be done in phases as specified on the construction drawings.

This phasing of construction will help limit erosion caused during the installation of the improvements and will act as an erosion control measure.

2) Clearing and Grubbing. The Contractor is to clear the entire width of the permanent easement of trees, stumps, shrubs, and brush. The natural vegetative cover is to remain intact until the installation of the line begins, except that which has to be removed during the clearing and grubbing operation. Stumps, brush, and rubbish resulting from the clearing operation shall not be disposed of by placing on adjoining privately owned property unless the Contractor has a written instrument from the property owner. All other spoil is expected to be trucked off to the sanitary landfill for disposal.

3) Rip Rap. Rip Rap shall be installed at locations as shown on plans or as directed by the Engineer per the NC DENR erosion control manual.

4) Berms. Drainage berms and ditches shall be installed as shown on the Drawings per the NC DENR erosion control manual.

5) Silt Fence. Silt fences shall be installed as shown on the Drawings or when directed by the Engineer per the NC DENR erosion control manual.

6) Excelsior Matting. Matting shall be installed at location shown on the Drawings and shall be in compliance with "Standards and Specifications for Soil Erosion and Sediment Control" by the Land Quality Section of NCDENR per the NC DENR erosion control manual.

7) Utility Line Installation. Soil resulting from trench excavation to be used as backfill material shall be placed on the uphill side of the trench. This will prohibit runoff directly into the creek. No excavation shall be placed in the creek or on the bank at any time. Rock encountered during excavation shall be removed from the site and shall not be disposed of by placing on adjoining privately owned property.

8) Creek Crossing. Where the sewer line or water line crosses a creek, it shall be installed true to line and grade. Material excavated shall not be placed into the stream. Rock shall be removed from the site. Creek banks shall be stabilized immediately after installation of the line with Class I Rip Rap as specified on drawings. Temporary site roads crossing creeks will require approval from the Engineer. Approved temporary crossings shall be piped and conform to acceptable North Carolina erosion control details.

9) Permanent Vegetative Cover. Prepare seedbed by ripping, chiseling, harrowing or plowing to depth of six inches so as to produce a loose, friable surface. Remove all stones, boulders, stumps or debris from the surface which would prohibit germination or plant growth per the NC DENR erosion control manual.

Incorporated into the soil 800 to 1,000 pounds of 10-10-10 fertilizer plus 500 pounds of twenty percent (20%) Superphosphate per acre and two tons of dolomitic lime per acre unless soil tests indicate that a lower rate can be used.

Mulch after seeding with 2.0 tons of grain straw per acre and either crimp straw into soil or tack with liquid asphalt at 400 gallons per acre or emulsified asphalt at 300 gallons per acre.

PERMANENT SEEDINGS

<u>PLANTS & MIXTURE</u>	<u>PLANTING RATE/ACRE</u>	<u>PLANTING DATES</u>
TALL FESCUE (LOW MAINTENANCE)	100-150 LBS.	AUG. 15 - OCT. 15 FEB. 15 - MAY 1
TALL FESCUE WATERWAYS AND LAWNS (HIGH MAINTENANCE)	200-250 LBS.	AUG. 15 - OCT. 15 FEB. 15 - MAY 1
BLEND OF TWO TURF-TYPE TALL FESCUES (90%) AND TWO OR MORE IMPROVED KENTUCKY BLUEGRASS VARIETIES (10%) (HIGH MAINTENANCE)	200-250 LBS.	AUG. 15 - OCT. 15 FEB. 15 - MAY 1
TALL FESCUE AND KOBE OR KOREAN LESPEDEZA	100 LBS. & 20-25 LBS.	FEB. 15 - MAY 1 AUG. 15 - OCT. 15
TALL FESCUE AND SERICEA LESPEDEZA	50 LBS. 60 LBS./ACRE	NOV. 1 - FEB. 1 (UNSCARIFIED)
TALL FESCUE AND GERMAN MILLET OR SUNDANGRASS	70 LBS. AND 40 LBS.	JULY AND AUGUST
TALL FESCUE AND RYEGRASS	70 LBS. AND 25 LBS.	NOV. 1 - JAN. 30
COMMON BERMUDAGRASS	8 LBS. (HULLED) 15-20 LBS. (UNHULLED)	APRIL 15 - JUNE 30 FEB. 1 - MARCH 30

Permanent Seeding Notes:

1. For spring seedlings, use scarified lespedeza seed. For late fall and winter seedings, use unscarified seed.
2. Annuals such as millet, sundangrass and ryegrass must be kept at 10-12" maximum height. The use of annual rye grass is not permitted.

The preceding permanent cover requirements pertain to all areas disturbed during the project construction including road shoulders, temporary access roads, spoil areas, building sites, rights-of-way, easements and line work.

29. Bonds and Permits Required by N. C. DOT. The Contractor, at his own expense, will secure from the N. C. DOT, the "Encroachment Agreement" required prior to the installation of

that portion of this project that lies within the right of way of the said NCDOT. Any or all other bonds and/or permits required by the said NCDOT in connection with this project shall be provided and paid for by the Contractor. This relates especially to the "Permit to Open Pavement" and the performance bond.

30. Guarantee. The Contractor shall guarantee that if any materials, equipment or workmanship covered by these Specifications and the accompanying Drawings proves defective within one year after final acceptance, such defects shall be made good by him. The Engineer shall provide a letter to the Town indicating the start of the 12-month guarantee period. Provide State required certifications and "As Builts" with guarantee letter.

31. Manhole Testing. This section is to supplement the manhole specifications. All manholes shall be tested using either the exfiltration test or vacuum test as specified below. Manholes shall be tested by plugging the inlet and outlet lines with airtight plugs prior to performing the manhole test.

- a. **Exfiltration:** Fill the manhole to the rim with water and allow the level to equalize due to saturation.

Refill the manhole and mark the level to begin the test. The test shall last at least 2 hours and allowable leakage shall be 3 gallons per hour. Manholes that fail the test shall be repaired as necessary and retested until they pass.

- b. **Vacuum Air:** The manhole shall be sealed at the top of the rim with the test rig and shall have 10-inches of mercury applied through the rig. The time for the mercury to drop from 10-inches to 9-inches shall be measured. The minimum test time for the specified drop shall not be less than that shown in the following table. All manholes on the project shall be tested. If any manhole fails, it shall be repaired as necessary and retested until it passes.

<u>Manhole Depth</u>	<u>Diameter of Manhole</u>		
	48" Ø	60" Ø	72" Ø
≤ 10 ft.	60 sec.	75 sec.	90 sec.
> 10 ft. but < 15 ft.	75 sec.	90 sec.	105 sec.
> 15 ft.	90 sec.	105 sec.	120 sec.

32. Video Inspection. All sewers and sewer services shall be video inspected by the Contractor and a copy of such video delivered to the Town in DVD format. Prior to the video of the sewers, all lines shall be pressured cleaned and flushed and the contractor shall pour 5 gallons of water down each service. All parging of joints, installation of slides, etc., shall be completed prior to performing the video inspection. All defects noted during the video inspection shall be corrected by the Contractor. The Contractor shall provide 48 hours' notice to the Town prior to the cleaning and/or video inspection in the event the Town desires to witness the inspection.

33. Testing Notice. Notice to the Town, for any testing related to sewer line work, will be required of the Contractor, 48 hours in advance of testing.

34. Damaged Piping. Should any piping be damaged prior to acceptance by the Town, the whole joint will be replaced.

RELATION OF WATER MAINS TO SEWERS

- (a) *Lateral Separation of Sewer and Water Mains. Water Mains shall be laid at least 10 feet laterally from existing or proposed sewer, unless local conditions or barriers prevent a 10 foot lateral separation in which case:*
1. *The water main is laid in a separate trench, with the elevation of the bottom of the water main at least 18 inches above the top of the sewer; or*
 2. *The water main is laid in the same trench as the sewer with the water main located at one side of a bench of undisturbed earth, and with the elevation of the bottom of the water main at least 18 inches above the top of the sewer.*
- (b) *Crossing a Water Main over a Sewer. Whenever it is necessary for a water main to cross over a sewer, the water main shall be laid at such an elevation that the bottom of the water main is at least 18 inches above the top of the sewer, unless local conditions or barriers prevent an 18 inch vertical separation – – in which case both the water main and sewer shall be constructed of ferrous materials and with joints that are equivalent to water main standards for a distance of 10 feet on each side of the point of crossing.*
- (c) *Crossing a Water Main Under a Sewer. Whenever it is necessary for a water main to cross under a sewer, both the water main and the sewer shall be constructed of ferrous materials and with joints equivalent to water main standards for a distance of 10 feet on each side of the point of crossing. A section of water main pipe shall be centered at the point of crossing.*

History Note: Statutory Authority G.S. 130–157 to 1611; Eff. January 1, 1977

W-1

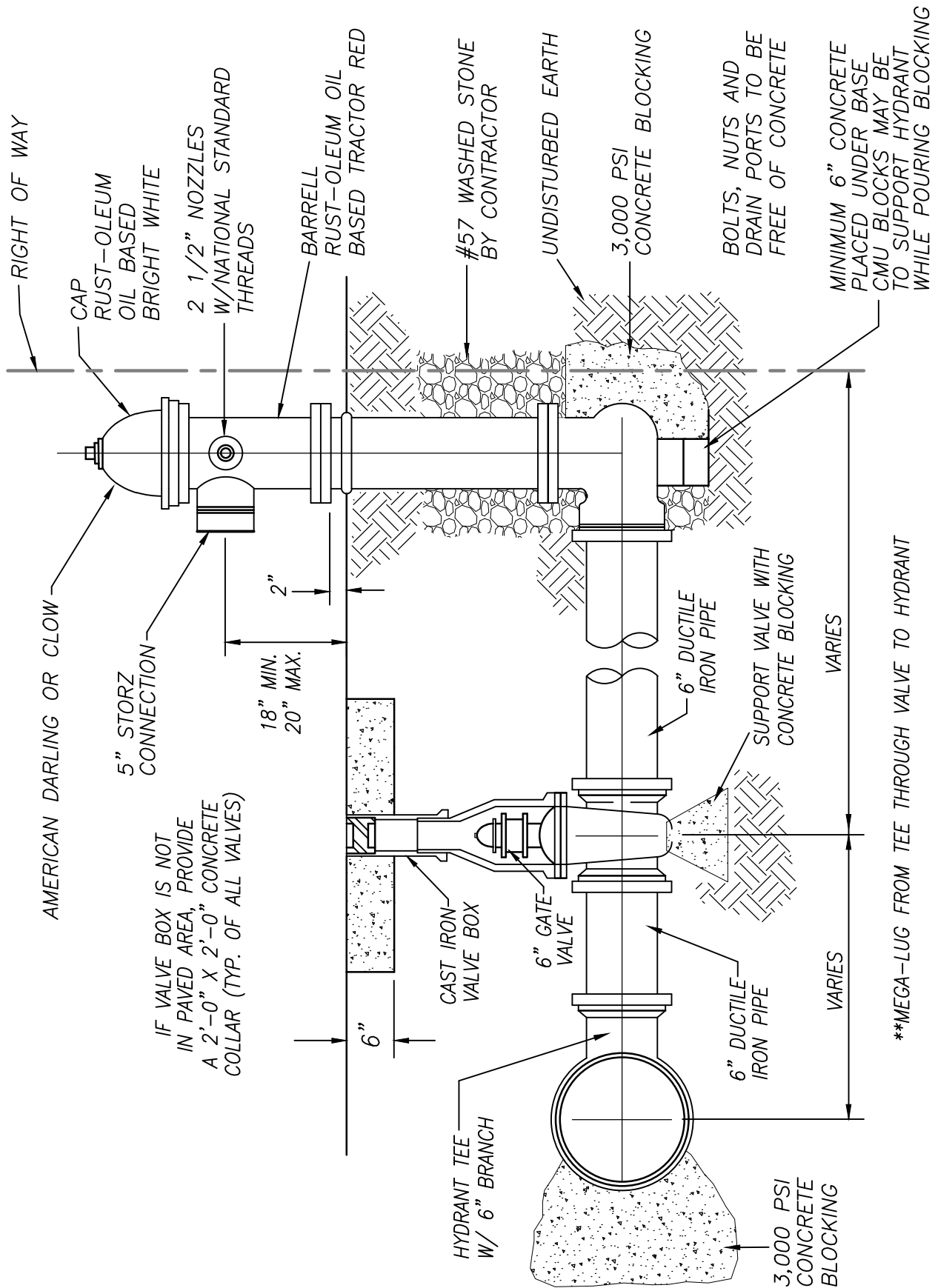
**TOWN OF HAW RIVER
STANDARD**

**RELATION OF WATER
MAINS TO SEWER**

SCALE: N.T.S.

DATE: 7/23/26

DRAWN BY: WDF



W-2

TOWN OF HAW RIVER STANDARD

FIRE HYDRANT INSTALLATION

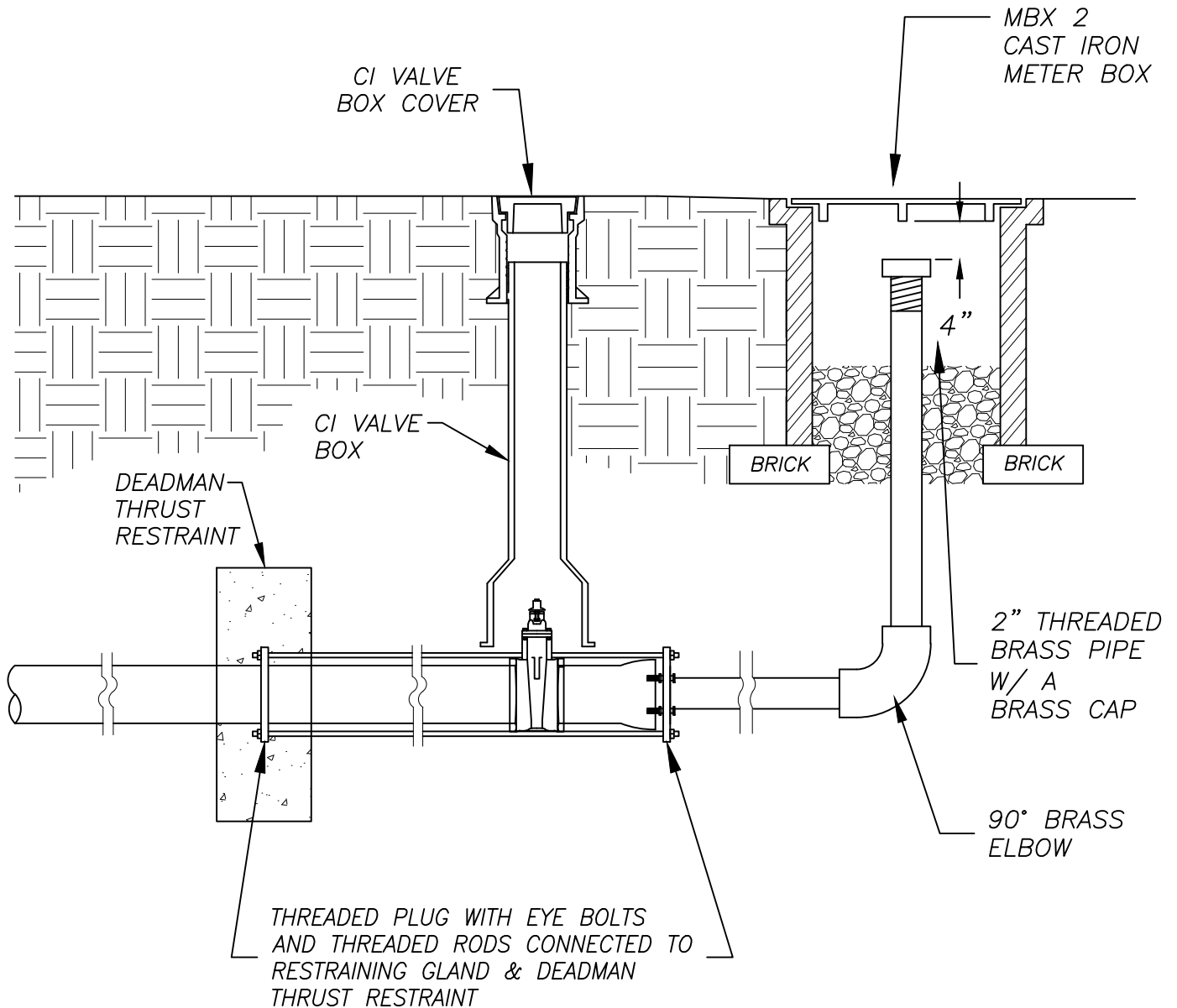
SCALE: N.T.S.

DATE: 7/23/26

DRAWN BY: WDF

NOTES:

1. 1" BLOW-OFF REQUIRED ON 2", 3", AND 4" MAINS
2. 2" BLOW-OFF REQUIRED ON 6"-8" MAINS
3. TEMPORARY HYDRANT AS BLOW-OFF REQUIRED ON 10" & GREATER MAINS
4. ALL BLOW-OFF'S SHALL BE BEHIND CURB & SIDEWALK.



W-4

**TOWN OF HAW RIVER
STANDARD**

2" BLOW-OFF ASSEMBLY

SCALE: N.T.S.

DATE: 7/23/26

DRAWN BY: WDF

APPROVED DEVICES

A. RPZ

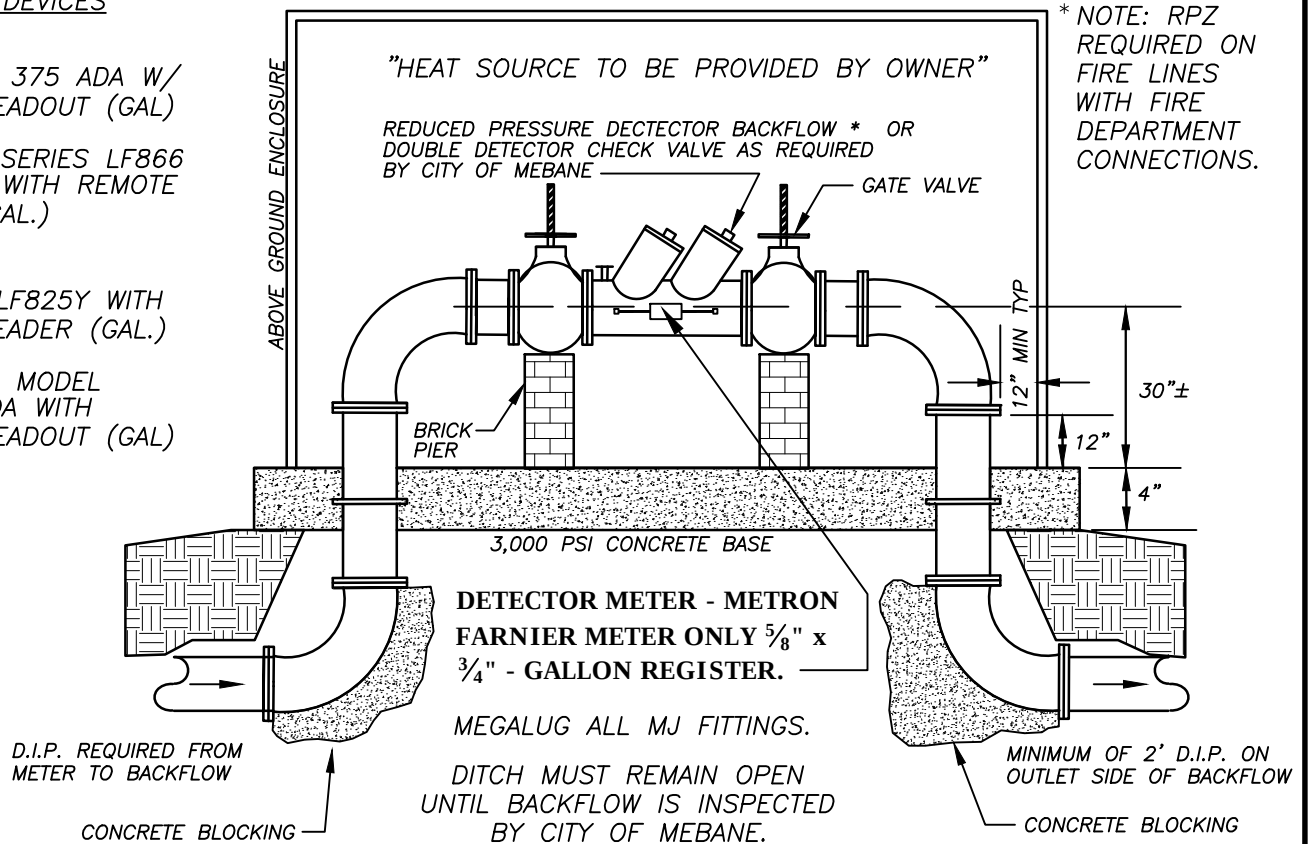
1. WILKINS 375 ADA W/
REMOTE READOUT (GAL)

2. FEBCO SERIES LF866
DETECTOR WITH REMOTE
READER (GAL.)

B. DDC

1. FEBCO LF825Y WITH
REMOTE READER (GAL.)

2. WILKINS MODEL
975XL2 ADA WITH
REMOTE READOUT (GAL)



NOTES

1. THE BACKFLOW DEVICE SHALL BE WITHIN 10' OF AND ON THE PROPERTY SIDE OF THE METER. ENCLOSURE SHALL NOT OBSTRUCT SITE DISTANCE AT ROAD CROSSINGS.
2. ALL BACKFLOW DEVICES SHALL BE INSTALLED ABOVE GROUND IN A HORIZONTAL POSITION UNLESS OTHERWISE PREAPPROVED BY THE TOWN OF HAW RIVER.
3. SHUT OFF VALVES SHALL BE RESILIENT SEAT WITH FLANGED END AND O.S.&Y HAND WHEELS.
4. ALL INTERIOR AND EXTERIOR IRON SURFACES SHALL HAVE EPOXY COATINGS TO CONFORM TO ANSI/AWWA C550 OR MANUFACTURED OF STAINLESS STEEL.
5. APPROVED ABOVE GROUND ENCLOSURES: "HOT BOX", HYDROCOWL, SMI MODEL # b68-EHPZD, B80-EHPZD, B110-EHPZD) OR BFP (#640-1PD, 800-1PD, 950-APD OR 1150-APD. ENCLOSURE MUST HAVE A DRAIN
6. CONTRACTOR SHALL PROVIDE AND INSTALL ON EXTERIOR OF ABOVE GROUND ENCLOSURE AN EXTERIOR ANTENNA FOR DETECTOR METER.
7. TANDEM BACKFLOWS REQUIRED IF SERVING MULTIPLE USERS OR SERVICE CANNOT BE INTERRUPTED
8. DETECTOR METER AND BACKFLOW ASSEMBLY SHALL BE INSTALLED IN ENCLOSURE.
9. PIPE & FITTINGS BELOW GRADE TO BE M.J. WITH RETAINER GLANDS, 150 PSI MIN. WORKING PRESSURE. THREADED ROD TO BE INSTALLED AS NEEDED.
10. INSTALL BACKFLOW DEVICE NEAR MAIN WATERLINE CONNECTION AT STREET RIGHT OF WAY.
11. ALL BACKFLOW DEVICES SHALL BE TESTED, INSPECTED, AND MAINTAINED BY THE OWNER. PROVIDE ANNUAL REPORTS TO CITY.

W-5

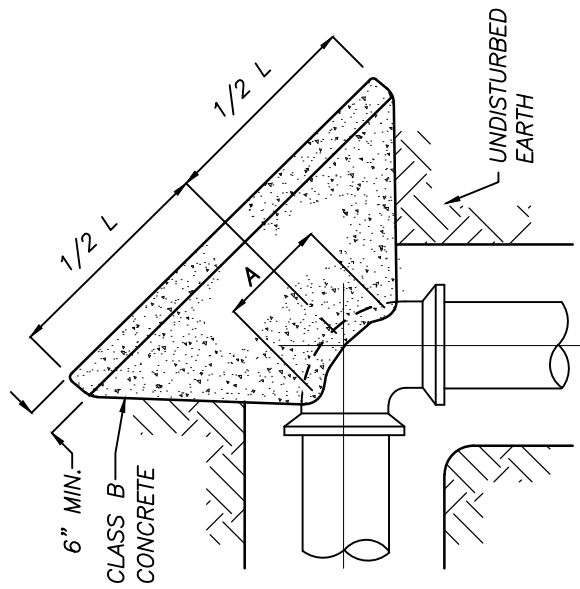
TOWN OF HAW RIVER STANDARD

ABOVE GRADE BACKFLOW PREVENTER, 3" AND GREATER

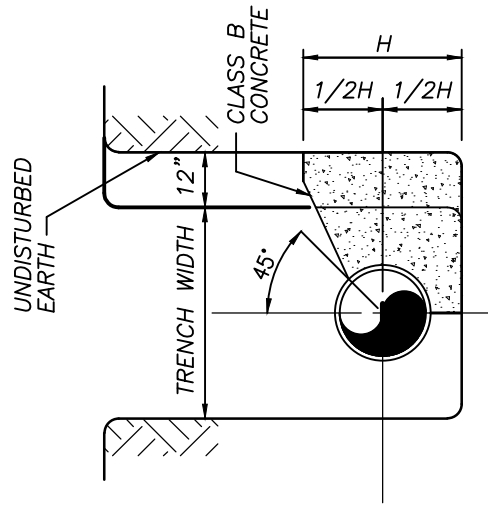
SCALE: N.T.S.

DATE: 7/23/26

DRAWN BY: WDF



PLAN - BENDS



SECTION

PIPE SIZE	BUTTRESS DIMENSIONS			
	22 1/2° BENDS	45° BENDS	90° BENDS	
	L	H	L	H
6"	1'-0"	1'-0"	1'-4"	1'-2"
8"	1'-0"	1'-4"	1'-10"	1'-6"
12"	1'-4"	1'-10"	2'-8"	2'-3"

NOTES:

1. DIMENSION "A" SHOULD BE AS LARGE AS POSSIBLE WITHOUT INTERFERING WITH THE MECHANICAL JOINT BOLTS
2. THE SHAPE OF THE BACK OF THE BUTTRESS MAY VARY PROVIDED THE CONCRETE IS AGAINST FIRM, UNDISTURBED EARTH.
3. BUTTRESS DIMENSIONS ARE BASED UPON A SOIL RESISTANCE OF TWO TONS PER SQ. FT. AND A WATER PRESSURE OF 150 P.S.I.

TOWN OF HAW RIVER
STANDARD

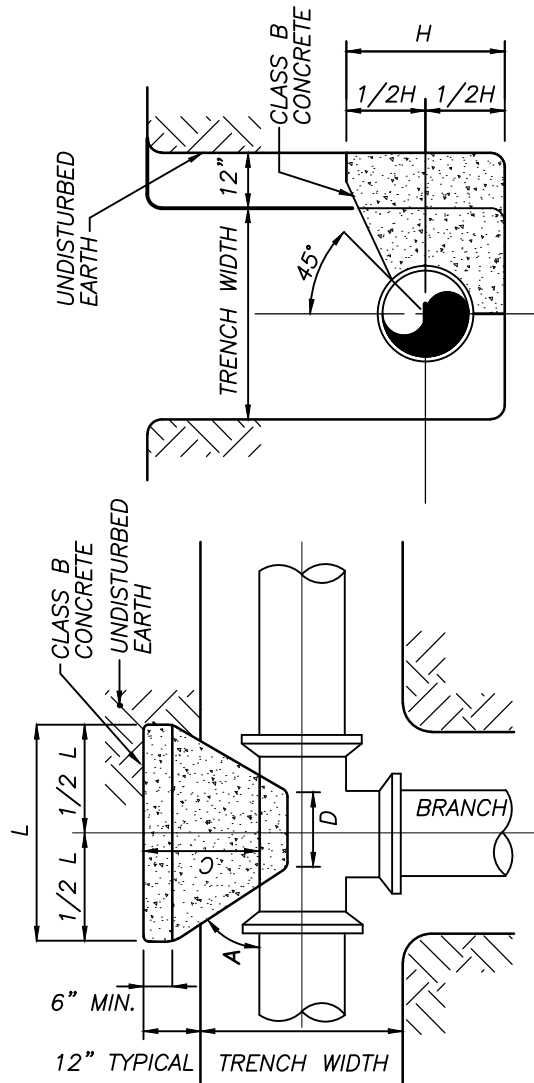
THRUST BLOCKS - BENDS

SCALE: N.T.S.

DATE: 7/23/26

DRAWN BY: WDF

W-6



PLAN - TEE

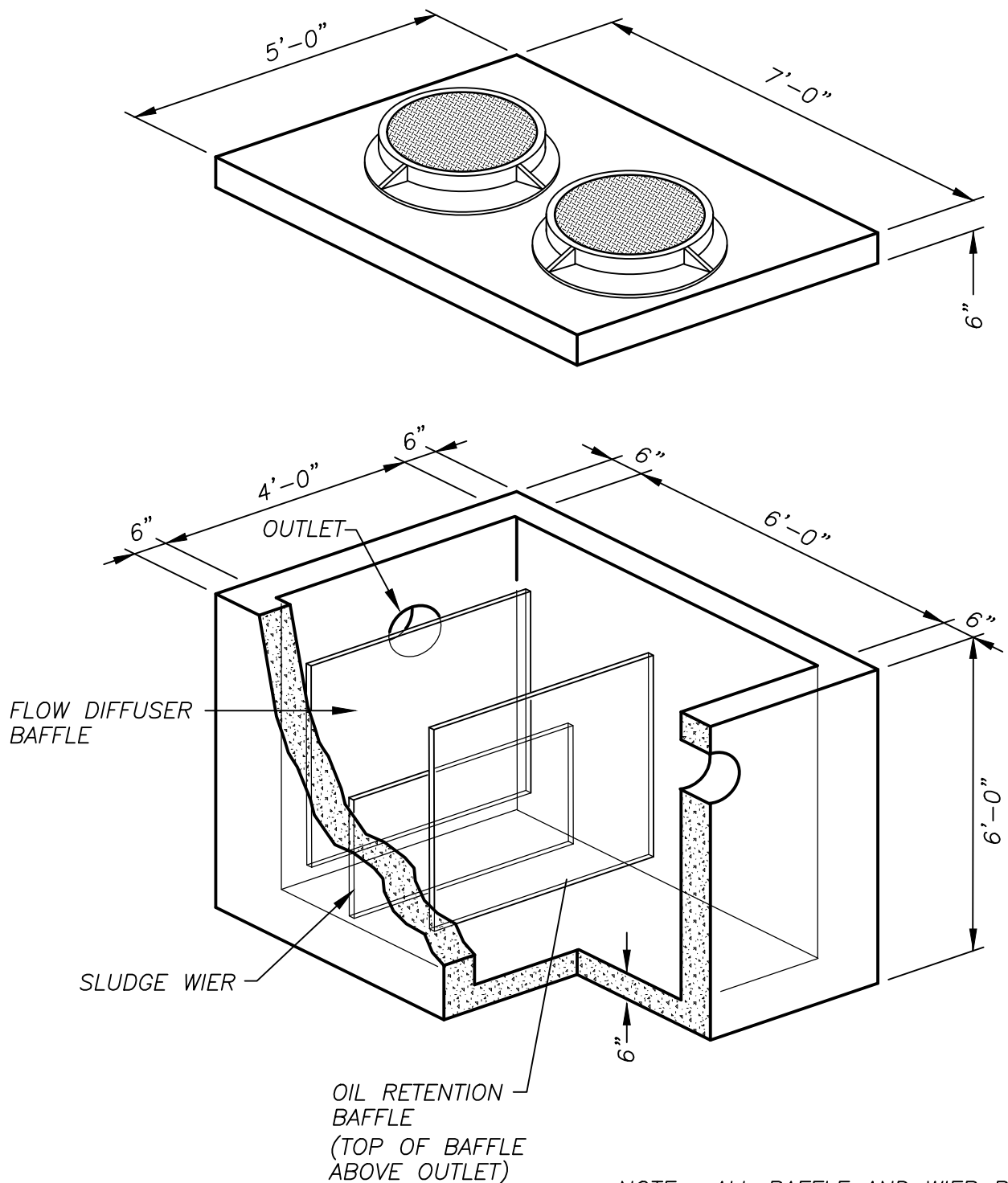
SECTION

BUTTRESS DIMENSIONS				
B. D.	L	H	C	D
6"	1'-3"	1'-0"	SEE NOTE NO. 1	SEE NOTE NO. 2
8"	1'-6"	1'-4"		
12"	2'-3"	2'-0"		

B. D. = BRANCH DIAMETER

NOTES:

1. DIMENSION "C" SHOULD BE LARGE ENOUGH TO MAKE ANGLE "A" EQUAL TO OR GREATER THAN 45°.
2. DIMENSION "D" SHOULD BE AS LARGE AS POSSIBLE WITHOUT INTERFERING WITH EHT MECHANICAL JOINTS.
3. BUTTRESS DIMENSIONS ARE BASED UPON A SOIL RESISTANCE OF TWO TONS PER SQ. FT. AND A WATER PRESSURE OF 150 P.S.I.



NOTE : ALL BAFFLE AND WIER PLATES ARE TO BE GALVANIZED.

W-8

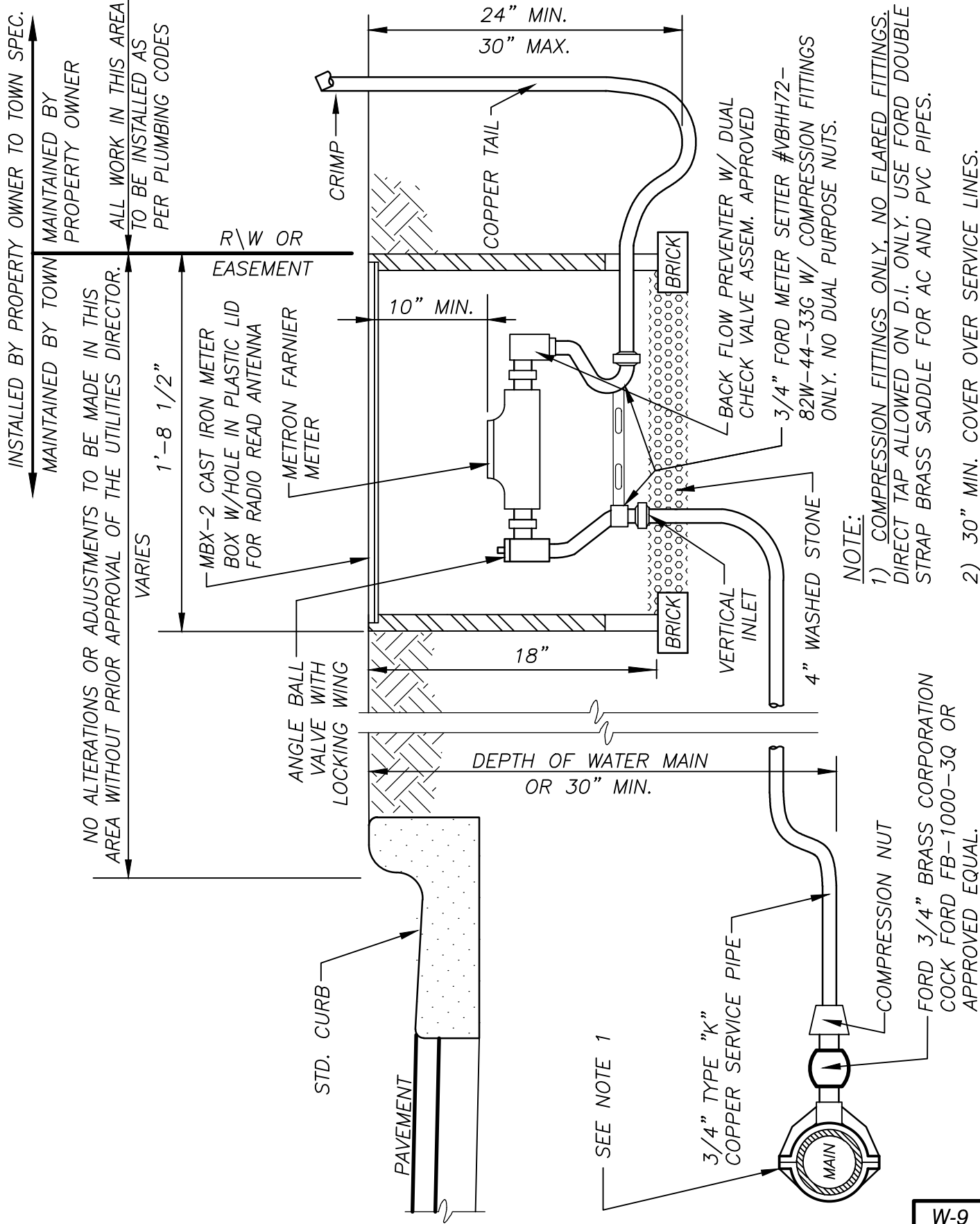
**TOWN OF HAW RIVER
STANDARD**

**OIL WATER SEPARATOR
4' X 6' I.D.**

SCALE: N.T.S.

DATE: 7/23/26

DRAWN BY: WDF



TOWN OF HAW RIVER STANDARD

3/4" DOMESTIC WATER SERVICE CONNECTION

SCALE: N.T.S. DATE: 7/23/26 DRAWN BY: WDF

INSTALLED BY PROPERTY OWNER TO TOWN SPEC.

MAINTAINED BY TOWN

MAINTAINED BY PROPERTY OWNER

MODEL 825Y FEBCO RPZ ASSEMBLY W/STRAINER - OR EQUAL AFTER SETTER - OR EQUAL

NO ALTERATIONS NOR ADJUSTMENTS TO BE MADE IN THIS AREA WITHOUT APPROVAL OF THE UTILITIES ENGINEER.

MBX-2 CAST IRON METER BOX W/HOLE IN PLASTIC LID FOR RADIO READ ANTENNA

VARIES IF THERE IS A SIDEWALK

ANGLE BALL VALVE WITH LOCKING WING

FORD METER SETTER #VBH72-82W-44-33G W/ COMPRESSION FITTINGS ONLY. NO DUEL PURPOSE NUTS.

METRON FARMER RADIO METER

10" MIN.

18"

6"

1'-8 1/2"

3/4" STRAINER

2'-3"

12"

3/4" BALL VALVES

4" WASHED STONE

36"L X 22"W X 4"H CONCRETE PAD

INSTALL THREADED UNIONS ABOVE CONCRETE PAD FOR REMOVAL

3/4" BRASS PIPE

3/4" BRASS ELBOW

3/4" MALE COMPRESSION FITTING (MCF)

INSTALL AS PER PLUMBING CODE

FLOW

POWER SUPPLY BY PROPERTY OWNER

SLEEVE

HOT BOX MODEL HB1

18"

4" WASHED STONE

BRICK

VERTICAL INLET

BACK FLOW PREVENTER W/ DUAL CHECK VALVE ASSE APPROVED

3/4" TYPE "K" COPPER

10" MIN.

18"

6"

4" WASHED STONE

BRICK

VERTICAL INLET

BACK FLOW PREVENTER W/ DUAL CHECK VALVE ASSE APPROVED

3/4" TYPE "K" COPPER

10" MIN.

18"

6"

4" WASHED STONE

BRICK

VERTICAL INLET

BACK FLOW PREVENTER W/ DUAL CHECK VALVE ASSE APPROVED

3/4" TYPE "K" COPPER

10" MIN.

18"

6"

4" WASHED STONE

BRICK

VERTICAL INLET

BACK FLOW PREVENTER W/ DUAL CHECK VALVE ASSE APPROVED

3/4" TYPE "K" COPPER

10" MIN.

18"

6"

4" WASHED STONE

BRICK

VERTICAL INLET

BACK FLOW PREVENTER W/ DUAL CHECK VALVE ASSE APPROVED

3/4" TYPE "K" COPPER

10" MIN.

18"

6"

4" WASHED STONE

BRICK

VERTICAL INLET

BACK FLOW PREVENTER W/ DUAL CHECK VALVE ASSE APPROVED

3/4" TYPE "K" COPPER

10" MIN.

18"

6"

4" WASHED STONE

BRICK

VERTICAL INLET

BACK FLOW PREVENTER W/ DUAL CHECK VALVE ASSE APPROVED

3/4" TYPE "K" COPPER

10" MIN.

18"

6"

4" WASHED STONE

BRICK

VERTICAL INLET

BACK FLOW PREVENTER W/ DUAL CHECK VALVE ASSE APPROVED

3/4" TYPE "K" COPPER

10" MIN.

18"

6"

4" WASHED STONE

BRICK

VERTICAL INLET

BACK FLOW PREVENTER W/ DUAL CHECK VALVE ASSE APPROVED

3/4" TYPE "K" COPPER

10" MIN.

18"

6"

4" WASHED STONE

BRICK

VERTICAL INLET

BACK FLOW PREVENTER W/ DUAL CHECK VALVE ASSE APPROVED

3/4" TYPE "K" COPPER

10" MIN.

18"

6"

4" WASHED STONE

BRICK

VERTICAL INLET

BACK FLOW PREVENTER W/ DUAL CHECK VALVE ASSE APPROVED

3/4" TYPE "K" COPPER

10" MIN.

18"

6"

4" WASHED STONE

BRICK

VERTICAL INLET

BACK FLOW PREVENTER W/ DUAL CHECK VALVE ASSE APPROVED

3/4" TYPE "K" COPPER

10" MIN.

18"

6"

4" WASHED STONE

BRICK

VERTICAL INLET

BACK FLOW PREVENTER W/ DUAL CHECK VALVE ASSE APPROVED

3/4" TYPE "K" COPPER

10" MIN.

18"

6"

4" WASHED STONE

BRICK

VERTICAL INLET

BACK FLOW PREVENTER W/ DUAL CHECK VALVE ASSE APPROVED

3/4" TYPE "K" COPPER

10" MIN.

18"

6"

4" WASHED STONE

BRICK

VERTICAL INLET

BACK FLOW PREVENTER W/ DUAL CHECK VALVE ASSE APPROVED

3/4" TYPE "K" COPPER

10" MIN.

18"

6"

4" WASHED STONE

BRICK

VERTICAL INLET

BACK FLOW PREVENTER W/ DUAL CHECK VALVE ASSE APPROVED

3/4" TYPE "K" COPPER

10" MIN.

18"

6"

4" WASHED STONE

BRICK

VERTICAL INLET

BACK FLOW PREVENTER W/ DUAL CHECK VALVE ASSE APPROVED

3/4" TYPE "K" COPPER

10" MIN.

18"

6"

4" WASHED STONE

BRICK

VERTICAL INLET

BACK FLOW PREVENTER W/ DUAL CHECK VALVE ASSE APPROVED

3/4" TYPE "K" COPPER

10" MIN.

18"

6"

4" WASHED STONE

BRICK

VERTICAL INLET

BACK FLOW PREVENTER W/ DUAL CHECK VALVE ASSE APPROVED

3/4" TYPE "K" COPPER

10" MIN.

18"

6"

4" WASHED STONE

BRICK

VERTICAL INLET

BACK FLOW PREVENTER W/ DUAL CHECK VALVE ASSE APPROVED

3/4" TYPE "K" COPPER

10" MIN.

18"

6"

4" WASHED STONE

BRICK

VERTICAL INLET

BACK FLOW PREVENTER W/ DUAL CHECK VALVE ASSE APPROVED

3/4" TYPE "K" COPPER

10" MIN.

18"

6"

4" WASHED STONE

BRICK

VERTICAL INLET

BACK FLOW PREVENTER W/ DUAL CHECK VALVE ASSE APPROVED

3/4" TYPE "K" COPPER

10" MIN.

18"

6"

4" WASHED STONE

BRICK

VERTICAL INLET

BACK FLOW PREVENTER W/ DUAL CHECK VALVE ASSE APPROVED

3/4" TYPE "K" COPPER

10" MIN.

18"

6"

4" WASHED STONE

BRICK

VERTICAL INLET

BACK FLOW PREVENTER W/ DUAL CHECK VALVE ASSE APPROVED

3/4" TYPE "K" COPPER

10" MIN.

18"

6"

4" WASHED STONE

BRICK

VERTICAL INLET

BACK FLOW PREVENTER W/ DUAL CHECK VALVE ASSE APPROVED

3/4" TYPE "K" COPPER

10" MIN.

18"

6"

4" WASHED STONE

BRICK

VERTICAL INLET

BACK FLOW PREVENTER W/ DUAL CHECK VALVE ASSE APPROVED

3/4" TYPE "K" COPPER

10" MIN.

18"

6"

4" WASHED STONE

BRICK

VERTICAL INLET

BACK FLOW PREVENTER W/ DUAL CHECK VALVE ASSE APPROVED

3/4" TYPE "K" COPPER

10" MIN.

18"

6"

4" WASHED STONE

BRICK

VERTICAL INLET

BACK FLOW PREVENTER W/ DUAL CHECK VALVE ASSE APPROVED

3/4" TYPE "K" COPPER

10" MIN.

18"

6"

4" WASHED STONE

BRICK

VERTICAL INLET

BACK FLOW PREVENTER W/ DUAL CHECK VALVE ASSE APPROVED

3/4" TYPE "K" COPPER

10" MIN.

18"

6"

4" WASHED STONE

BRICK

VERTICAL INLET

BACK FLOW PREVENTER W/ DUAL CHECK VALVE ASSE APPROVED

3/4" TYPE "K" COPPER

10" MIN.

18"

6"

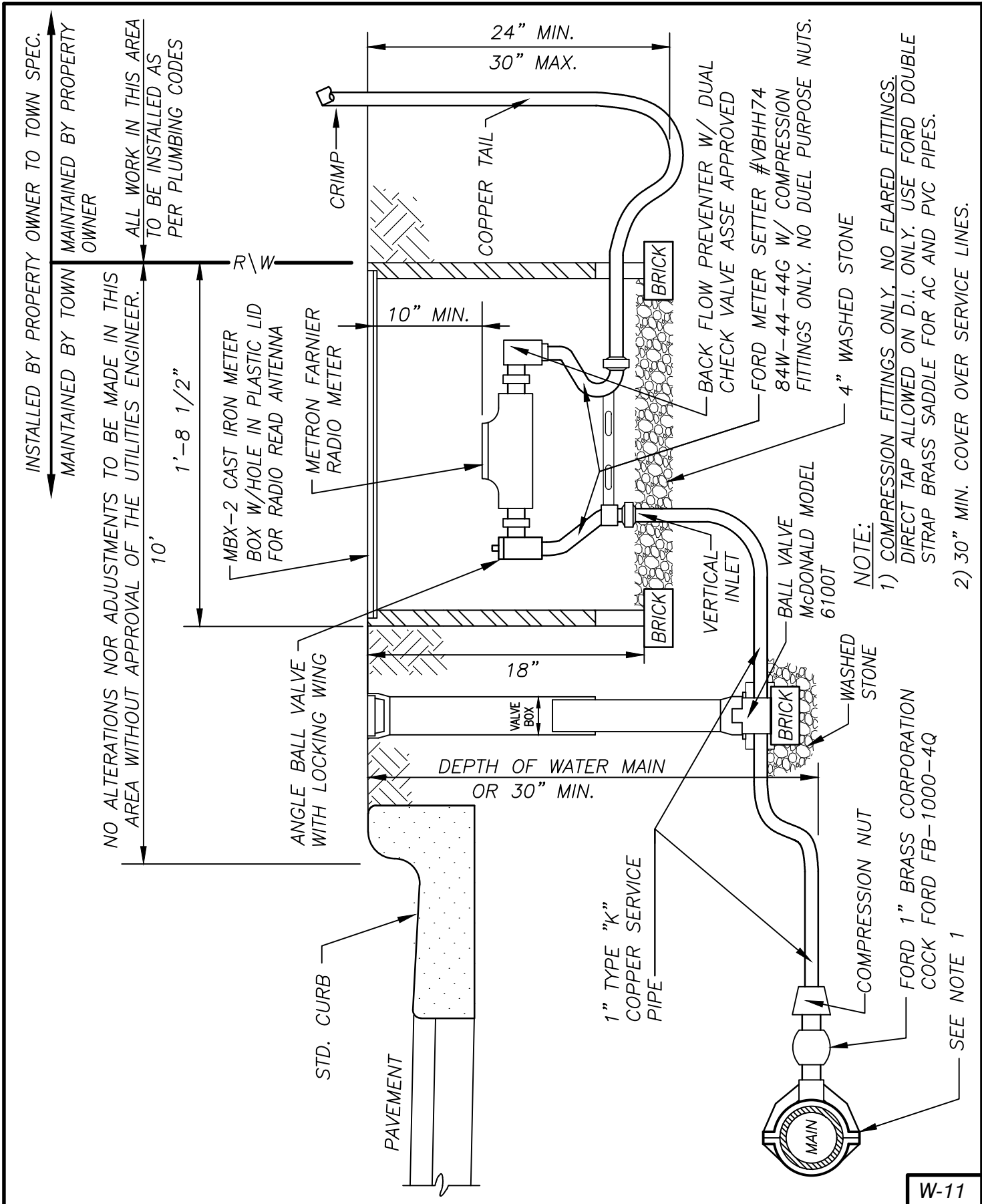
4" WASHED STONE

BRICK

VERTICAL INLET

BACK FLOW PREVENTER W/ DUAL CHECK VALVE ASSE APPROVED

3/4" TYPE "K" COPPER



TOWN OF HAW RIVER STANDARD

1" DOMESTIC WATER SERVICE CONNECTION

SCALE: N.T.S. DATE: 7/23/26 DRAWN BY: WDF

INSTALLED BY PROPERTY OWNER TO TOWN SPEC.

MAINTAINED BY TOWN

OWNER

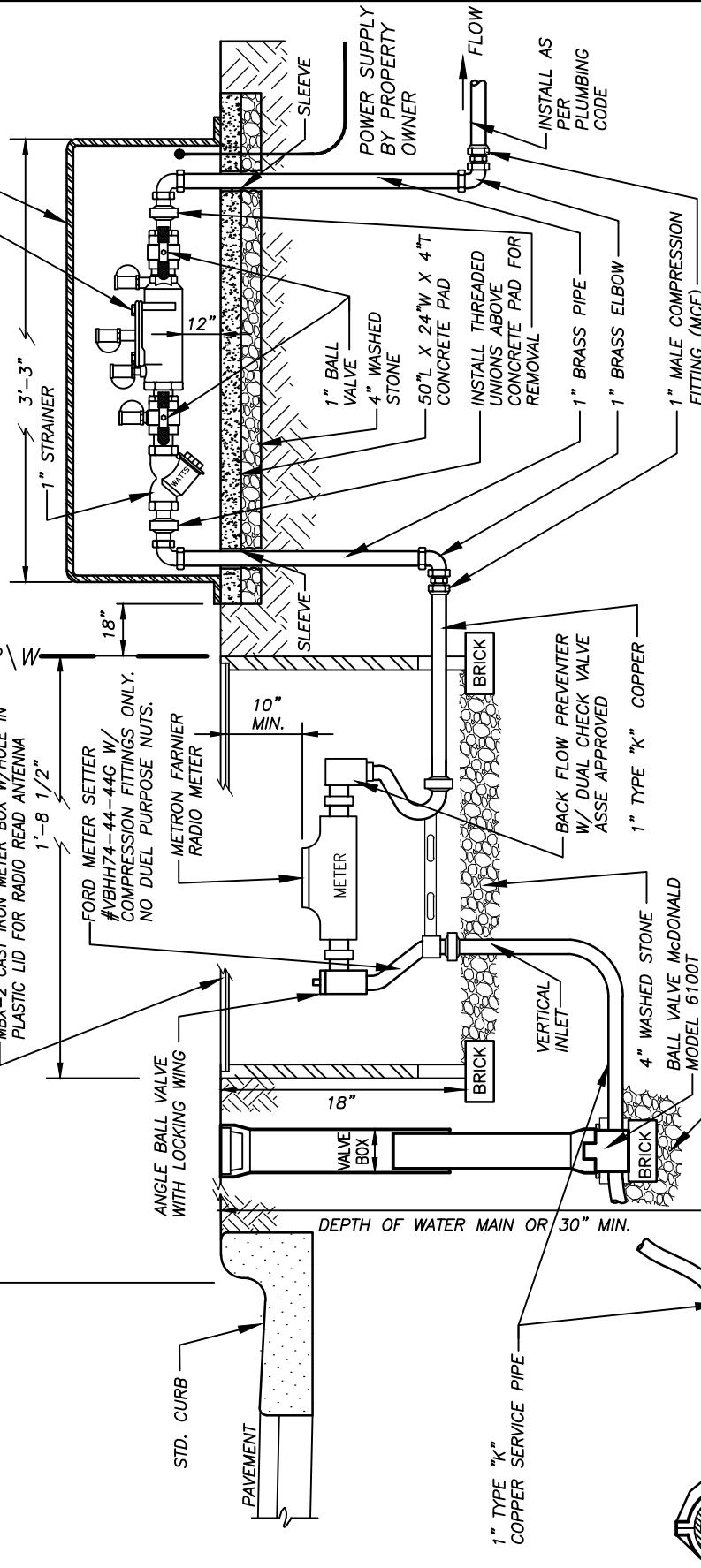
MODEL 825Y FEBCO RPZ
ASSEMBLY W/STRAINER
AFTER SETTER - OR EQUAL

NO ALTERATIONS NOR ADJUSTMENTS TO BE MADE
IN THIS AREA WITHOUT APPROVAL OF THE UTILITIES
ENGINEER.

10'
MBX-2 CAST IRON METER BOX W/HOLE IN
PLASTIC LID FOR RADIO READ ANTENNA

ALL WORK IN THIS AREA TO BE
INSTALLED AS PER PLUMBING
CODES

HOT BOX
MODEL HB 2



NOTE:

- 1) COMPRESSION FITTINGS ONLY. NO FLARED FITTINGS. DIRECT TAP ALLOWED ON D.I. ONLY. USE FORD DOUBLE STRAP BRASS SADDLE FOR AC AND PVC PIPES.
- 2) RPZ'S TO BE TESTED ANNUALLY. PROVIDE COPY OF TEST TO TOWN.

TOWN OF HAW RIVER STANDARD

1" WATER CONNECTION WITH RPZ BACKFLOW ASSEMBLY

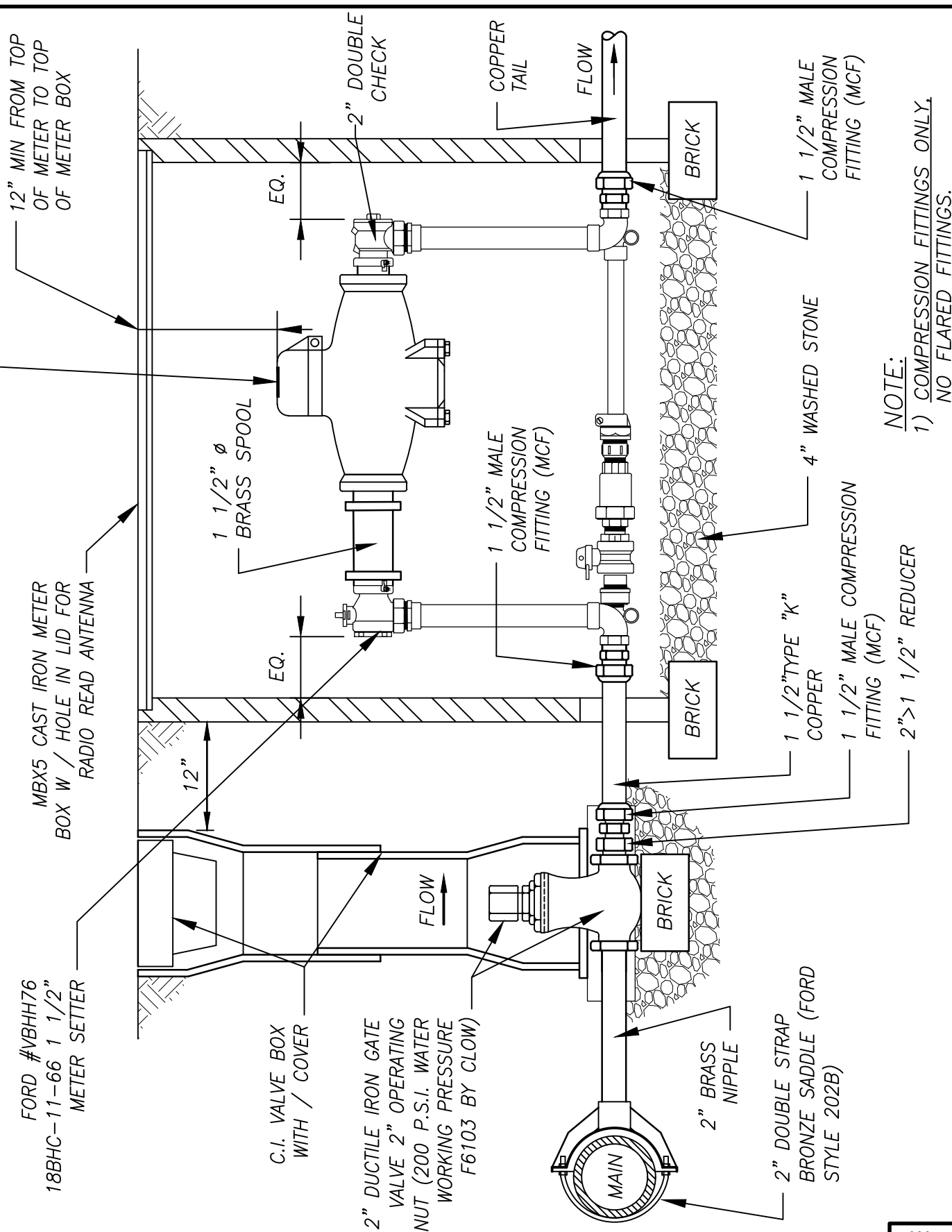
SCALE: N.T.S.

DATE: 7/23/26

DRAWN BY: WDF

W-12

SEE NOTE 1



NOTE:
 1) COMPRESSION FITTINGS ONLY.
NO FLARED FITTINGS.

TOWN OF HAW RIVER STANDARD

1 1/2" DOMESTIC WATER CONNECTION

SCALE: N.T.S. DATE: 7/23/26 DRAWN BY: WDF

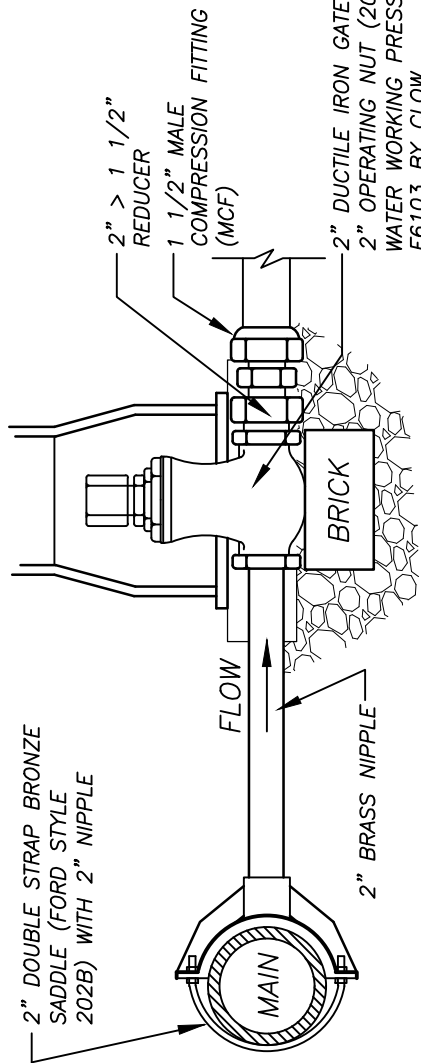
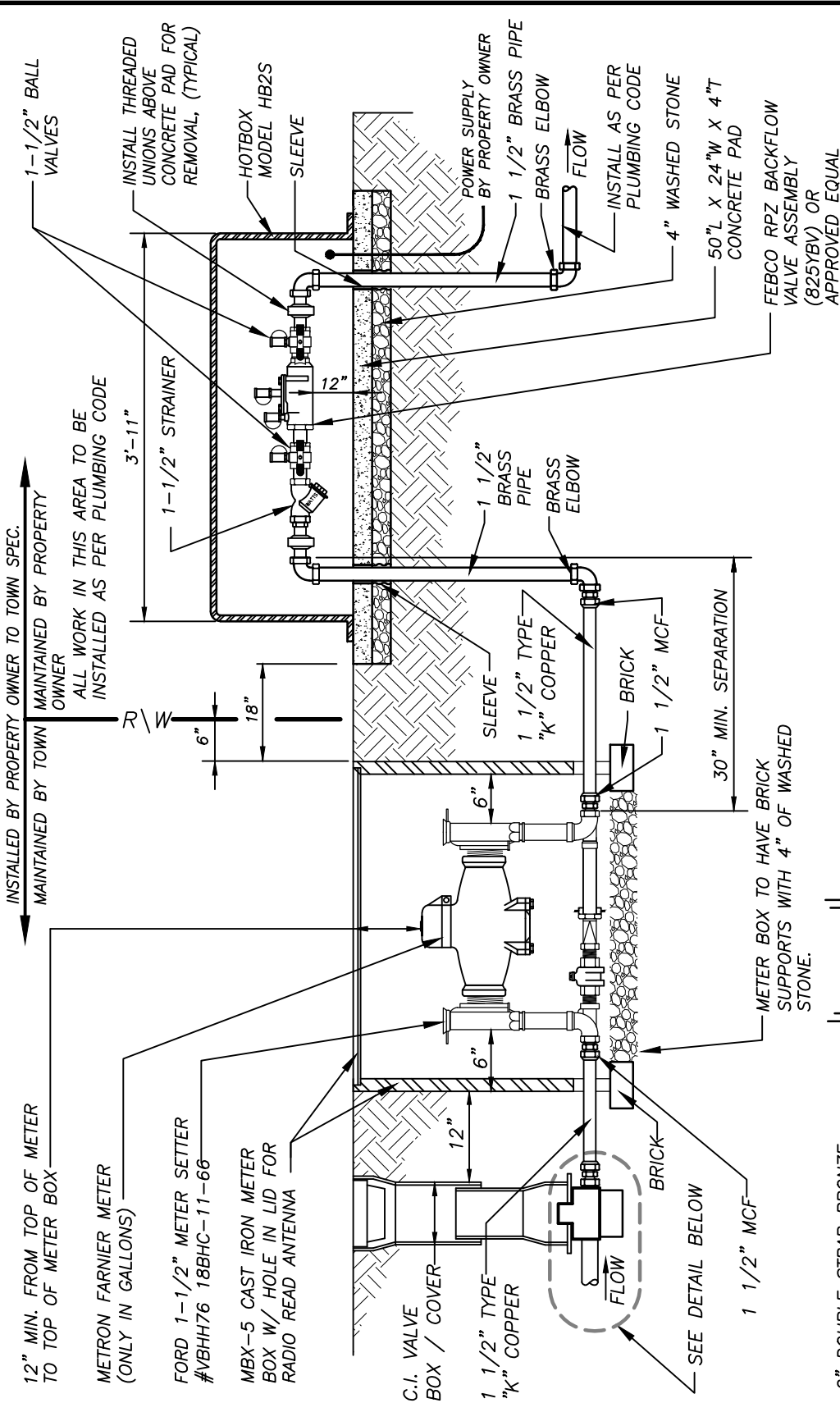
TOWN OF HAW RIVER STANDARD

1 1/2" WATER CONNECTION WITH RPZ BACKFLOW ASSEMBLY

SCALE: N.T.S.

DATE: 7/23/26

DRAWN BY: WDF



NOTE:

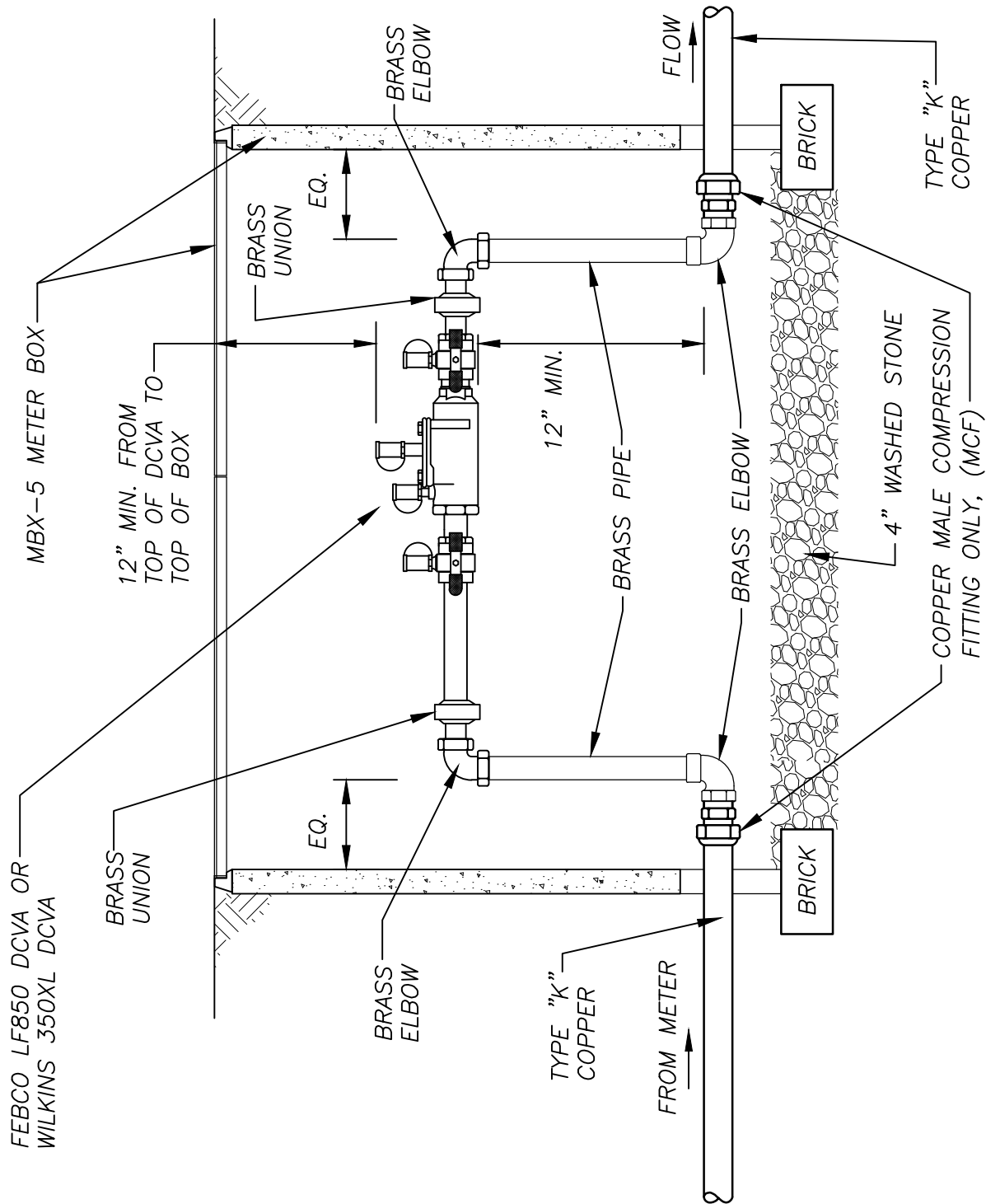
- 1) COMPRESSION FITTINGS ONLY, NO FLARED FITTINGS.
- 2) RPZ'S TO BE TESTED ANNUALLY. PROVIDE COPY OF TEST TO TOWN.

W-14



W-15

DRAWN BY: WDF



NOTE:

- 1) COMPRESSION FITTINGS ONLY, NO FLARED FITTINGS.
- 2) DCVA IS ONLY ALLOWED WHEN THERE IS NO CHEMICAL INJECTION FEED OR BOOSTER PUMP.

**TOWN OF HAW RIVER
STANDARD**

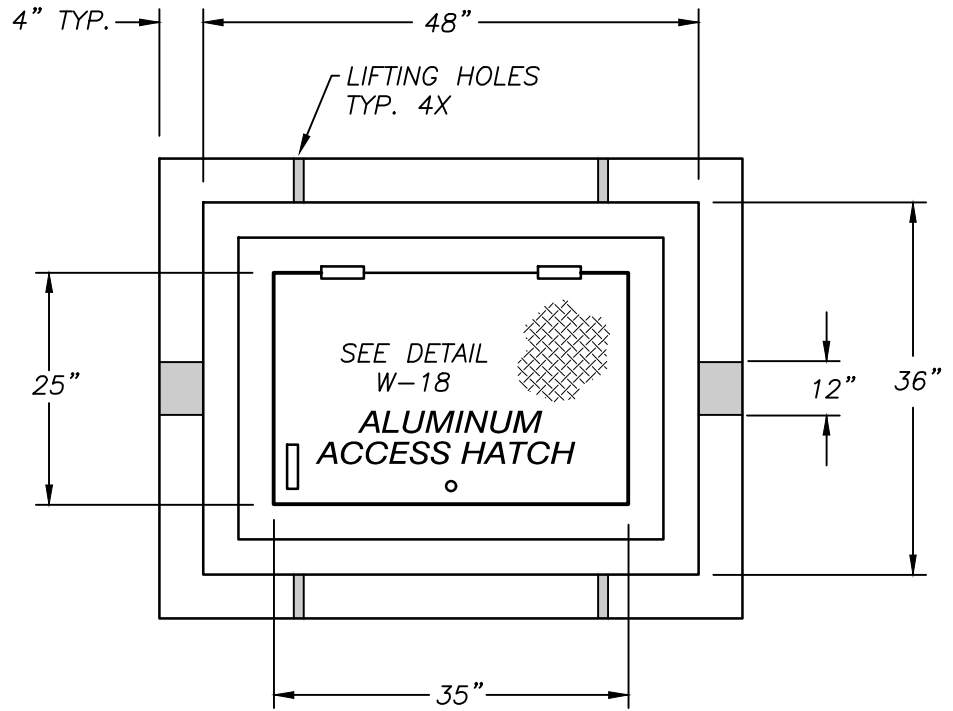
**DOMESTIC BELOW GRADE DOUBLE
CHECK VALVE ASSEMBLY**

SCALE: N.T.S.

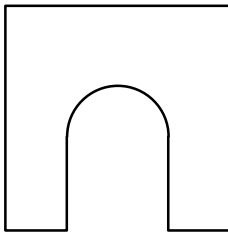
DATE: 7/23/26

DRAWN BY: WDF

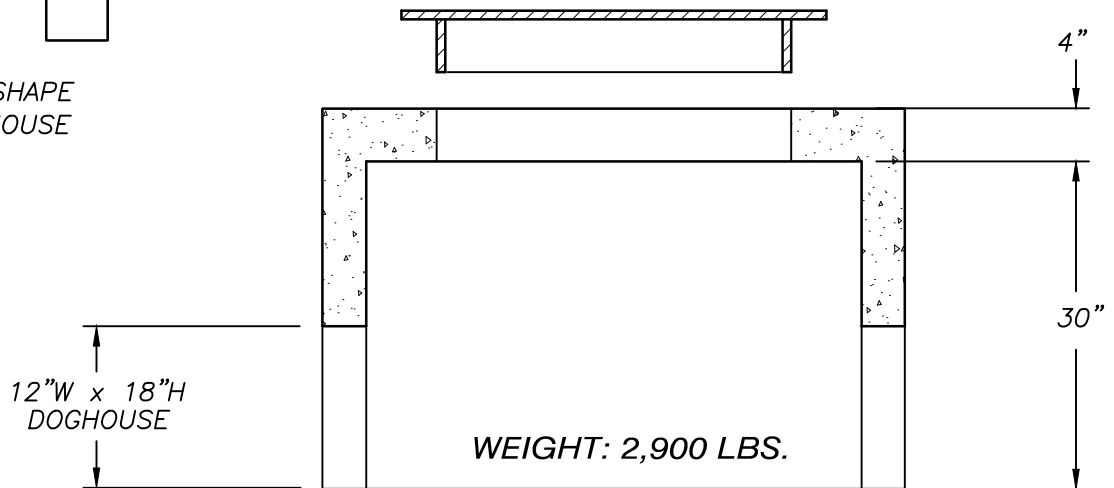
W-16



PLAN VIEW



TYP. SHAPE
DOGHOUSE



ELEVATION

W-17

**TOWN OF HAW RIVER
STANDARD**

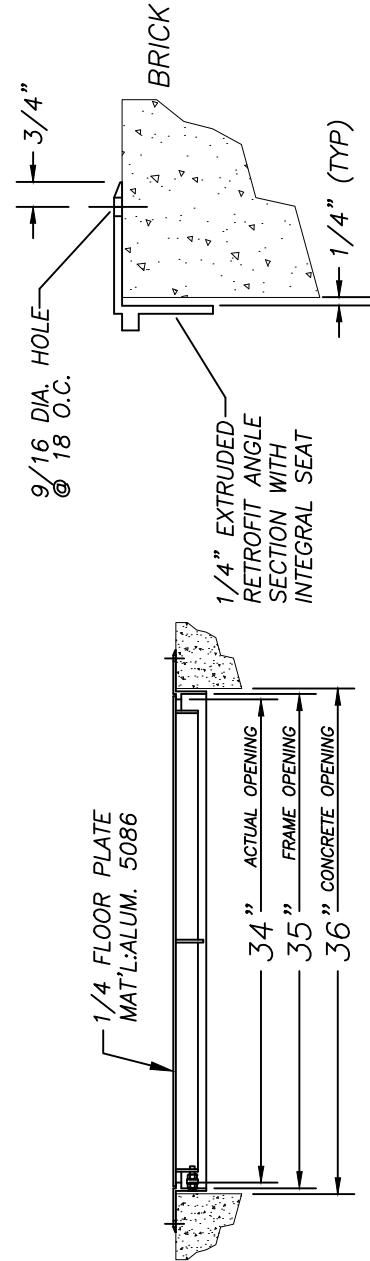
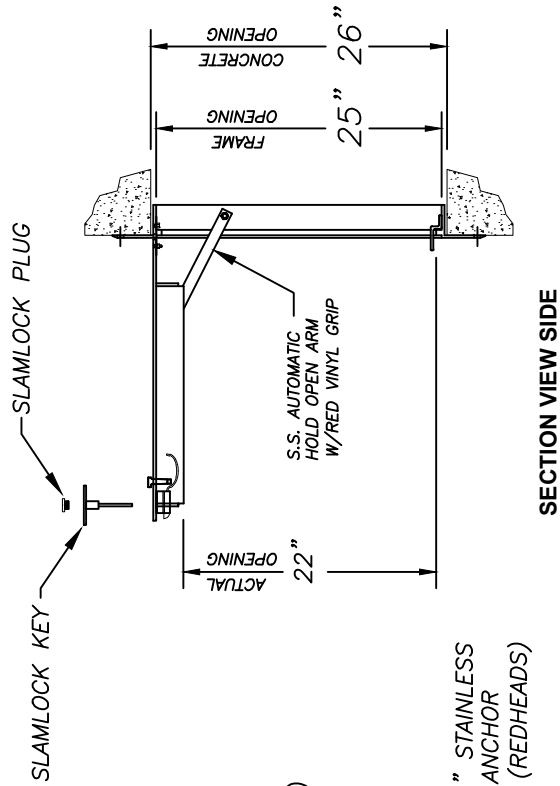
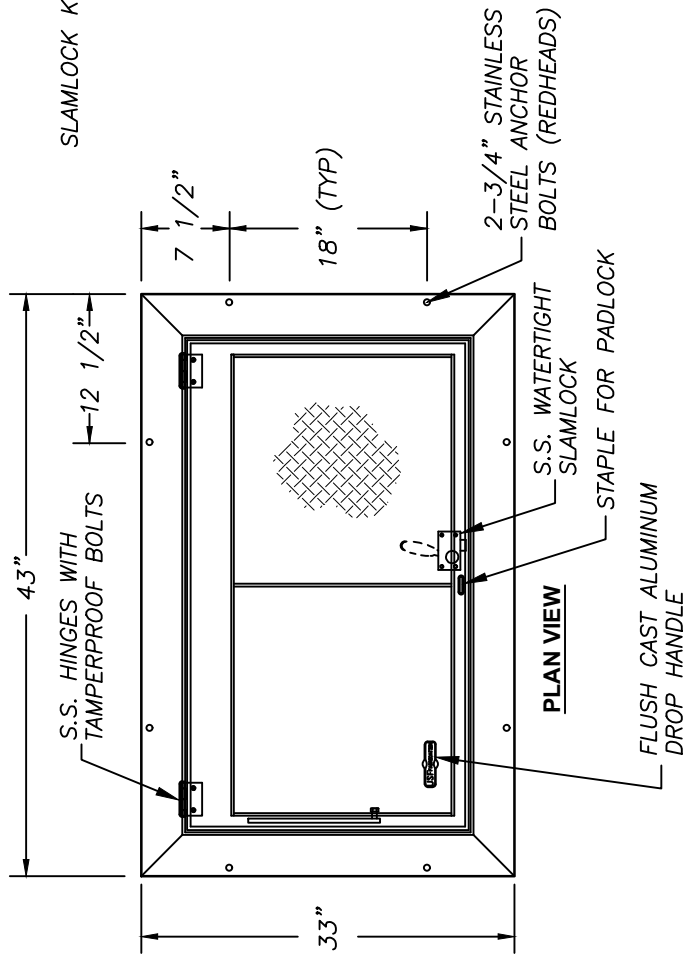
**PRECAST CONCRETE 4' X 3'
DOUBLE CHECK VAULT**

SCALE: N.T.S.

DATE: 7/23/26

DRAWN BY: WDF

PROVIDE - TWO HOLES IN LID FOR RADIO
READER ANTENNAS. COORDINATE SIZE AND
LOCATIONS WITH UTILITY INSPECTOR.



NOTES:

- 1- MATERIAL: ALUMINUM
- 2- LOADING: 300 LBS. PER SQ. FT.
- 3- 316 STAINLESS STEEL BOLTS
- 4- APPROXIMATE WEIGHT: 59 LBS.

FRAME DETAIL

SECTION VIEW FRONT

W-18

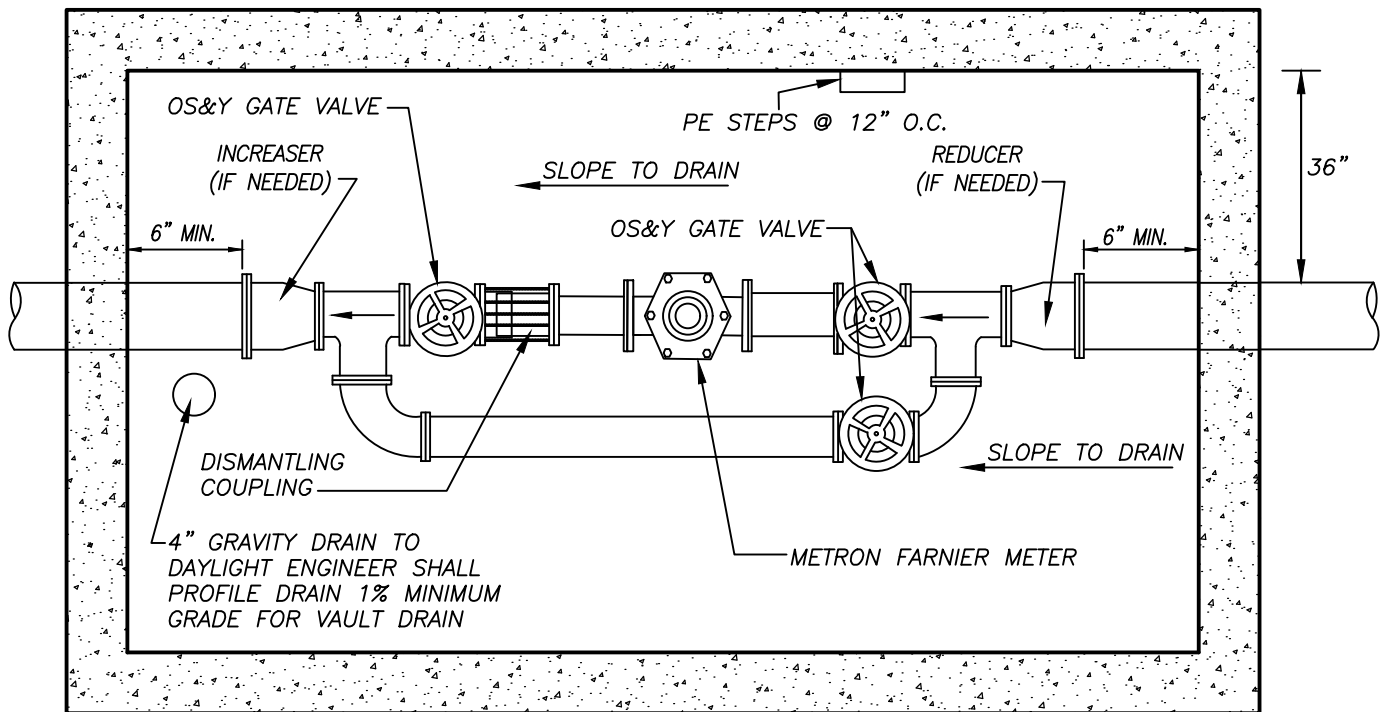
**TOWN OF HAW RIVER
STANDARD**

ALUMINUM ACCESS HATCH

SCALE: N.T.S.

DATE: 7/23/26

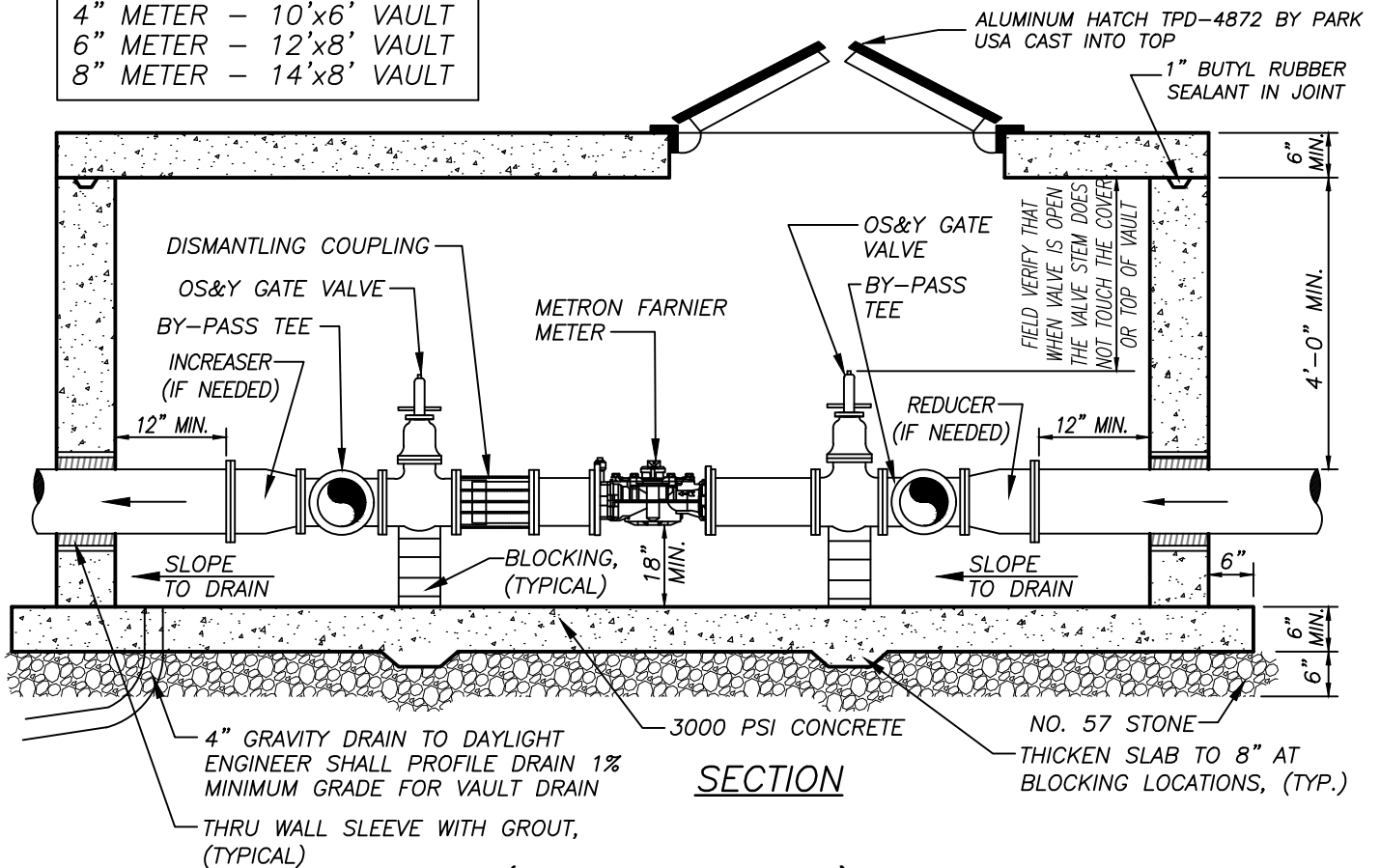
DRAWN BY: WDF



VAULT SIZES (INSIDE DEM):

3" METER	- 10'x6' VAULT
4" METER	- 10'x6' VAULT
6" METER	- 12'x8' VAULT
8" METER	- 14'x8' VAULT

TOP VIEW



(SHEET 1 OF 2)

W-20

**TOWN OF HAW RIVER
STANDARD**

**3" - 8" METER ASSEMBLY WITH
PRECAST METER VAULT**

SCALE: N.T.S.

DATE: 7/23/26

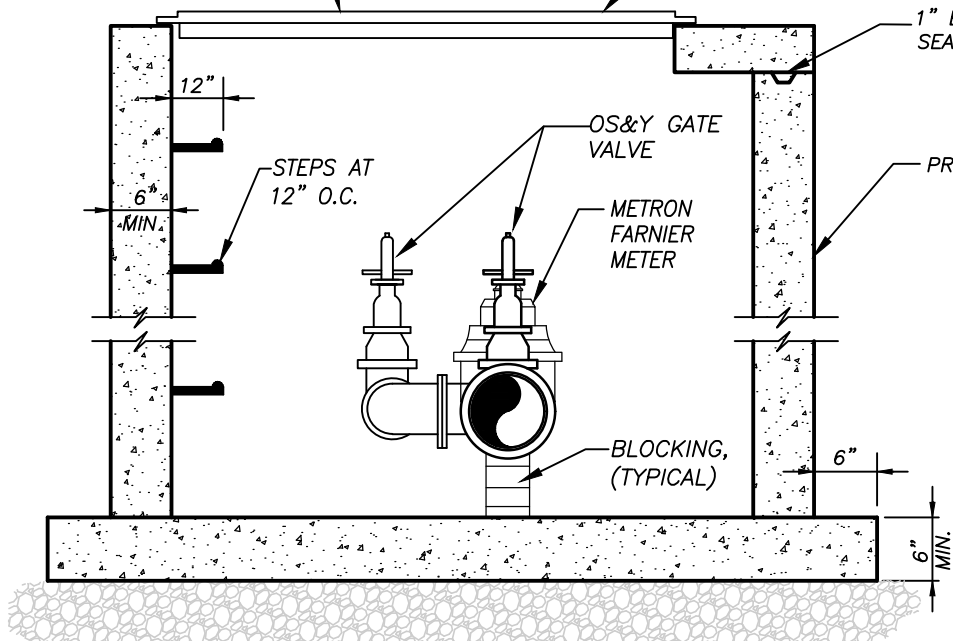
DRAWN BY: WDF

PROVIDE (2) 2" HOLES FOR RADIO
READ ANTENNAS

ALUMINUM HATCH TPD-4872 BY PARK
USA CAST INTO TOP

1" BUTYL RUBBER
SEALANT IN JOINT

PRECAST CONCRETE VAULT



SECTION

NOTES:

- 1-VAULT WALLS TO BE THE MIN CONCRETE THICKNESS INDICATED, REINFORCED WITH NO. 4 REBAR ON 12" CENTERS EACH WAY, PLACED 2" FROM THE INSIDE WALL THE AMOUNT OF REINFORCING AND WALL THICKNESS MAY BE INCREASED FOR EXTRA DEPTH WALLS OR IN HEAVY TRAFFIC SITUATIONS AS REQUIRED BY THE ENGINEER.
- 2-SUBSTITUTE MATERIALS MAY BE USED AS APPROVED BY THE ENGINEER.
- 3-REINFORCED CONCRETE LID WITH TRAFFIC BEARING DOORS H-20 LOADING TO BE USED IN TRAFFIC SITUATIONS.
- 4-PROVIDE A THRU WALL SLEEVE AT OPENING IN CONCRETE OR CMU WALL LARGE ENOUGH FOR FLANGE OF PIPE TO PASS THRU. FILL VOID BETWEEN PIPE AND SLEEVE WITH NON SHRINK GROUT.
- 5-PIPE OUTSIDE VAULT TO BE M.J. WITH RETAINER GLANDS.
- 6-ALL CLEARANCE DIMENSIONS ARE MINIMUMS.
- 7-ALL JOINTS TO BE FLANGED THROUGH OUT VAULT.
- 8-STEPS ARE TO BE INSTALLED IN ALL VAULTS EXCEEDING 4 FEET DEEP AT A LOCATION FOR EASE OF ACCESS. LOCATE DOOR OVER STEPS. CONTRACTOR TO COORDINATE SIZE OF VAULT TO THE SIZE OF VAULT DOOR TO WORK PROPERLY.
- 9-CONCRETE TO BE A MINIMUM OF 3000 PSI.
- 10-ALL METERS MUST BE INSTALLED LEVEL.
- 11-ALL VALVES GREATER THAN 2" SHALL BE OS&Y VALVES.
- 12-ADDITIONAL BACKFLOW PREVENTION WILL BE REQUIRED ON ALL 3" - 8" METERS.
- 13-DISMANTLING COUPLING SHALL BE A SMITH BLAIR INC., 970 SERIES OR APPROVED EQUAL.

(SHEET 2 OF 2)

W-21

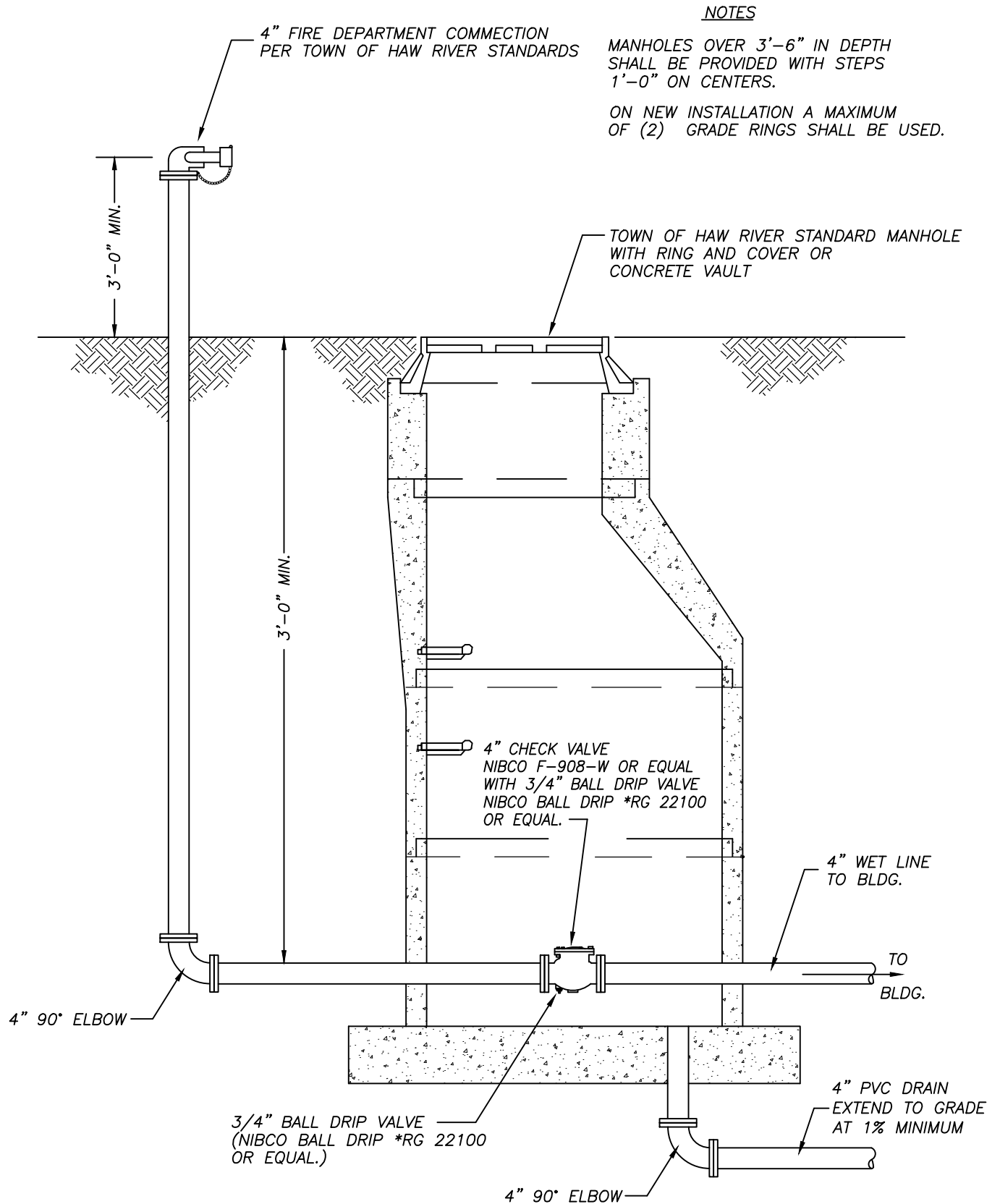
**TOWN OF HAW RIVER
STANDARD**

**3" - 8" METER ASSEMBLY WITH
PRECAST METER VAULT**

SCALE: N.T.S.

DATE: 7/23/26

DRAWN BY: WDF



SECTION THRU MANHOLE

W-22

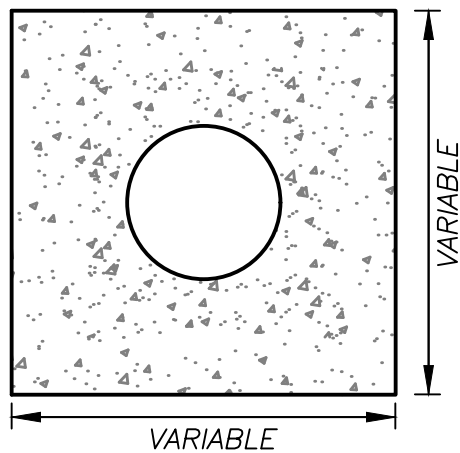
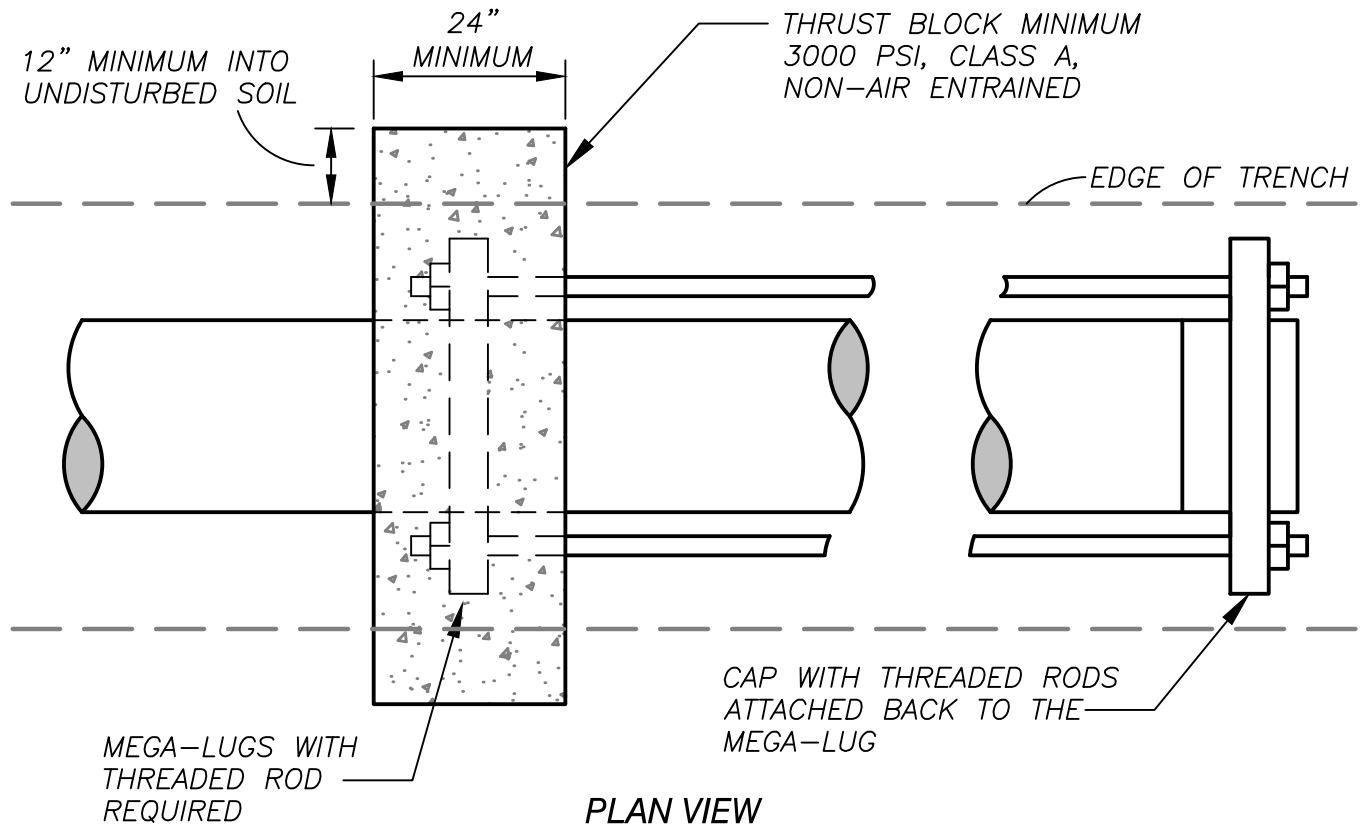
**TOWN OF HAW RIVER
STANDARD**

**4" FIRE DEPARTMENT CONNECTION
WITH CHECK VALVE ASSEMBLY**

SCALE: N.T.S.

DATE: 7/23/26

DRAWN BY: WDF



MINIMUM CUBIC YARDS OF CONCRETE	
PIPE DIAMETER	CUBIC YARDS
6"	1
8"	2
10"	3
12"	5
16"	7.25

W-23

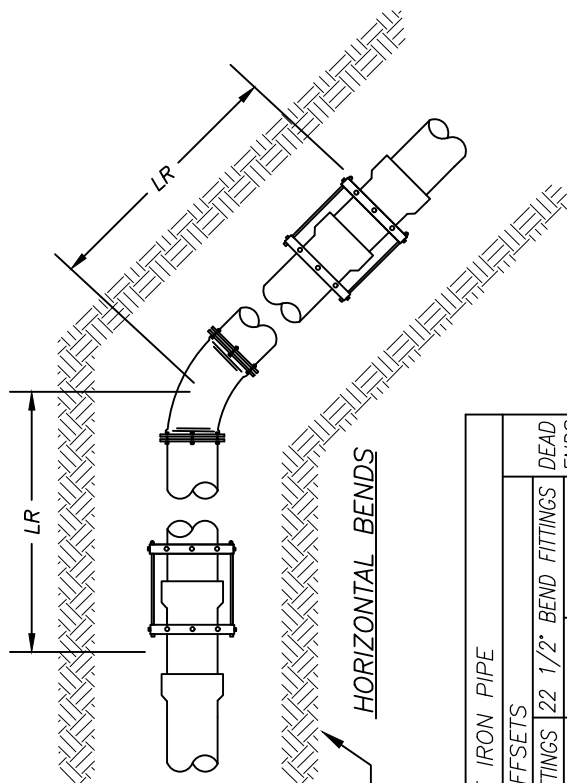
**TOWN OF HAW RIVER
STANDARD**

**END OF LINE
DEADMAN DETAIL**

SCALE: N.T.S.

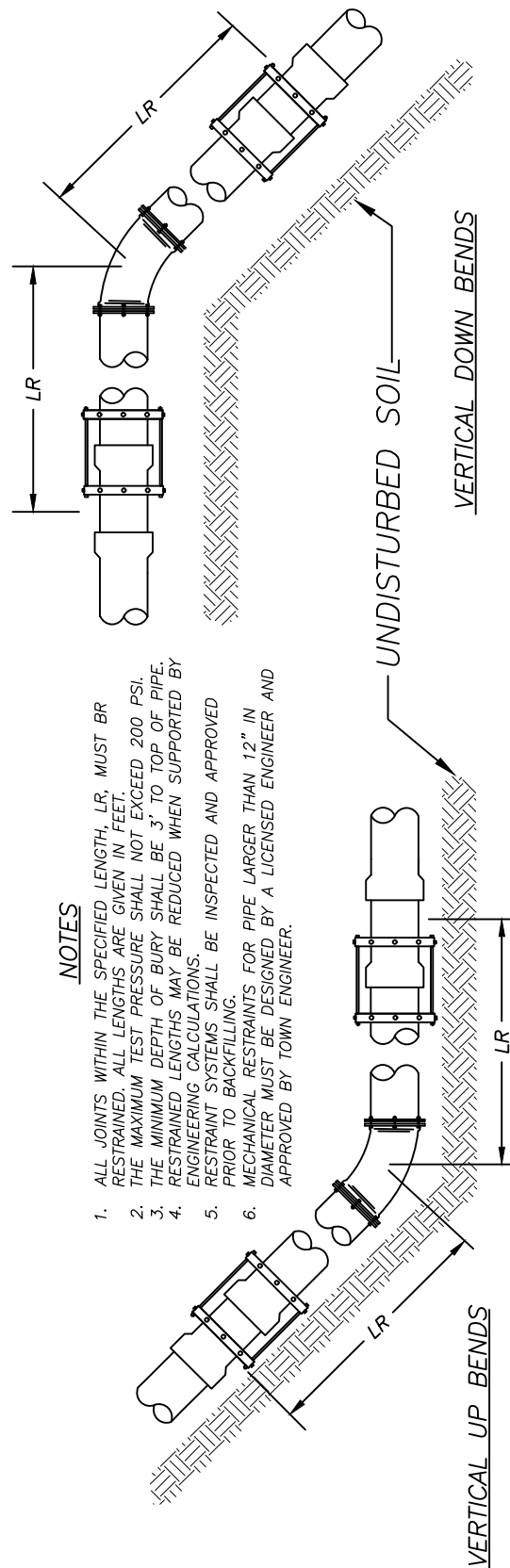
DATE: 7/23/26

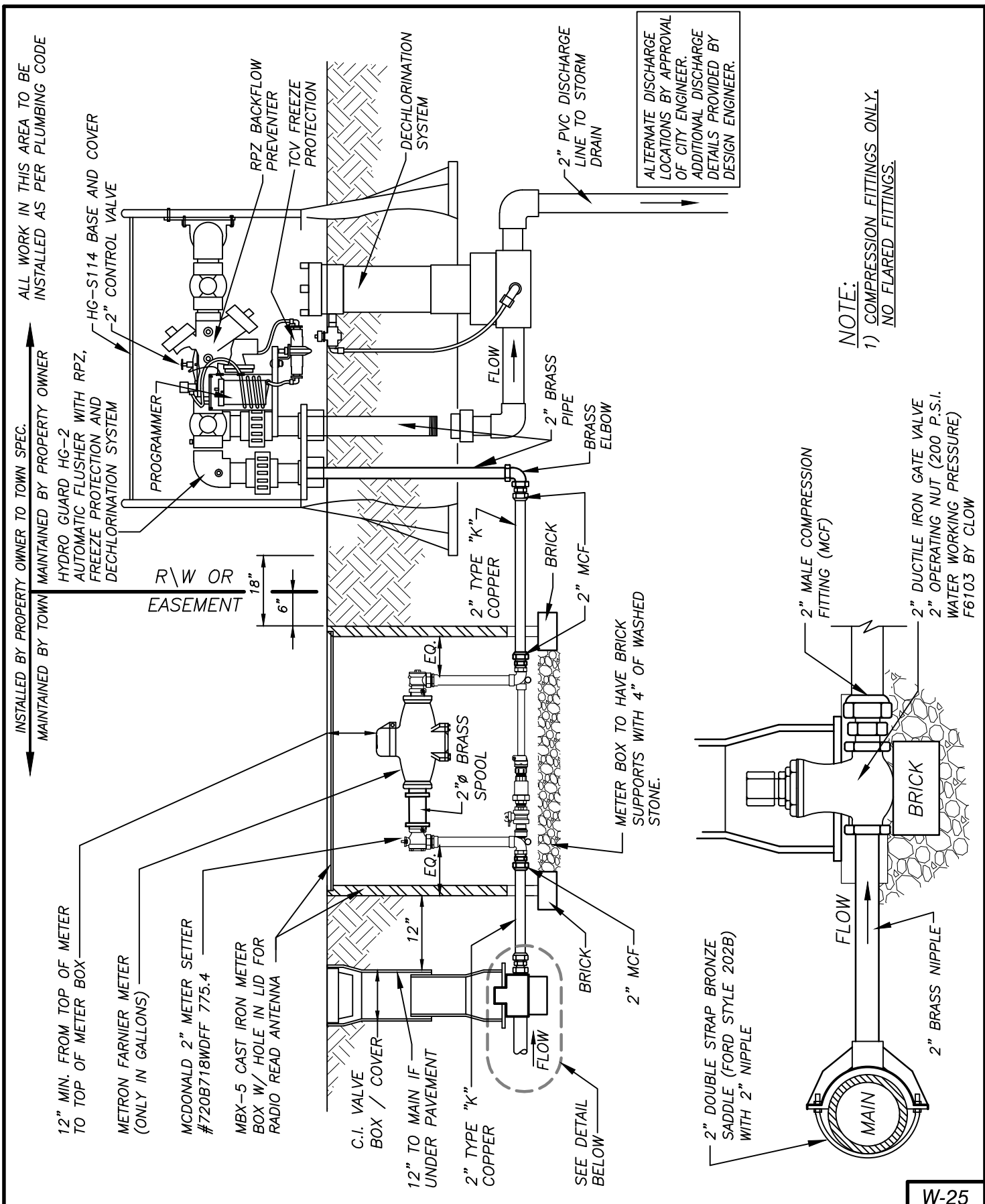
DRAWN BY: WDF



RESTRAINED LENGTHS, LR, FOR DUCTILE IRON PIPE												
NOMINAL PIPE SIZE INCHES	HORIZONTAL BENDS			VERTICAL OFFSETS								DEAD ENDS
				90° BEND FITTINGS		45° BEND FITTINGS		22 1/2° BEND FITTINGS		12 1/2° BEND FITTINGS		
	DOWN BEND	UP BEND	DOWN BEND	UP BEND	DOWN BEND	UP BEND	DOWN BEND	UP BEND	DOWN BEND	UP BEND		
4	18	7	4	31	18	13	7	6	3	31		
6	25	10	5	44	25	18	10	9	5	44		
8	32	13	6	58	32	24	13	11	6	58		
10	38	16	8	69	38	29	16	14	8	69		
12	45	19	9	81	45	34	19	16	9	81		

1. ALL JOINTS WITHIN THE SPECIFIED LENGTH, LR, MUST BE RESTRAINED. ALL LENGTHS ARE GIVEN IN FEET.
2. THE MAXIMUM TEST PRESSURE SHALL NOT EXCEED 200 PSI.
3. THE MINIMUM DEPTH OF BURY SHALL BE 3' TO TOP OF PIPE.
4. RESTRAINED LENGTHS MAY BE REDUCED WHEN SUPPORTED BY ENGINEERING CALCULATIONS.
5. RESTRAINT SYSTEMS SHALL BE INSPECTED AND APPROVED PRIOR TO BACKFILLING.
6. MECHANICAL RESTRAINTS FOR PIPE LARGER THAN 12" IN DIAMETER MUST BE DESIGNED BY A LICENSED ENGINEER AND APPROVED BY TOWN ENGINEER.

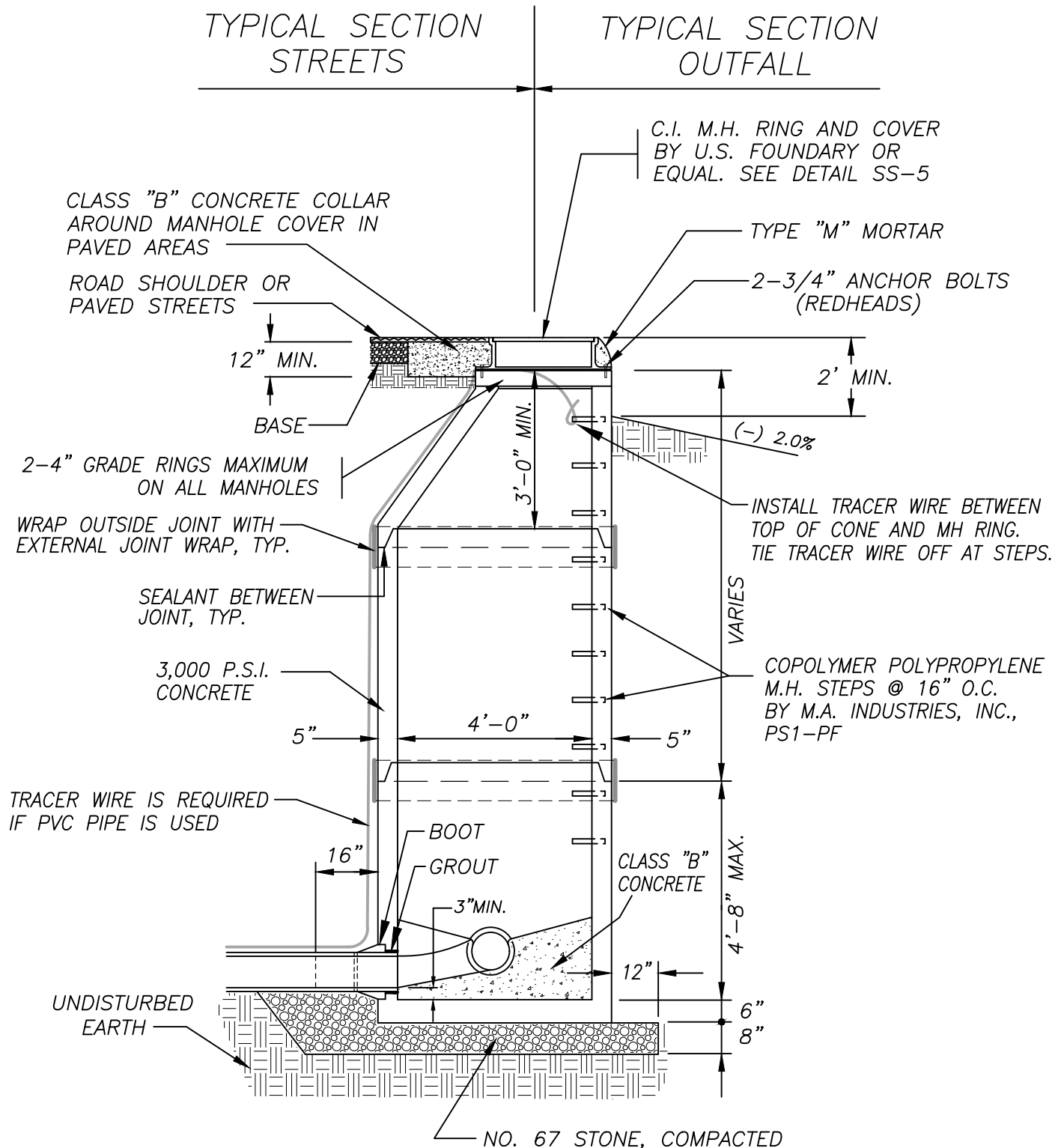




TOWN OF HAW RIVER STANDARD

2" HG-2 AUTOMATIC FLUSHER WITH 2" SPECTRUM 130D METER

SCALE: N.T.S. DATE: 7/23/26 DRAWN BY: WDF



NOTES:

1. MANHOLES ARE TO BE AS MFG. N.C. PRODUCTS OR APPROVED EQUAL.
2. GROUT ALL JOINTS FROM INSIDE.

SS-1

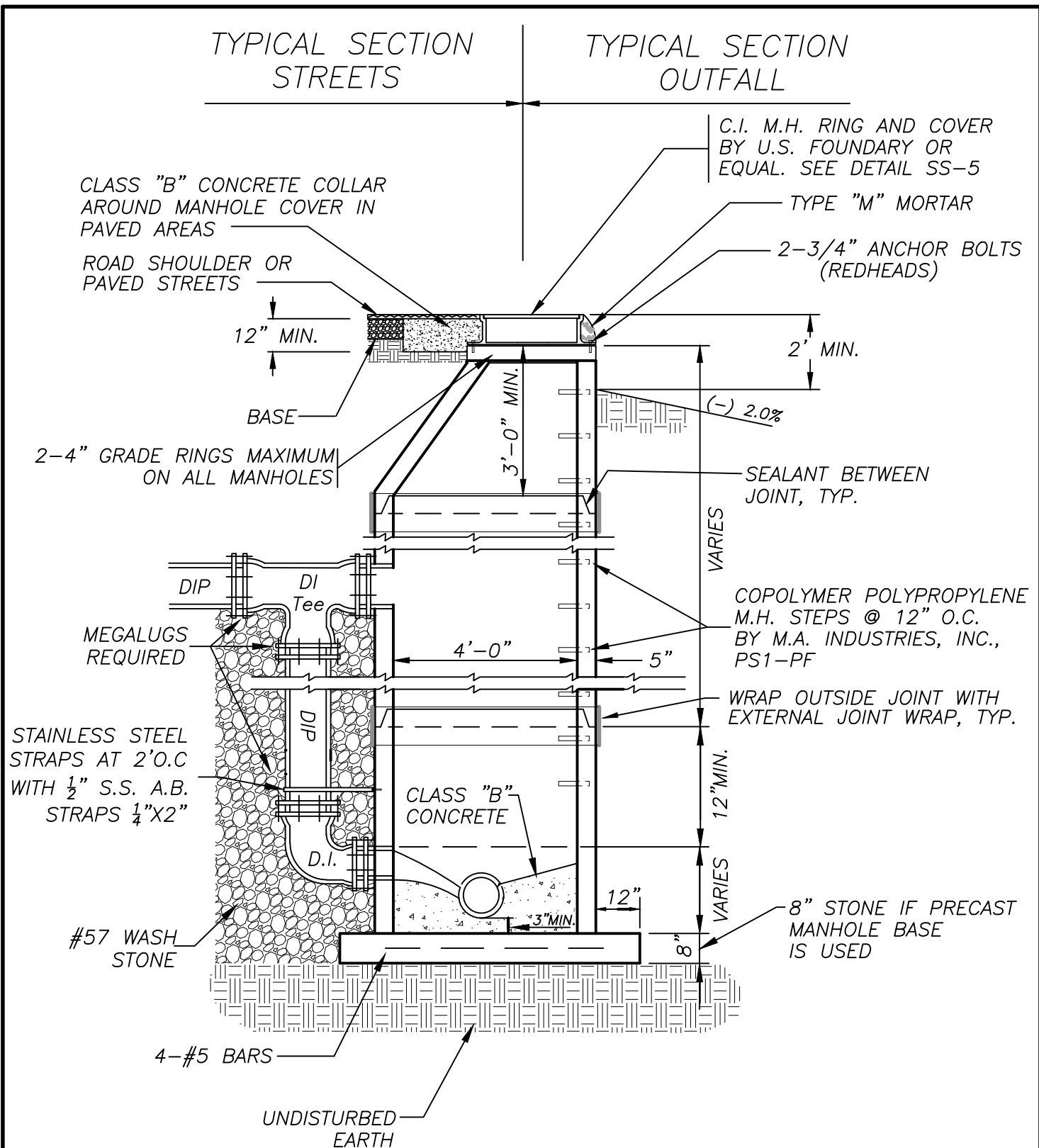
**TOWN OF HAW RIVER
STANDARD**

**STANDARD PRECAST
MANHOLE**

SCALE: N.T.S.

DATE: 7/23/26

DRAWN BY: WDF



NOTES:

1. MANHOLES ARE TO BE AS MFG. N.C. PRODUCTS OR APPROVED EQUAL.
2. GROUT ALL JOINTS FROM INSIDE.

SS-2

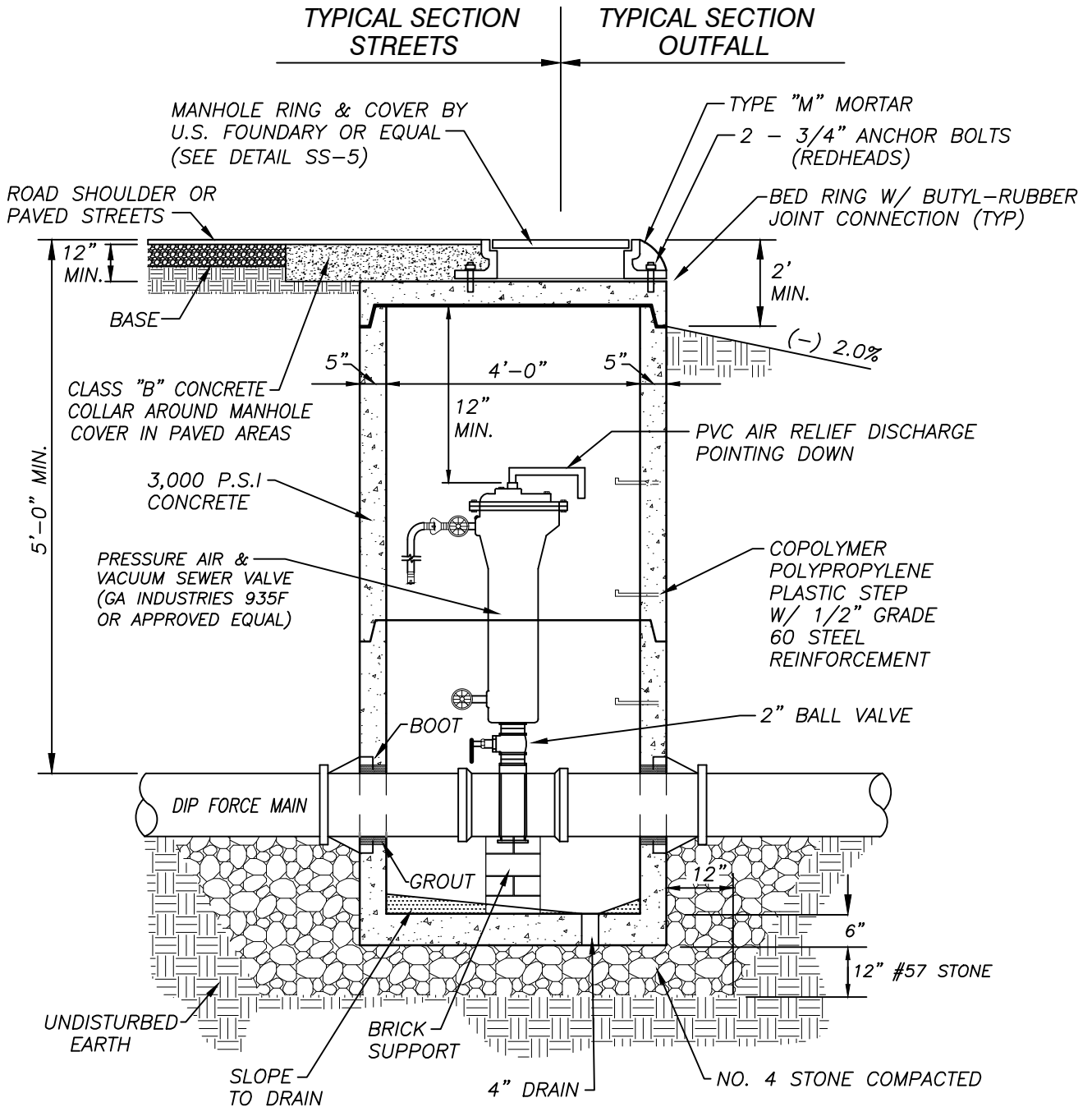
**TOWN OF HAW RIVER
STANDARD**

**STANDARD PRECAST
DROP MANHOLE**

SCALE: N.T.S.

DATE: 7/23/26

DRAWN BY: WDF



NOTES:

1. MANHOLES ARE TO BE AS MFG. N.C. PRODUCTS OR APPROVED EQUAL.
2. GROUT ALL JOINTS FROM INSIDE.

SS-3

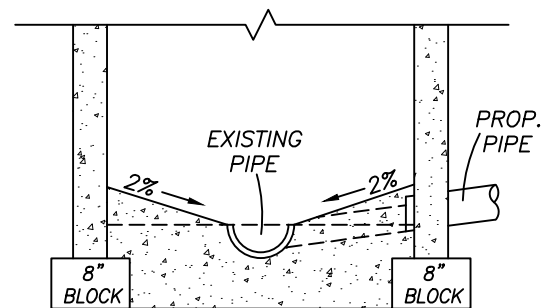
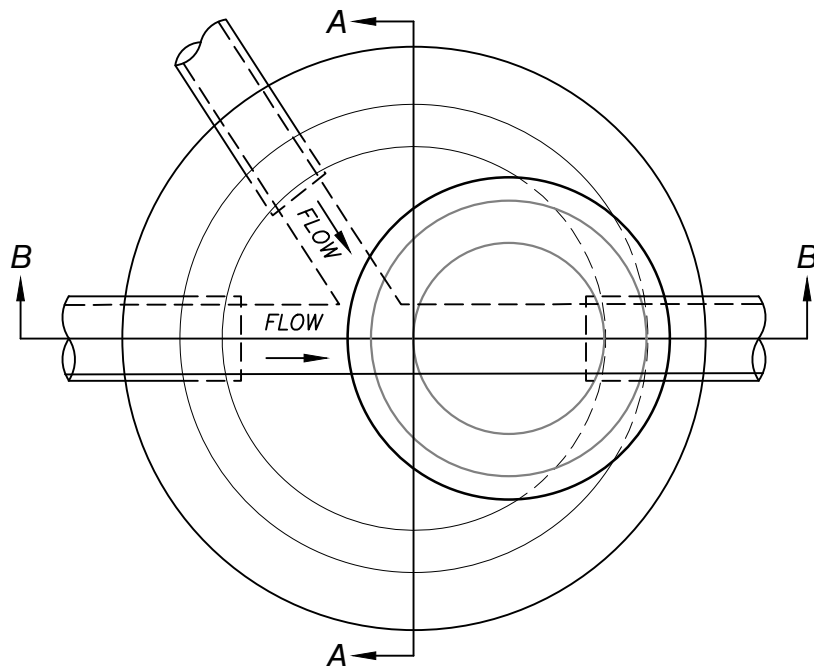
**TOWN OF HAW RIVER
STANDARD**

**SEWER AIR RELIEF MANHOLE
WITH FLAT SLAB TOP**

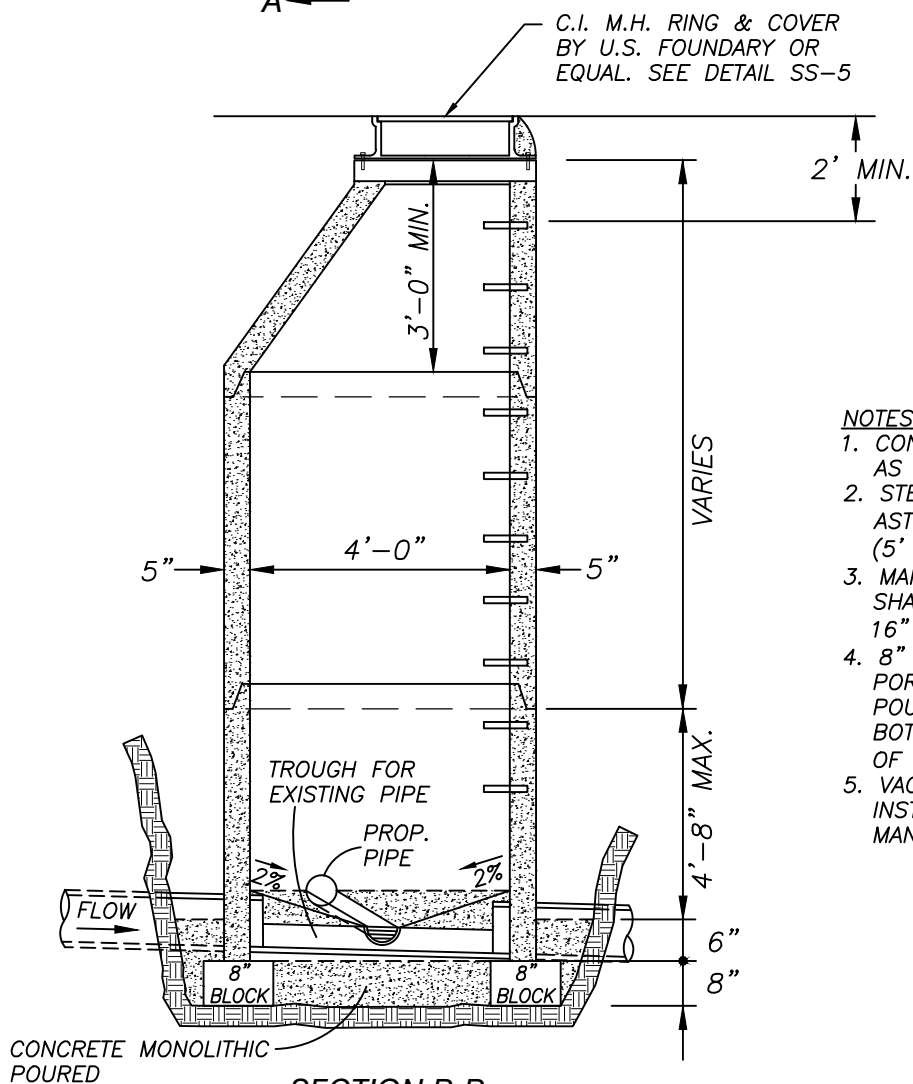
SCALE: N.T.S.

DATE: 7/23/26

DRAWN BY: WDF



SECTION A-A



SECTION B-B

NOTES:

1. CONCRETE SHALL BE 3,000 PSI AS PER ASTM-478.
2. STEEL REINFORCING SHALL MEET ASTM-185 (4' DIA.) OR ASTM-478 (5' DIA.).
3. MANHOLES OVER 3'-6" IN DEPTH SHALL BE PROVIDED WITH STEPS 16" ON CENTERS.
4. 8" CONCRETE UNDER MANHOLE PORTIONS OF THE INVERT CAN BE POURED AT THE SAME TIME. BOTTOM SHOULD EXTEND A MIN. OF 6" BEYOND MANHOLE BASE.
5. VACUUM TEST REQUIRED ON ALL INSTALLATIONS PRIOR TO PUTTING MANHOLE INTO SERVICE.

SS-4

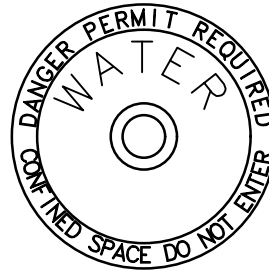
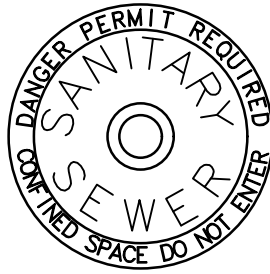
TOWN OF HAW RIVER STANDARD

ECCENTRIC PRECAST BOTTOMLESS MANHOLE OVER
EXISTING SANITARY SEWER (DOGHOUSE MANHOLE)

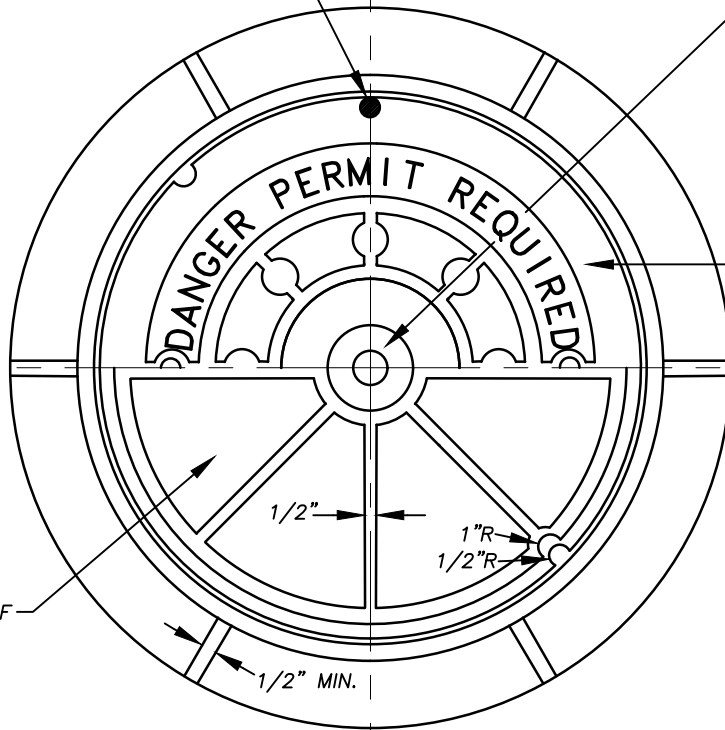
SCALE: N.T.S.

DATE: 7/23/26

DRAWN BY: WDF



4- 1/2" X 13/4" HEXHEAD,
STAINLESS STEEL BOLTS
AT 90° COUNTERSUNK.
BOLTS TO BE TYPE 316
STAINLESS STEEL.
(FOR WATERTIGHT MANHOLES)



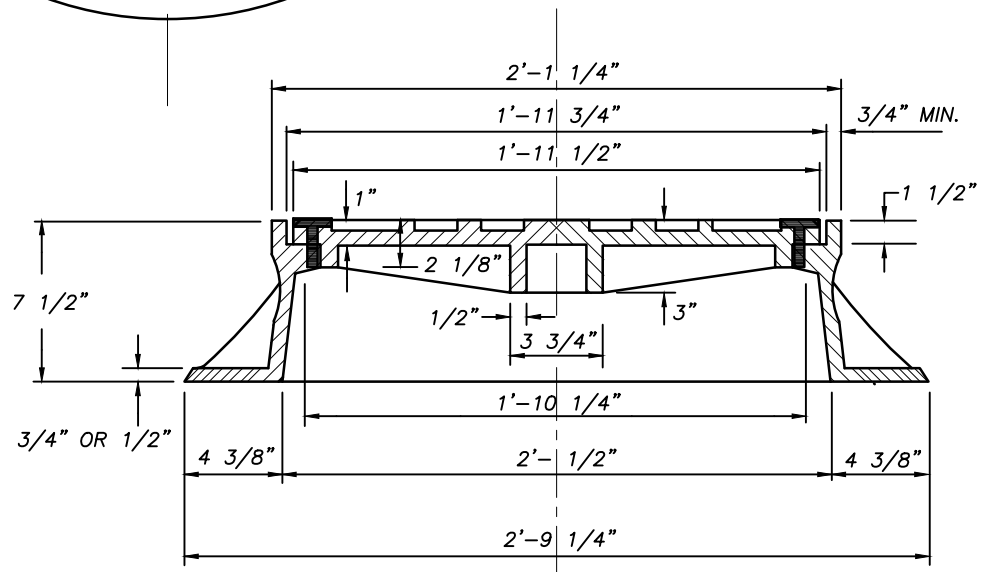
TOP OF COVER

BOTTOM OF COVER

RING & COVER WILL BE MACHINED AND
WILL CONFORM TO ASTM A48, CLASS 30B

MINIMUM AVERAGE WEIGHTS

RING	190 LBS.
COVER	120 LBS.
TOTAL	310 LBS.



SS-5

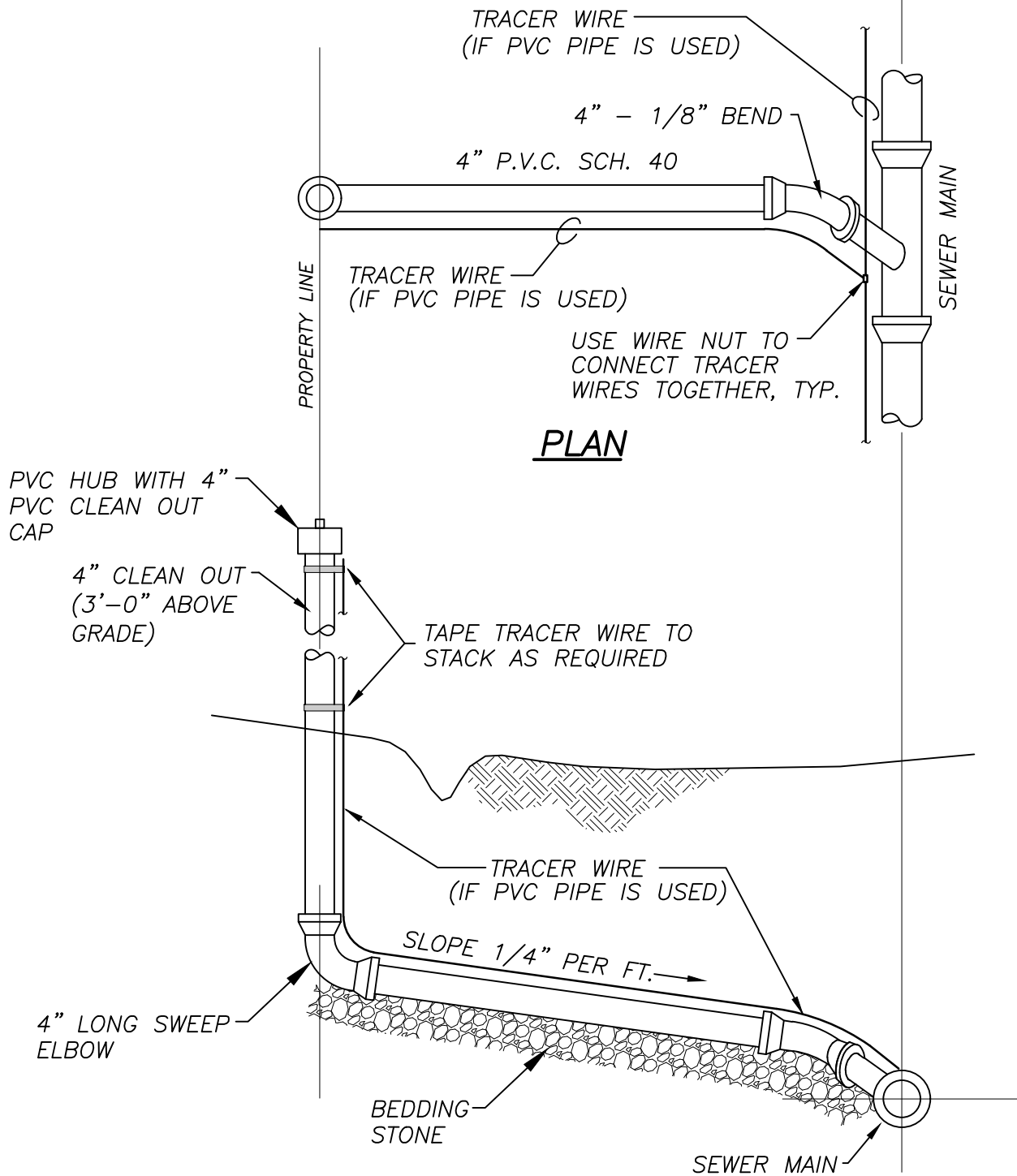
**TOWN OF HAW RIVER
STANDARD**

MANHOLE RING & COVER

SCALE: N.T.S.

DATE: 7/23/26

DRAWN BY: WDF



NOTE: PLUMBER TO CONNECT TO STUB-OUT/STACK AND LOWER CLEAN-OUT CAP TO GROUND LEVEL

SS-6

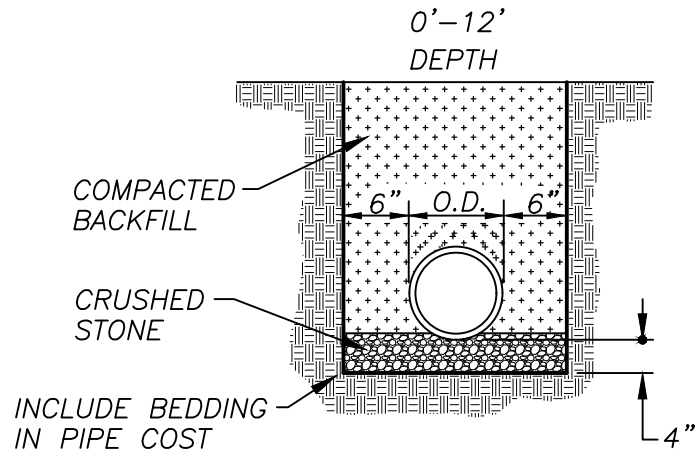
**TOWN OF HAW RIVER
STANDARD**

**SEWER SERVICE
CONNECTION**

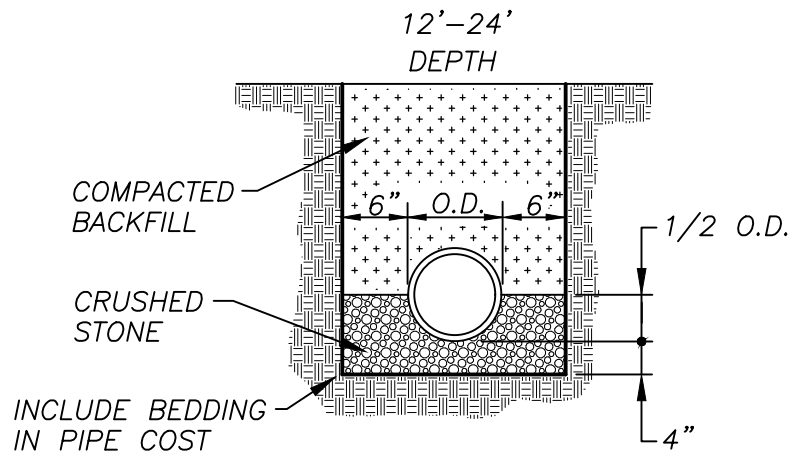
SCALE: N.T.S.

DATE: 7/23/26

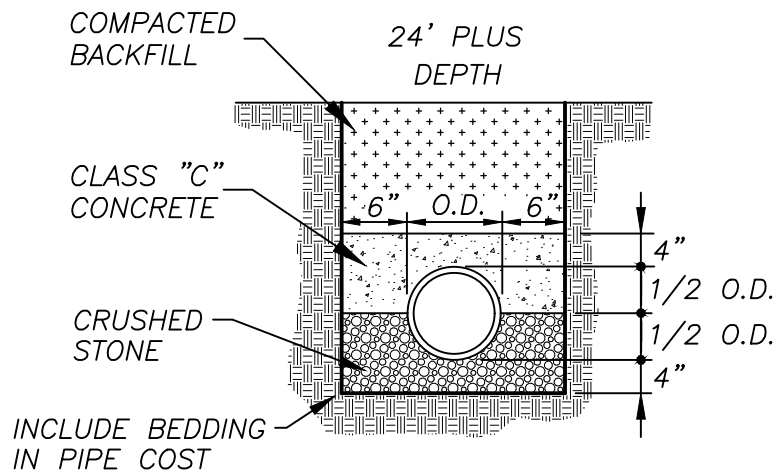
DRAWN BY: WDF



CLASS "C" BEDDING



CLASS "B" BEDDING



CLASS "A" BEDDING

SS-7

**TOWN OF HAW RIVER
STANDARD**

**SANITARY SEWER
BEDDING**

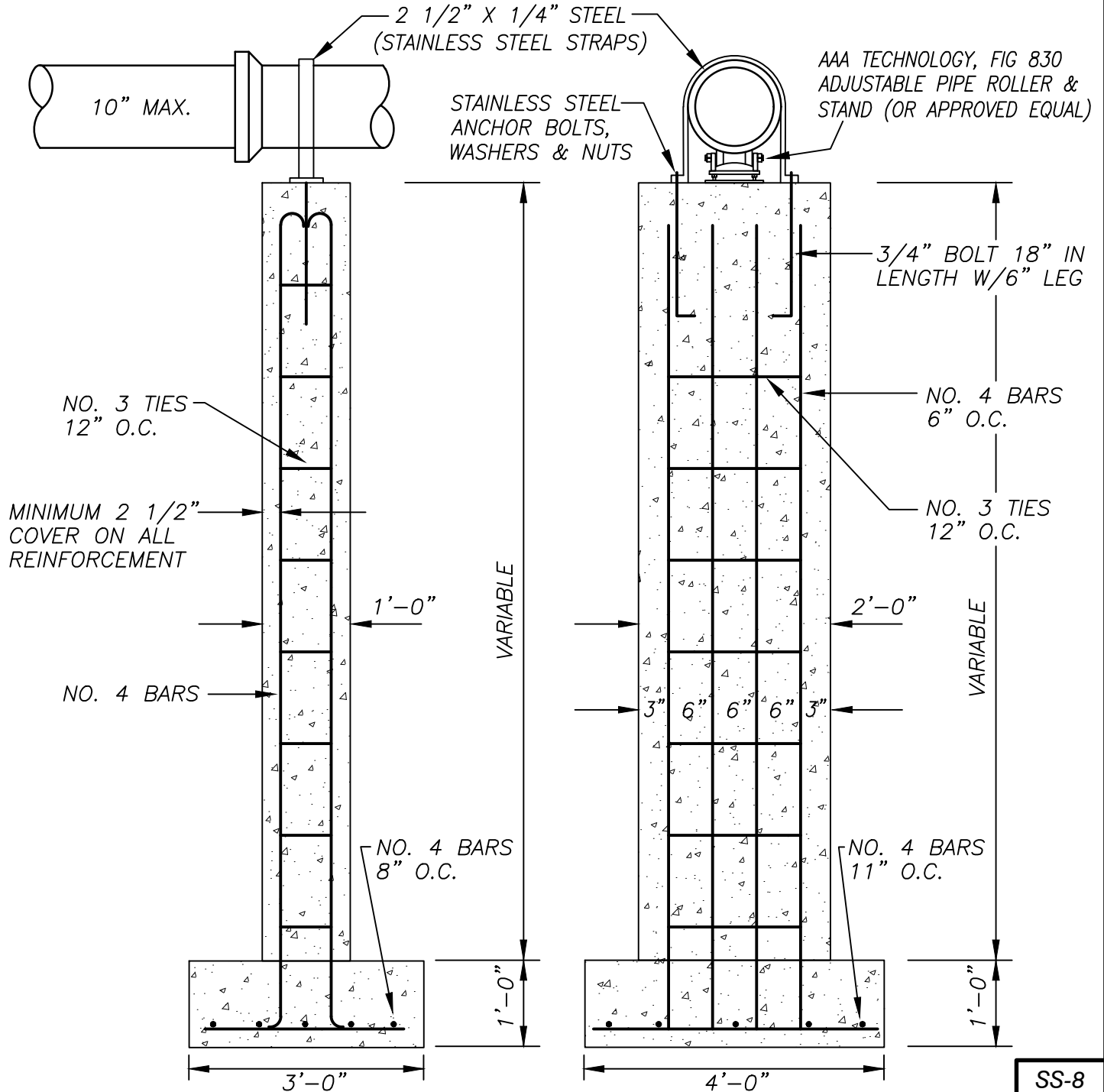
SCALE: N.T.S.

DATE: 7/23/26

DRAWN BY: WDF

NOTES:

1. REBAR BENDS NOT TO BE BENT BY HEAT.
2. ALL CONCRETE TO BE AIR ENTRAINED CLASS 'A'.
3. PROVIDE 1/8" TO 1/2" NEOPRENE PAD BETWEEN PIPE AND CONCRETE.
4. ALL HARDWARE TO BE STAINLESS STEEL.
5. FOUNDATION SOIL SHALL HAVE A MINIMUM SOIL BEARING PRESSURE OF 2000 PSI TO BE FIELD VERIFIED BY GEOTECHNICAL ENGINEER.
6. WHERE SHALLOW ROCK IS FOUND TO EXIST, PIN FOOTING TO ROCK BY DRILLING & EPOXYING DOWELS INTO THE ROCK.
7. ALL PIPE THAT IS TO BE SUPPORTED ON A PIER SHALL BE FLANGED DIP. INCLUDE PROVISIONS FOR EXPANSION AS DIRECTED BY ENGINEER.
8. ALL PIERS SHALL BE DESIGNED AND SUBMITTED (ALONG WITH DOCUMENTATION SHOWING DESIGN PARAMETERS, ASSUMPTIONS, AND SAFETY FACTORS USED TO RESIST THE FORCES ACTING ON THE PIER/PIPE SYSTEM) AS PART OF THE PLAN REVIEW PROCESS. ALL PIER DESIGNS MUST BE SIGNED AND SEALED BY A REGISTERED NORTH CAROLINA PROFESSIONAL ENGINEER.
9. LOCATION OF ALL JOINTS TO BE DETERMINED BY THE DESIGN ENGINEER. A DETAIL OF THE ENTIRE PIER SYSTEM PROFILE SHALL BE INCLUDED IN THE DESIGN SUBMITTAL AS PART OF THE PLAN REVIEW PROCESS.



**TOWN OF HAW RIVER
STANDARD**

CONCRETE PIER

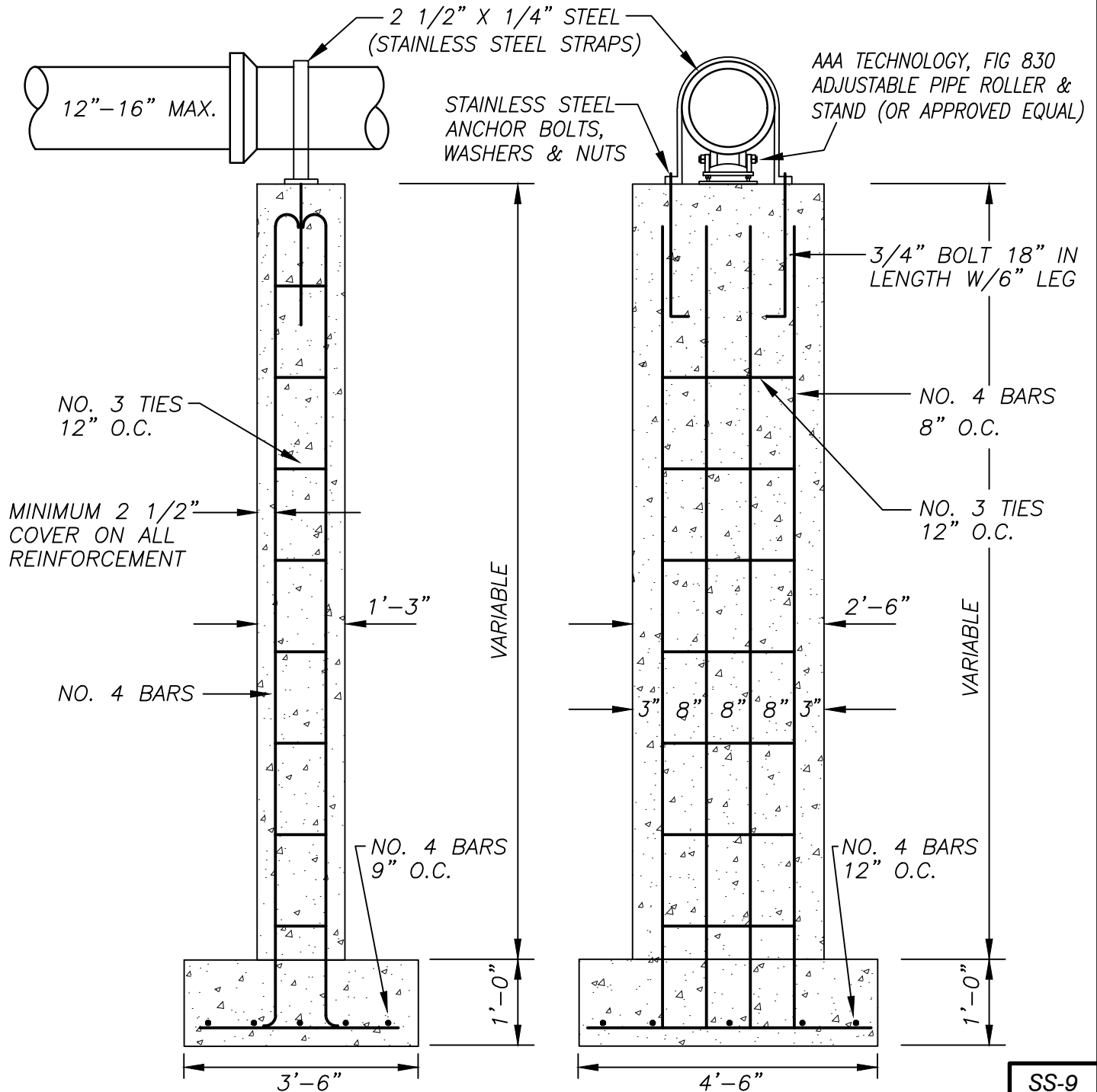
SCALE: N.T.S.

DATE: 7/23/26

DRAWN BY: WDF

NOTES:

1. REBAR BENDS NOT TO BE BENT BY HEAT.
2. ALL CONCRETE TO BE AIR ENTRAINED CLASS 'A'.
3. PROVIDE 1/8" TO 1/2" NEOPRENE PAD BETWEEN PIPE AND CONCRETE.
4. ALL HARDWARE TO BE STAINLESS STEEL.
5. FOUNDATION SOIL SHALL HAVE A MINIMUM SOIL BEARING PRESSURE OF 2000 PSI TO BE FIELD VERIFIED BY GEOTECHNICAL ENGINEER.
6. WHERE SHALLOW ROCK IS FOUND TO EXIST, PIN FOOTING TO ROCK BY DRILLING & EPOXYING DOWELS INTO THE ROCK.
7. ALL PIPE THAT IS TO BE SUPPORTED ON A PIER SHALL BE FLANGED DIP. INCLUDE PROVISIONS FOR EXPANSION AS DIRECTED BY ENGINEER.
8. ALL PIERS SHALL BE DESIGNED AND SUBMITTED (ALONG WITH DOCUMENTATION SHOWING DESIGN PARAMETERS, ASSUMPTIONS, AND SAFETY FACTORS USED TO RESIST THE FORCES ACTING ON THE PIER/PIPE SYSTEM) AS PART OF THE PLAN REVIEW PROCESS. ALL PIER DESIGNS MUST BE SIGNED AND SEALED BY A REGISTERED NORTH CAROLINA PROFESSIONAL ENGINEER.
9. LOCATION OF ALL JOINTS TO BE DETERMINED BY THE DESIGN ENGINEER. A DETAIL OF THE ENTIRE PIER SYSTEM PROFILE SHALL BE INCLUDED IN THE DESIGN SUBMITTAL AS PART OF THE PLAN REVIEW PROCESS.



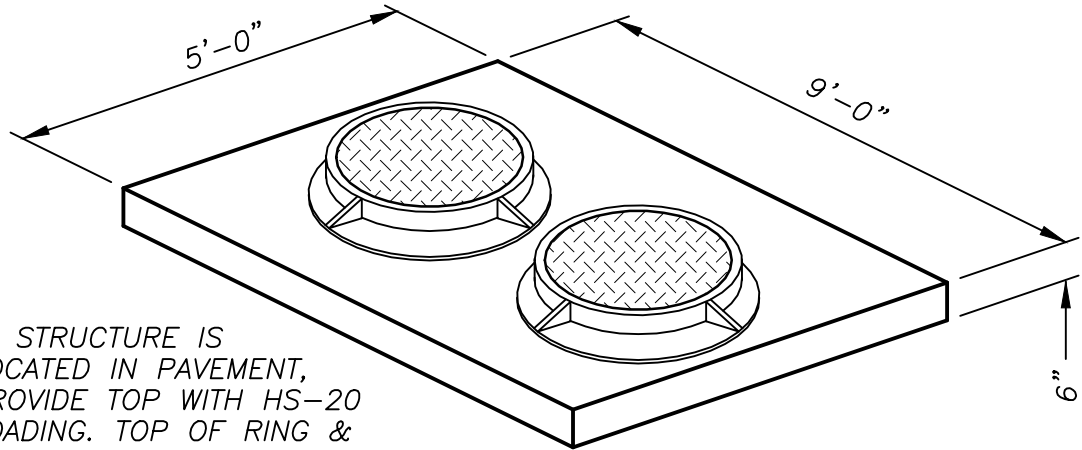
**TOWN OF HAW RIVER
STANDARD**

CONCRETE PIER

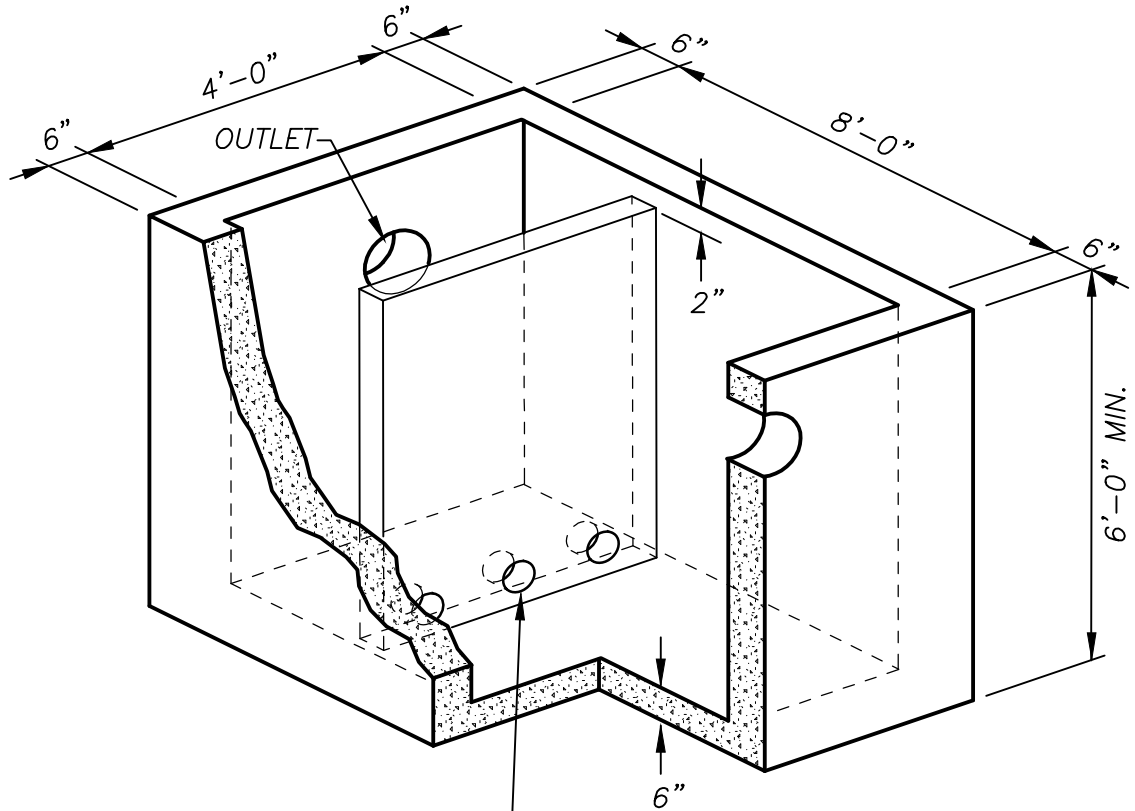
SCALE: N.T.S.

DATE: 7/23/26

DRAWN BY: WDF



NOTE : IF STRUCTURE IS
LOCATED IN PAVEMENT,
PROVIDE TOP WITH HS-20
LOADING. TOP OF RING &
COVER TO BE AT FINISHED
GRADE.



CONCRETE BAFFLE
WITH 3-4" HOLES
IN BOTTOM

NOTE : PROVIDE REINFORCING
AS APPROPRIATE FOR
LOCATION.

SS-10

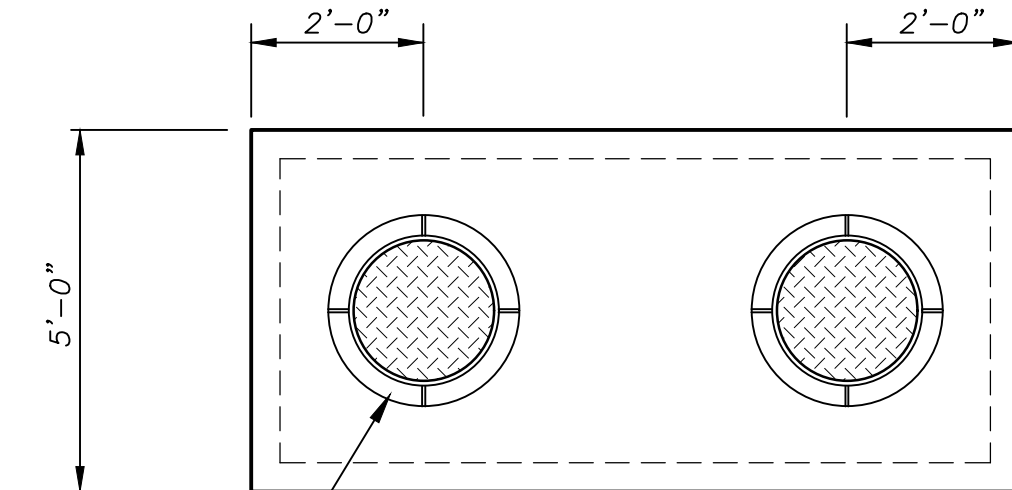
**TOWN OF HAW RIVER
STANDARD**

**1,000 GALLON
GREASE TRAP**

SCALE: N.T.S.

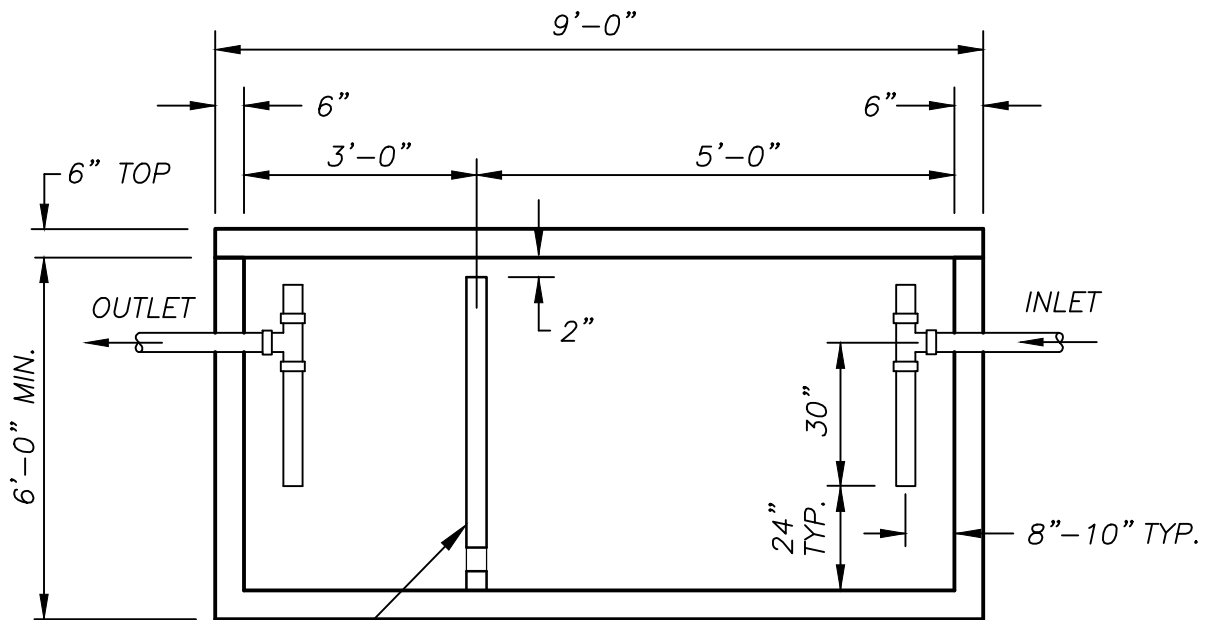
DATE: 7/23/26

DRAWN BY: WDF



PLAN

NOTE: IF STRUCTURE IS LOCATED IN PAVEMENT, PROVIDE TOP WITH HS-20 LOADING. TOP OF RING & COVER TO BE AT FINISHED GRADE.



SECTION

CONCRETE BAFFLE WITH 3-4" HOLES IN BOTTOM

NOTE: PROVIDE REINFORCING AS APPROPRIATE FOR LOCATION.

SS-11

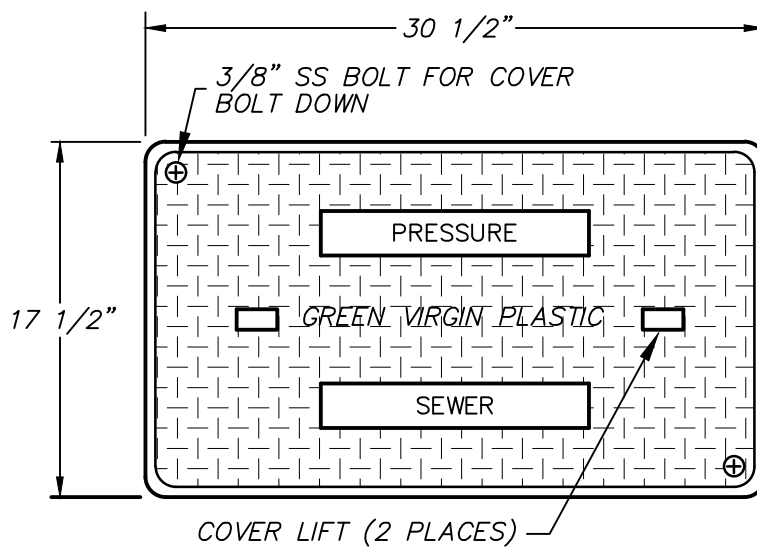
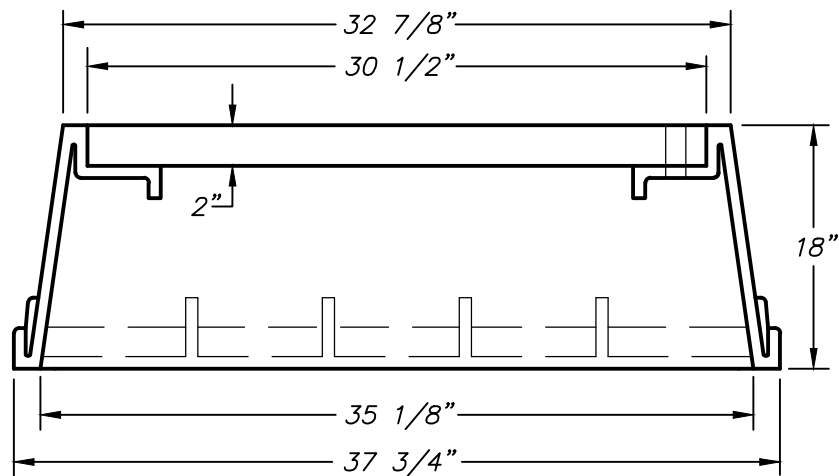
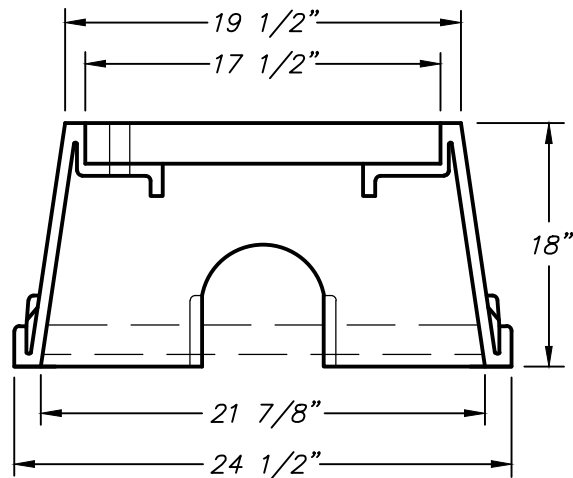
**TOWN OF HAW RIVER
STANDARD**

**1,000 GALLON
GREASE TRAP**

SCALE: N.T.S.

DATE: 7/23/26

DRAWN BY: WDF



PLAN VIEW

SS-12

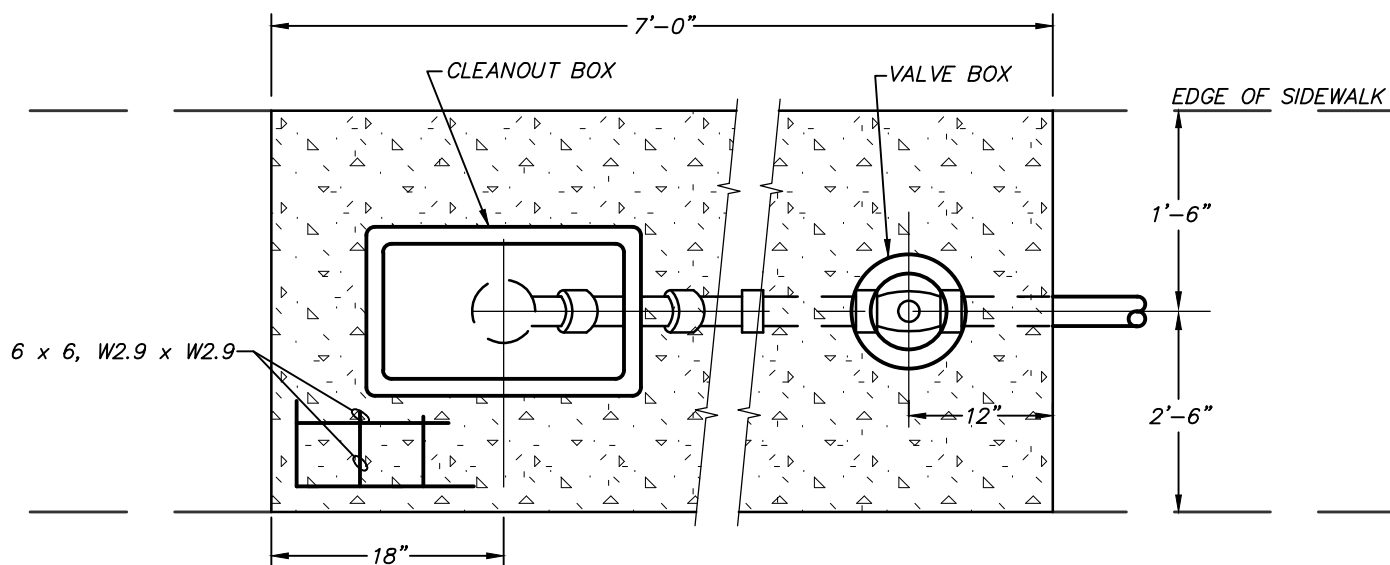
**TOWN OF HAW RIVER
STANDARD**

**STANDARD PRESSURE SEWER
METER BOX**

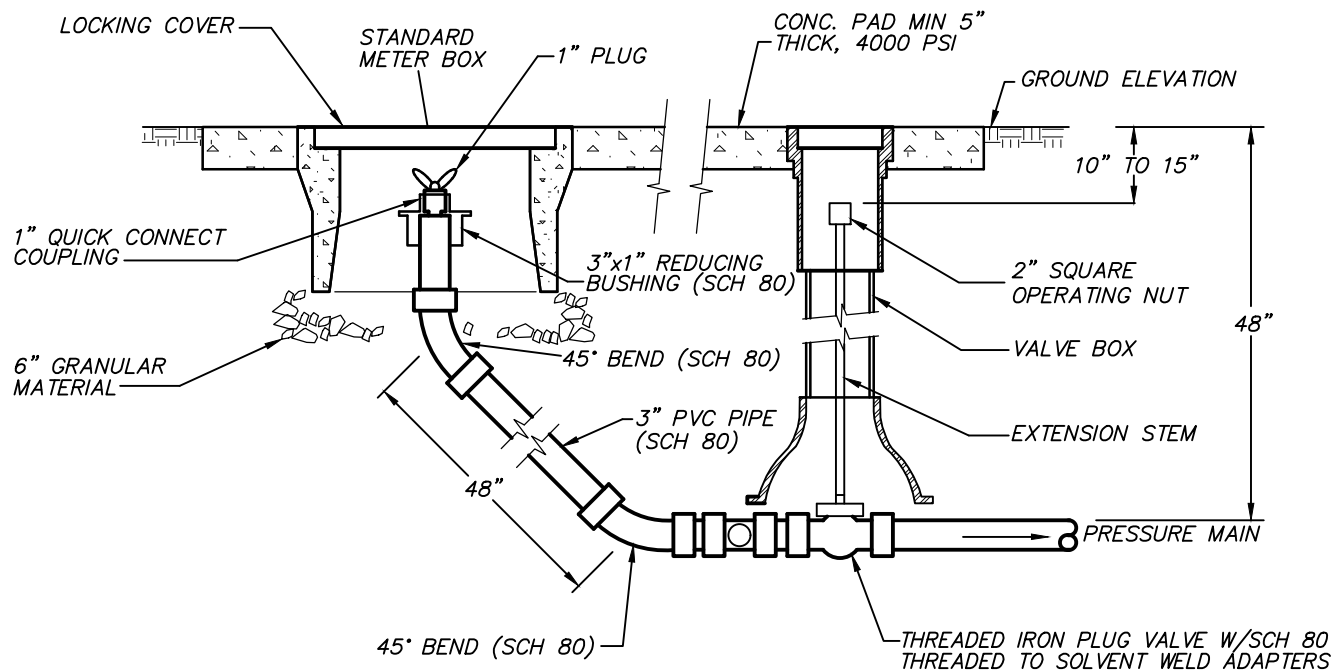
SCALE: N.T.S.

DATE: 7/23/26

DRAWN BY: WDF



PLAN VIEW



ELEVATION "A-A"

SS-13

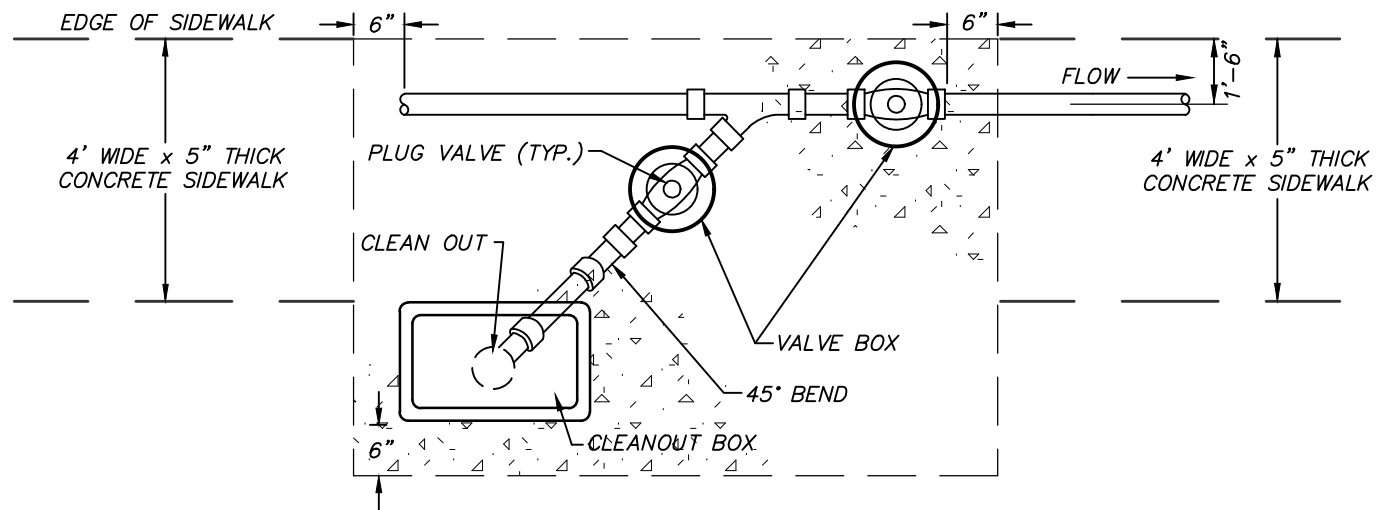
**TOWN OF HAW RIVER
STANDARD**

**CLEANOUT AT END OF MAIN FOR
PRESSURE SEWER SYSTEMS**

SCALE: N.T.S.

DATE: 7/23/26

DRAWN BY: WDF

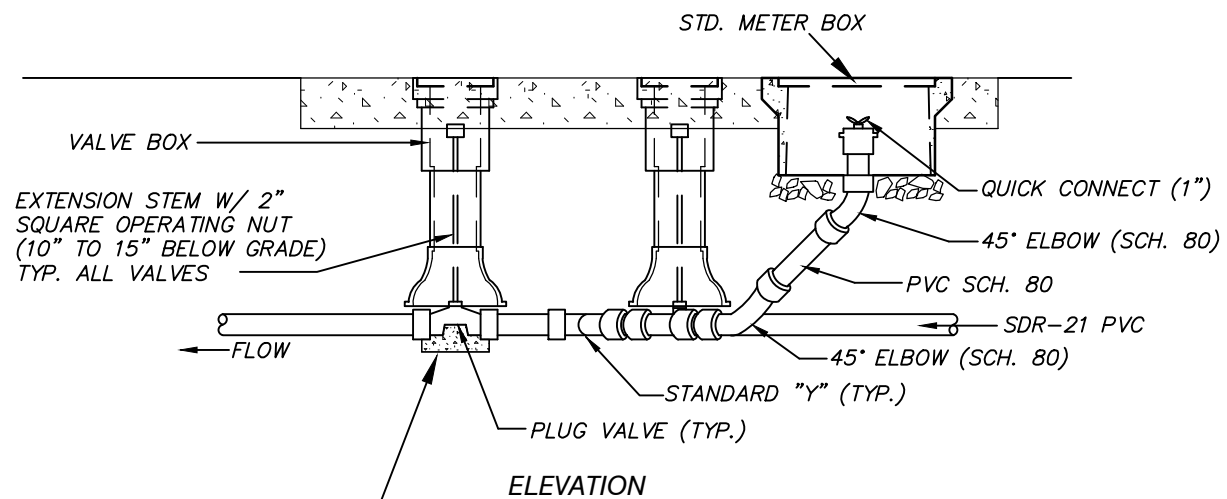


PLAN VIEW

NOTES:

CONCRETE PAD UNDER AND UP ON SIDES OF ALL VALVES TO PREVENT SETTLEMENT AND TWISTING OF VALVE.

CONCRETE PAD SHALL BE MIN. 5" THICK, 4000 PSI



NOTE: CONTRACTOR SHALL LOCATE BOTTOM OF VALVE BOX SUCH THAT BOX SHALL BEAR ONTO A BRICK SUPPORT & NOT THE PIPE OR VALVE.

SS-14

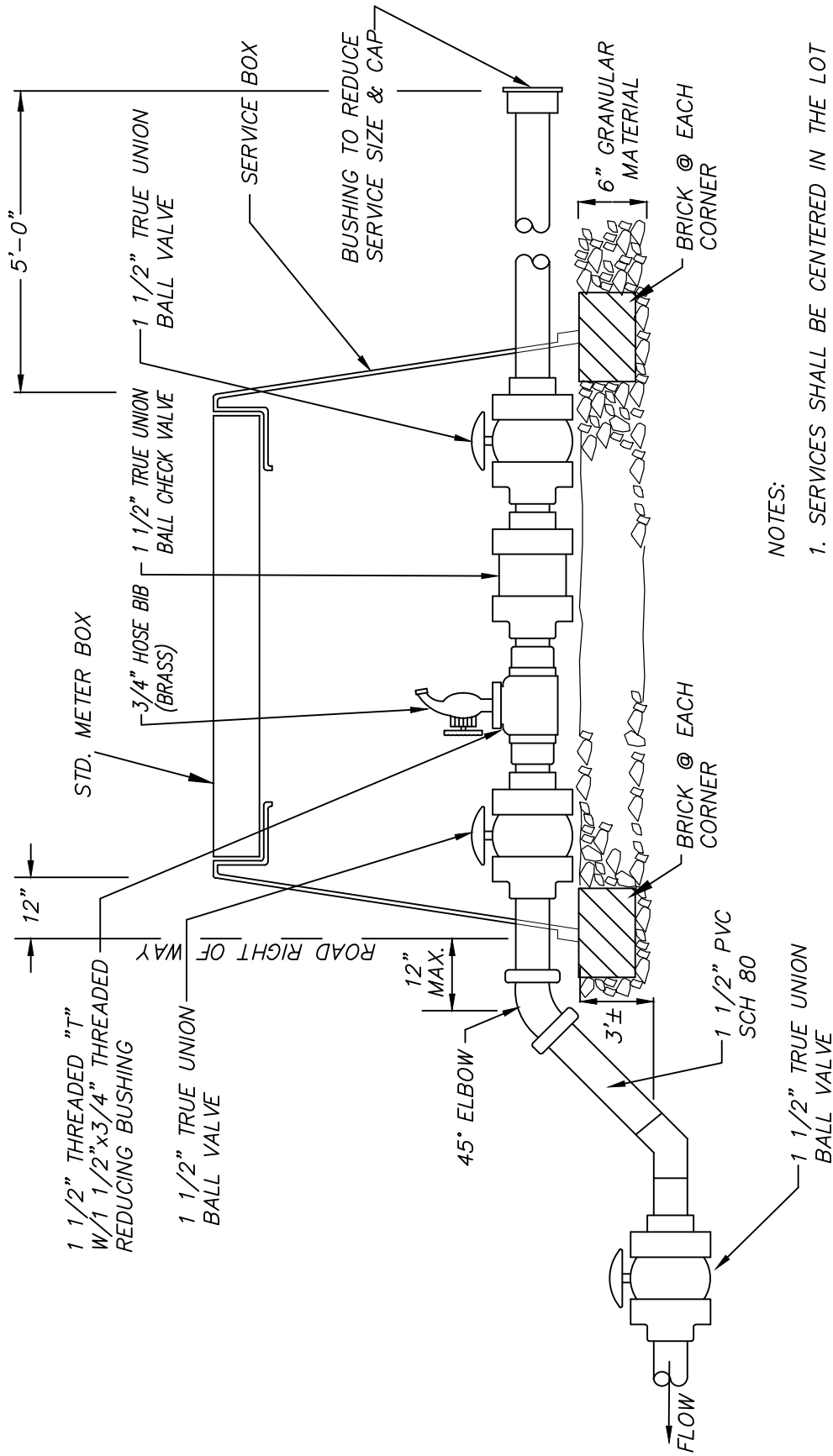
TOWN OF HAW RIVER STANDARD

MAIN LINE VALVE FOR
PRESSURE SEWER SYSTEM

SCALE: *N.T.S.*

DATE: 7/23/26

DRAWN BY: WDF



NOTES:

1. SERVICES SHALL BE CENTERED IN THE LOT ROAD FRONTAGE.
2. BOX SHALL NOT BE IN SIDEWALKS OR DRIVEWAYS.
3. TOP OF BOX SHALL BE FLUSH WITH FINISH GRADE OF LOT.

SS-15

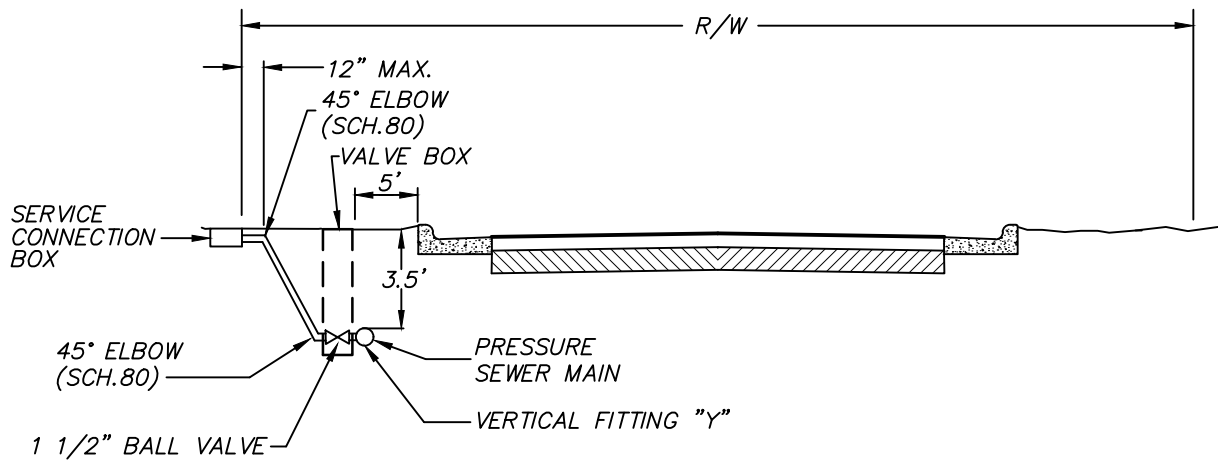
**TOWN OF HAW RIVER
STANDARD**

**STANDARD PRESSURE SEWER
SERVICE CONNECTION**

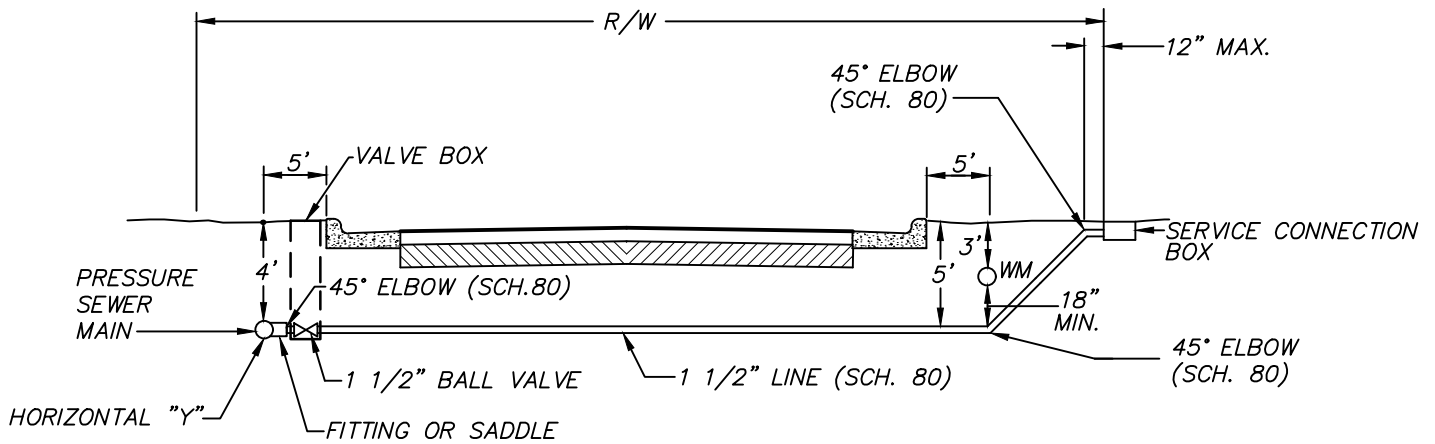
SCALE: N.T.S.

DATE: 7/23/26

DRAWN BY: WDF



PRESSURE SEWER SHORT SIDE LATERAL SERVICE



PRESSURE SEWER LONG SIDE LATERAL SERVICE

SS-16

**TOWN OF HAW RIVER
STANDARD**

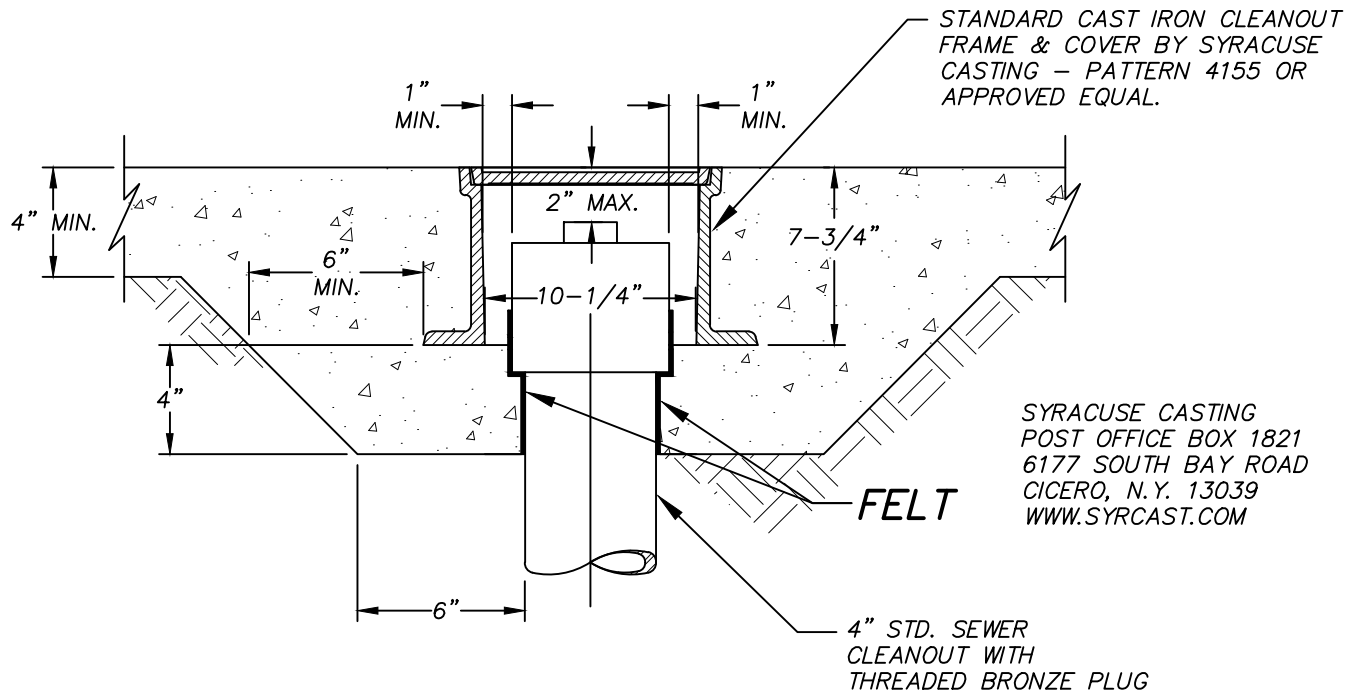
**PRESSURE SEWER
LATERAL SERVICES**

SCALE: N.T.S.

DATE: 7/23/26

DRAWN BY: WDF

WHERE RESIDENTIAL CLEAN-OUTS OCCUR IN DRIVEWAYS IN NEW CONSTRUCTION, A CASTING SHALL BE INSTALLED TO PROTECT IT. THE CAST IRON CASTING IS TO BE A MIN. OF 2" GREATER I.D. THAN THE SIZE OF PIPE IT IS INSTALLED OVER, IT SHALL BE SET IN CONCRETE AT FINISHED GRADE. CASTING SHALL CONFORM TO THE REQUIREMENTS OF AASHTO H20-44. SEE THE FOLLOWING SKETCH FOR FURTHER DETAILS.



ELEVATION VIEW

SS-18

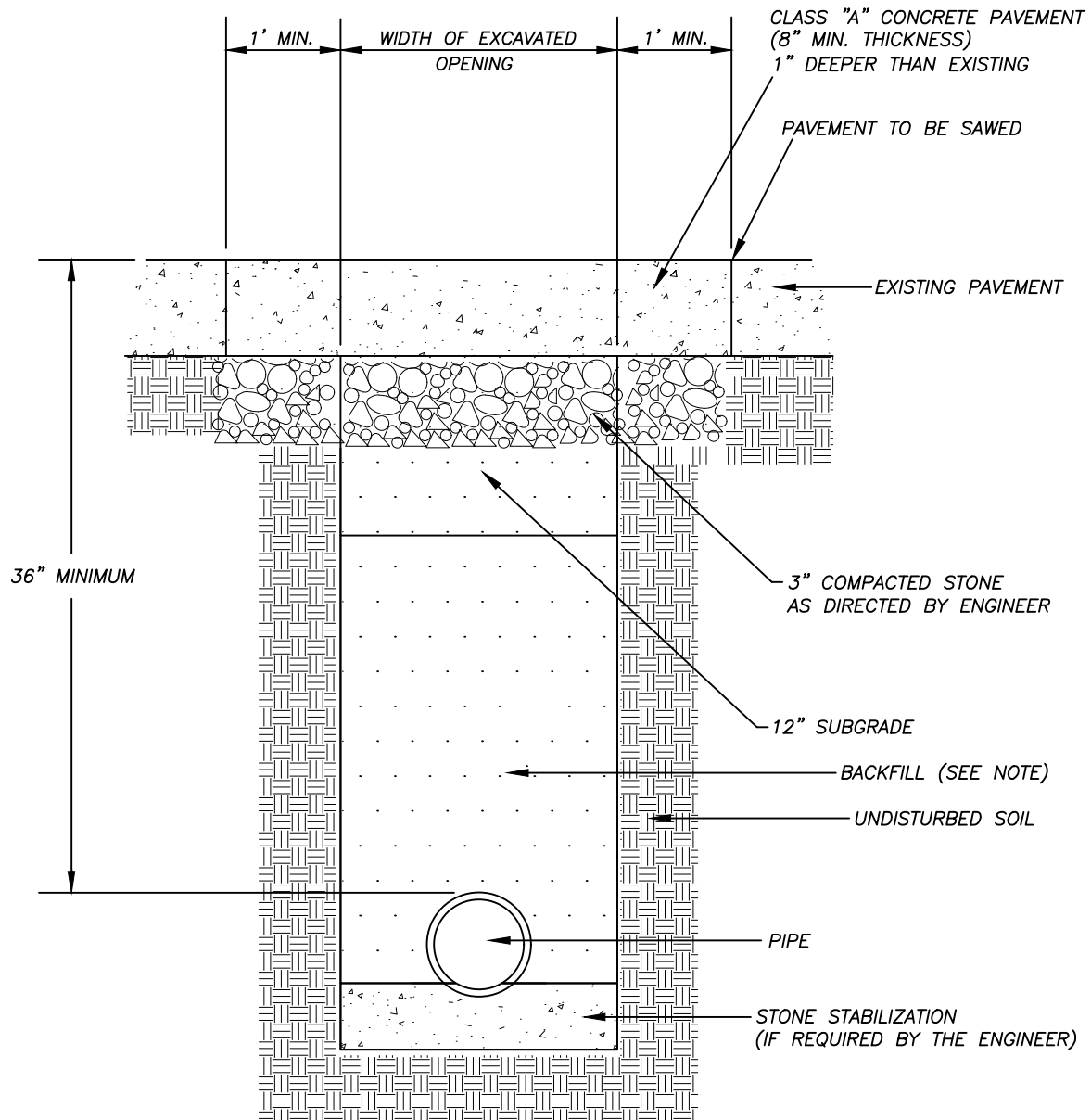
**TOWN OF HAW RIVER
STANDARD**

SEWER CLEANOUT IN TRAFFIC AREA

SCALE: N.T.S.

DATE: 7/23/26

DRAWN BY: WDF



NOTE:
WHERE THE EDGE OF THE PATCH OR SECTION OF REMOVED PAVEMENT IS LESS THAN 10' FROM A TRANSVERSE EXPANSION OR CONTRACTION JOINT OR CRACK, THE ENTIRE SECTION OF PAVEMENT SHALL BE REMOVED UP TO THE JOINT OR CRACK AND REPLACED WITH NEW CONCRETE AND ABC STONE IN ACCORDANCE WITH THE MOST CURRENT N.C.D.O.T. STANDARD SPECIFICATIONS.

THE BACKFILL SHALL BE MADE IN 6" LAYERS AND SHALL BE COMPACTED TO AT LEAST 95% OF STANDARD DENSITY (AASHTO METHOD T-99). EACH LAYER MUST BE THOROUGHLY TAMPED BY A MECHANICAL TAMP BEFORE THE NEXT LAYER IS PLACED.

SS-19

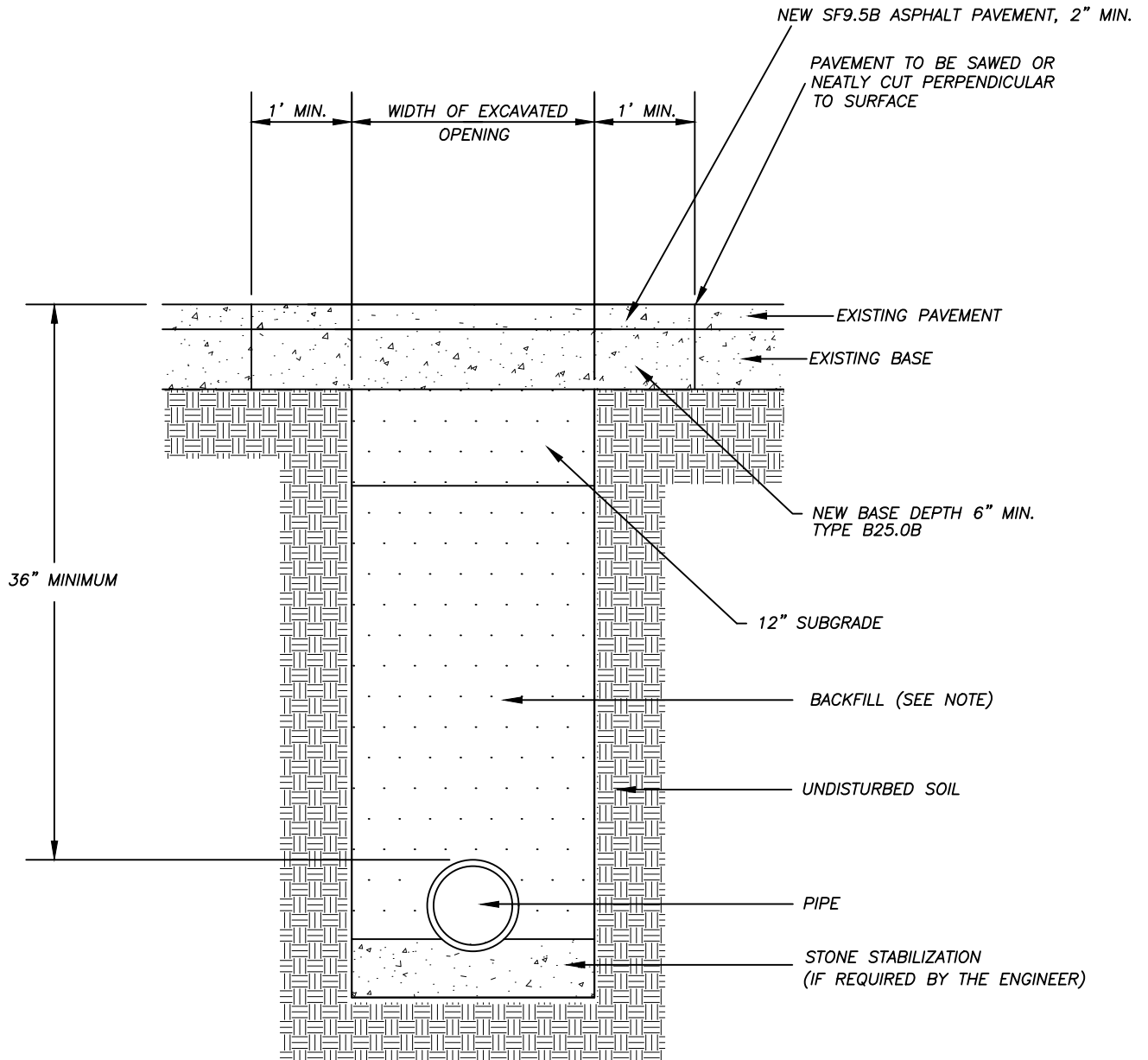
**TOWN OF HAW RIVER
STANDARD**

**CONCRETE DRIVEWAY
REPAIR DETAIL**

SCALE: N.T.S.

DATE: 7/23/26

DRAWN BY: WDF



NOTE:

THE BACKFILL SHALL BE MADE IN 6" LAYERS AND SHALL BE COMPACTED TO AT LEAST 95% OF STANDARD DENSITY (AASHTO METHOD T-99). EACH LAYER MUST BE THOROUGHLY TAMPED BY A MECHANICAL TAMP BEFORE THE NEXT LAYER IS PLACED. ALL ASPHALT PAVEMENT REPLACED SHALL BE IN ACCORDANCE WITH THE MOST CURRENT N.C.D.O.T. STANDARD SPECIFICATIONS. BASE COURSE DENSITY AND SUBGRADE DENSITY SHALL BE 100%.

SS-20

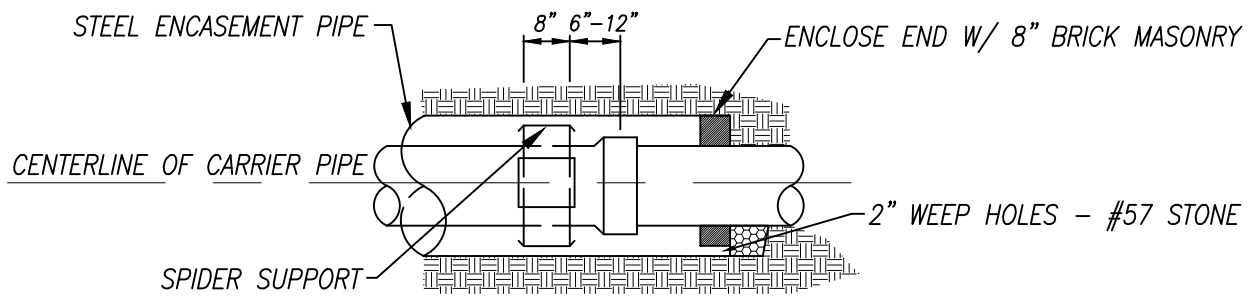
**TOWN OF HAW RIVER
STANDARD**

**ASPHALT PAVEMENT
REPAIR DETAIL**

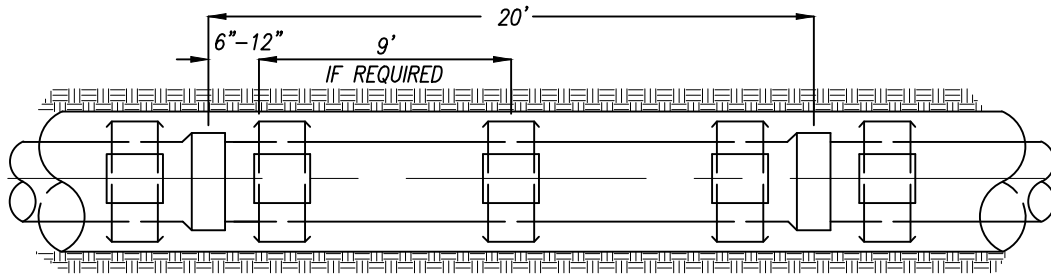
SCALE: N.T.S.

DATE: 7/23/26

DRAWN BY: WDF



CASING END SECTION



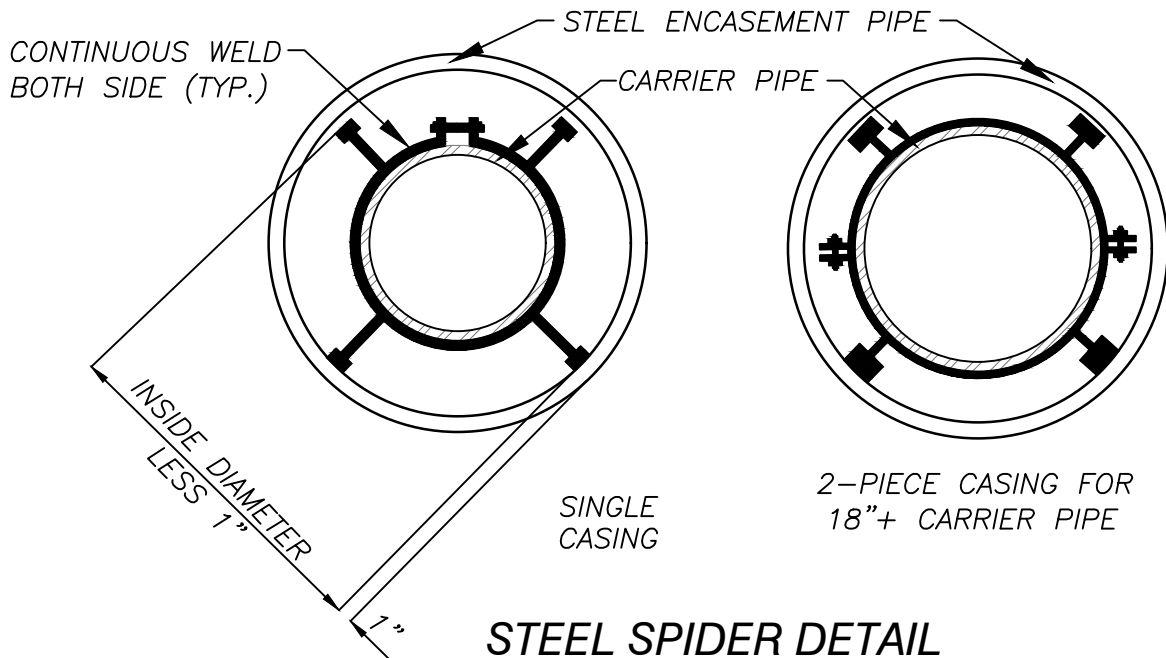
SIDE VIEW

TYPICAL SPACING FOR STEEL SPIDERS

STEEL ENCASEMENT DETAIL

NOTES:

1. NORMAL SPACING FOR SPIDERS IS 3 PER 18' LENGTH OF PIPE, ONE SUPPORT AT EACH END AND A SUPPORT AT 9' CENTER.
2. SPACERS SHALL BE STAINLESS STEEL WITH STAINLESS STEEL HARDWARE AND POLYMER SKIDS.
3. PROVIDE RUBBER WRAP BETWEEN CARRIER PIPE AND SPACER.
4. FIELD MODIFY AS REQUIRED TO PROVIDE DESIGN SLOPE IN CARRIER PIPE.
5. ALL ENCASEMENT PIPES SHALL BE FIELD SURVEYED, AND LOCATION & ELEVATIONS PROVIDED ON AS-BUILTS.



STEEL SPIDER DETAIL

SS-21

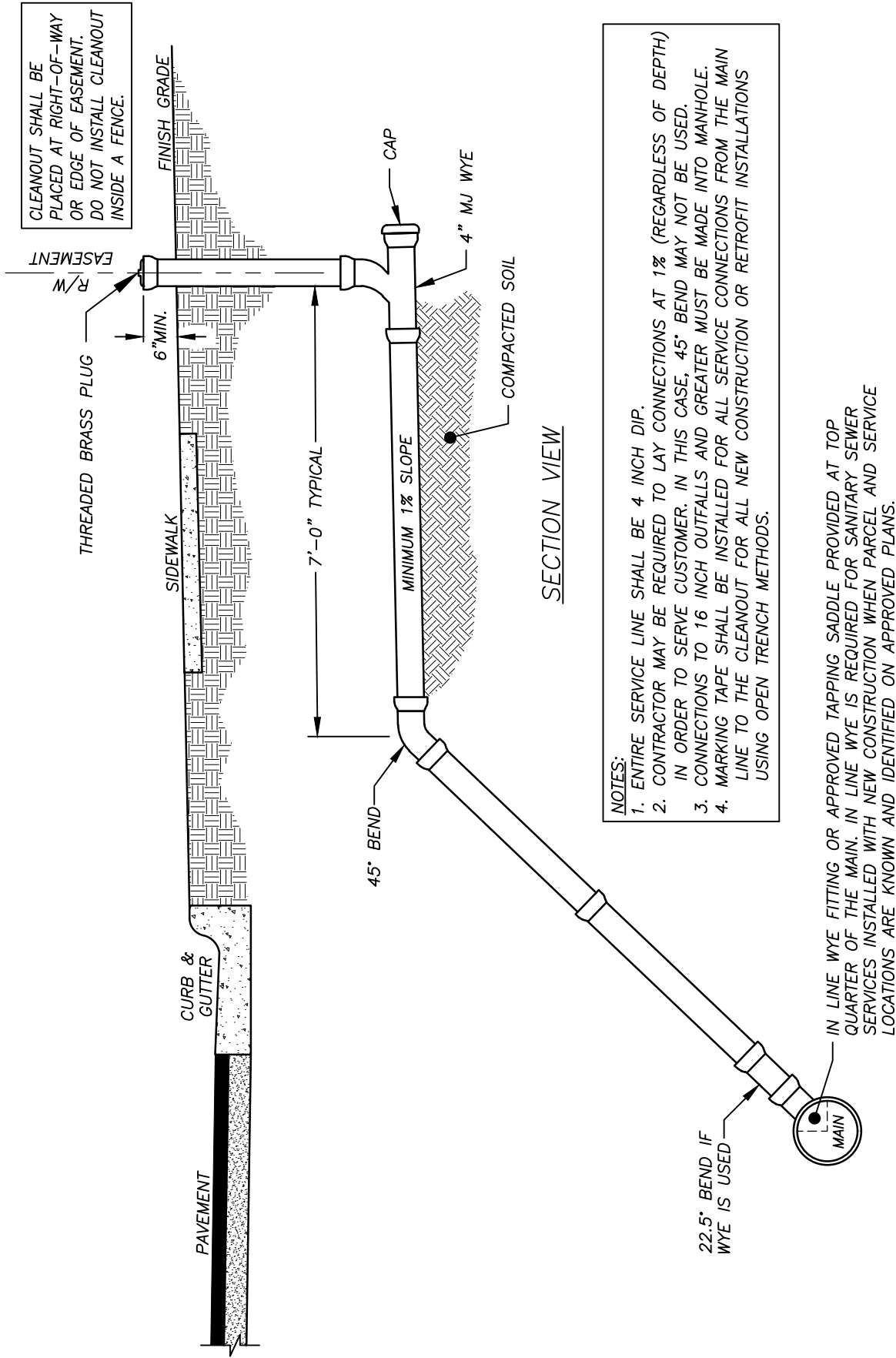
**TOWN OF HAW RIVER
STANDARD**

**ENCASEMENT PIPE
SUPPORT AND SPACERS**

SCALE: N.T.S.

DATE: 7/23/26

DRAWN BY: WDF



NOTES:

1. ENTIRE SERVICE LINE SHALL BE 4 INCH DIP.
2. CONTRACTOR MAY BE REQUIRED TO LAY CONNECTIONS AT 1% (REGARDLESS OF DEPTH) IN ORDER TO SERVE CUSTOMER. IN THIS CASE, 45° BEND MAY NOT BE USED.
3. CONNECTIONS TO 16 INCH OUTFALLS AND GREATER MUST BE MADE INTO MANHOLE.
4. MARKING TAPE SHALL BE INSTALLED FOR ALL SERVICE CONNECTIONS FROM THE MAIN LINE TO THE CLEANOUT FOR ALL NEW CONSTRUCTION OR RETROFIT INSTALLATIONS USING OPEN TRENCH METHODS.

IN LINE WYE FITTING OR APPROVED TAPPING SADDLE PROVIDED AT TOP QUARTER OF THE MAIN. IN LINE WYE IS REQUIRED FOR SANITARY SEWER SERVICES INSTALLED WITH NEW CONSTRUCTION WHEN PARCEL AND SERVICE LOCATIONS ARE KNOWN AND IDENTIFIED ON APPROVED PLANS.

SECTION VIEW

SS-22

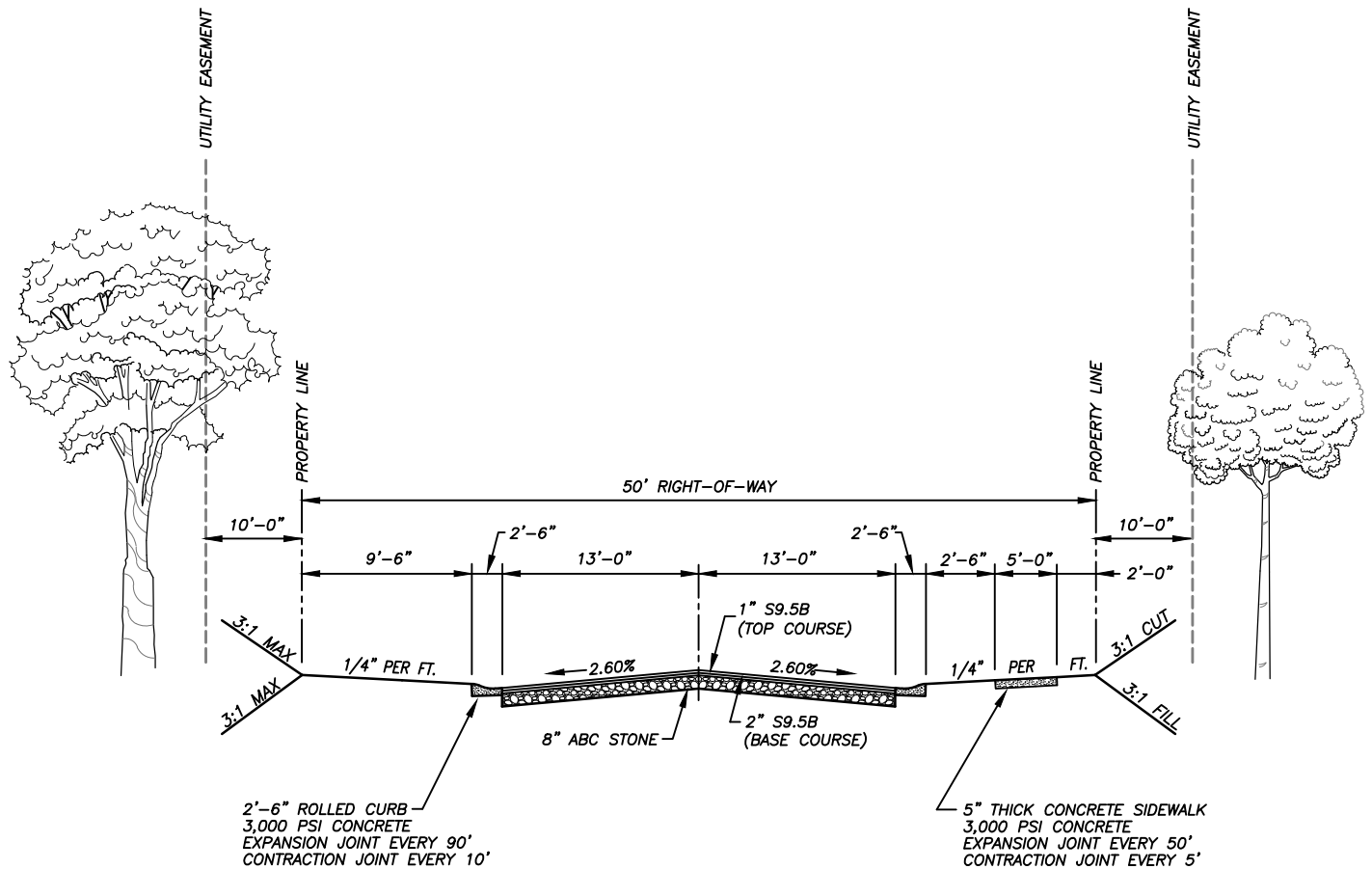
TOWN OF HAW RIVER STANDARD

STANDARD 4" S.S. SERVICE FOR DEEP SEWER MAINS (14' & GREATER)

SCALE: N.T.S.

DATE: 7/23/26

DRAWN BY: WDF



NOTES:

1. ALL ASPHALT CEMENT PLANT MIX AND METHOD OF PLACEMENT SHALL COMPLY WITH N.C. DOT STANDARD SPECIFICATIONS.
2. ALL WORK SHALL COMPLY WITH N.C. DOT STANDARD SPECIFICATIONS.
3. TOP COURSE TO BE PLACED WITHIN 12 MONTHS OF ASPHALT BASE COURSE. THE TOP COAT WILL BE PLACED NO EARLIER THAN 6 MONTHS AFTER BASE COURSE IS PLACED.
4. COMMERCIAL AND INDUSTRIAL STREET SECTIONS TO BE DETERMINED ON A CASE BY CASE BASIS.
5. WHERE NEW SIDEWALK CROSSES EXISTING GRAVEL DRIVEWAY, SIDEWALK NEEDS TO BE 6" THICK.
6. PROVIDE APPROVED NCDOT SEALANT OVER ALL EXPANSION JOINTS ALONG CONCRETE CURBS AND CONCRETE SIDEWALKS.
7. CUT FILL SLOPE EXCEEDING MAXIMUM MUST BE APPROVED BY THE CITY ENGINEER.
8. SIDEWALK MUST BE LOCATED ON ONE SIDE OF THE STREET EXCEPT WHEN CITY PROJECT APPROVAL REQUIRES ON BOTH SIDES.
9. STREET TREES ARE TO BE LOCATED BEHIND THE UTILITY EASEMENT.

ST-1

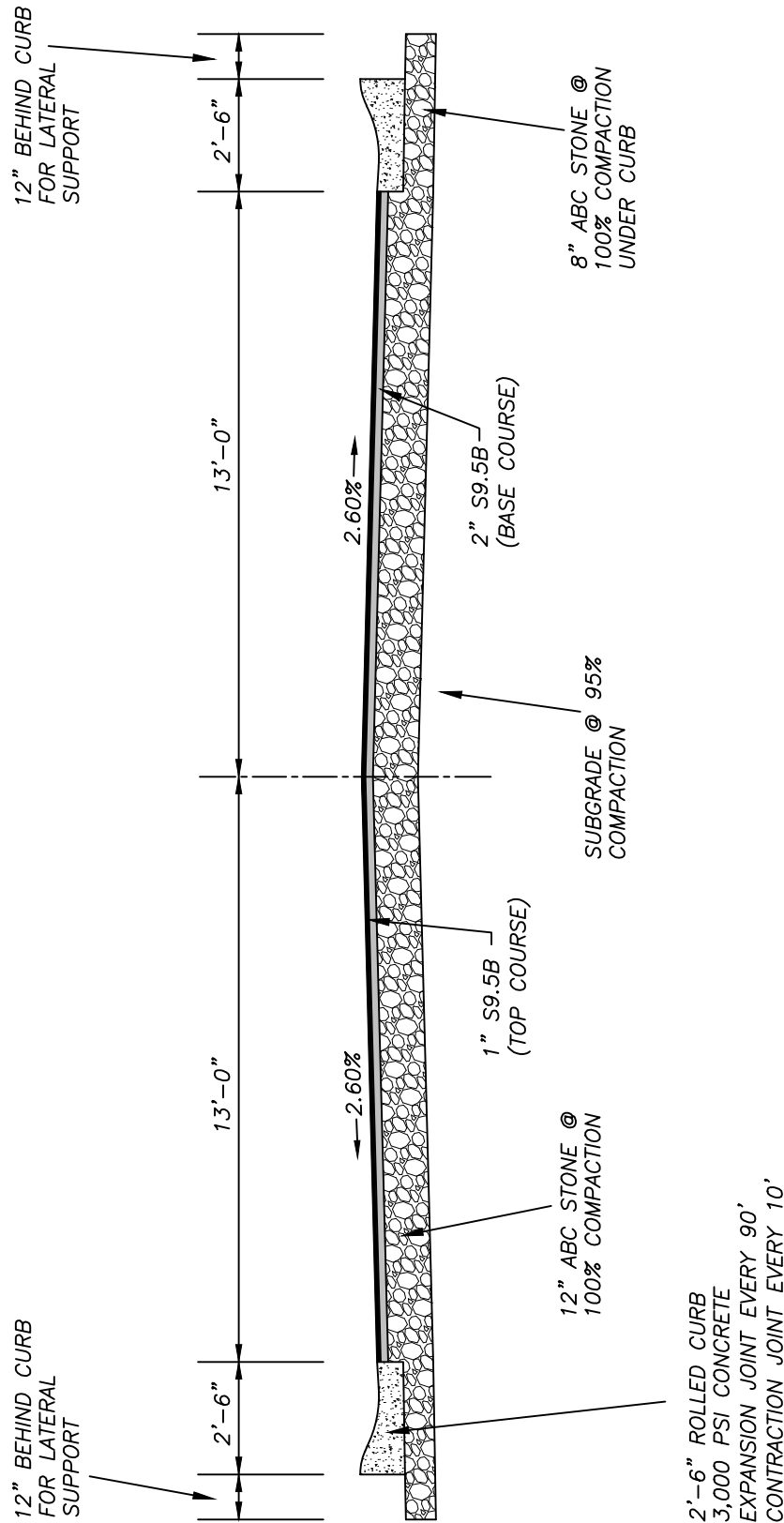
**TOWN OF HAW RIVER
STANDARD**

**RESIDENTIAL STREET SECTION
(50' ROW - 31' B-B)**

SCALE: N.T.S.

DATE: 7/23/26

DRAWN BY: WDF



NOVEMBER - APRIL

ST-3

TOWN OF HAW RIVER
STANDARD

WINTER STREET SECTION

SCALE: N.T.S.

DATE: 7/23/26

DRAWN BY: WDF

DRAWN BY: WDF

NOTES :

1. UTILITY LOCATIONS

- WATER LINE UNDER THE SIDEWALK
- SEWER LINE MIDDLE OF STREET
- NATURAL GAS IN 10' UTILITY EASEMENT ADJACENT TO STREET R/W
- ELECTRIC UNDERGROUND IN 10' UTILITY EASEMENT ADJACENT TO STREET R/W
- TELEPHONE IN 10' UTILITY EASEMENT ADJACENT TO STREET R/W
- CABLE IN 10' UTILITY EASEMENT ADJACENT TO STREET R/W

2. WATER AND SEWER IMPROVEMENTS

- ALL WATER LINES ARE TO BE A MIN. OF 8" IN SIZE EXCEPT FOR CUL-DE-SACS WHERE 6" IS ALLOWED WHEN LESS THAN 600 FT. AND 4" IS ALLOWED WHEN LESS THAN 400 FT.
- WATER MAIN IS TO BE DUCTILE IRON PIPE CLASS 50
- SEWER MAINS ARE TO BE A MIN. OF 8" IN SIZE
- SEWER MAINS ARE TO BE VITRIFIED CLAY PIPE OR DUCTILE IRON PIPE, CLASS 50.
- FOR RESIDENTIAL AREAS, PVC SDR-35 CAN BE USED AS APPROVED BY THE PUBLIC WORKS DIRECTOR

3. STORM DRAINAGE

- ALL STORM DRAINS ARE TO BE A MIN. OF 15 INCH IN SIZE
- MATERIALS ARE TO BE REINFORCED CONCRETE PIPE OR HDPE EXCEPT WHEN LARGER THAN 72 INCH. ALTERNATIVE PIPE MATERIAL MAY BE USED AS APPROVED BY THE PUBLIC WORKS DIRECTOR
- CURB INLETS TO BE LOCATED WHERE NO MORE THAN 1.0 ACRE OF DRAINAGE CONTRIBUTES TO ANY INLET EXCEPT IN SAGS WHERE 6' WIDE BASINS CAN BE USED WHICH WILL BE ALLOWED TO DRAIN 1.5 ACRE SUB-BASINS.

4. CONCRETE SIDEWALKS

- 3,000 P.S.I.
- 5' WIDE AND 5" THICK
- SEE CURRENT CITY REQUIREMENTS

5. OTHER

- ANY CHANGES TO THE GENERAL REQUIREMENTS SHALL BE PRE-APPROVED BY THE PUBLIC WORKS DIRECTOR
- TOWN OF HAW RIVER STANDARD SPECIFICATIONS AND DETAILS ARE TO BE USED
- NO BURNING ALLOWED INSIDE THE TOWN OF HAW RIVER
- CONDUIT AND STREET LIGHTING LAYOUT TO BE APPROVED PRIOR TO CURB INSTALLATION. FAILURE TO RECEIVE APPROVAL PRIOR TO CURB INSTALLATION WILL RESULT IN THE REQUIREMENT OF AN ENCROACHMENT AGREEMENT PRIOR TO INSTALLATION.
- THE TOWN HAS THE RIGHT TO REQUEST RELOCATION OF ANY UTILITY LINES OR CABLES NOT INSTALLED IN ACCORDANCE WITH THESE REQUIREMENTS, UNLESS PRIOR APPROVAL IS MADE FOR A VARIANCE.

ST-5

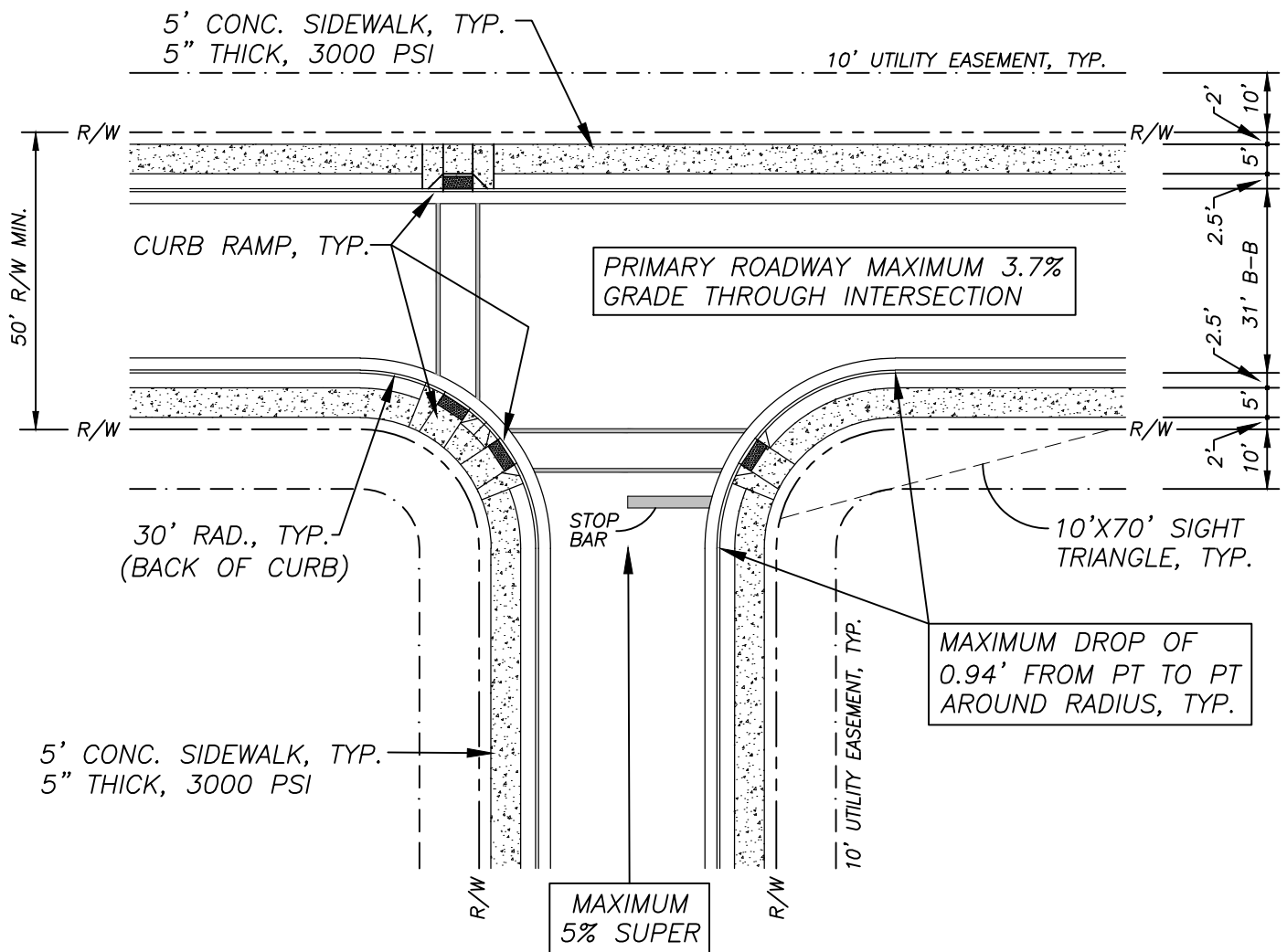
**TOWN OF HAW RIVER
STANDARD**

**GENERAL SUBDIVISION REQUIREMENTS
FOR ROADWAYS AND UTILITIES**

SCALE: N.T.S.

DATE: 7/23/26

DRAWN BY: WDF



ADA INTERSECTION GUIDELINES AND STANDARDS

R302.6 CROSS SLOPE – EXCEPT AS PROVIDED IN R302.6.1 AND R302.6.2, THE CROSS SLOPE OF PEDESTRIAN ACCESS ROUTES SHALL BE 2 PERCENT MAXIMUM.

R302.6.1 PEDESTRIAN STREET CROSSINGS WITHOUT YIELD OR STOP CONTROL – WHERE PEDESTRIAN ACCESS ROUTES ARE CONTAINED WITHIN PEDESTRIAN STREET CROSSINGS WITHOUT YIELD OR STOP CONTROL, THE CROSS SLOPE OF THE PEDESTRIAN ACCESS ROUTE SHALL BE 5 PERCENT MAXIMUM.

ADVISORY R302.6.1 PEDESTRIAN STREET CROSSINGS WITHOUT YIELD OR STOP CONTROL – PEDESTRIAN STREET CROSSINGS WITHOUT YIELD OR STOP CONTROL ARE CROSSINGS WHERE THERE IS NO YIELD OR STOP SIGN, OR WHERE THERE IS A TRAFFIC SIGNAL THAT IS DESIGNED FOR THE GREEN PHASE. AT PEDESTRIAN STREET CROSSINGS WITHOUT YIELD OR STOP CONTROL, VEHICLES CAN PROCEED THROUGH THE INTERSECTION WITHOUT SLOWING OR STOPPING. WHERE PEDESTRIAN ACCESS ROUTES ARE CONTAINED WITHIN PEDESTRIAN STREET CROSSINGS WITH YIELD OR STOP CONTROL, THE CROSS SLOPE OF THE PEDESTRIAN ACCESS ROUTE MUST BE 2 PERCENT MAXIMUM (SEE R302.6). AT PEDESTRIAN STREET CROSSINGS WITH YIELD OR STOP CONTROL, VEHICLES SLOW OR STOP BEFORE PROCEEDING THROUGH THE INTERSECTION.

R302.6.2 MIDBLOCK PEDESTRIAN STREET CROSSINGS – WHERE PEDESTRIAN ACCESS ROUTES ARE CONTAINED WITHIN MIDBLOCK PEDESTRIAN STREET CROSSINGS, THE CROSS SLOPE OF THE PEDESTRIAN ACCESS ROUTE SHALL BE PERMITTED TO EQUAL THE STREET OR HIGHWAY GRADE.

ST-6

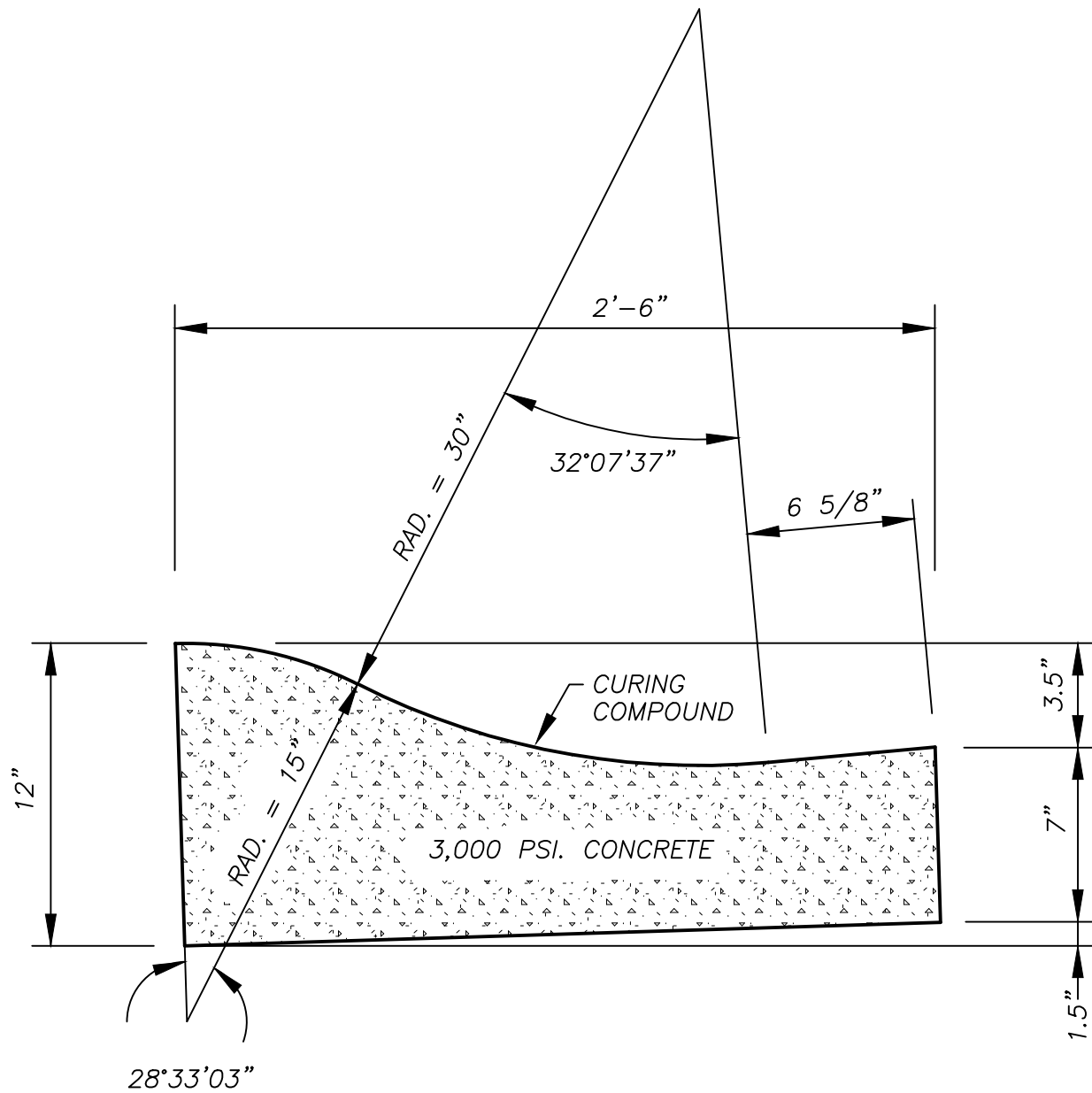
**TOWN OF HAW RIVER
STANDARD**

ADA INTERSECTION

SCALE: N.T.S.

DATE: 7/23/26

DRAWN BY: WDF



NOTES:

1. 3,000 PSI CONCRETE CURB.
2. EXPANSION JOINT EVERY 90' AND CONTRACTION JOINT EVERY 10'.
3. PROVIDE SEALANT OVER EXPANSION JOINTS AS PER NCDOT STANDARD SPECIFICATIONS.

ST-7

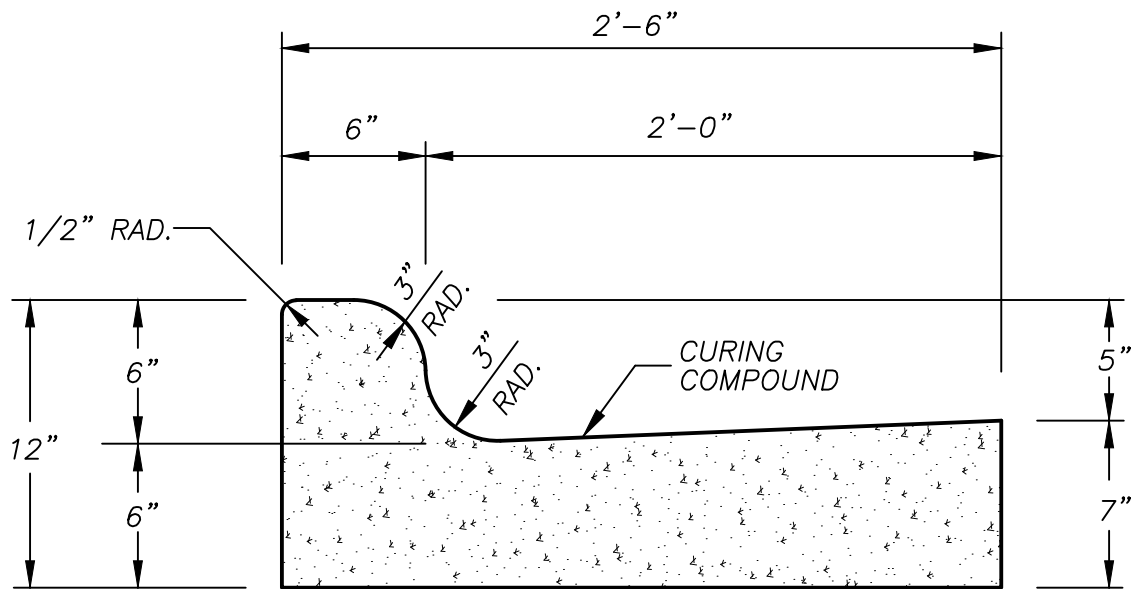
**TOWN OF HAW RIVER
STANDARD**

30" ROLLED CURB

SCALE: N.T.S.

DATE: 7/23/26

DRAWN BY: WDF



NOTES:

1. 3,000 PSI CONCRETE CURB.
2. EXPANSION JOINT EVERY 90' AND CONTRACTION JOINT EVERY 10'.
3. PROVIDE SEALANT OVER EXPANSION JOINTS AS PER NCDOT STANDARD SPECIFICATIONS.

ST-8

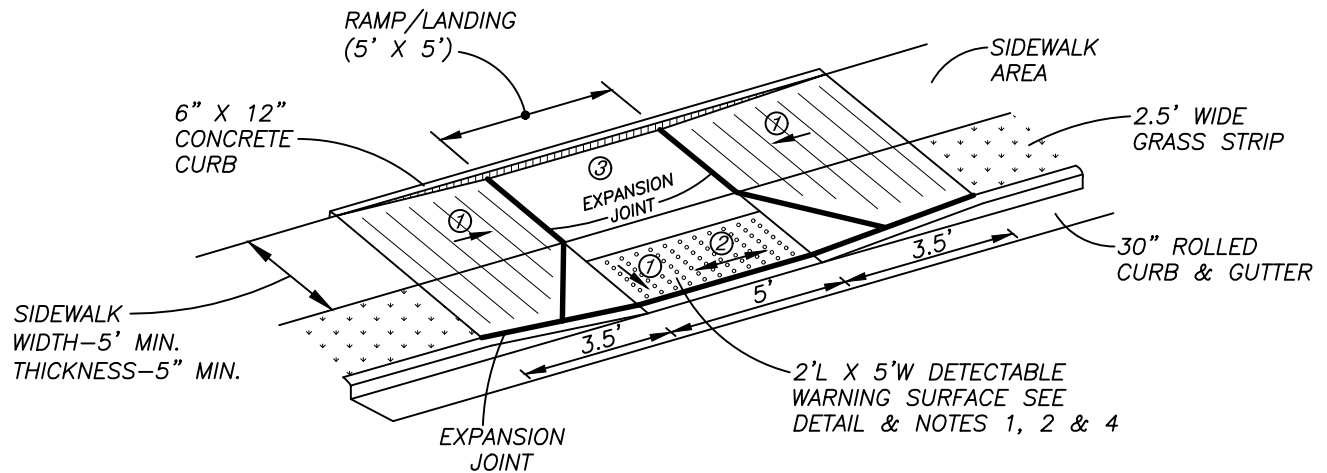
**TOWN OF HAW RIVER
STANDARD**

30" STANDARD CURB

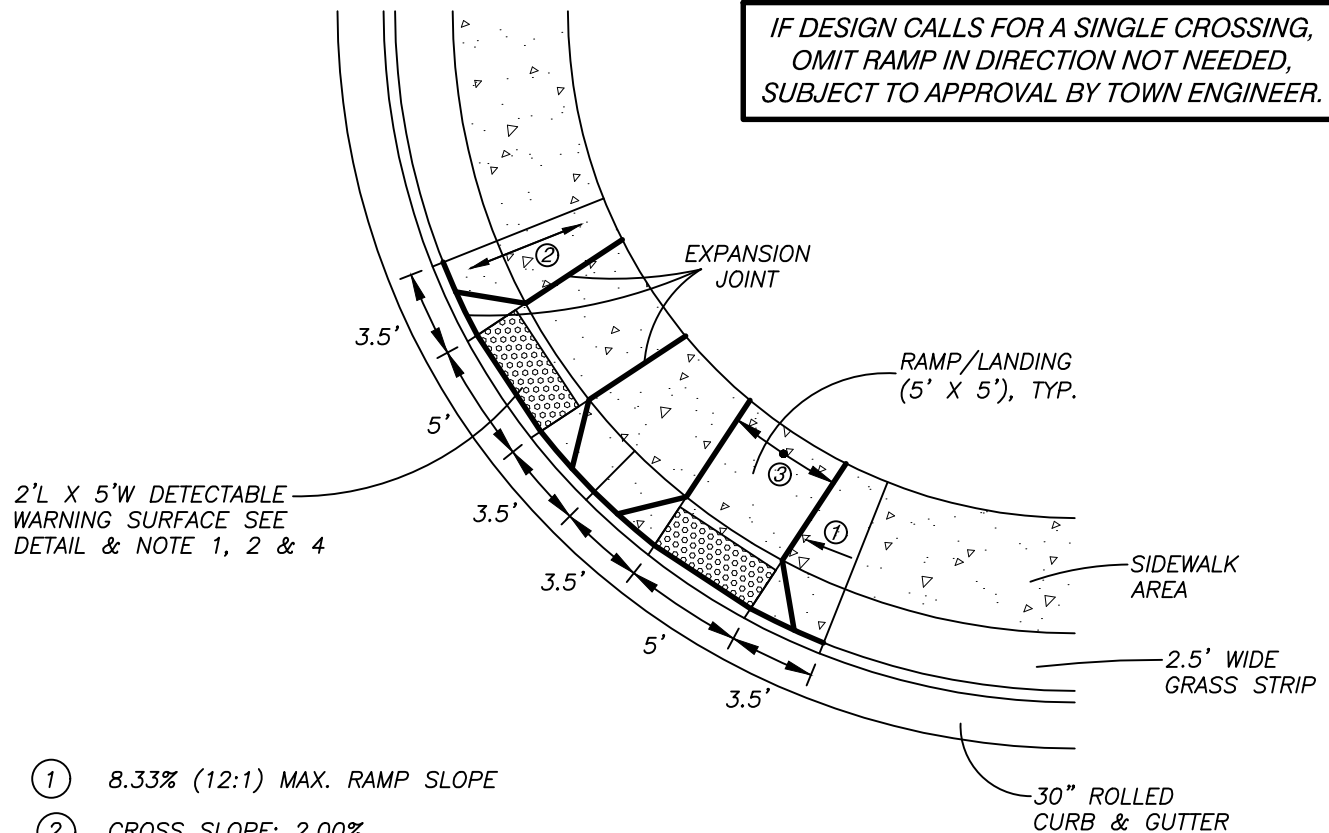
SCALE: N.T.S.

DATE: 7/23/26

DRAWN BY: WDF



IF DESIGN CALLS FOR A SINGLE CROSSING, OMIT RAMP IN DIRECTION NOT NEEDED, SUBJECT TO APPROVAL BY TOWN ENGINEER.



- ① 8.33% (12:1) MAX. RAMP SLOPE
- ② CROSS SLOPE: 2.00%
- ③ CURB RAMPS REQUIRE A (5'-0") MINIMUM LANDING WITH A MAXIMUM GROSS SLOPE AND LONGITUDINAL SLOPE OF 2.00% WHERE PEDESTRIANS PERFORM TURNING MANEUVERS. SLOPE TO DRAIN TO CURB.
- ④ CAST IN PLACE TRUNCATED DOMES MUST BE USED ON ALL NEW CURB RAMPS.

ST-9

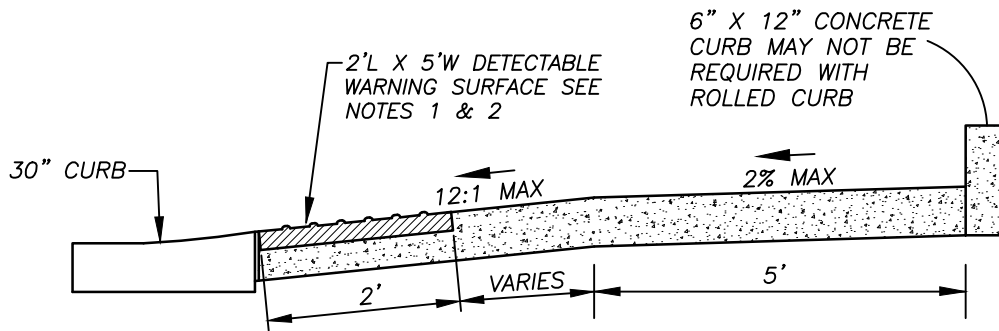
**TOWN OF HAW RIVER
STANDARD**

CURB RAMP

SCALE: N.T.S.

DATE: 7/23/26

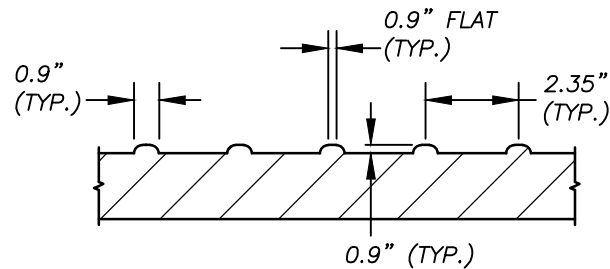
DRAWN BY: WDF



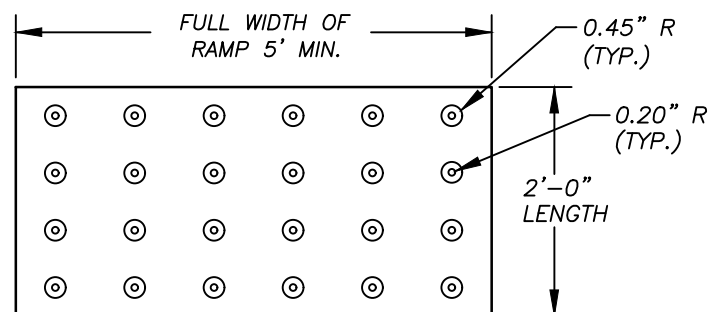
SECTION

NOTES:

1. DETECTABLE WARNING DOMES SHALL COVER 2'-0" LENGTH AND FULL WIDTH OF THE RAMP FLOOR AS SHOWN ON THE DETAILS.
2. THE RAMP MAY BE YELLOW IN COLOR OR ANY COLOR WITH A 70% CONTRAST RATIO.
3. PROVIDE SEALANT OVER EXPANSION JOINTS AS PER NCDOT STANDARD SPECIFICATIONS.



SECTION



PLAN

DETECTABLE WARNING DOMES DETAIL

ST-10

**TOWN OF HAW RIVER
STANDARD**

CURB RAMP

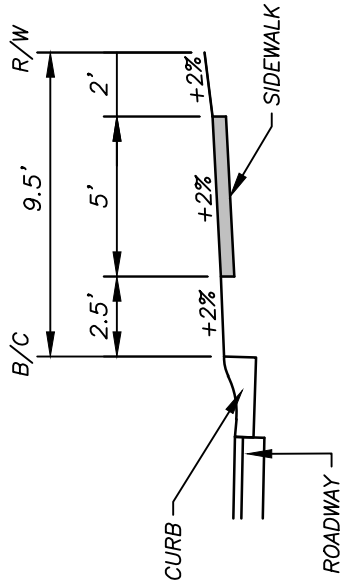
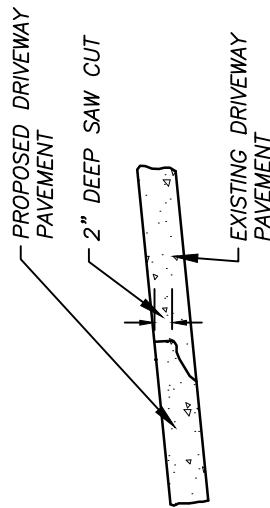
SCALE: N.T.S.

DATE: 7/23/26

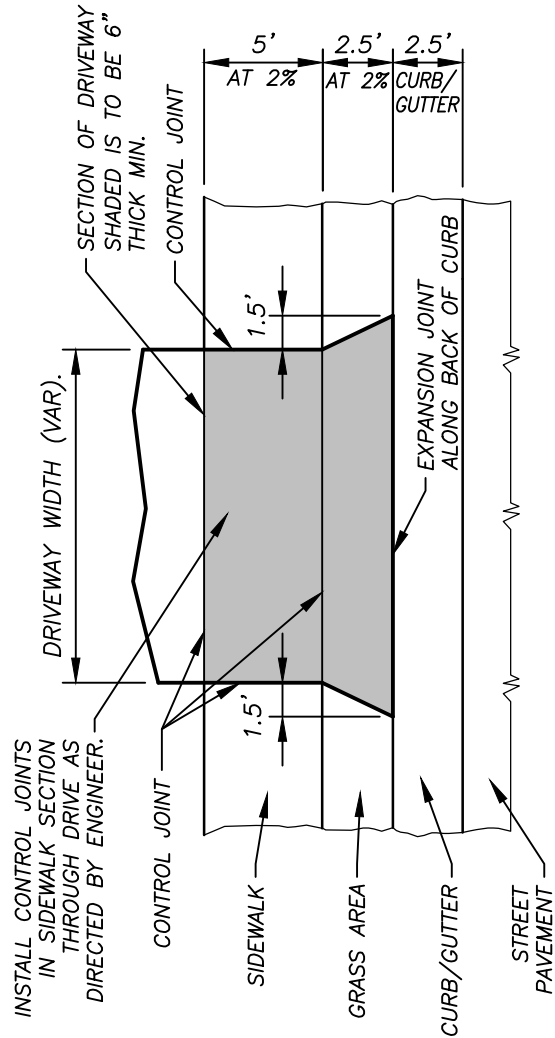
DRAWN BY: WDF

METHOD OF TIE IN

WHEN EXISTING DRIVEWAY PAVEMENT IS CONCRETE A SAW CUT 2" DEEP SHALL BE REQUIRED AT THE POINT OF TIE IN WITH EXISTING DRIVEWAY GRADE. SAW JOINT TO BE PERPENDICULAR TO EDGE OF EXISTING DRIVEWAY PAVEMENT.



DRIVEWAY SECTION WITH AND WITHOUT SIDEWALK



DETAIL OF PROPOSED DRIVEWAY W/ ROLLED CURB

GENERAL NOTES:

1. INSTALL CAST IRON CLEAN-OUT FRAME & COVER OVER CLEAN OUT IF CLEAN-OUT IS IN DRIVEWAY. SEE MEBANE'S SPECIFICATIONS DETAIL SS-17 FOR DETAILS.
2. WATER METER BOX IS TO LOCATED A MINIMUM OF 2'-0" FROM EDGE OF DRIVEWAY.
3. DRIVEWAY APRON IS TO BE 3,000 PSI CONCRETE AND AIR ENTRAINED.

TOWN OF HAW RIVER
STANDARD

DRIVEWAY DETAIL WITH
30" ROLLED CURB

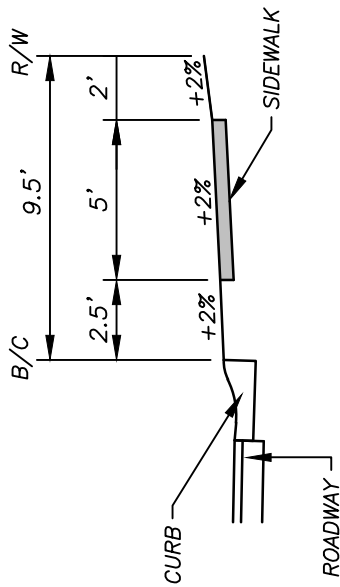
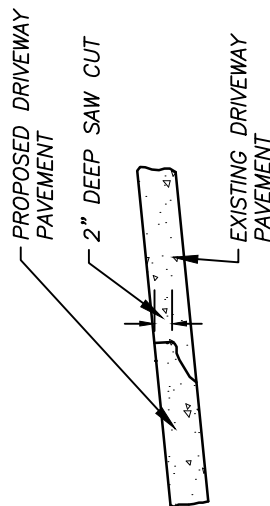
SCALE: N.T.S.

DATE: 7/23/26

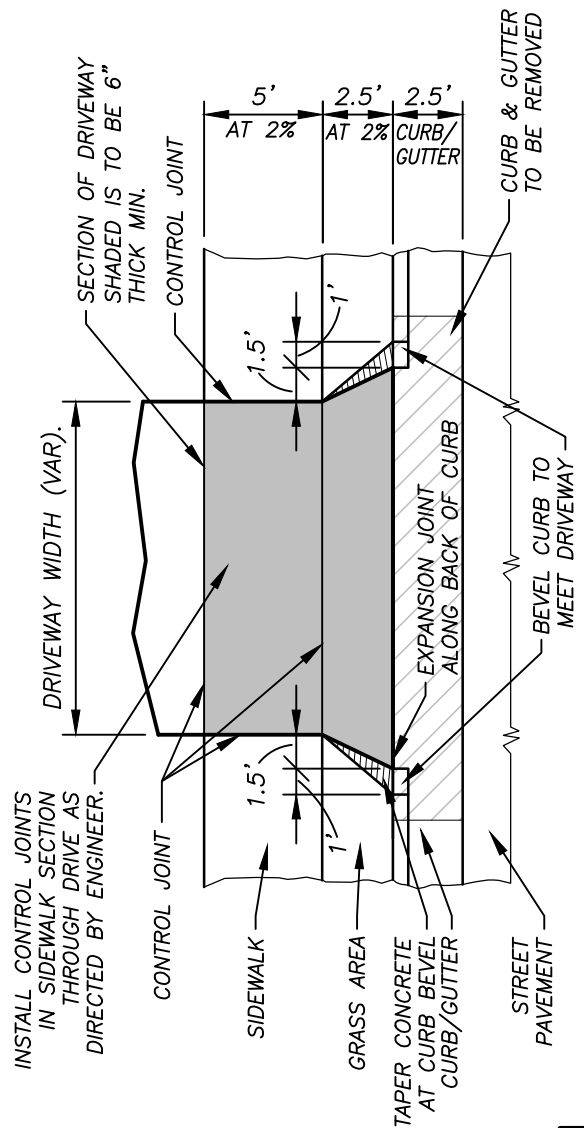
DRAWN BY: WDF

ST-11

METHOD OF TIE IN
WHEN EXISTING DRIVEWAY PAVEMENT IS CONCRETE A
SAW CUT 2" DEEP SHALL BE REQUIRED AT THE POINT
OF TIE IN WITH EXISTING DRIVEWAY GRADE. SAW
JOINT TO BE PERPENDICULAR TO EDGE OF EXISTING
DRIVEWAY PAVEMENT.



DRIVEWAY SECTION WITH AND WITHOUT SIDEWALK



DETAIL OF PROPOSED DRIVEWAY W/ STANDARD CURB

GENERAL NOTES:

1. INSTALL CAST IRON CLEAN-OUT FRAME & COVER OVER CLEAN OUT IF CLEAN-OUT IS IN DRIVEWAY. SEE MEBANE'S SPECIFICATIONS DETAIL SS-17 FOR DETAILS.
2. WATER METER BOX IS TO LOCATED A MINIMUM OF 2'-0" FROM EDGE OF DRIVEWAY.
3. DRIVEWAY APRON IS TO BE 3,000 PSI CONCRETE AND AIR ENTRAINED.

TOWN OF HAW RIVER STANDARD

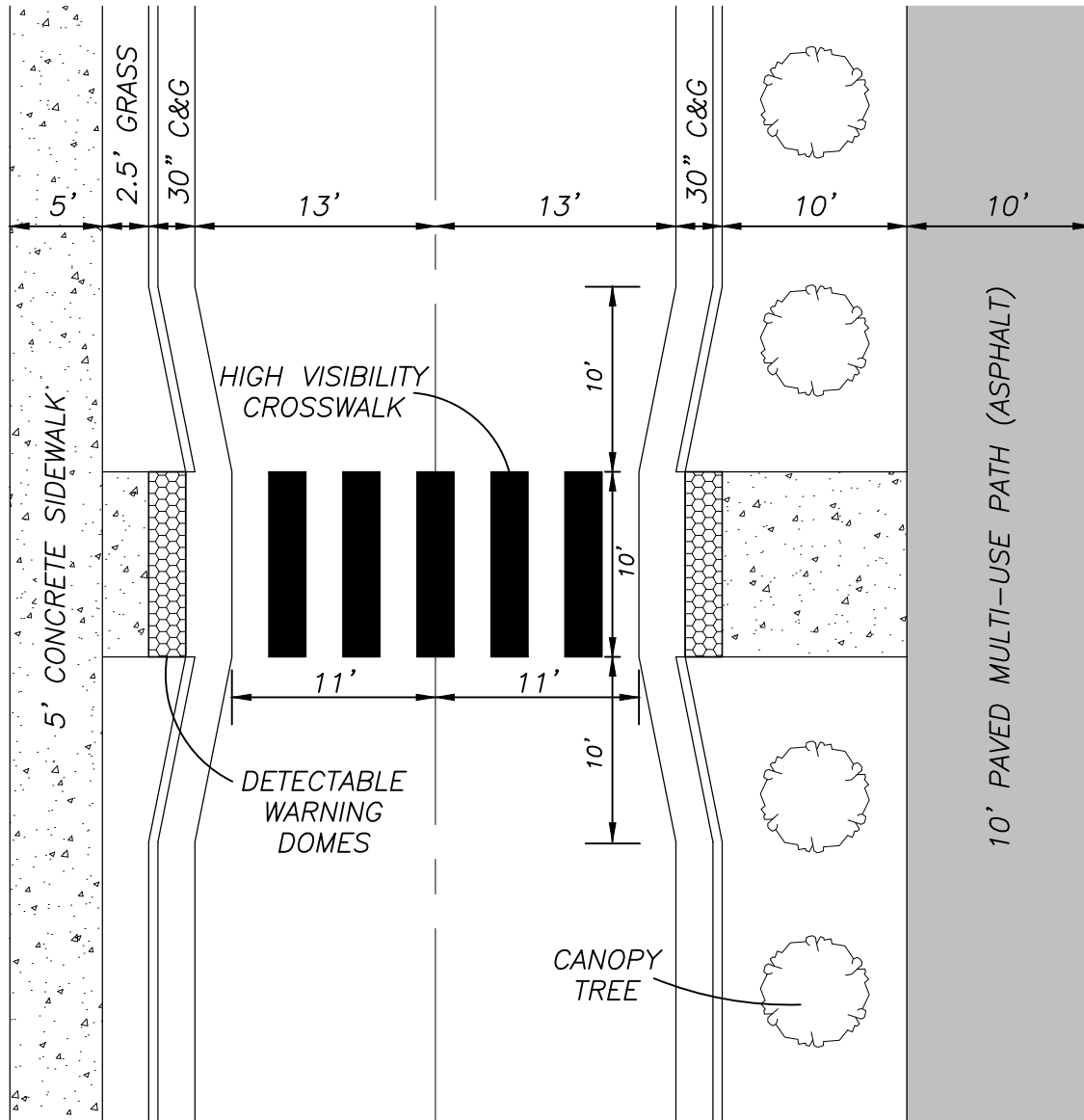
DRIVEWAY DETAIL WITH 30" STANDARD CURB

SCALE: N.T.S.

DATE: 7/23/26

DRAWN BY: WDF

ST-12



ST-13

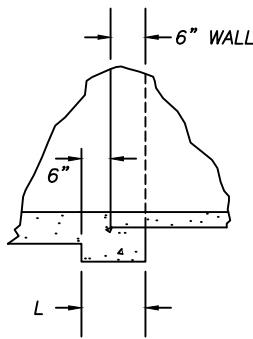
TOWN OF HAW RIVER STANDARD

BUMPOUT CROSSWALK DETAIL FOR MID-BLOCK CROSSING

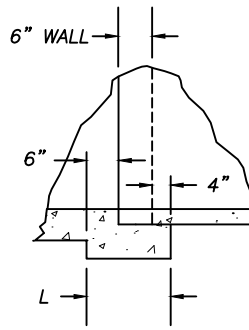
SCALE: N.T.S.

DATE: 7/23/26

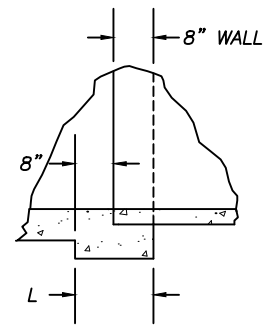
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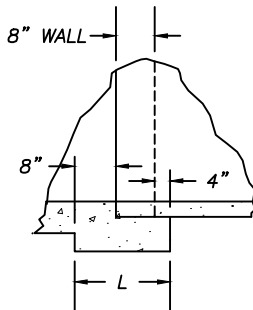
PART SECTION
6" WALL



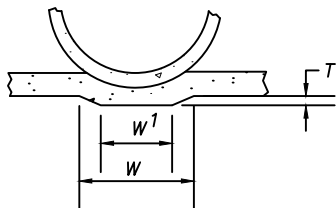
PART SECTION
6" WALL/4" LIP



PART SECTION
8" WALL



PART SECTION
8" WALL/4" LIP



PART SECTION OF END ELEVATION

TABLES OF QUANTITIES FOR PIPE SET IN PAD

PIPE D	"W" DIM	"W1" DIM	"T" DIM	C.Y. QUANTITIES WHEN L IS		
				12"	16"	20"
12"	1'-1 7/8"	0'-7 7/8"	0'-1 3/4"	0.005	0.007	0.008
15"	1'-3 5/8"	0'-9 1/8"	0'-9 7/8"	0.006	0.008	0.010
18"	1'-5 1/4"	0'-10 3/8"	0'-2"	0.007	0.010	0.012
24"	1'-8 3/4"	1'-0 1/8"	0'-2 1/2"	0.011	0.014	0.018
30"	2'-0 1/4"	1'-2 3/4"	0'-2 3/4"	0.014	0.018	0.023
36"	2'-3 3/4"	1'-5 3/8"	0'-3"	0.017	0.023	0.025
42"	2'-7 1/8"	1'-7"	0'-3 1/2"	0.025	0.030	0.036
46"	2'-10 5/8"	1'-8 3/4"	0'-4"	0.028	0.038	0.047
54"	3'-2 1/8"	1'-10 1/2"	0'-4 1/2"	0.035	0.047	0.058
60"	3'-5 5/8"	2'-0 1/4"	0'-5"	0.042	0.056	0.071
66"	3'- 9"	2'-2 1/4"	0'-5 1/2"	0.050	0.067	0.084
72"	4'-0 1/2"	2'-3 3/4"	0'-6"	0.058	0.078	0.098

GENERAL NOTES:

THIS STANDARD SHALL BE USED WITH ALL DRAINAGE STRUCTURES
USING REINFORCED CONCRETE PIPE SET IN BASE SLAB.

ST-14

**TOWN OF HAW RIVER
STANDARD**

**STANDARD CONCRETE BASE PAD
FOR DRAINAGE STRUCTURES**

SCALE: N.T.S.

DATE: 7/23/26

DRAWN BY: WDF

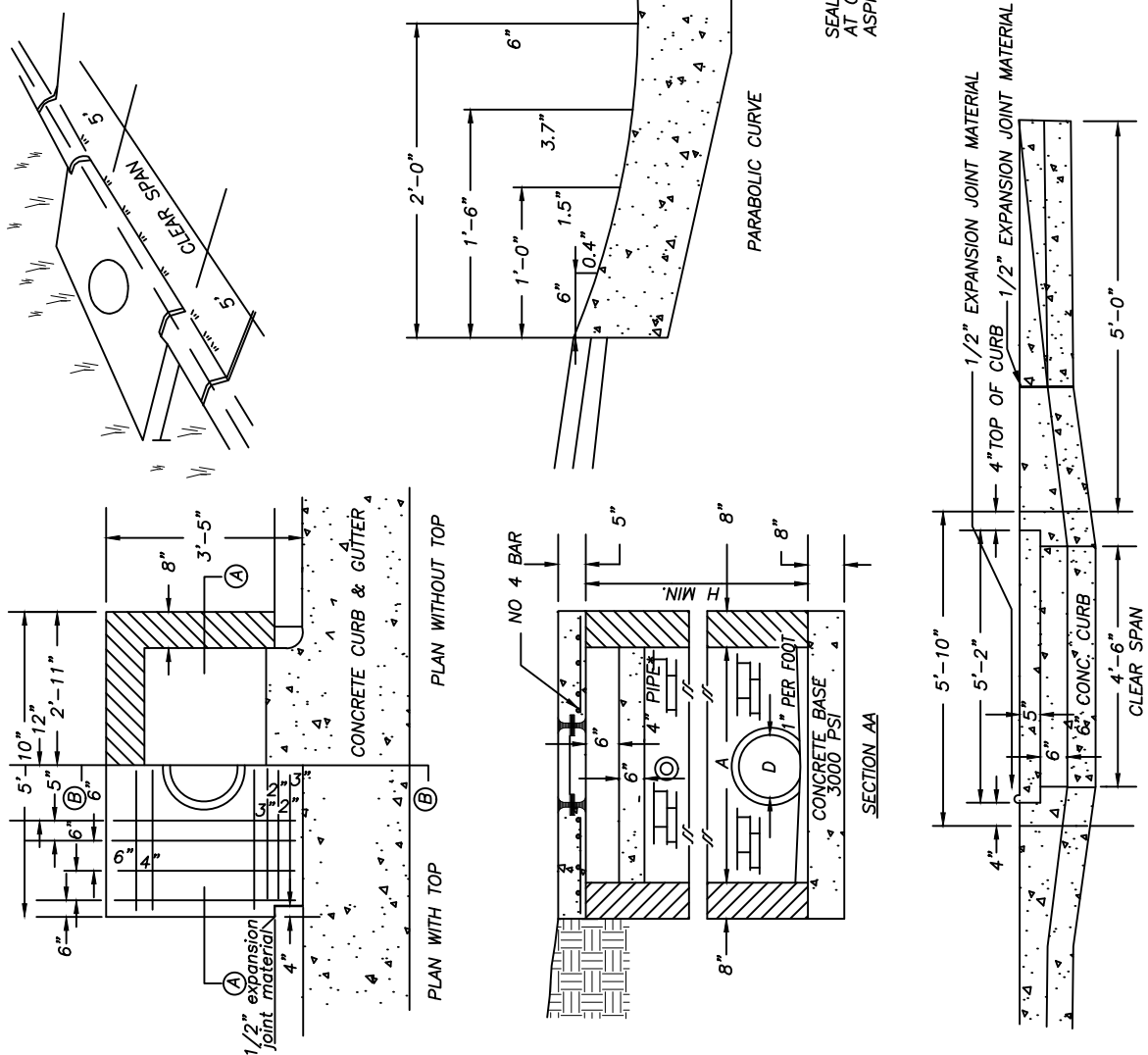
CURB INLET DETAILS

SCALE: *N.T.S.*

DATE: 7/23/26

DRAWN BY: WDF

ST-15



* 4" CAST IRON SOIL
PIPE OR PVC

TOWN OF HAW RIVER STANDARD

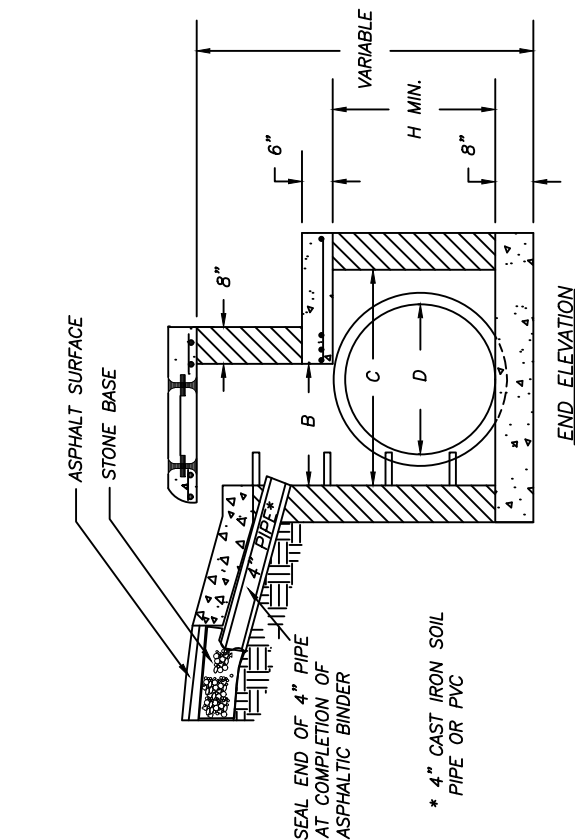
CURB INLET DETAILS

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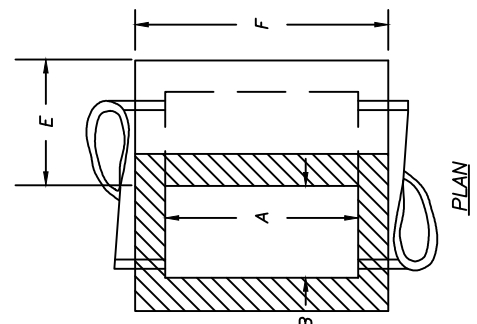
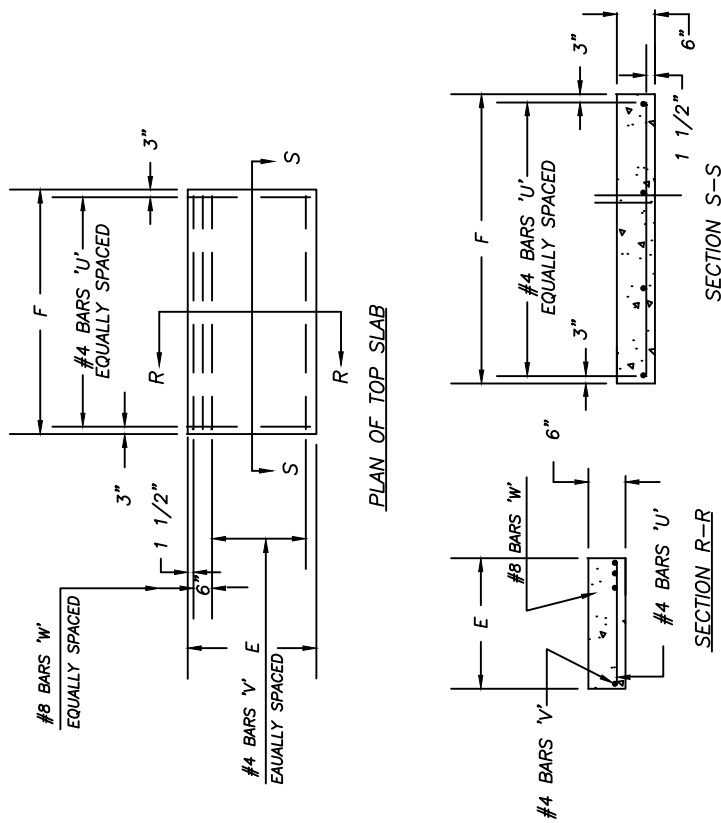
DATE: 7/23/26

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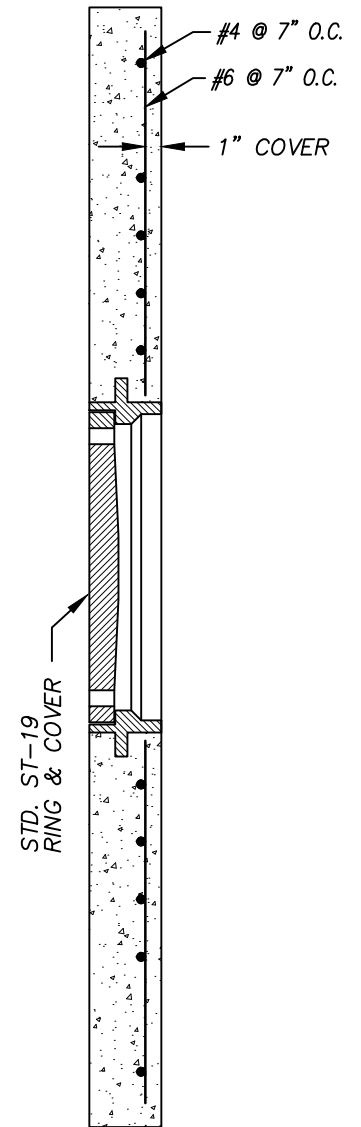
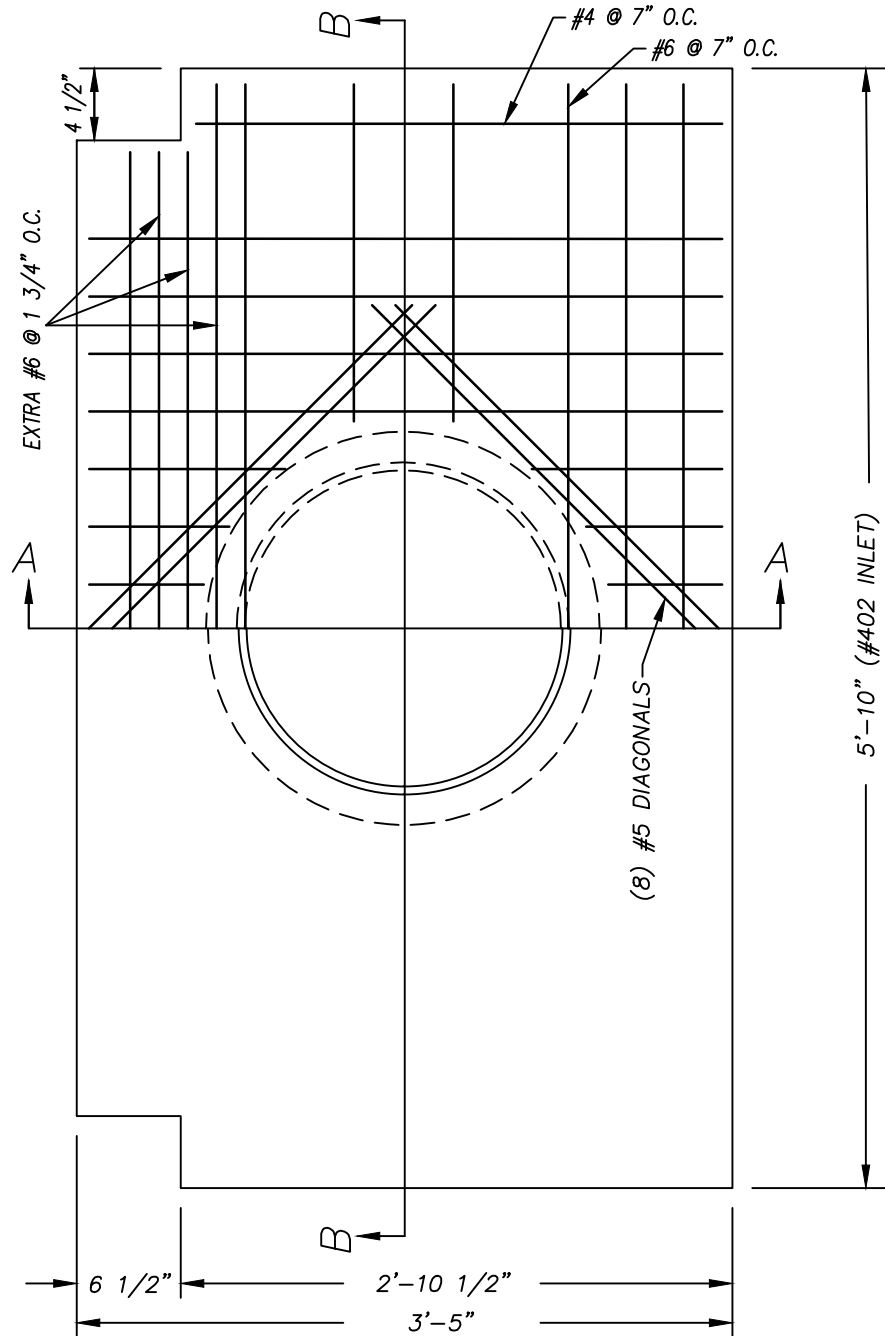
ST-16



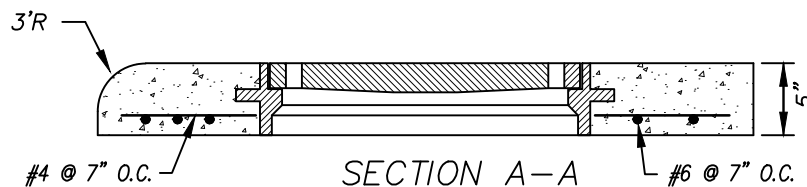
* 4" CAST IRON SOIL
PIPE OR PVC



DIMENSIONS FOR BRICK CURB INLET									
DIMENSIONS OF BOX AND PIPE				SLAB DIMENSION		REINFORCING			
PIPE	SPAN	WIDTH	WIDTH	HEIGHT	BARS U		BARS V		BARS W
D	A	B	C	H	NO.	LENGTH	NO.	LENGTH	NO. LENGTH
12"	4'-6"	2'-3"	-	3'-1"	-	-	-	-	-
15"	-	-	-	3'-1"	-	-	-	-	-
18"	-	-	-	3'-3"	-	-	-	-	-
24"	-	-	-	3'-9"	-	-	-	-	-
30"	-	-	3'-4"	3'-4"	6	1'-5"	3	5'-6"	3 5'-6"
36"	-	-	3'-10"	3'-10"	-	1'-11"	4	-	-
42"	4'-6"	-	4'-6"	4'-6"	-	2'-7"	5	-	-
48"	6'-0"	-	5'-0"	5'-0"	-	3'-1"	6	-	-
54"	6'-0"	2'-3"	5'-8"	5'-6"	6	3'-9"	7	5'-6"	3 5'-6"



SECTION B-B



SECTION A-A

NOTES:

1. CONCRETE: 28 DAY COMPRESSIVE STRENGTH $f'_c = 4,500$ PSI.
2. REINFORCING: ASTM A-615, GRADE 60.
3. ALL COVER TO REINFORCING IS 1".
4. ALL STEEL CUT OUT FOR OPENINGS WILL BE REPLACED, 1/2 THE REINFORCING ON EACH SIDE OF OPENING.

THE MANUFACTURER SHALL STAMP OR STENCIL ITS LOGO OR NAME IN TWO LOCATIONS ON THE SIDE OR REAR EDGES OF THE TOP

FOR USE ON #402 INLET BOX

ST-17

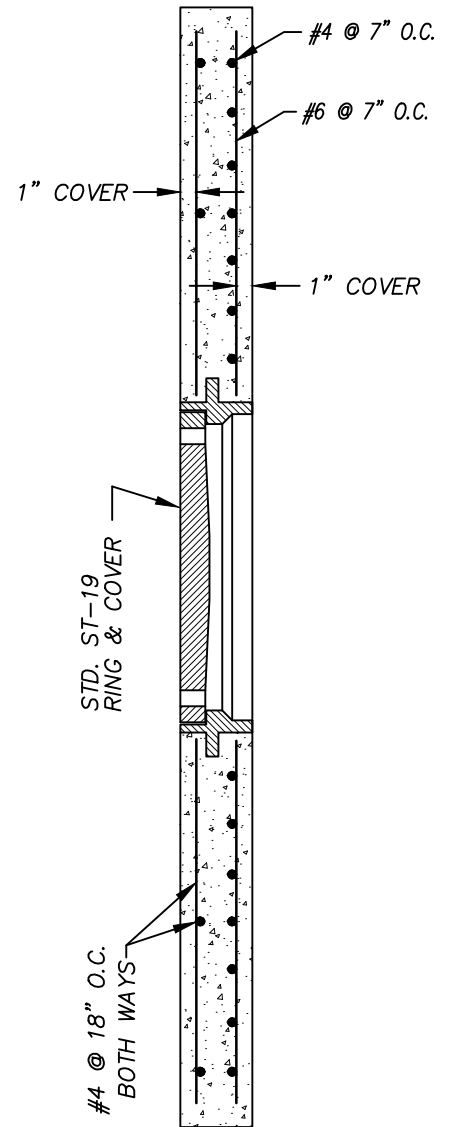
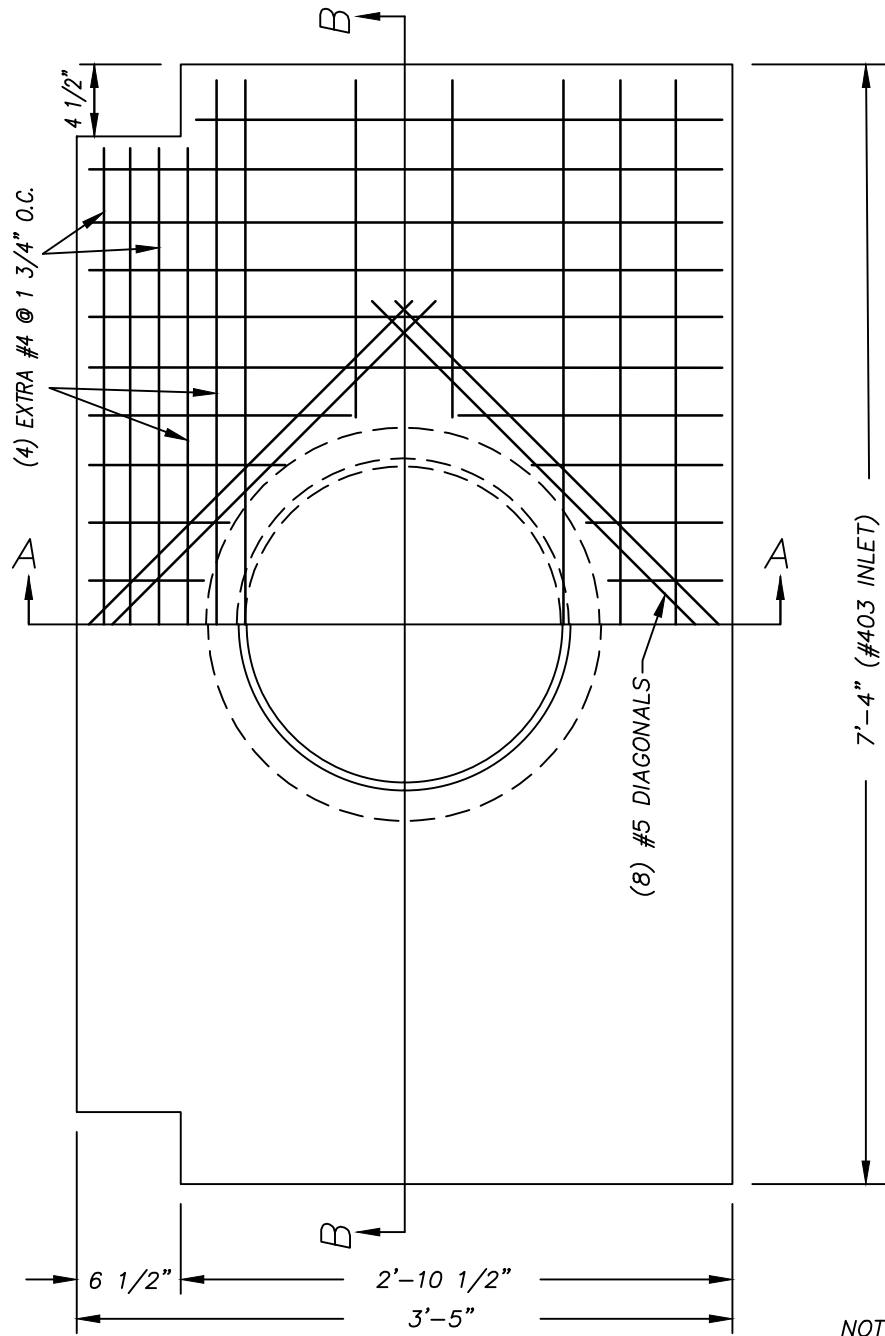
**TOWN OF HAW RIVER
STANDARD**

**STD. PRECAST CONCRETE CURB INLET
TOP FOR STD. 402 CURB INLET**

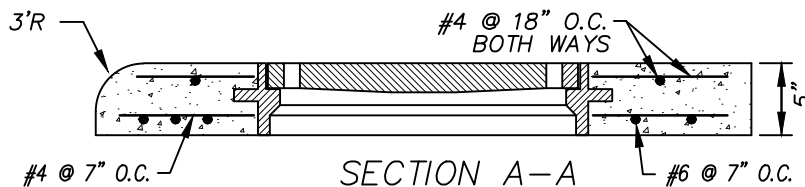
SCALE: N.T.S.

DATE: 7/23/26

DRAWN BY: WDF



SECTION B-B



SECTION A-A

NOTES:

1. CONCRETE: 28 DAY COMPRESSIVE STRENGTH $f'_c = 4,500$ PSI.
2. REINFORCING: ASTM A-615, GRADE 60.
3. ALL COVER TO REINFORCING IS 1".
4. ALL STEEL CUT OUT FOR OPENINGS WILL BE REPLACED, 1/2 THE REINFORCING ON EACH SIDE OF OPENING.

THE MANUFACTURER SHALL STAMP OR STENCIL ITS LOGO OR NAME IN TWO LOCATIONS ON THE SIDE OR REAR EDGES OF THE TOP

FOR USE ON #403 INLET BOX

ST-18

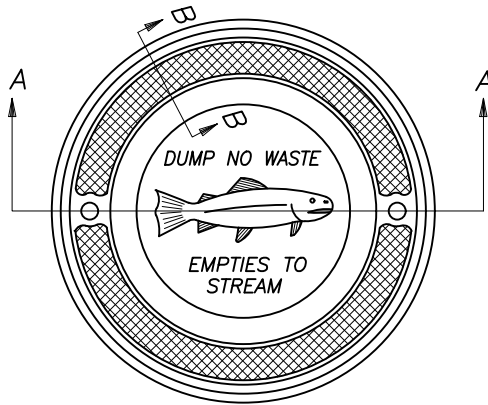
**TOWN OF HAW RIVER
STANDARD**

**STD. PRECAST CONCRETE CURB INLET
TOP FOR STD. #403 CURB INLET**

SCALE: N.T.S.

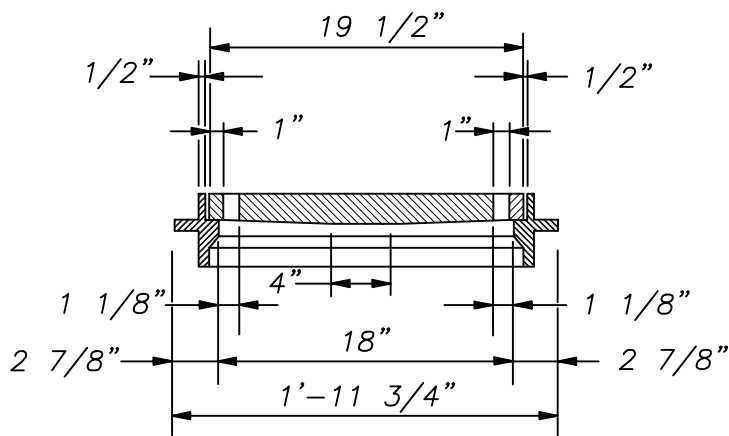
DATE: 7/23/26

DRAWN BY: WDF

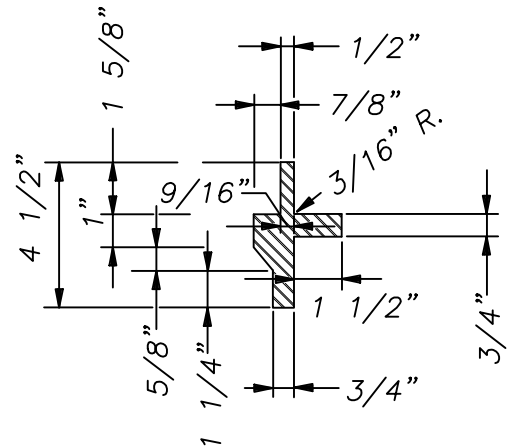


PLAN

RING — 70 LBS.
COVER — 118 LBS.



SECTION A-A



SECTION B-B

ST-19

**TOWN OF HAW RIVER
STANDARD**

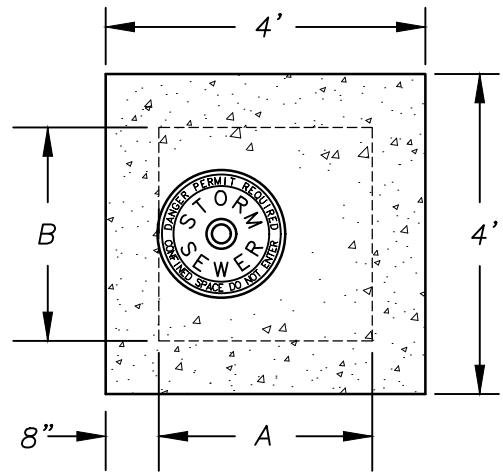
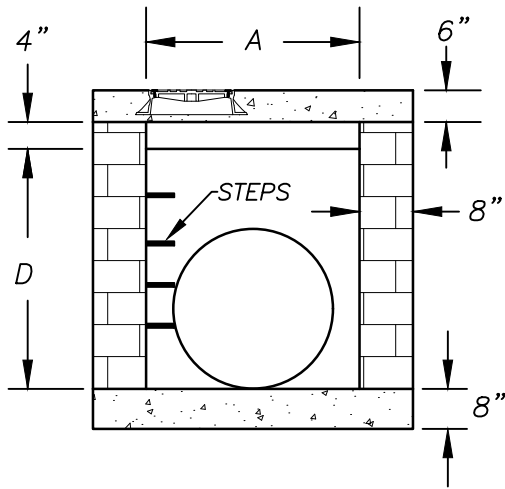
INLET RING & COVER DETAIL

SCALE: N.T.S.

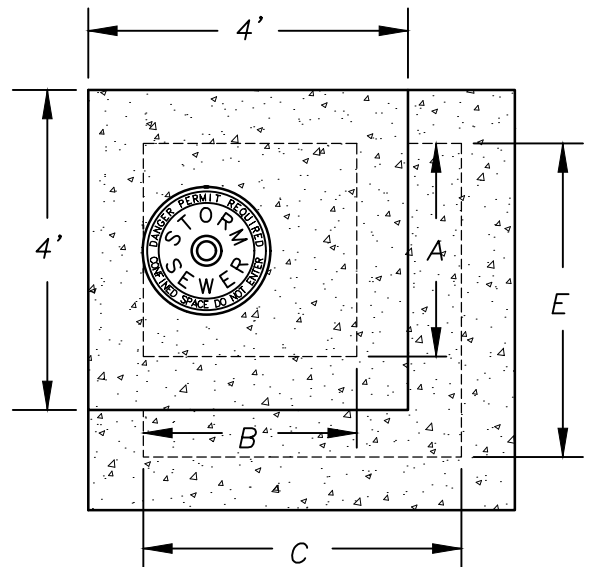
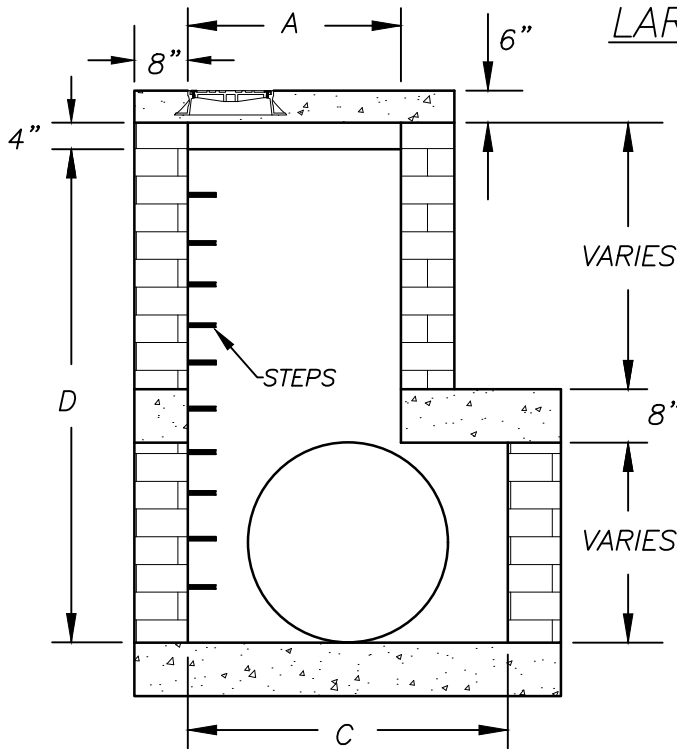
DATE: 7/23/26

DRAWN BY: WDF

SMALL BOX



LARGE BOX



MINIMUM DIMENSIONS FOR BRICK YARD INLET						
PIPE (IN)	A	B	SMALL BOX D	C	E	LARGE BOX D
12	2'-8"	2'-8"	3'-1"			
15	2'-8"	2'-8"	3'-3"			
18	2'-8"	2'-8"	3'-6"			
24	2'-8"	2'-8"	4'-0"			
30				5'-0"	5'-0"	4'-6"
36				5'-0"	5'-0"	5'-0"
42				6'-0"	6'-0"	5'-6"
48				6'-0"	6'-0"	6'-0"

ST-20

**TOWN OF HAW RIVER
STANDARD**

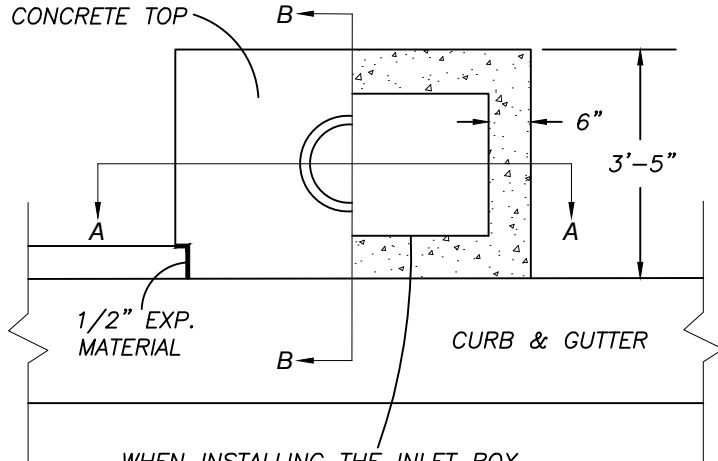
**STANDARD BRICK YARD INLET
12" THRU 48" PIPE**

SCALE: N.T.S.

DATE: 7/23/26

DRAWN BY: WDF

C.O.M. STD. 17/18
PRECAST
CONCRETE TOP



WHEN INSTALLING THE INLET BOX,
THE INSIDE FACE OF THE FRONT
WALL IS TO LINE UP WITH THE
BACK OF CURB.

NOTES:

THE USE OF PRECAST CONCRETE CURB INLETS IS
SUBJECT TO APPROVAL OF THE TOWN ENGINEER.

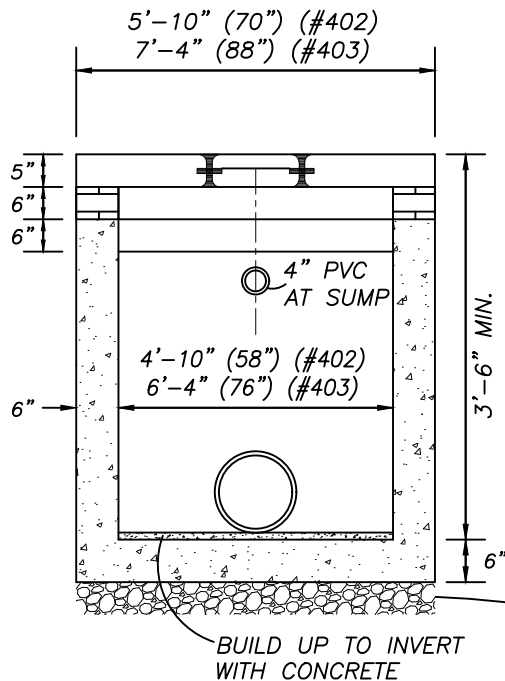
CONSTRUCTION AND USE OF PRECAST CONCRETE
STRUCTURES SHALL ADHERE TO ALL PERTINENT
REQUIREMENTS OF THE C.O.M. STD. 402/403
BRICK MASONRY STRUCTURES.

STEEL DESIGN IS NOT SHOWN ON THIS DRAWING.
STEEL DESIGN IS THE RESPONSIBILITY OF THE
MANUFACTURERS ENGINEER AND SHALL BE
SHOWN ON SEALED SHOP DRAWINGS SUBMITTED
FOR APPROVAL FOR USE IN THE TOWN OF HAW
RIVER DRAINAGE INFRASTRUCTURE.

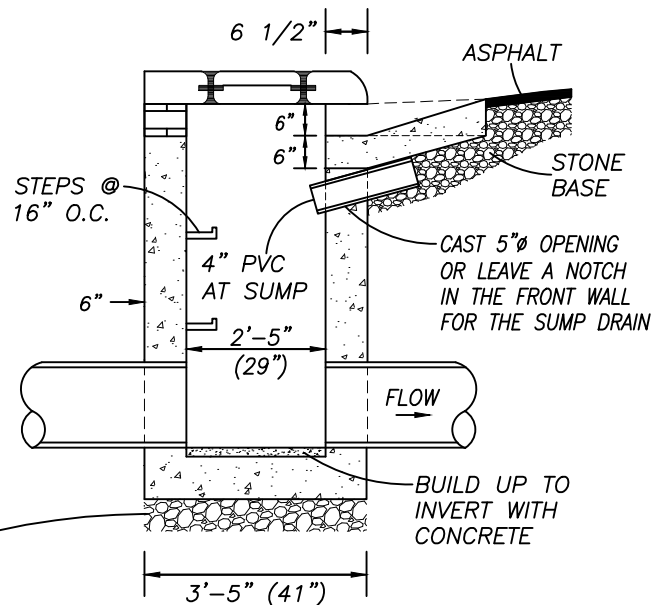
DIMENSIONS TO MATCH EXTERIOR SIZING LISTED
IN "DIMENSIONS FOR BRICK CURB INLET" CHART
ON ST-16. ANY BOXES THAT CAN NOT MATCH
DIMENSIONS LISTED ARE TO BE BUILT IN THE
FIELD.

FOR PRECAST CONCRETE MODELS OF THIS
STRUCTURE, THE MANUFACTURER SHALL
STAMP OR STENCIL ITS LOGO OR NAME ON
THE INSIDE AND OUTSIDE OF THE STRUCTURE.

PRECAST STRUCTURE SHOULD BE BROUGHT
UP TO FINAL GRADE USING BRICK MASONRY.



SECTION A-A



SECTION B-B

ST-21

**TOWN OF HAW RIVER
STANDARD**

STD. PRECAST CONCRETE CURB INLET

SCALE: N.T.S.

DATE: 7/23/26

DRAWN BY: WDF

8" STONE BASE
COMPACTED OR 5"
OF BLACK BASE

30'

40'

TEMPORARY
EASEMENT

30' R

R/W

60'

31'
B-B
C&G

60'

R/W

120'

8" STONE BASE
COMPACTED
2" BINDER (FINAL 1"
SURFACE DELAYED)

PHASE

LINE

ST-22

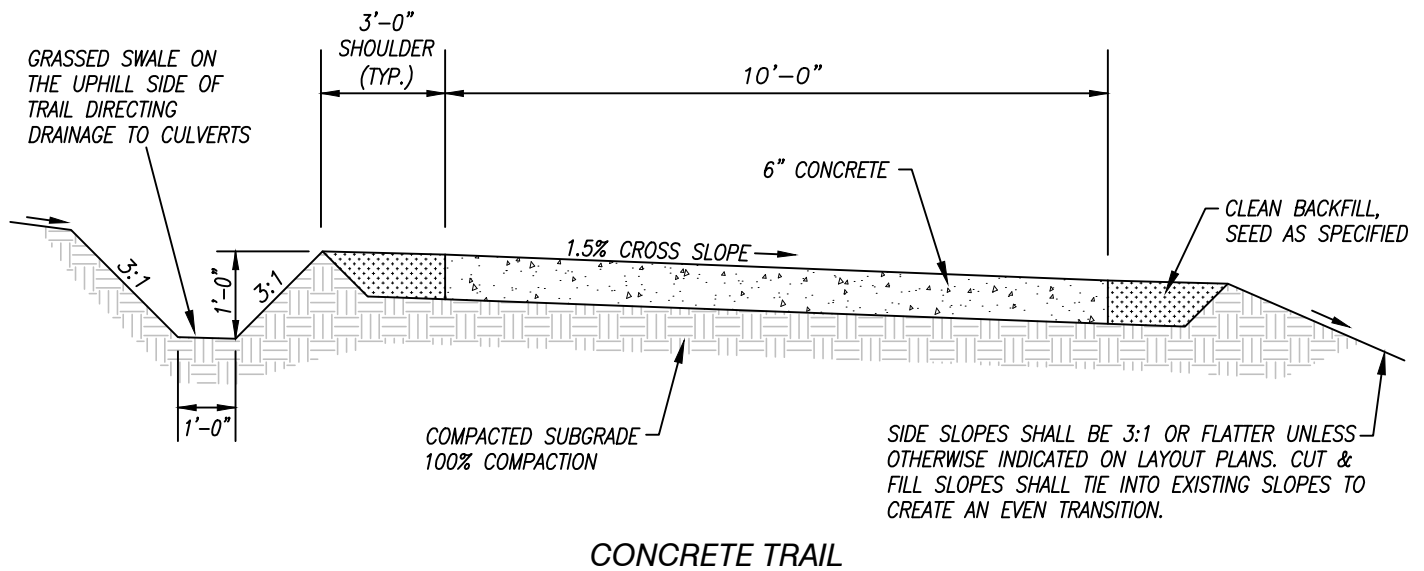
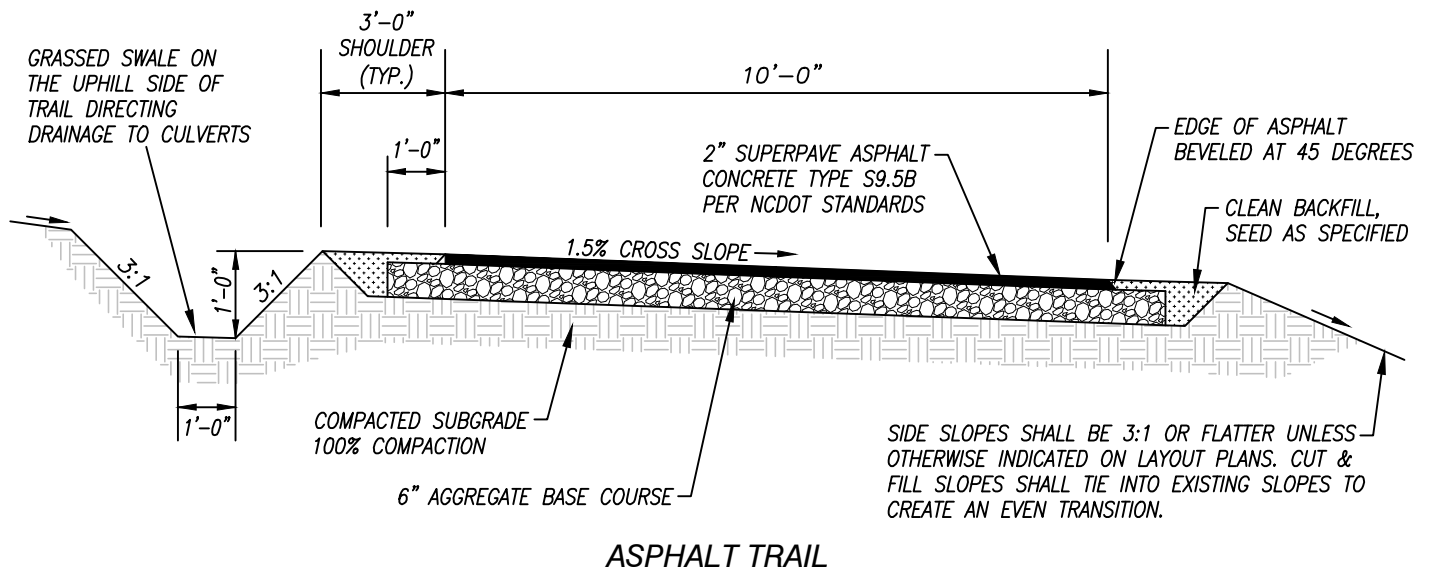
TOWN OF HAW RIVER
STANDARD

TEMPORARY TURNAROUND
FOR PHASED SUBDIVISION

SCALE: N.T.S.

DATE: 7/23/26

DRAWN BY: WDF



NOTES:

1. CROSS SLOPE DIRECTION VARIES. SEE LAYOUT PLANS FOR DIRECTION OF SLOPE.
2. 2.0% MAX. CROSS SLOPE ON TRAIL SHOULDER.
3. CONTRACTOR IS RESPONSIBLE FOR RE-ESTABLISHING ALL SLOPES DISTURBED BY CONSTRUCTION.
4. NO UTILITY SURFACE COVERS/PLATES/MANHOLES (I.E. WATER LINE VALVE COVERS, ETC.) SHALL BE LOCATED WITHIN TRAIL AND SHALL BE A MINIMUM OF 2 FEET FROM THE EDGE OF THE TRAIL.
5. SPECIAL PERMISSION TO REDUCE THE WIDTH OF THE TRAIL MUST BE GRANTED BY THE TOWN OF HAW RIVER.

ST-23

**TOWN OF HAW RIVER
STANDARD**

10' GREENWAY TRAIL

SCALE: N.T.S.

DATE: 7/23/26

DRAWN BY: WDF

WATER TAPS OVER 1"

1. Water taps over 1" shall be made by others to Town specs.
2. Copper pipe, brass valves and brass fittings shall be used with prior Town approval.
3. A by-pass shall be used on all metered connections 1 ½" and greater.
4. All meters and meter vaults shall be placed on the property line or right of way.
5. All backflow assemblies shall be tested prior to Town acceptance.
6. All RPZ backflow prevention devices shall be above ground in a "Hot Box" with an electric power outlet for a heater.

SEWER TAPS

1. All sewer taps shall be made by the Town unless otherwise specified.
2. 4" sewer taps shall be the minimum size permitted by the Town.
3. All sewer services shall be with the water service.
4. All sewer services shall have a cleanout at the property line.
5. All service pipe shall be PVC, Schedule 40.

FIRE LINES AND SPRINKER SYSTEMS

1. All vaults and detector checks shall be set on the property line or right of way.
2. Vaults shall have a provision for drainage.
3. All RPZ backflow assemblies shall be above ground in "Hot Box" or equal enclosure and tested prior to Town acceptance. Backflow assemblies are allowed in vertical risers in buildings where access can be readily gained by the Town.
4. All Fire Department connections shall be labeled (FDC) with 6-inch letters in front of building with directional arrows pointing toward location.

BROKEN OR DAMAGED CURB AND GUTTER REPLACEMENT POLICY

The following methods will be permitted for replacement of broken or damaged curb and gutter:

1. Replace the complete section of curb and gutter.
2. Replace a 5-foot section of curb and gutter with 2 - #6 rebar on each end of the 5-foot section embedded 1-foot deep into each piece of original curb doweled in with non-shrink grout or approved epoxy.
3. Replace a 5-foot section of curb and gutter without the rebar and give an additional 12-month warranty for a total of 24 months after acceptance by the Town.

CONSTRUCTION INSPECTION

The Town of Haw River has Engineering Site/Subdivision Construction Plan Review and Inspection Fees that cover additional oversight per Town policy of private and public water, sewer, roads/alleys, storm drain, stormwater management, sidewalks/multi-use paths, and water/sewer services. Upon site/subdivision construction plan approval and payment of related fees and having obtained all required permits and encroachment agreements a preconstruction conference can be held for the project where project requirements are then reviewed. Additionally, the Town must be informed of all testing with advanced notice as required and witness all tests prior to acceptance by the Town. All costs associated with tests, etc., shall be borne by the contractor. It is noted that the developer/contractor will need to provide compaction testing in trenches and roads by a certified geotechnical company at their own cost and at an interval as approved by the Town.

All work that requires certification upon completion is the responsibility of the design engineer who has sealed the approved plans.

Any substantial changes made in the approved plans shall be made by the design engineer and copies provided to the Town for approval prior to implementation of the changes. Should such changes require a permit modification, the design engineer shall provide such revised plans and permits to affect approval of the modifications.

Conduit layouts to be submitted to the Town with the construction drawings.

CONSTRUCTION AS-BUILTS

The Town shall be furnished a complete set of "As-Built" plans at the completion of all water, sewer and street projects. No service will be provided until such "as-built" plans are provided.

"Certification As-Builts" shall include actual invert elevations of all sewer and storm sewer manholes, catch basins, junction boxes, sewer clean outs, water meters steel encasement pipes and as-installed separations labeled at all crossings. If curb and finished grades have not been constructed at time of preparation of certification as-builts, provide note stating, "For certification purposes only, all finish grades listed are based on plan grades and will be updated once installed with As-Built elevations." The "Certification As-Builts" shall also include all valve and blow off "tie downs" to at least two (2) permanent markers and provided on 8 1/2" x 11" sheets as Intersection Drawings with each street name clearly identified. Certification As-Builts shall be provided to The Town prior to requesting State Certifications.

"Final As-Builts" shall include all information from the Certification As-Built as well as actual rim, top of grate, top of curb, grading, pad elevations, and drainage swell elevations. Provide one (1) reproducible copy and one (1) copy of the "Final As-Builts" in both paper and digital formats. CAD files including water, storm, sewer, streets and lots shall be provided. Final As-Builts shall be provided to The Town prior to requesting plat recordation.

SEWER LINE TIE-INS

1. All sewer tie-ins to existing manholes shall be cored with a boot.
2. All 6" or greater sewer service lines shall tie into manholes.

PARKING LOTS

1. All parking lots shall be paved.
2. All parking lots to have standard curb and gutter.
3. Curb and gutter to meet the same specification as in street specifications.

Town of Haw River Project Requirements and Related Timing of Procedures

1. Preconstruction checklist

- Water permit
- Sewer permit
- Buffer authorization
- Erosion control permit
- Engineering Construction Plan Review and Inspection Fees paid
- NCDOT driveway permit
- DOT encroachment/bond in place
- Submittals prior to placement
- Geotechnical spreadsheet approved
- Any special provisions

2. As-Builts

- List as-built condition of utility separations verified by pictures or survey during construction
- Sewer grades and CO locations
- Storm drain grades
- Hydrant location and grades as well as water meter locations
- Lot and drainage swale grades
- TOC shots at lot lines and mid lot as well as along radii at crosswalk locations
- Provide valve and blow off “tie down” sheets with as-built submittal
- Provide CAD files with as-built submittal

3. Certification Process

- Complete utility installation and testing
- Submit as-builts for Town approval
- Once as-builts have been approved the water line can then be chlorinated.
- Submit certification package for Town signature
- Certification package should include a site map highlighting items covered by the certification
- Once signed by the Town the package will be returned to the design engineer for submission to the State
- State will provide letter of final acceptance for water
- Design engineer to provide proof of submission to the State for sewer
- Once final acceptance or proof of submission is received by the Town the line can be placed into service.

4. Roadway

- All conduit crossings to be placed prior to preparing for curb or roadway installation
- Curb stakes and string line
- Curb grade check / handicap ramp locations to be staked
- Densities under curb
- Proof roll subgrade for curb
- Curb installation

- Grade check on road subgrade
 - Dirt subgrade densities in roadway
 - Proof roll subgrade
 - Stone placement*
 - *Any excavation between back of curbs after stone placement will require diggable flowable fill for backfill
 - Stone grade check
 - Stone densities
 - Proof roll stone base
 - Asphalt placement
 - Asphalt cores
- 5. Grading (Once curb is installed)**
- Have pad corners and swells staked with C/F to finish grades and hub elevations
 - If crawl lots – stake approx. house corners and swells
 - Borrow pits to be surveyed prior to backfill
 - ROW graded at 2% to property corners prior to 3rd party utility placement
- 6. Utilities (sewer, storm drain, water)**
- Deepest utility installed first
 - MH maximum grade ring adjustment 8" otherwise should be adjusted via riser section
 - Separations documented via survey or pictures with labels of locations
 - All third-party utilities not obtaining encroachment agreement to have roadway conduits installed prior to curb installation
- 7. Testing – after all utilities installed**
- Sewer – Pressure test lines, vacuum test MH's, mandrel PVC, jet and video main and services
 - Water – Pressure test, obtain as-builts, chlorinate and bac-t, obtain certification prior to activation
 - Storm Drain – Video
 - Pre-testing required on all utilities prior to requesting official test
 - Pre-testing water main prior to service installation
 - Complete all testing prior to curb installation
- 8. Geotechnical**
- Geotechnical spreadsheet to be completed and approved prior to start of construction.
 - All test below subgrade to be completed during installation of associated utility.
 - All subgrade testing to be completed once fine grade of subgrade has been achieved (ex. After placement of string line for curb and prior to requesting proof roll)
 - Contractor and Geotech shall proof roll and make all necessary repairs prior to proof roll being conducted by the Town
 - Geotechnical testing daily field reports should be provided on a weekly basis during construction. Tests conducted and reported on the daily field reports should be updated on the geotechnical spreadsheet which should accompany the daily field reports.
 - No geogrid or fabric allowed within the right of way without approval by the Town Engineer

CONSTRUCTION DOCUMENTS CHECKLIST FOR PLAN REVIEW

Section 1: General Plan Preparation Guidelines

- ☐ Sheets shall be no larger than 36" x 24" plan and profile paper.
- ☐ Minimum text size shall be 1/8"
- ☐ Scale on plan view shall be no smaller than 1" = 50'; scale on profile view shall be no smaller than 1" = 50' horizontally and 1" = 5' vertically using a grid showing 1' intervals.
- ☐ Cover sheet shall have a vicinity map at a scale no smaller than 1" = 2000'.
- ☐ Provide a legend indicating existing and proposed lines, features and symbols.
- ☐ Cover sheet shall include all general notes, owner's name, telephone number, and mailing address.
- ☐ All elevations shall be given in relation to mean sea level; elevations in profile view shall be labeled in 10' intervals on the heavy lines (Ex. 350, 360).
- ☐ Benchmark elevations and locations shall be shown on plan view.
- ☐ Plan views shall have a north arrow on each drawing.
- ☐ Each drawing shall have the following information in the title block: Street or project title, limits, horizontal and vertical scales, original date, revisions date, drawing number, checked by and drawn by. Recommended placement is lower right-hand corner.
- ☐ All drawings sealed, signed and dated by a NC Professional Engineer.
- ☐ Plan view shall show all actual street names. State road numbers shall be shown if applicable. Plan view should also indicate whether street is asphalt, concrete, gravel or dirt. Proposed street & Right-of-way widths will be dimensioned back-to-back and labeled in plan view.
- ☐ Plan view shall show proposed and existing curb and gutter, storm sewers, drainage structures, driveway pipes, water mains, sanitary sewer mains, etc. All available elevations shall be shown on the profile view. Direction of flow shall be shown on plan view for all sanitary sewers and storm drains.
- ☐ Existing utility lines shall be shown and labeled on plan view and indicated in the legend.
- ☐ Plans shall show final proposed locations and dimensions of all water, storm drain, and sanitary sewer lines, including services to each property line for water and sanitary sewer, devices to be installed on the system, catch basins, culverts, ditches, including grades, pipes sizes, elevations, assumptions, calculations, invert elevations for all inlets and manholes and profiles of sanitary sewer lines.
- ☐ Plan shall bear the note: "All construction to be in accordance with all Town of Haw River, Specifications and Standard Details, latest edition."
- ☐ All existing and proposed water, storm drainage and sanitary sewer easements shall be shown on all applicable sheets.

Section 2: Water Distribution Design

Applicant Validation		COM Staff Check	
N/A	Included		
_____	_____	_____	All water distribution system extensions shall be designed to provide fire flow plus peak daily water demand. The peak daily water demand is based on 2.5 times the average daily water demand for the type of user. The distribution system shall be designed to maintain a minimum of 20 PSI at all points in the distribution system under all conditions of usage, including fire flow using a C factor of not more than 130. Fire flow demand varies with the type and size of user; however, the following shall be used as the minimum fire flow demand to design the distribution system extensions: A. Residential Buildings 1. One and two family dwellings if more than 11 ft. of separation between buildings----- 1000 GPM 2. One and two family dwellings if less than 11 ft. of separation between buildings----- 1500 GPM 3. Multifamily units----- 1500 GPM minimum, but refer to Table B105.1 in the NC Fire Prevention Code if more applies. B. Commercial/Business Users----- 2000 GPM minimum, but refer to Table B105.1 in the NC Fire Prevention Code if more applies. C. Industrial Users ----- 2500 GPM minimum, but refer to Table B105.1 in the NC Fire Prevention Code if more applies. At the time of preliminary development plans, a preliminary design shall be submitted which indicates that the proposed distribution system extensions comply with the above requirements. Upon submittal of the construction plans, detailed modeling documentation shall be submitted showing compliance with the above requirements. Acceptable modeling programs include Watercad, Hydraulicad, WatSys by Civilsystems, and other modeling programs approved in advance. The minimum size water line extension shall be 8", except that in cul-de-sacs, 6" is allowed if less than 600 ft. in length and 4" is allowed if less than 250 ft. in length.
_____	_____	_____	In all residential districts, the maximum distance between fire hydrants, measured along public street centerlines and/or other private travel ways shall be 500 feet.
_____	_____	_____	Valves should be installed on all branches from feeder mains and between mains and hydrants according to the following schedule: a. four (4) valves at X's (crosses), b. three (3) valves at T's (tees) and c. one (1) valve on single hydrant branch All fittings, valves, hydrants, plugs, etc. shall be indicated in a fitting box with the number of items.
_____	_____	_____	Water mains 12" and larger in diameter which have a change in elevation of fifteen feet or greater shall have an air release at high points.
_____	_____	_____	Show water service to each lot and show the water meter 1 foot on street side of the right-of-way line. The developer will be responsible for the cost of relocating services and meters that fall within driveways.
_____	_____	_____	Multi-family, Commercial and Industrial Developments - Hydrants shall be located within 250 feet of most remote portion of building(s).

_____	_____	_____	Minimum Radius for ductile iron pipe without fittings: 4" - 125' 6" - 145' 8" - 195' 10" - 195' 12" - 195' 14" - 285' 16" - 285' 18" - 340' 20" - 340' 24" - 450"
_____	_____	_____	On all 12" and larger water main provide joint restraint calculations for all fittings, valves and dead ends.
_____	_____	_____	Main line valves on straight runs between street intersections shall be spaced no greater than the distances given below and shall be located within fifty (50) feet of the nearest hydrant to their location. Main Size Maximum Spacing 6"- 600' 8"- 900' 12"- 1000' 16"- 1000' 24"- 1500'
_____	_____	_____	When phasing a project, locate valves in order to not place any existing service out of water. When extending water line to a new phase add additional valves beyond above requirements if necessary.
_____	_____	_____	Indicate in profile vertical separation 18" water to storm drain 24" water to a sanitary sewer.
_____	_____	_____	Provide 3 foot of cover minimum over water main (8" or less), 4 foot of cover (10" or greater) and 5 foot of cover minimum at air release valve installation.
_____	_____	_____	If water main is outside of street right-of-way indicate 20 feet easement. Show all existing and proposed water line easements
_____	_____	_____	Indicate water main material Ductile Iron Pipe and class
_____	_____	_____	Indicate how new water will connect to existing water main.
_____	_____	_____	Indicate backflow prevention.
_____	_____	_____	Hydrant leads are off hydrant tees unless at the end of a water main.
_____	_____	_____	If road bore and jack is required show bore size (dia.), length, thickness of steel encasement and length of restrained pipe through encasement.

Section 3: Sanitary Sewer Collection Design

Applicant Validation		COM Staff Check	
N/A	Included		
_____	_____	_____	All gravity sewer mains shall be designed and sized to serve the total natural drainage basin. The total off-site drainage area in acres must be shown on the plans and calculations should be submitted to the Town upon request to justify pipe sizing. An 8-inch main shall be the minimum size permitted.
_____	_____	_____	When preparing the plans for sewer mains, deflection angles for all horizontal turns shall be shown on the drawings. All elevations shall be tied to mean sea datum and the benchmark shall be shown or described on the plans. Spot elevations on 100 foot stations, 75 feet from the centerline on both sides, shall be shown on the plan, or cross-sections supplied to ensure that the sewer can adequately serve the property. The plans shall show the manhole number (MH #1 etc.), top elevation, station, depth including invert elevations, length of sewer reach, and slope (in percent). Established creek centerlines and inverts will be platted on the sewer plan and profile sheets, adjacent to proposed sewer alignment, within 75 feet.
_____	_____	_____	Grades for sanitary sewers must be such that a minimum flow velocity of 2 feet per second is maintained. The minimum grade for an 8-inch sewer line is 0.50%. If necessary, for slope to be less than 0.50%, provide reason.
_____	_____	_____	Minimum widths of permanent and construction sanitary sewer easements, for public sewer mains, are: Permanent / Construction 8" & 15" main - 30 feet wide / 20 feet wide 18" & 24" main - 40 feet wide / 20 feet wide Larger size easements may be required based upon the depth of installation or other consideration as determined by the Staff. Sewer mains shall be centered in the easement. Indicate all existing and proposed easements.
_____	_____	_____	If less than 3 feet of cover over proposed sanitary sewer, pipe shall be ductile iron.
_____	_____	_____	Show sewer service terminating at a cleanout one foot beyond right-of-way. Do not tie 4" lateral sanitary service directly into manhole. Cleanouts shall not be placed in drives
_____	_____	_____	Indicate in profile vertical separation 24" sanitary sewer to storm drain and 24" sanitary sewer to water main.
_____	_____	_____	Sanitary sewer lines shall be located a minimum distance of 100 feet from the center of any well used as a community or private water supply. This buffer may be reduced to 50 feet provided that the sanitary sewer lines are constructed of materials and joints that are equivalent to water main standards.
_____	_____	_____	The maximum length of sewer line, which shall be constructed between manholes, shall be four hundred (420') feet.

Section 3: Sanitary Sewer Collection Design - cont

Applicant <u>Validation</u>		COM Staff Check																											
N/A	Included																												
_____	_____	_____	The elevation of all sewer lines at creek crossings shall be set such that the top of the pipe is at or below the elevation of the stream bed or for crossings above water level, the bottom of the pipe should be located above the 25-year flood elevation.																										
_____	_____	_____	Sewer manholes located within the 100-year flood plain shall be constructed for watertight manholes, or sewer manholes located within the 100-year flood plain shall have a minimum height of two (2') feet above the 100-year flood elevation.																										
_____	_____	_____	Drop in manhole greater than 6" but less than or equal to 24" indicate concrete slide. If drop is greater than 24" provide an outside drop manhole.																										
_____	_____	_____	Public sanitary sewer pipe material shall be indicated in profile.																										
_____	_____	_____	Where it is not possible to provide gravity sanitary sewer service, indicate which lots will have a private pump system.																										
_____	_____	_____	Minimum Slope requirements: <table><tr><th>Dia of Pipe (inches)</th><th>Minimum Slope (Feet per 100 feet)</th></tr><tr><td>8</td><td>0.50</td></tr><tr><td>10</td><td>0.28</td></tr><tr><td>12</td><td>0.22</td></tr><tr><td>14</td><td>0.17</td></tr><tr><td>15</td><td>0.15</td></tr><tr><td>16</td><td>0.14</td></tr><tr><td>18</td><td>0.12</td></tr><tr><td>21</td><td>0.10</td></tr><tr><td>24</td><td>0.08</td></tr><tr><td>27</td><td>0.07</td></tr><tr><td>30</td><td>0.06</td></tr><tr><td>36</td><td>0.05</td></tr></table>	Dia of Pipe (inches)	Minimum Slope (Feet per 100 feet)	8	0.50	10	0.28	12	0.22	14	0.17	15	0.15	16	0.14	18	0.12	21	0.10	24	0.08	27	0.07	30	0.06	36	0.05
Dia of Pipe (inches)	Minimum Slope (Feet per 100 feet)																												
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36	0.05																												
_____	_____	_____	If road bore and jack is required show bore size (dia.), length, thickness of steel encasement and length of restrained pipe through encasement.																										

Section 4: Roadway and Street Design

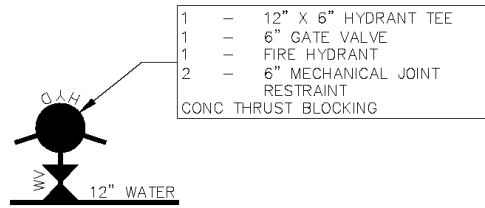
Applicant Validation		COM Staff Check	
N/A	Included		
_____	_____	_____	Street typical sections shall be on the cover sheet or the first sheet of plan and profiles and will include street and right-of-way width, sidewalk location, cross-slopes, and pavement design. Do not place aggregate under curb for Town streets.
_____	_____	_____	Pavement Cross Section meets or exceeds Town Standards – 8" ABC, 1 1/4" of H (Binder) and 1" I-2 Bituminous Pavement. No ABC under curb and gutter.
_____	_____	_____	Plan view shall show all property lines and lot frontages. Existing property irons shall be labeled "E.I.P." Right-of-way lines shall be dimensioned and labeled "R/W."
_____	_____	_____	Complete street curve data shall be shown on plans. This information shall include, but is not limited to: intersection radii, length of all arcs, internal angles, sight triangles, intersection centerlines, superelevation rates, if any along with the top of curb or edge of pavement profiles, vertical curve length, rate of vertical curvature (K), PVI, PVC, and PVT station and elevation, horizontal curve length, tangent, centerline radius, and delta.
_____	_____	_____	RCP within the right of way with less than 3' of cover shall be class IV RCP

OTHER:

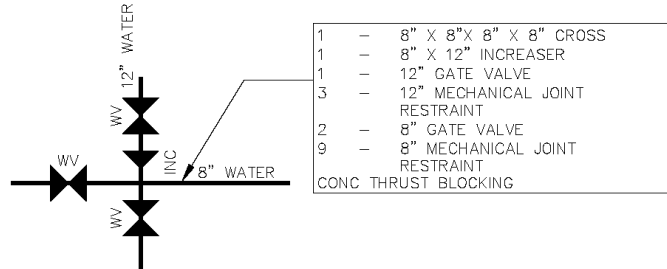
1. Comply with the Haw River Storm Sewer Design Manual and the Haw River Flood Damage Prevention Ordinance.
2. Water Supply Watershed requirements may apply.
3. State Stormwater rules may apply.
4. The Department of Transportation may have additional requirements.
5. This document shall be submitted with all plan submittals, including after any plan revisions. All resubmittals of plans shall include a certification from the engineer that all revisions have been made per review comments (unless otherwise noted) and that any other revisions not required per the review comments have been noted on the plans and in the certification.

Section 5: Examples

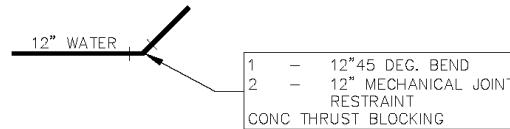
Water Main Fitting Box



- 1 - 12" X 6" HYDRANT TEE
- 1 - 6" GATE VALVE
- 1 - FIRE HYDRANT
- 2 - 6" MECHANICAL JOINT RESTRAINT
- CONC THRUST BLOCKING

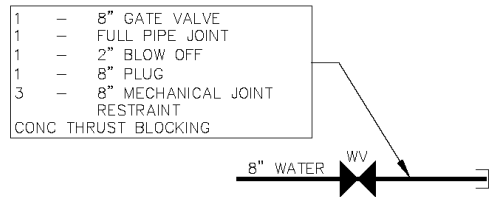


- 1 - 8" X 8" X 8" X 8" CROSS
- 1 - 8" X 12" INCREASER
- 1 - 12" GATE VALVE
- 3 - 12" MECHANICAL JOINT RESTRAINT
- 2 - 8" GATE VALVE
- 9 - 8" MECHANICAL JOINT RESTRAINT
- CONC THRUST BLOCKING



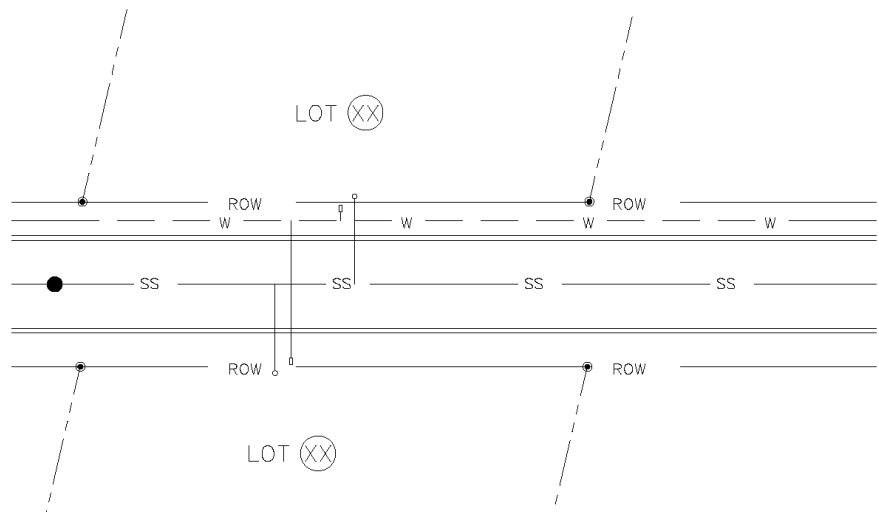
- 1 - 12" 45 DEG. BEND
- 2 - 12" MECHANICAL JOINT RESTRAINT
- CONC THRUST BLOCKING

End of Water Line with Future Connection



- 1 - 8" GATE VALVE
- 1 - FULL PIPE JOINT
- 1 - 2" BLOW OFF
- 1 - 8" PLUG
- 3 - 8" MECHANICAL JOINT RESTRAINT
- CONC THRUST BLOCKING

Typical Service Layout



GENERAL NOTES:

1. All construction shall be performed in accordance with the project plans and/or specifications, Town of Haw River standard details and construction standards, state construction standards, OSHA regulations and other applicable contract documents.
2. A copy of the construction drawings bearing the Approval stamp from the Town of Haw River shall always be on site and available.
3. Material submittals to be approved by the Town of Haw River prior to ordering material.
4. Modification to the approved drawings shall not be made without the written approval of the design engineer and the Town of Haw River.
5. Prior to construction, all necessary permits to complete the construction should be acquired and followed.
6. Prior to starting construction, the general contractor shall hold a pre-construction conference with the Town of Haw River, owner/rep, planning, erosion control, geotechnical engineer, all sub-contractors, and engineer/rep.
7. Geotechnical spreadsheet to be provided to the Town prior to pre-construction meeting for review. Spreadsheet to accompany geotechnical reports.
8. All soil within the right of way and public easements shall be compacted to Town of Haw River Specifications. Town representative to be notified 24 hours in advance and given the opportunity to be present during Geotech testing.
9. All utility separations shall meet the requirements as stated in the Town of Haw River construction documents checklist. All utility separations to be field verified during installation and as-installed separation labeled on as-builts. Contractor shall provide design engineer verification of as-installed separations to be included on as-builts submitted to State.
10. All water main to include two forms of restraint (mega-lugs and blocking) and conform to the distances stated in detail W-26.
11. Testing procedures per Town of Haw River standards as follows: water line – pressure test, chlorinate, bac-t. Sanitary sewer – pressure test, vacuum test manholes, mandrel, video. Storm sewer – video. Concrete – cylinders every 30 yards. Roadway – density and proof roll. Asphalt – cores for binder, nuke on final lift.
12. For all projects where the final lift of asphalt is not anticipated prior to the onset of winter, all manholes and valve boxes are to be adjusted flush with the binder course. The final adjustment to finish grade will not be done until immediately prior to the placement of the final lift of surface course.
13. Class III RCP shall have a minimum of 3' of cover within the ROW per NCDOT requirements, where 3' of cover is not provided, Class IV RCP.
14. All drainage swells shall have a minimum of 1% slope.
15. All third-party utilities to acquire an encroachment agreement with the Town of Haw River prior to starting installation.
16. Borrow pit locations to be surveyed for in field verification and be identified on the plat.
17. Under absolutely no circumstances shall any unmanned excavation be left open or unprotected during non-working hours. Utilize signs, barricades, etc. to ensure the safety of the general public.
18. When staking water line, curb radius points should also be staked to ensure valves are placed outside of curb line and handicap ramp truncated domes.
19. Contractor responsible for notifying the Town of Haw River and the design engineer prior to testing water and sewer lines to coordinate scheduling since design engineer will be certifying and may want to witness testing.
20. Contractor to schedule punch list walk through after binder lift of asphalt has been installed.
21. All retaining walls greater than 30" to have fences at top of wall for fall protection.
22. All slopes steeper than 3:1 shall specify how they are to be maintained (landscaped to avoid maintenance requirement)
23. Certification as-builts containing all pertinent inverts and separations along with valve drawings to be provided prior to chlorination of the water line. Grading as-builts containing all as installed surface information including pad and swell grades, top of curb, rim elevations, etc. to be provided prior to plat.
24. All public walkways within the ROW or public easements are to be designed and installed to meet current ADA requirements.

Spreadsheet Procedures:

This spreadsheet is to be updated with the applicable information specific to each project and submitted to The City for approval prior to the preconstruction meeting.

All testing below subgrade elevation is to be completed during installation of applicable utility. No fill greater than 4' shall be placed without testing. In locations where the test depth on the spreadsheet conflicts with the pipe, somewhere in the first 4' from the invert of the pipe shall be tested. Either just above the pipe installation (when pipe size is less than 48") or beside the pipe (when pipe size is 48" or larger).

All utilities outside of the right-of-way should be testing in their entirety during the installation of the utility.

All subgrade testing should be completed once fine grade of subgrade has been achieved for utilities within the right of way.

Subgrade tests in areas where it would compromise the structural integrity of the curb line to repair should be provided after string line has been installed and fine grade for the curb has been established and verified and results provided prior to proof roll for curb. (ex. Storm drain pipe parallel to the roadway and associated structures) Water and sewer services should be tested at this same time within the curb line location.

Subgrade tests within the roadway should be tested after curb placement once finish grade has been achieved and verified and results provided prior to proof roll of roadway subgrade. (ex. Sewer pipes and associated structures, remainder of storm pipe, water main, and roadway)

Geotechnical testing daily field reports should be provided on a weekly basis during construction. Tests conducted and reported on the daily field reports should be updated on the geotechnical spreadsheet which should accompany the daily field reports.

Backfill and Fill Material. All backfill and fill material shall be suitable to acquire the following density:

Building Areas: ASTM-D-698 98.0% Standard Proctor
Density - minimum of 3,000 psf. (includes 5' outside building)
Road and Parking and trenches in Right of Way: ASTM-D-698 95.0% Standard Proctor
Density except top 12" – 100.0% Standard Proctor.
ASTM-D-698 100.0%. Stone base compacted to 100.0% Standard Proctor.
SF 9.5B shall be compacted to a minimum of 92.0% of maximum specific gravity (G_{mm})
S 4.75A shall be compacted to a minimum of 85.0% of maximum specific gravity (G_{mm})
All other asphalt mixes shall be compacted to a minimum of 92.0% specific gravity (G_{mm})
General Site Areas (non-structural): ASTM-D-698 90.0% Standard Proctor Density.

The Contractor will be responsible for testing of site during grading. All areas that do not meet the hereinbefore density test shall be removed and recompacted with acceptable materials at contractors' expense. Copies of compaction test reports shall be provided to the Town prior to placement of curb or stone base and prior to pavement placement. See compaction testing requirements under Section 27. Compaction reports should include density as well as moisture content being within +/- 3% of the Proctor.

27. Geotechnical Testing Requirements. Section 10 provides the standards for compaction in all streets and trenches. Testing reports shall be submitted to the engineer prior to proceeding to the next phase of construction (i.e. Subgrade tests shall be submitted prior to curb or stone placement). The contractor is responsible for notifying the Town 48 hours prior to any testing to allow the Town the opportunity to be present during testing if desired. The following is the minimum testing schedule for compaction tests and each test shall be independent of other tests, additional testing may be required at Engineer's request:

A. Sanitary and Storm Sewer Line trenches

- i. If trench 0-8 ft. deep, provide one (1) test at half depth and at subgrade between each manhole.
- ii. If trench over 8 ft. deep, provide one (1) test for each 4 ft. and at subgrade excluding bottom of trench between each manhole. Tests shall be taken at the depths based on the trench depth divided by 4. As an example, for a 12 ft. trench, tests are required at the 4 ft. and 8 ft. depths plus at subgrade ($12/4 = 3$).
- iii. Services- provide one (1) compaction test for every 5 services.
- iv. Manholes or curb inlets-provide compaction tests for every 5th MH(CI) within 2 ft. of the manhole based on the trench depth as described above.

B. Water Line trenches

- i. One (1) compaction test for every 500 ft. of line at subgrade if water line is less than 4 ft. of cover.
- ii. Services- provide one (1) compaction test for every 5 services.

C. Street Compaction tests

- i. One per 500 ft. of street outside of trench lines. This includes the subgrade, stone testing, and asphalt testing.
- ii. Minimum 2 tests per roadway or one test per 500 ft. of street, whichever is greater.

D. Right of Way tests

- i. Any pit (Bore/Thump) within the Right of Way shall be required to be tested at depths described in A i. and A ii above.

Project Name Here

Storm Drain Structures

[illegible]

Project Name Here

Storm Drain Pipes

[illegible]

Project Name Here

Sewer Structures

[illegible]

Project Name Here

Sewer Pipes

[illegible]

Project Name Here

Other

PIPES	LENGTH	Tests	Qty	Depth	Spec	Density	Date	Lot Number	Report/Test #
Water	1700	4	1	SG	100%				
			2	SG	100%				
			3	SG	100%				
			4	SG	100%				
Water									
Services	29	6	1	SG	100%				
	Lots		2	SG	100%				
			3	SG	100%				
			4	SG	100%				
			5	SG	100%				
			6	SG	100%				
Sewer									
Services	29	6	1	SG	100%				
	Lots		2	SG	100%				
			3	SG	100%				
			4	SG	100%				
			5	SG	100%				
			6	SG	100%				
Roadway	1875	4	1	SG	100%				
			2	SG	100%				
			3	SG	100%				
			4	SG	100%				
Stone	1875	4	1	SG	100%				
Densities			2	SG	100%				
			3	SG	100%				