

TOWN OF THURMONT

PUBLIC WORKS DEPARTMENT

**STANDARD DETAILS AND
SPECIFICATIONS**

FOR

WATER MAINS, SANITARY SEWER, STREETS,
ELECTRIC AND RELATED STRUCTURES

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TOWN OF THURMONT
STANDARD SPECIFICATIONS
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TOWN OF THURMONT
STANDARD SPECIFICATIONS
SANITARY SEWER SYSTEM
SECTION 1000

I. General

A. Description

This section includes all work necessary to provide sanitary sewer complete in place in accordance with contract documents.

B. Quality Assurance

1. Sanitary Sewer Pipe Field Tests

- a) Reference Section 1200 for Ductile Iron Pipe
- b) Reference Section 1250 for PVC Pipe
- c) Reference Section 1300 for Cured in Place Pipe Lining
- d) Reference Section 1500 for CCTV Inspection of Sanitary Sewer Line
- e) One year after manholes, sanitary sewer main lines, and sanitary sewer laterals have been installed, the manholes, sanitary sewer main lines, and sanitary sewer laterals are to be high pressure cleaned and CCTV inspected. This is the responsibility of the contractor. Reference Sections 1500 and 1550.

2. Sanitary Sewer Manhole Field Tests

- a) Reference Section 1350 for Precast Concrete Manholes
- b) Reference Section 1400 for Rehabilitated Manholes

3. Sanitary Sewer Force Main Tests

- a) Reference Section 1200 for Ductile Iron Pipe

b) The contractor shall provide all equipment for and conduct pressure tests under pressures indicated on the plans. Tests conducted on Ductile Iron Pipe shall also meet requirements of Section 1200.

(1) Test pipe after completion of backfill in lengths directed by the Superintendent. Close ends of test sections with valves or plugs where possible.

(2) Fill the length of force main under test with water and subject it to the maximum of 100 psi sustained internal pressure plus water hammer, at the low point: as indicated in the contract documents. Maintain pressure for a minimum of two hours. Town personnel will operate all valves during the test.

(3) Should test results show any visible leakage, displacement, or damage. The contractor can stop the test and repair the problem. After the repair the contractor shall retest until specified conditions are met to the satisfaction of the superintendent, at no additional cost to the Town.

c) The maximum allowable leakage shall be determined from the following formula:

$$L = 25 DM$$

L allowable leakage in gallons per hour

D nominal diameter of pipe in inches

M miles of pipe

4. Inspection and Testing of Pipe and Materials

a) The superintendent may inspect and test all pipe, pipe fittings, and joint material upon delivery to the site. The pipe manufacturer or supplier shall furnish materials to be tested and labor as required to assist the superintendent with tests.

b) The manufacture or supplier shall provide ample space between rows of stockpiled pipe and materials to facilitate adequate inspection.

c) The manufacturer or supplier shall provide to the superintendent prior to commencing the inspection of pipe and

material for an order, with the complete contract number, contractors name, the pipe diameters, classes and footage of pipe needed to fill the order.

d) The manufacturer or supplier shall provide evidence to the superintendent prior to inspection, that there is adequate quantity of pipe available of the required diameters, classes and designs for inspection.

e) The pipe manufacturer or supplier shall provide facilities for conducting a load bearing test.

f) The pipe manufacturer or supplier shall provide competent personnel for the preparation and conducting hydrostatic and load bearing tests. The superintendent and/or inspector have the right to be present during all phases of testing.

II. MATERIALS

A. General

1. The contractor shall furnish and lay all PVC and Ductile Iron Pipe sanitary sewers, including excavation and backfill and all appurtenances, such as manholes and house connections as shown on the drawings, details and/or as specified.

a) For house connections from the mainline connection to the property line cleanout furnish PVC pipe wall thickness classification 35. Install pipe per Detail numbers 100, 110, 111, 112, and 113. Reference details 121 and 122 for Sewer Mains which are CIP Lined. Also reference sections 1100, 1150, and 1250.

b) For main line sanitary sewer mains use PVC Pipe or Ductile Iron Pipe as specified. Reference section 1100, 1150, and 1250.

c) For force main lines from pumping stations use Ductile Iron Pipe.

B. Materials Requirements

1. Pipe and Fittings

- a) Reference Sections 1200 for Ductile Iron Pipe, 1250 for PVC Pipe, 1300 for Cured in Place Pipe Lining.
 - b) General-all pipe between structures shall be of the same size and material, and shall be furnished by the same manufacturer. Each pipe length and all fittings shall be clearly marked with the manufacturer's name and pipe type or strength.
 - c) Pipe with blisters, bubbles, cuts or scrapes on the interior or exterior surfaces, which appreciably damage the wall thickness, or other imperfections which impair the performance or life of the pipe will be rejected.
 - (1) Joints shall be elastomeric gasket joints resulting in water tight seals.
 - (2) PVC pipe shall be legibly marked as follows at intervals of five feet maximum; manufacturer's name or trademark, pipe size, PVC classification, appropriate legend such as PSM SDR-35 PVC Sewer pipe, ASTM D 3034, manufacturer' lot number, date of manufacture and point of origin. Pipe not marked as indicated herein may be rejected.
 - (3) PVC fittings shall be legibly marked as follows; manufacturers name or trademark, normal size, PVC ASTM D 3034 or AST F 679.
 - d) Ductile Iron Pipe for force mains or sanitary sewer mains shall meet requirements set forth in Section 1200.
 - e) Stoppers for all types of pipe shall be watertight, made as the same material it is inserted in, and be of an approved design as furnished by the pipe manufacturer.
2. Granular Bedding Material Reference Sections 1050, 1200, 1250, and 1350. Also Reference Detail number 100.
3. Manholes
- a) Precast Manholes Reference Section 1350. Also Reference Detail numbers 101, 102, 103, 104, 105, 107, and 115.

- b) Existing Manhole Rehabilitation Reference Section 1400. Also reference Detail numbers 101, 104, 105, 106, 107, 109, 109 A, 114, 115, 116, and 117.
 - c) Asphalt based waterproof coating for exterior of manholes shall be mineral filled solvent type meeting requirements of MIL-C-82052.
4. Quick setting non shrink grout shall conform to requirements of Corp of Engineers CDR-588, octocrete, speedcrete or equal. Also Reference Section 1700 for Concrete and Grouts.

III. Execution

A. Preparation

1. Trench excavation and backfill shall be as specified in Detail number 100. Also Reference Section 1150. Before commencing excavation at each location, dig test pits as directed by the superintendent. Excavate test pits as specified sufficiently in advance of trench construction so that reasonable changes in line and grade can be made where the location of existing structures varies from that shown.
2. Provide granular bedding material under all sanitary sewer pipes in accordance with Sections 1150, 1200, and 1250. Also Reference Detail 100. Provide encasement and/or concrete cradle where indicated on the plans. Ensure that pipes are well bedded.

B. Laying Pipe

1. Lay pipe to a true uniform line and grade as indicated with continuous bearing of barrel in cradle or bedding material. Handle pipe and fittings with care so as to avoid damage. Where indicated, provide erosion checks or concrete anchors in accordance with Standard Details.
2. Lay pipe upgrade with the bell or groove pointing the direction of upstream. Lay each section of pipe in such a manner as to form a close concentric joint with the adjoining section and to prevent sudden offsets in the flow line.
3. Construct mitered and curved bends where indicated in accordance with the Standard Details and plans. Curved bends shall have a uniform interior radius.

4. Place sufficient backfill on each section of pipe, as it is laid to hold it firmly in place.
5. Clean out the interior of the pipe as the work progresses.
6. Keep trenches and excavations free of water during construction until final inspection. When the work is not in progress, securely close open ends of pipe and fittings to prevent trench water, earth or other substances from entering the pipes or fittings.
7. Provide a minimum of three feet of cover over PVC and Ductile Iron Pipe.

C. Sewer House Connections

1. Provide sewer house connections and sewer drop house connections where indicated in accordance with the Standard Detail numbers 100, 110, 111, 112, 113, and 119. Reference details 121 and 122 for Sewer Mains which are CIP Lined Also Reference Sections 1150 and 1250.
2. Where sanitary sewer lines exceeds nine feet in depth, drop house connections shall be used to meet a depth of eight feet six inches below pavement at the cleanout profile at the cleanout at the property line.
3. Where possible, place house connections simultaneously with construction with the construction of the new main line sewer before backfilling the main line sewer.
4. Lay house connection pipe at a two percent grade, unless otherwise indicated on the plans.
5. Mark the location of the end of the sewer connection pipe at the property line with a 2x4 timber, painted red placed vertically from the bottom of the trench and extending two feet above grade.
6. If curb and gutter are present mark on curb with a stamped S into the concrete where sewer lateral enters property.

D. Joints

1. Joints for Sanitary Sewer Pipe
 - a) Prior to joining pipe liberally coat pipe joints with lubricant. Fit the bell or spigot with gasket according to manufacturer's instructions.

Join pipes with equipment designed for the purpose. Before joint is completely home, check the position of the gasket using a suitable gauge. If the gasket is found to be dislocated, repeat the entire joining process using a new gasket. The rubber gasket shall be the sole element relied upon for water tightness.

2. Joints for Ductile Iron Pipe for main line sanitary sewers shall be as specified in Section 1200.

3. Joints for PVC Pipe shall be elastomeric gasket joints assembled with the manufacturer's recommendations. Also Reference Section 1250.

E. Manholes

1. For Precast Concrete Manholes Reference Section 1350 and Detail numbers 101, 102, 103, 104, 105, 107, 109, 109 A and 115.

2. For Manhole Rehabilitation Reference Section 1400. Also reference Detail numbers 101, 104, 105, 105, 106, 107, 109, 114, 115, 116, and 117.

3. Manholes shall be watertight.

4. Construct manholes or precast sections, in accordance with Standard Details and the plans. Make watertight connections between base and risers. Place axis of manholes over directly over the center lines of the pipe unless otherwise shown.

5. Construct appropriate flow channels in the bottom of the manholes, shown in the Standard Detail numbers 101 and 115 and plans specified herein below.

a) Channel shall be lined with cast-in-place concrete mix #1 using type II cement with silka sand and GP aggregate. Channel shall slope smoothly and evenly from inlet pipes to the effluent pipe.

6. Drop Manholes

a) Drop Manholes shall be used when the invert of the influent sanitary sewer is two feet or more above the manhole invert. When this difference in elevation is less than two feet the manhole invert shall be filleted to prevent solids deposition.

b) Drop Manhole shall be constructed with inside drop connection. Reference Detail number 109 and 109A.

7. When installing pipe in to a sanitary sewer manhole Reference Section's 1350, 1400, and 1700. Also Reference Detail number 116.

8. Manhole Hardware

a) Reference Section's 1350 and 1400. Also Reference Detail numbers 101, 102, 103, 104, 105, 106, and 107.

b) Install additional steps as needed.

c) Install cast iron watertight frame and cover for each manhole.

d) Cement rubber gasket in watertight manholes requiring the inner cover in groove with a material not affected by water such as Permatex or equal.

9. If a manhole lid is installed that has open pick holes an Inflow Protector shall be installed.

10. Adjustments to manhole rim height may be done by using approved East Jordan Ironworks riser ring. Locking Lid manhole covers shall be dug up and adjusted, no riser rings are allowed for height adjustments on Locking Lids.

F. Sewer Vents

1. Provide sewer vent as shown on plans.

2. Pipe fitting for the sewer vent shall be made of Brass or Stainless Steel.

G. Repairs of leaks in sanitary sewer pipe

1. Repairs of leaks in sanitary sewer pipe shall follow detail 118.

H. Sanitary Sewer House Connection

1. Utilize existing PVC tap at sanitary sewer main unless otherwise directed by the superintendent. If this cannot be done abandon existing tap and cut in a new wye branch per Detail numbers 110 and 111. After new wye

is in place, continue installing the sanitary sewer house connection to- the property line as shown in Standard Detail numbers 112 and 113.

a) For VCP Sanitary Sewer Main use a Ductile Iron wye fitting with PVC pipe on either end of the fitting. Attach new assembly to existing sanitary sewer main with shear band ferncos on each end of assembly.

b) For PVC Sanitary Sewer Main use a PVC wye fitting with PVC pipe on either end of the fitting. Attach new assembly to existing sanitary sewer main with shear band ferncos on each end of the assembly.

c) For Cured in Place Lined Sanitary Sewer Main reference Detail 121 and 121.

2. Where indicated or directed by the superintendent, tap directly in sanitary sewer manholes for house connections.

3. Provide cleanouts installed four feet back of the property line toward home or as indicated on the plans for all sewer connections. Reference Detail numbers 112 and 113.

I. Once sanitary sewer pipe and sanitary sewer manholes have been installed the Town's GIS profile is to be updated with the new GIS points. This is to include inverts for rim elevation of manholes, inverts of all influent and effluent pipes inside manholes, and manhole placement.

J. Reference Detail number 400, 401, and 402 for restoration of paved areas on Town owned Roads. Also Reference section 400 and 450. Reference section 500 for restoration of grassed areas. Reference Detail 134 for restoration of paved areas on State owned Roads. Also Reference section 1600.

IV. Repairs

A. Any Damaged Sewer Main/ Sewer Lateral shall be repaired by Referencing Detail 118 and Referencing Section 1150, 1100, 1200, 1250, 1450, and 1600.

B. Any Damaged CIP Sewer Main shall be repaired by Referencing Detail 123 and Referencing Section 1100, 1300, 1450, 1500, and 1550.

C. Any Damaged Manhole shall be repaired by Referencing Detail 101, 102, 103, 104, 105, 106, 107, 109, 114, 115, 116, and 117. Also Reference Section 1150, 1200, 1350, 1400, 1450, and 1700.

D. Any Damaged Manhole that has been Rehabilitated shall be repaired by Referencing Detail 101, 102, 103, 104, 105, 106, 107, 109, 114, 115, 116, and 117. Also Reference Section 1150, 1200, 1350, 1400, 1450, and 1700.

TOWN OF THURMONT
STANDARD SPECIFICATIONS

SECTION 1050

SEDIMENT AND EROSION CONTROL

I. GENERAL

A. DESCRIPTION

Work required by regulations to prevent soil erosion and control sedimentation during Work on the Project.

B. RELATED SECTIONS

1. Section 1150 - Excavation, Backfill and Compaction
2. Section 1600 - Restoration of Paved and Grassed Areas

C. SUBMITTALS

1. Sediment and Erosion Control Plan
 - a) The requirements of the Sediment and Erosion Control Plan are given in the following Articles of this Section. Construction details for various Sediment and Erosion Control measures are shown on the Drawings.
 - b) This work shall consist of the installation of both structural and vegetative erosion and sediment control practices as indicated on the Plans. The practices shall include, but are not limited to, inlet protection, crushed stone, filters or other approved methods indicated on the Plans.
 - c) Erosion and sediment control measure shall be implemented any time that land is disturbed by construction activities including clearing, grading, excavating, stripping, filling or related work unless exempt by State law or local ordinance.
 - d) Application of erosion and sediment control measures shall be coordinated with the construction of permanent sewer facilities to insure effective control of erosion from the construction site.

D. REGULATORY REQUIREMENTS

1. The sediment and erosion control measures are subject to inspection by State, County and local regulatory agencies. The Contractor shall be fully responsible for constructing and maintaining the sediment and erosion control measures to the extent that they are, at all times, acceptable to the regulatory agencies. The Contractor shall be liable for payment of any fines or legal costs that the Town of Thurmont may incur as a result of the Contractor's failure to properly construct and maintain the sediment and erosion control measures.
2. The objective of the "Sediment and Erosion Control Plan" is the protection of private property. To assist any damaged property owners in redress of grievances, the following stipulations are made.
 - a) Any silt, sediment, or mud leaving the construction site will be construed as damage to neighboring property and evidence of negligence on the part of the Contractor.
 - b) Any damages claimed by neighboring property owners will be rectified and restitution made by the Contractor.
3. Comply with the 1994 Maryland Standards and Specifications for Soil Erosion and Sediment Control, published jointly by the Water Resources Administration, Soil Conservation Service and State Soil Conservation Committee.
4. Comply with any local laws, codes and regulations concerning the construction and maintenance of sediment and erosion control measures.
5. The contractor shall not utilize any offsite areas for obtaining borrow material or for depositing spoil material unless those areas have an approved erosion and sedimentation control plan and all current permits as may be required by state law or local ordinance.

E. SEQUENCE OF WORK

1. Install all sediment and erosion control measures prior to start of clearing operations.
2. Perform sediment and erosion control work in accordance with details and notes on the Contract Drawings.

II. PRODUCTS (Not Applicable to this Section)

III. EXECUTION

A. GENERAL SEDIMENT AND EROSION CONTROL
METHODS/PROCEDURES

1. In all cases, the smallest practical area of land surface shall be disturbed. Contractor shall only uncover the amount of pipe they will be able to replace and backfill in a day. No material shall be stored on site. Excess and/or unsuitable material shall be trucked off at the end of each workday.
2. Topsoil shall be kept separate from all other materials. Temporary stockpiles of topsoil left at the end of the day need to be stabilized until the next re-disturbance.
3. Excavated material shall be placed up slope from the excavation whenever possible. Runoff from spoil piles shall be directed through a sediment filter structure and discharged in a non-erosive manner. Temporary stockpiles of excavation material left at the end of the day need to be stabilized until the next re-disturbance.
4. Dewatering equipment discharge shall be directed onto a stabilized surface so erosion does not occur. Discharges shall be directed through a sediment filter structure or sedimentation basin and discharged in a non-erosive manner.
5. Backfilled excavations shall be restored to original type of cover and grade in accordance with Specifications. Temporary stabilization is required for any and all erodible/soluble areas within 14 days.
6. Areas to be seeded or sodded shall be finish graded with six inches of topsoil unless otherwise specified. Positive drainage shall be maintained away from all structures. No isolated low spots shall be created.
7. All sediment shall be prevented from entering any storm drain, ditch or water course through use of a sediment filter structure.
8. Construction access from unpaved areas to paved areas or streets (public or private) shall be via a stabilized construction entrance. The entrance shall be maintained in a condition, which will prevent tracking or flowing of sediment onto the paved surface. Sediment spilled, dropped or tracked on paved surface shall be removed immediately.

B. SPECIFIC SEDIMENT AND EROSION CONTROL PROCEDURES

1. Clearing/Grubbing

a) Upstream diversion facilities shall be constructed and operational prior to removal of vegetation from Project areas. This system shall divert surface runoff away from the construction area.

b) A temporary diversion and collection system shall be provided at the downstream limits of all areas to be stripped. This facility shall be in place and functional prior to stripping operations. This system shall collect sediment-carrying water from the construction area and convey it to temporary or permanent sediment traps for non-erosive discharge onto stabilized areas.

c) Temporary and permanent sediment traps and discharge structures shall be located such that all surface water leaving the construction area passes through them.

2. Stockpiles

a) No stockpiling allowed on asphalt.

b) All temporary stockpiles left at the end of the day need to be stabilized until the next re-disturbance.

3. Dewatering Operations

a) Dewatering equipment discharge shall be directed onto a stabilized surface so erosion does not occur. Discharges shall be directed through a sediment filter structure or sedimentation basin and discharged in a non-erosive manner.

4. Temporary Sediment Traps for Storm Drain Inlets

a) Traps shall be installed where there is a possibility of runoff from the construction area entering existing storm drain inlets.

b) Sediment traps shall be inspected after each rain and maintained in a functional condition at all times during the construction period. When the structure does not drain completely within 48 hours after a storm, it is clogged. When this occurs, accumulated sediment

must be removed, and the geotextile fabric and stone must be cleaned or replaced.

c) Traps shall be removed when contributing drainage areas are stabilized.

5. Silt Fence Sediment Barrier

a) Silt fence sediment barrier shall be used to filter sediment from runoff.

b) Sediment barriers shall be inspected after each rain and repaired as required to maintain proper function.

c) Remove sediment behind barrier whenever sediment deposit reaches depth of approximately six inches.

d) See Drawings for details on construction of silt fence sediment barrier.

6. Stabilized Construction Entrance

a) Stabilized construction entrances reduce tracking of sediment onto streets or public rights-of-way and provide a stable area for entrance or exit from construction site.

b) Stabilized construction entrances shall be located at points of construction ingress and egress that are not on existing paved area.

c) The entrance shall be maintained in a condition which will minimize tracking of sediment onto public rights-of-way.

d) All sediment spilled, dropped or tracked onto public rights-of-way shall be removed immediately by vacuum sweeping, scraping or sweeping.

e) When necessary, wheels shall be cleaned or washed to remove sediment prior to entrance onto public rights-of-way. When washing is required, it shall be done on an area stabilized with stone and which drains into an approved sediment trapping device. Daily maintenance and inspection is required.

f) After construction is complete and the site is stabilized, the stabilized construction entrances shall be removed and the area shall be stabilized.

7. Temporary Cover:

The following methods shall be used to provide temporary ground cover and stabilization of erodible surfaces.

a) Seeding

(1) The seed shall be 100% (by weight) annual rye, and shall be applied at the rate of 10 pounds per 1,000 square yards.

(2) Temporary seeding on slopes in excess of 5:1 shall be mulched. All temporary seeding between June 1 and September 15 shall be mulched. Temporary seeding shall be watered as required to develop cover.

(3) Mulch shall be straw, shall be clean and free from noxious weeds and shall be applied at the rate of 1.5 tons per acre.

b) Black Polyethylene Sheeting

(1) 3 mil black polyethylene sheeting may be used to stabilize erodible/soluble material stockpiles. Sheets shall be overlapped so as to shed and not contain water. Sheets shall be anchored with tires or approved equal at six feet O.C. along seams and edges and ten feet O.C. throughout.

c) Plywood Sheeting

(1) Plywood sheeting may be used to protect existing vegetation under short duration storage/stockpile areas. Use of this protection method shall be limited to maximum four days. Contractor shall be responsible for restoring or replacing vegetation damaged under sheeting.

C. RESTORATION

1. After completion of construction, remove all temporary erosion and sedimentation control devices. Restore areas in which these devices were

located to the original condition or to the condition called for by the Contract Documents.

END OF SECTION

TOWN OF THURMONT
STANDARD SPECIFICATIONS
SECTION 1100
MAINTENANCE OF TRAFFIC

I. GENERAL

A. DESCRIPTION

1. This work pertains to the maintenance of traffic, both vehicular and pedestrian, on any area affected by the work of the Contract.
2. All work shall be in accordance with the latest issue of the Maryland Manual of Uniform Traffic Control Devices (Md MUTCD), the Contract Documents and as directed by the Engineer. Unless specifically called out on the Bid Form as a separate bid item, maintenance of traffic shall include all requirements listed here and on the Contract Drawings including furnishing traffic managers and flaggers, relocating, maintaining, and removing existing traffic signs and other traffic control devices and implementation of a Traffic Control Plan (TCP), and the cost for such shall be rolled into the unit prices for the related sewer rehabilitation work.

B. RELATED SECTIONS

1. Section 1150 - Excavation, Backfill and Compaction
2. Section 1600-Restoration of Paved and Grassed Areas

C. QUALITY ASSURANCE

1. Source Quality Control
 - a) The Engineer will inspect all materials furnished by the Contractor for maintenance of traffic to ensure compliance with the Contract Documents. However, the inspection, or the lack thereof, by the Engineer shall in no way relieve the Contractor of his responsibility to provide for the maintenance of traffic in accordance with the Contract Documents.

D. SUBMITTALS

1. Each Contract shall contain a Traffic Control Plan (TCP) for all work within any obstruction of and/or crossing of any public right-of way or any private drive, access road, parking lot or sidewalk, which will assure the safety of motorists, pedestrians and construction workers during construction projects. The TCP will cover such items as signing, pavement markings, methods and devices for delineation and channelization, the placement and design of barriers, barricades and impact attenuators and other items required.
2. The Contractor is required to develop and implement the TCP. The Contractor's TCP shall be submitted in writing to the Engineer 20 days prior to starting any work. The Contractor must have written approval from the Engineer of his TCP prior to its implementation.
3. The TCP shall be implemented by the Contractor's traffic manager.
4. The TCP is subject to amendment during the life of the Contract due to changing field conditions. Implementation of either TCP does not relieve the Contractor of any of the provisions set forth in the Special Provisions or of these Specifications.
5. The Contractor shall assign to the project an employee to serve in the capacity of traffic manager. The employee shall be thoroughly experienced in all aspects of traffic control.
 - a) The Contractor shall submit the traffic manager's name, qualifications and copy of certificates to the Engineer for approval at least 10 working days prior to commencing any work on the project. Any change in the appointment of the individual during the term of the Contract shall require a written submission and approval by the Engineer.
 - b) The traffic manager shall have the primary responsibility and sufficient authority for the implementation of the approved Traffic Control Plan, the monitoring and maintenance of signs, pavement markings, channelizing devices, arrow boards, detour signals, turnouts, the furnishing of watchpersons, flaggers and other safety aspects of the Contract.

c) The traffic manager shall closely coordinate his operations with the Town. The traffic manager shall oversee and supervise all aspects of maintenance of traffic on the project including those involving Subcontractors. The traffic manager will be required to make on-site inspection of those operations that affect traffic (vehicular and pedestrian) on a regular basis and be available for consultation at all times. The increase, decrease or elimination of the item shall be in accordance with the Specifications.

II. PRODUCTS

A. MATERIALS

1. All materials, whether temporary or permanent, shall meet the requirements of the Maryland Manual on Uniform Traffic Control Devices (MdMUTCD), the Maryland State Highway Administration and the Contract Documents.

III. EXECUTION

A. PERFORMANCE

1. The Contractor shall provide for the safe and expeditious movement of all traffic through the project in accordance with the TCP, the Contract Documents and as directed by the Engineer.

2. Equipment which is in use, and required temporary storage within the limits of the project and materials stored or stockpiled on the project site shall be placed in a location which shall not be hazardous to the traveling public and as approved by the Engineer.

3. All vehicles and all construction equipment entering or leaving the Project site and/or work area must follow the traffic flow pattern as established by the Traffic Control Plan.

4. All construction operations shall be performed in the normal direction of traffic flow unless written permission is obtained from the Engineer prior to the commencement of such work. Work performed and equipment moving against the normal traffic flow pattern is strictly prohibited, unless a written exception is granted by the Engineer.

5. Upon completion and acceptance of the work or as the need for temporary traffic control devices ceases, the devices shall be removed by

the Contractor in a timely manner and shall remain the property of the Contractor.

END OF SECTION

TOWN OF THURMONT
STANDARD SPECIFICATIONS

SECTION 1150

EXCAVATION, BACKFILL AND COMPACTION

I. GENERAL

A. DESCRIPTION

The Contractor shall furnish all labor, materials, equipment and incidentals necessary to perform all excavation, backfill, fill, grading and excavation stabilization required to install the piping and structure work shown on the Drawings and specified herein. The work shall include, but not necessarily be limited to manholes and chambers; duct, conduit and pipe; roadways and paving; backfill, fill and b01Tow; grading; disposal of surplus and unsuitable materials; and all related work such as sheeting, bracing and water handling.

The Contractor shall examine the site and undertake his own subsurface investigations prior to submitting his bid, taking into consideration all conditions that may affect his work. The Owner and Engineer make no representation as to subsurface characteristics at locations where this project work is to take place.

Excavation and backfill for pipe trenches and structures shall be to elevation as shown on the Drawings.

Prior to construction, the Contractor shall be responsible for taking sufficient measurements, horizontal and vertical, to ensure that all completed work, which includes but is not limited to pavement, curbs, gutters and drainage facilities, are restored to their original lines and grades.

Prior to the start of work and at each change of construction circumstances, the Contractor shall submit his proposed method of dewatering, excavation, backfilling, and compaction to the Engineer to facilitate inspection and testing.

B. RELATED SECTIONS

1. Section 1050 - Sediment and Erosion Control
2. Section 1200 - Ductile Iron Gravity Sewer Pipe and Fittings

3. Section 1250-PVC Gravity Sewer Pipe and Fittings
4. Section 1350-Precast Concrete Manholes
5. Section 1600-Restoration of Paved and Grassed Areas

C. SUBMITTALS

1. Granular Materials

a) Granular materials required for filling, backfilling, bedding, subbase and other purposes shall be as shown on the Drawings. Prior to bidding, prospective contractors shall familiarize themselves with the available quantities of approved on-site and off-site materials.

b) For each on-site or off-site materials proposed, notify the Engineer of the source of the material and furnish to the Engineer for acceptance a representative sample weighing approximately 50 pounds at least 10 calendar days prior to the date of anticipated use of such material. Except as specified herein, only off-site approved materials shall be utilized.

c) The Engineer reserves the right to inspect proposed sources of off-site granular material and to order such tests of the materials as he deems necessary to ascertain its quality and gradation of particle size. The Contractor shall, at his own expense, engage an approved testing laboratory to perform such test, and submit certified test results to the Engineer. If similar tests of the material from a particular source were performed previously, submit results of these tests to the Engineer for consideration.

d) No granular materials shall be used on this project for fill, backfill, bedding, subbase or other purpose until approval is obtained from the Engineer, and only material from approved sources shall be used.

2. Compaction

a) Submit in writing a description of the equipment and methods proposed to be used for compaction.

D. REFERENCE SPECIFICATIONS, CODES AND STANDARDS

1. Standard Material Specifications for gravel, sand, crushed stone and gravel-cement mixtures published by the Maryland Department of Transportation, State Highway Administration are listed below:

ASTMC136	Sieve Analysis of Fine and Course Aggregates
ASTMD698	Laboratory Compaction of Soil Using Standard Effort
ASTMD1556	Density of Soil in Place by Sand-Cone Method
ASTMD1557	Laboratory Compaction of Soil Using Modified Effort
ASTMD2922	Density of Soil in Place by Nuclear Methods
ASTMD3017	Water Content of Soil in Place by Nuclear Methods
OSHA	Occupational Safety and Health Administration

II. PRODUCTS

A. MATERIALS

Materials for use as fill and backfill shall be as described below. For each material, the contractor shall notify the Engineer of the Source of the material and shall furnish the Engineer, for approval, a representative sample weighing approximately 50 pounds at least ten calendar days prior to the date of anticipated use of such material. Disposal of unsuitable material is specified further herein.

1. Structural Fill: Structural fill shall be used below spread footing foundations, slab-on-grade floors, and other structure not founded on undisturbed earth. Structural fill material shall be well graded stone or clean sand, free of organic, deleterious and/or compressible material. Minimum acceptable density shall be 95 percent of the maximum density as determined by AASHTO T-180. If moisture content is not within plus or minus 3 percent of optimum moisture content or improper for attaining the specified density, either water shall be added or material shall be dried until the proper moisture content for compaction is reached. Stone shall comply with all requirements for Gradation CR-14 or 57 as specified in the MDSHA Standard Specifications for Highway Construction 1986 Edition or latest edition. Sand shall meet the requirements of ASTM C-33.

2. Common Fill: Common fill material shall be free from organic matter, muck or marl, and rock exceeding 6 inches in diameter. Rock of 3-1/2 to 6 inches in diameter can be used in the fill material except around pipe as shown on Detail 100 and a maximum of 3-1/2 inches within 12 inches of road sub-grade or a structure. Common fill shall not contain broken concrete, masonry, rubble, wood, roots, plants or other similar materials. Common fill shall have a moisture content of plus or minus 3 percent of the optimum

moisture for maximum compaction density and shall not be frozen or lumpy. Material falling within the above specification encountered during the excavation may be stored for reuse. All material which, in the opinion of the Engineer, is not suitable for reuse shall be removed for disposal as unsuitable materials.

3. Crushed Stone Bedding: Crushed stone for pipe bedding, structure bases and at other locations indicated on the Drawings shall consist of clean well graded crushed stone. Crushed stone shall comply with all requirements for Gradation 57 as specified in the MDSHA Standards.

4. Geofabric: At locations directed by the Engineer, geofabric shall be placed over the bottom of the excavation prior to placing structural fill or crushed stone bedding. The geofabric shall be Mirafi I 40N or equal and shall meet the following properties:

Weight- 4.5 oz. /square yard per ASTM D3376

Grab Tensile Strength - Average 120 lbs. per ASTM D 1682

Grab Tensile Elongation to Break - Average 55% per ASTM D 1682

Mullen Burst Strength- 210 psi per ASTM D-3786-80

Puncture Strength-Average 70 lbf per ASTM D-3787-80

Water Permeability, Kv-0.2 cm/sec per Constant head permeability testing

Equivalent Opening Size (EOS)-100 Sieve per US-Standard COE CW2215

III. EXECUTION

A. PREPARATION

1. Clearing: All clearing on the permanent sewer rights-of-way and temporary construction easements shall be performed as necessary for access, stringing of sewer materials and construction of sewers and structures. The Permanent Sewer Right of Way (R/W) or other limits as shown on the Drawings shall be cleared of all logs, trees, roots, brush, tree trimmings, rock and other objectionable materials and debris. All stumps shall be removed or ground in place to a minimum of 24 inches below the surface. Town/Engineer must approve each stump to be ground in place. All stumps that are ground in place shall be treated to prevent regrowth of the tree from the stump. Subgrades for fills and embankments shall be cleaned and stripped of all surface vegetation, sod and organic topsoil. All waste materials shall be removed from the site and disposed of by and at the expense of the Contractor.

Trees 6 inches in diameter or larger shall only be removed from the Temporary Construction Easement, when it is necessary for the trenching operation and only then with permission of the Owner.

Refer to Section 1600 for additional requirements.

2. Excavation Stabilization: All excavations shall be stabilized to protect the safety of workers in the excavations from earth slides and cave-ins and to protect the structural integrity of the pipe or structure being constructed.

With reference to the terms and conditions of the construction standards for excavations set forth in the OSHA "Safety and Health Regulations for Construction", Chapter XVII of Title 29, CFR, Part 1926, the Contractor shall employ a competent person and, when necessary, a registered Professional Engineer in the State of Maryland, to act upon all pertinent matters of the Work of this section. All OSHA requirements shall be continually adhered to.

Excavations shall provide adequate working space and clearances for the Work to be performed therein and for installation and removal of concrete forms when required. In no case shall excavation faces be undercut for extended footings.

Groundwater control is necessary for creating stable foundations for pipes and structures and for stabilizing excavation slopes.

The type of excavation stabilization systems to be used for different sections of sewers and structures shall be selected by the Contractor based upon geotechnical characteristics, excavation depth, groundwater probability, proximity of existing structures, area available for excavation storage, use of excavation area, etc. The Contractor shall employ the services of a Maryland Registered Professional Engineer as necessary to evaluate these conditions and to design the necessary excavation stabilization system and groundwater control system for each such section.

Town/Engineer will not permit excavated material to be stored outside of the designated Permanent Sewer RJW and Temporary Construction Easement shown on the Drawings unless approved by the property owner.

The Contractor shall be solely responsible for stabilizing excavations and selecting the appropriate stabilization methods. Options include using movable earth retaining devices (trench boxes) and installing sheeting and shoring systems. The Contractor will not be allowed to slope trench walls

instead of providing stabilization systems such as those mentioned herein unless otherwise approved by the Engineer and/or specified as acceptable elsewhere.

Where trench boxes are used to stabilize excavations for pipes, the trench boxes shall be designed and certified trench boxes purchased from a manufacturer in the business to sell trench box equipment with supporting literature. If the Contractor chooses to build the trench box, it must be designed and certified by a Professional Engineer Registered in Maryland. Design drawings and computations shall be submitted to the Engineer for information prior to construction. The trench box interior widths shall accommodate the trench widths specified in the details and shall provide adequate space for exterior jointing and compaction of pipe bedding. The lower edges of trench boxes shall not be deeper than the mid-diameter of the pipe.

Sheeting and shoring systems shall also be designed by a Professional Engineer Registered in Maryland. Sheeting shall be plumb and securely braced in position. Sheeting and shoring systems shall be adequate to withstand all pressures to which they will be subjected. For trench sheeting for pipes, no sheeting closer than one pipe diameter or two feet (whichever is greater) from the outside edge of the pipe shall be withdrawn if driven below mid-diameter of any pipe, and no sheeting shall be cut off at a level lower than the top of any pipe unless otherwise approved by the Engineer. Any sheeting beyond these limits which is withdrawn shall be done in a manner in which the sheeting slides smoothly out of position without any disturbance of adjacent bedding. The remaining hole shall immediately be filled by hand with sand.

All sheeting and shoring shall be carefully removed in such a manner as not to endanger workers, the construction, other structures, utilities, piping or property. For structures, all sheeting and shoring shall be removed after completion of the substructure or base slab. All voids left or caused by withdrawal of sheeting shall be immediately backfilled and compacted to project specifications.

B. INSTALLATION/APPLICATION

1. Excavation Dewatering: The Contractor shall construct and place all pipes, concrete structures, structural fill, and crushed stone bedding in-the-dry and all such work shall stop at any time that water appears in the

excavation until the water is completely removed. The Contractor shall maintain the water level a minimum of one foot below proposed bottom of the excavation. For purposes of these Specifications, "in-the-dry" is defined as no free water inside the excavation. Dewatering shall be continuous until all work in the area is complete and backfilled.

Structures, casings and pipes installed adjacent to streams and at or below the stream water level will be below the natural groundwater table, and thus, extensive groundwater handling will be required and should be expected.

The Contractor shall, at all times during construction, provide and maintain proper equipment and facilities to lower the groundwater table below the excavation, to remove promptly and dispose of properly all ground and surface water entering excavations, and to keep such excavations dry so as to obtain a satisfactory undisturbed sub-grade foundation condition until the fill, structure, or pipes to be built thereon have been completed to such extent that they will not be :floated or otherwise damage by allowing water levels to return to natural elevations.

Pipes, casings and structures shall not be installed in water or submerged within 24 hours after being placed. Water shall not flow over new concrete within four days after placement unless otherwise approved by the Engineer. Pipe not meeting this requirement shall be removed as directed by the Engineer.

In no event shall water rise to cause unbalanced pressure on structures until the concrete or mortar has set at least 24 hours. The Contractor shall prevent flotation of pipes by promptly placing and compacting backfill to these Specifications.

Surface drainage shall be controlled so that no surface drainage shall enter the excavation at any time. At no time shall installed sewer pipe be used for dewatering, drainage or dewatering any surface water conveyance.

Dewatering shall at all times be conducted in such a manner as to preserve the natural undisturbed bearing capacity of the sub-grade soils at the proposed bottom of the excavation. The Contractor shall be responsible for connecting any disturbances to natural bearing soils or damage to structures caused by inadequate dewatering systems or by interruption of the continuous operation of the system as specified. If the trench bottom at final excavation is loosened or unstable to extent that proper support of the bedding or pipe has been compromised in the opinion of the Engineer, the

loosened/unstable material shall be removed and replaced with structural fill as directed by the Engineer at no additional cost to the Owner.

The Contractor shall be solely responsible for designing and implementing dewatering systems to meet the requirements specified herein. The Contractor shall retain a Professional Engineer registered in Maryland to design the dewatering systems as necessary and/or required by the Engineer. The contractor shall submit to the Engineer for information a conceptual plan for dewatering system prior to commencing work. The installed dewatering system shall conform to the conceptual plan. The Contractor and/or his Engineer, where required, shall monitor the performance of the dewatering systems during the progress of the Work and make modifications as necessary to remain in compliance with the requirement specified herein. Modifications and alternate dewatering methods shall be submitted to the Engineer for review.

The Contractor's dewatering system may include pumping from well points, deep wells or sumps. The method(s) selected must maintain the ground water levels at least 12 inches below the bottom of the excavation as specified herein. Whenever the selected method(s) do not meet this requirement, the Contractor shall immediately employ additional dewatering measures. The Contractor is advised that pre-drainage of the soil may be required to achieve acceptable soil moisture contents so that the soil can be promptly used for backfilling as specified further herein. Pumping equipment shall be quiet or silent pumps or electric motor-driven pumps. All pumping systems must be approved by the Engineer.

The Contractor shall provide for the disposal of the water removed from the excavation in such manner as shall not cause erosion, siltation or turbidity increases in any water course; injury to public health; degradation or damage to private or public property or to any portion of the work completed or in progress, or to roads to streets; or cause any impediment to the reasonable use of the site by others. Dewatering and drainage water shall not be discharged into other sewers or storm drains unless approved by the Engineer. Discharges to water courses or storm drains shall comply with all applicable requirements of all governmental agencies having jurisdiction. All water shall be filtered or desilted in temporary sedimentation basins before discharge to water courses or storm drains.

Where specified or required by the Engineer on the Drawings or in the Supplemental Conditions, the Contractor shall install groundwater

observation wells (piezometer wells) along the sewer route to be used to determine the ground water level prior to and during construction. Locations of the observation wells at structures and along pipes shall be approved by the Engineer prior to their installation. The observation wells shall be extended to 6 inches above finished grade, capped with screw-on caps protected against damage. Where designated by the Engineer, the wells shall be left in place at the completion of the Project. Otherwise the wells shall be filled with concrete and cut off 2 feet below finish grade. The Contractor shall obtain all applicable permits to construct and abandon piezometer wells for the Project from the Maryland Department of the Environment (MDE) and any other governmental agencies having jurisdiction. The Contractor shall comply with the terms and conditions of the permits whether by himself or others. The Contractor shall provide a suitable electronic probe for use by himself and the Engineer for monitoring the water depth in the observation wells.

2. Excavation: Excavation may be done with equipment of the Contractor's choosing. All excavation shall be stabilized by methods specified herein on the Contractor's choosing. No more trench shall be opened in advance of pipe laying than is necessary to expedite the Work. No more than 200 feet of trench shall be open on any sewer under construction. Failure to comply with this requirement shall be cause of the shutdown of that portion of the project until such backfilling is accomplished.

Excavated material which has suitable characteristics for common fill backfill shall be covered and/or stockpiled in such a manner that it will not collect either surface water or rainwater. The stockpile top surface shall be sloped to drain away from the excavation site and graded smooth and compacted to drain rainwater rapidly. Backfill containing excessive moisture shall not be used. It shall be the Contractor's responsibility to control or adjust the moisture content of excavated materials to the requirements for common fill before such materials may be used for backfill at no cost to the Owner.

Excavation shall be stockpiled within the permanent and temporary rights-of-way of sewers. Trees to remain on temporary rights-of-way shall not be damaged by excavation, stockpiling and backfilling operations. Any inadvertent damage shall be immediately repaired as specified elsewhere.

All excavation left unattended for more than one hour shall be completely barricaded and provided with warning signs and lights.

All OSHA and other applicable safety regulations shall be observed on all excavation work.

The depth of excavation shall be to the bottom elevation of the bedding for structures and pipes. The width shall be to at least two feet beyond the neat lines of structure footings and as shown on Drawings or in the Details for sewer pipes.

The Contractor shall over-excavate pipe and structure trenches and backfill with structural fill where approved by the Engineer. Over-excavation will be required when the bottom of the trench is not stable for support of the pipe or structure as determined by the Contractor. The Contractor shall be paid for such over-excavation at the unit prices bid when so provided in the Bid Schedule and when so agreed by the Engineer. The Engineer must approve over-excavation before it is performed, or it will not be paid for. However, if the bottom is not stable due to improper dewatering or other preparatory work by the Contractor, then no additional payment shall be made to the Contractor as specified elsewhere herein. It shall be the Contractor's sole responsibility to provide a stable and solid trench bottom for installation of the sewer facilities.

Where rock is excavated with earth material, care shall be taken not to contaminate the excavation stored for use as common fill with excavated rock larger than the maximum size allowed.

3. Rock Excavation: Rock excavation shall mean the removal of rock, which in the opinion of the Engineer, requires for its' removal drilling and blasting, wedging, sledging, cutting or barring, and which cannot be removed by excavation equipment with a bucket curling force of at least 18,300 pounds. Rock excavation includes boulders, which in the sole opinion of the Engineer, require blasting for removal. Rock excavation will be paid at the unit price bid. The Bid Schedule includes an estimated quantity for rock excavation. The Contractor shall not be due any adjustment to the unit price bid, if the estimated quantity is exceeded or not used.

Rock, which can be excavated at a reasonable rate with trench excavation equipment, shall be considered earth. Boulders up to 1 cubic yard in volume, which can be removed without resorting to blasting, shall be considered earth.

If blasting is required, the Contractor shall state so in writing with a request to blast. If blasting is approved by Engineer, pre-blasting and post-blasting

surveys shall be conducted on and reported for all major structures within the influence range of any blasting operations or within a minimum of 200 feet, whichever is greater from any blast site. The surveys shall consist of a visual inspection and recording by notes and photographs of structures, to include specifically cracks or other structural damage previously sustained, and shall be conducted by a qualified technician furnished by the contractor's Insurance Underwriter. A copy of all notes and photographs shall be submitted to the Owner prior to the beginning of blasting operations and prior to final payment. The records so obtained shall be retained in the Contractor's file for at least three years after completion of the Contract. In the event of any damage claim, a report shall be prepared by the Contractor on the particular structure involved to include those notes and photographs and submitted to the Engineer. Costs for blasting survey shall be a subsidiary obligation of the Contract and included in the unit price bid for rock excavation. Seismographs shall be used where deemed necessary by the Contractor and/or Engineer.

At least 24 hours advance notice shall be given in writing to the Police and Fire Departments, other Town and County officials, all tenants and residents within 1,000 feet of the work, and authorized representatives of all utilities which might be affected by blasting operations before blasting. Care shall be taken to avoid damage to utilities or other structures above and below ground. Unless otherwise permitted, no blasting will be allowed prior to 8:00 A.M. or after 4:00 P.M. local time.

Prior to commencing any blasting operations, the Contractor shall furnish to the Engineer a Certificate of Insurance specifically covering any and all obligations assumed pursuant to the use of explosives.

All blasting operations shall be conducted in strict accordance with any and all decrees, rules, regulations, ordinances and laws as may be imposed by any regulatory body and/or agency having jurisdiction over the work relative to handling, transporting, use and storage of explosives. All blasting operations shall be conducted by qualified persons licensed in Maryland and meeting requirements enumerated in OSHA Regulations Part 1926, Subpart U, Section 1926.901 - Blaster Qualifications. Satisfactory information must be submitted to the Engineer prior to any blasting to document the qualifications of the blasters. All blasting shall be performed with all possible care to avoid injury to persons and property.

In addition to observing all laws, regulations and ordinances relating to transporting, storage and handling of explosives, conform to any further requirement which the Engineer may deem appropriate. All rock, dirt and debris from blasting shall be contained within the excavation by use of weighted mats or undisturbed overburden. The Contractor's blaster shall be fully responsible for determining the method of containment and the weight, size and placement of material required to contain the charge being used.

Charges shall be sized such that no damage to houses, structures, roadways, etc. outside the limits of the excavation will occur. Where there is a possibility of such damage, the charge should be initially set at a very low level and increased in small increments until the proper charge is determined. The Contractor shall be held responsible for any and all injury to persons and damage to public or private property.

If rock below the intended blasting grade is shattered by blasting, caused by holes drilled too deep, or too heavy charges of explosives or any other circumstance due to blasting and if, in the opinion of the Engineer, the shattered rock is unfit for sub-grade, the rock shall be removed and the excavation refilled with structural fill at no additional cost to the Owner.

Excavated rock and boulder material exceeding 6 inches in the largest cross-sectional dimensions shall not be used for backfilling unless otherwise approved. Rock of 3-1/2 to 6 inches in diameter can be used in the fill material except that a maximum of 1-1/2 inches shall be used within 12 inches of a pipeline and a maximum of 3-1/2 inches within 12 inches of road sub-grade or a structure. All rock used in backfill shall be mixed with granular backfill materials to achieve the required density. Rock used in backfill shall be free from organic matter, muck or marl.

All rock not used for backfilling shall be removed from the site and disposed of by the Contractor at no additional cost to the Owner. No disposal on Owner property or rights-of-way shall be permitted unless authorized by the Owner. The Contractor shall advise the Engineer in writing of the disposal location and submit a copy of the agreement with the disposal site property owner. The Contractor shall import soil as necessary to fill the volume displaced by the removed rock. The cost for the imported soil shall be included in the unit price for rock excavation.

4. Bedding: Bedding stone for structures and pipe shall be placed for the entire depth and width of excavation as shown in Standard Detail No. 100 except when rock is encountered, in which case the rock shall be removed to

6 inches below the final elevations. Bedding shall be placed only on dry, compacted sub-grade or on rock.

Pipe bedding shall be placed in the trench to the elevation of the pipe base and thoroughly compacted prior to pipe installation. This bedding shall not be used under any circumstances as a drain for groundwater. The Contractor shall take all precautions necessary to maintain the bedding in a compacted state and to prevent washing, erosion or loosening of this bed.

Final pipe elevation in the compacted bedding shall be obtained by manual excavations, including additional excavation under the pipe bells. Following jointing, crushed stone bedding shall be brought up to the mid-diameter of or above the pipe (per Standard Detail No. 100) level across the width of the Excavation and thoroughly compacted.

Pipe shall be laid to the true lines and grades shown on the Drawings with bedding and backfill as shown in Standard Detail No. 100 and as specified in these Specifications. Each section of pipe shall be laid to true alignment and grade as shown and specified on the Drawings. Pipe elevations and locations shall be checked immediately upon setting the pipe in the trench, and the location and elevation of each pipe shall be adjusted to meet the true alignment and grade specified. If the pipe is not installed to the true lines and elevations, the Engineer and Owner shall decide on appropriate connective measures. Such connective measures may require that the installed sewer be removed and re-installed correctly. The Engineer's decision shall be final and no additional payment or time shall be due the Contractor to comply with the Engineer's decision.

When pipe are to be encased in concrete, the top and bottom of the bedding shall be lowered by the specified thickness of the concrete encasement.

5. Pipe Installation: The trench and bedding shall be prepared in such a manner to prevent contamination of pipe joints with soil or bedding and to provide complete support of each section of pipe, except at the bells and spigots. After the pipe joint is finished, place and compact bedding under and around the pipe bell before continuing the bedding to mid-diameter of or above the sewer pipe per Standard Detail No. 100.

6. Backfilling: Backfilling of pipes and structures may utilize the excavated material, so long as it meets the requirements for common fill and the moisture content is within 3 percent of optimum moisture for compaction to specified density. Otherwise, imported common fill meeting these

requirements shall be used for backfill. Imported common fill shall be paid at the unit prices bid. Payment for imported soil shall only be made when approved by the Engineer prior to removing and importing soil. Where excavated material meets the requirements for common fill except for moisture content, the moisture content shall be adjusted upward by sprinkling or downward by spreading and turning and drying. It shall be the Contractor's responsibility to store and prepare such excavated materials to meet the moisture requirement. No additional payment for backfill materials, including imported fill, shall be paid by the Owner, where excavated materials meet the requirements for common fill, except for moisture content. All costs associated with adjustment (up or down) or moisture content of excavated materials to be used for backfill shall be borne by the Contractor. Backfill shall be placed only on dry compacted surfaces. Any water or soil above its liquid limit shall be removed before placing any backfill. The subgrade shall be compacted before any backfill placement. Backfill shall be placed in maximum 6-inch layers to 12 inches above the top of the pipe and 8-inch level layers compacted thereafter to at least 95 percent of maximum dry density at optimum moisture content as determined by AASHTO T-180 or ASTM D698. For pipe backfill above the top of the pipe in open areas, where specifically approved in writing by the Engineer, layer thickness may be increased to 12 inches with 90 percent compaction. In paved MDSA and Town/County roads, the Contractor shall remove all excavated soil from the site and import CR6 stone to completely backfill the trench to the pavement subgrade. The stone shall be installed and compacted via mechanical means in 12-inch layers. Costs associated with removing and disposing of the excavated soil and supplying and importing the stone shall be included in the various unit costs bid. Begin CR 6 at least 12 inches above the top of ductile iron pipe (first 12 inches to be #57 stone). Refer to Section 1600 for additional requirements. Compaction shall be by mechanical compactor. For pipe, the size of the compactor shall fit between the pipe and the trench sides below the pipe mid-diameter, and between the pipe and the sheeting or trench box above mid-diameter. Larger compaction equipment may be used, as desired, after backfill has reached at least two feet above the top of the pipe. For structures, the size of the compactor shall fit between the structure and the sheeting until the elevation at which sheeting is withdrawn, at which elevation the entire excavated area shall be compacted. Particular attention shall be given to compaction where sheeting is withdrawn. Sheetting holes shall be filled with structural fill or bedding material and manually compacted by ramming after the sheeting is withdrawn. The Owner may have compaction tests performed on the compacted backfill to verify

compliance with these requirements. The Owner will pay for the initial compaction tests. The Contractor shall pay for any re-tests required, because the backfill did not meet the specified compaction requirements. Backfilling of structures shall be deferred until any placed concrete has cured at least seven days, unless otherwise approved by the Engineer. Backfill of sewers in open areas shall be mounded approximately 3 inches above finish grade to allow for settlement where approved by the Engineer in writing and/or where specified by the Engineer, and that the Contractor agrees to regrade these areas as needed within the guarantee period. The top 4 inches of backfill shall be of stockpiled or imported topsoil. After final grading, the topsoil shall be prepared and seeded or sodded as specified in Section 1600.

C. FIELD QUALITY CONTROL

1. Test Pits: The contractor shall excavate test pits at structure locations and on sewer routes sufficiently in advance for the purpose of locating all known and unknown underground utilities or structures as an aid in establishing the nature of the soils to be excavated including locations of rock. These pits shall be backfilled as soon as the desired information has been obtained. The backfilled surface shall be maintained in a satisfactory condition for the original use until construction starts at the pit locations. If in a paved area, test pit backfill shall be cold patched with bituminous pavement.

Excavation of test pits shall be considered work incidental to the project and the cost shall be included in the various unit prices for the Work.

2. Protection of Utilities: The Contractor shall locate and protect all utilities which could be affected by the work, including railroads, overhead cables, poles, buried cables, wastewater pipes, water pipes, gas lines and drainage pipes and appurtenances. Before working in any area, the Contractor shall contact the local utilities locating company to mark the locations of underground utilities. Any underground utilities which could interfere with the work shall be staked and flagged.

Underground pipes and cables which cross the excavations shall be carefully exposed and temporarily supported from overhead beams furnished by the Contractor to the satisfaction of the utility owner. The utility shall be carefully incorporated in the backfill with full support and protection. Should any utilities need to be relocated, the Contractor shall discuss the situation in a meeting with the Engineer and utility owner.

Before operating any equipment near a buried or overhead electric cable, the Contractor shall contact the power company to arrange for protection of the cable and the Contractor's personnel and equipment. Compliance with the power company's conditions shall be considered a subsidiary obligation under the contract. The Engineer shall be invited to attend all meetings with the power company for information only.

3. Disposal of Excess Excavation: Excess excavation, excavation which is unsuitable for backfill and excavated rocks larger than 6 inches shall be disposed of off-site by the Contractor at no additional cost to the Owner, except where unanticipated unsuitable excavated material is directed by the Engineer to be disposed of and replaced by imported backfill.

Excess excavation which meets the requirements of common fill shall be stockpiled in a common readily accessible area, graded and/or covered for rain runoff, and used as a source of imported material until all the needs for imported material are identified, at which time the balance of the stockpiled excess material shall be disposed.

In certain areas the nature of the terrain in the right-of-way may be suitable for spreading excess and/or unsuitable excavation on the ground surface prior to preparation and seeding which would eliminate the need for offsite disposal. The Engineer shall solely make this judgment and will so direct the Contractor. The Contractor shall not presume in his bid price that any such areas exist.

The Contractor shall locate and make all arrangement for disposal of excess and unsuitable materials. All handling, hauling and disposal costs shall be included in the bid price. Stockpile areas shall be prepared and seeded or sodded as specified. Disposal shall be in compliance with all applicable regulations.

END OF SECTION

TOWN OF THURMONT
STANDARD SPECIFICATIONS
SECTION 1100
MAINTENANCE OF TRAFFIC

I. GENERAL

A. DESCRIPTION

1. This work pertains to the maintenance of traffic, both vehicular and pedestrian, on any area affected by the work of the Contract.
2. All work shall be in accordance with the latest issue of the Maryland Manual of Uniform Traffic Control Devices (MdMUTCD), the Contract Documents and as directed by the Engineer. Unless specifically called out on the Bid Form as a separate bid item, maintenance of traffic shall include all requirements listed here and on the Contract Drawings including furnishing traffic managers and flaggers, relocating, maintaining, and removing existing traffic signs and other traffic control devices and implementation of a Traffic Control Plan (TCP), and the cost for such shall be rolled into the unit prices for the related sewer rehabilitation work.

B. RELATED SECTIONS

1. Section 1150 - Excavation, Backfill and Compaction
2. Section 1600- Restoration of Paved and Grassed Areas

C. QUALITY ASSURANCE

1. Source Quality Control
 - a) The Engineer will inspect all materials furnished by the Contractor for maintenance of traffic to ensure compliance with the Contract Documents. However, the inspection, or the lack thereof, by the Engineer shall in no way relieve the Contractor of his responsibility to provide for the maintenance of traffic in accordance with the Contract Documents.

D. SUBMITTALS

1. Each Contract shall contain a Traffic Control Plan (TCP) for all work within any obstruction of and/or crossing of any public right-of way or any private drive, access road, parking lot or sidewalk, which will assure the safety of motorists, pedestrians and construction workers during construction projects. The TCP will cover such items as signing, pavement markings, methods and devices for delineation and channelization, the placement and design of barriers, barricades and impact attenuators and other items required.
2. The Contractor is required to develop and implement the TCP. The Contractor's TCP shall be submitted in writing to the Engineer 20 days prior to starting any work. The Contractor must have written approval from the Engineer of his TCP prior to its implementation.
3. The TCP shall be implemented by the Contractor's traffic manager.
4. The TCP is subject to amendment during the life of the Contract due to changing field conditions. Implementation of either TCP does not relieve the Contractor of any of the provisions set forth in the Special Provisions or of these Specifications.
5. The Contractor shall assign to the project an employee to serve in the capacity of traffic manager. The employee shall be thoroughly experienced in all aspects of traffic control.
 - a) The Contractor shall submit the traffic manager's name, qualifications and copy of certificates to the Engineer for approval at least 10 working days prior to commencing any work on the project. Any change in the appointment of the individual during the term of the Contract shall require a written submission and approval by the Engineer.
 - b) The traffic manager shall have the primary responsibility and sufficient authority for the implementation of the approved Traffic Control Plan, the monitoring and maintenance of signs, pavement markings, channelizing devices, arrow boards, detour signals, turnouts, the furnishing of watchpersons, flaggers and other safety aspects of the Contract.
 - c) The traffic manager shall closely coordinate his operations with the Town. The traffic manager shall oversee and supervise all aspects of maintenance of traffic on the project including those involving

Subcontractors. The traffic manager will be required to make on-site inspection of those operations that affect traffic (vehicular and pedestrian) on a regular basis and be available for consultation at all times. The increase, decrease or elimination of the item shall be in accordance with the Specifications.

II. PRODUCTS

A. MATERIALS

1. All materials, whether temporary or permanent, shall meet the requirements of the Maryland Manual on Uniform Traffic Control Devices (MdMUTCD), the Maryland State Highway Administration and the Contract Documents.

III. EXECUTION

A. PERFORMANCE

1. The Contractor shall provide for the safe and expeditious movement of all traffic through the project in accordance with the TCP, the Contract Documents and as directed by the Engineer.

2. Equipment which is in use, and required temporary storage within the limits of the project and materials stored or stockpiled on the project site shall be placed in a location which shall not be hazardous to the traveling public and as approved by the Engineer.

3. All vehicles and all construction equipment entering or leaving the Project site and/or work area must follow the traffic flow pattern as established by the Traffic Control Plan. All construction operations shall be performed in the normal direction of traffic flow unless "Written permission is obtained from the Engineer prior to the commencement of such work. Work performed and equipment moving against the normal traffic flow pattern is strictly prohibited, unless a written exception is granted by the Engineer.

4. Upon completion and acceptance of the work or as the need for temporary traffic control devices ceases, the devices shall be removed by the Contractor in a timely manner and shall remain the property of the Contractor.

END OF SECTION

TOWN OF THURMONT
STANDARD SPECIFICATIONS
SECTION 1200

DUCTILE IRON GRAVITY SEWER PIPE AND FITTINGS

I. GENERAL

A. DESCRIPTION

This section covers ductile iron gravity sewer pipe for main sewers and service laterals. Ductile iron pipe shall be furnished complete with all fittings, jointing, materials, blocking, encasement and other necessary appurtenances. Ductile iron pipe is approved for all sewer diameters and shall be provided for all sewers through casings and tunnels.

B. RELATED SECTIONS

1. Section 1150 - Excavation, Backfill and Compaction
2. Section 1250-PVC Gravity Sewer Pipe and Fittings
3. Section 1300 - Cured-in-Place Pipe Lining (CIPP)
4. Section 1350 - Precast Concrete Manholes
5. Section 1400 - Manhole Rehabilitation
6. Section 1450 - Maintenance of Sewer Flow
7. Section 1500 -Television Inspection
8. Section 1550 - Sewer Line Cleaning

C. SUBMITTALS

1. Shop Drawings and Product Data: Furnish completely dimensioned shop drawings, catalog cut or other data as required to provide a complete description of piping and piping specialties proposed to be used on the Contract work.
2. Certificates:

- a) Certified records or reports of results of shop tests, such records or report is to contain a sworn statement that shop tests have been made as specified, if required.
- b) Manufacturer's sworn certification that pipe will be manufactured in accordance with specified reference standards for each pipe type.
- c) Manufacturer's Installation Instructions - Indicate special procedures required to install products specified.

D. QUALIFICATIONS AND QUALITY ASSURANCE

All ductile iron pipe and fittings shall be furnished by manufacturers who are fully experienced, reputable and qualified in the manufacture of the materials to be furnished. The pipe and fittings shall be designed, constructed and installed in accordance with the best practices and methods and shall comply with these Specifications.

The Contractor shall furnish in duplicate to the Engineer, prior to each shipment of pipe, unless otherwise approved by the Engineer, manufacturer's certification and certified test reports, that the pipe was manufactured and tested in accordance with the ASTM and ANSI-AWWA Standards specified herein.

The manufacturer is responsible for the performance of all inspection requirements as specified in ANSI-AWWA Standards. In addition, all pipe and fittings to be installed under this Contract may be inspected at the plant for compliance with these Specifications by an independent testing laboratory selected by and paid for by the Owner.

Inspection of the pipe and fittings will also be made by the Engineer or representative of the Owner after delivery. The pipe shall be subject to rejection at any time on account of failure to meet any of the Specification requirements, even though sample pipes may have been accepted as satisfactory at the place of manufacture. Pipe rejected after delivery shall be marked for identification and shall be removed from the job.

All pipe and fittings shall be permanently marked with the following information:

- 1. Manufacturer, date.
- 2. Size, type, class or wall thickness.

3. Standard produced to (ANSI/AWWA, ASTM, etc.)

II. PRODUCTS

A. MATERIALS

Ductile iron pipe shall conform to the requirements of AWWA Standard C-151. Fittings shall be in accordance with AWWA C-110 or AWWA C-153.

Ductile iron pipe shall be furnished with push-on joints in accordance with AWWA C-110 or mechanical joints where necessary to join fittings and connect service laterals.

Restrained joints shall be required for all ductile iron pipe through casings and tunnels. Restrained joints shall be as manufactured by American (Flex-Ring, Lok-Fast or LokRing), US Pipe (TR Flex), Griffin (Snap-Lok) or approved equal.

Ductile iron pipe shall be minimum Class 51 pipe. The pipe class and related wall thickness shall be selected based on the installation conditions and depths per ANSI/AWWA C151/A21.51. The pipe thickness shall be increased as necessary to accommodate the installation conditions. Pipe shall be supplied in lengths not in excess of 21 feet.

Interior Pipe Lining: The interior of all ductile iron pipe and fitting shall be lined as follows:

8-inch-diameter and larger: All pipe to be lined with either ceramic epoxy lining or bonded polyethylene as specified by the Engineer. (Addendum #2)

The interior linings/coatings shall meet the following requirement:

Cement Mortar Lining:

Cement mortar lining shall be installed in accordance with AWWA C-104.

Epoxy Lining:

The internal ceramic epoxy lining shall be PROTECTO 401 Ceramic Epoxy or approved equal. The epoxy lining shall be applied to a minimum 40 mils dry film thickness and shall cover the entire inside of the pipe from the inside shoulder of the gasket groove to the end of the spigot. The gasket groove and spigot end up to 6 inches back from the end of the spigot end shall be coated with PROTECTO Joint Compound or approved equal. The Joint Compound shall be applied with a brush to ensure coverage and shall be smooth. Fittings shall be coated from gasket groove to gasket groove.

The epoxy lining shall be applied only by a firm certified as an applicator by the epoxy manufacturer. Application of the epoxy lining to the ductile iron pipe shall be in strict accordance with the epoxy manufacturer's specifications and installation procedures. All pipe linings shall be checked for thickness using a magnetic film thickness gauge. The thickness testing shall be done using the method outlined in SSPC-PA-2 film thickness testing. The barrel of all pipe and fittings shall be pinhole detected with a nondestructive 2,500-volt pinhole test. Each pipe joint and fitting shall be marked with the date of application of the lining system and with its numerical sequence of application on that date. The pipe or fitting manufacturer must supply a certificate attesting to the fact that the Applicator met the requirements of this specification, that the material used was as specified, and that the material was applied as required by the specification.

All pinholes and damaged lined areas shall be repaired in accordance with written repair procedure furnished by the manufacturer of the lining material, so the repaired area is equal in performance to the undamaged lined areas.

The Owner reserves the right to reject any defective pipe delivered to the job site.

Polyethylene Lining:

Pipe and fittings lined with polyethylene shall be Poly-bond Plus as manufactured by American Cast Iron Pipe Company.

The lining material for the pipe and fittings shall be virgin polyethylene complying with ASTM 1248 compounded with an inert filler and sufficient carbon black to resist ultraviolet rays. The polyethylene shall be bonded to the interior of the pipe and fittings by heat at the pipe manufacturer's plant. All surface areas to be lined shall be sandblasted clean prior to applying the polyethylene. The pipe and fittings shall be uniformly preheated to a temperature adequate to provide uniform fusing of the polyethylene powders and proper bonding to the pipe and fittings.

The lining at the ends shall be hermetically sealed and every pipe and fitting shall be subjected to and pass a 400 volt wet sponge or equivalent spark test. A sample cut from a production pipe shall pass the 4-hour boil adhesion test as described inASTMC541.

Polyethylene linings shall cover the inner surface of the pipe and fittings. In pipe utilizing push-on gaskets, the lining shall extend from the spigot end through the socket to the edge of the gasket sealing area. In mechanical joint

pipe, the lining shall extend from the spigot end through the socket to the edge of the gauging ring. The lining in fittings shall cover the interior surfaces including the socket areas as defined above. All bell areas which have not been lined shall be given one coat of 5 mils minimum (dry) thickness of epoxy coating Tnemec Series 20Pota-Pox (Polyamide) or equal or as recommended by the pipe manufacturer. Polyethylene lining thickness shall be 60 mils nominal, 50 mils minimum. The lining shall be checked for thickness using a magnetic film thickness gauge. The thickness testing shall be done using the method outlined in SSPC-PA-2 film thickness testing.

All pinholes and damaged lined area shall be repaired in accordance with written repair procedure furnished by the manufacturer of the lining material, so the repaired area is equal in performance to the undamaged lined areas.

Each section of pipe shall be marked with the date of application of the lining system. The pipe or fitting manufacturer must supply a certificate attesting to the fact that the Applicator met the requirements of this specification, that the material used was as specified, and that the material was applied as required by the specification.

The Owner Reserves the right to reject any defective pipe delivered to the job site.

Exterior Coating: The exterior of buried pipe and fittings shall receive a bituminous coating as recommended by the pipe manufacturer and in accordance with ANSI A2 I .5 for pipe and ANSI A2 I .10 and A2 I .53 for fittings (minimum 1 mil thick).

Pipe Couplings: Pipe couplings will be required whenever the Contractor is repairing existing or new main sewers, when connecting new service laterals to existing sewers using a tee-wye, and when connecting new services to existing services. Pipe couplings shall only be allowed in these specific circumstances. Couplings will not be allowed on new main sewers being installed from manhole to manhole or on new service laterals between the main sewer and cleanout. Pipe couplings shall be rubber sleeve couplings with stainless steel shear rings and compression bands as manufactured by Mission Products (or approved equal). Refer to Standard Detail No. 111 for additional requirements. Mechanical joint fittings shall be used for repairing new pipe installations.

Service Lateral Connections: All service lateral connections being installed as part of the new main sewer construction shall be connected to the main sewer using a tee-wye connection. Saddles shall not be allowed.

III. EXECUTION

A. DELIVERY, STORAGE AND HANDLING All pipe, fittings, valves and accessories shall be unloaded, stored and handled in accordance with AWWA C-600. Care shall be taken in loading, transporting and unloading to prevent injury to the pipe or coatings. Under no circumstances shall the pipe be dropped or skidded against each other. Slings, hooks or pipe tongs shall be padded and used in such a manner as to prevent damage to the exterior surface or internal lining of the pipe. Materials, if stored, shall be kept safe from damage. The interior of all pipe, fittings and other appurtenances shall be kept free from dirt or foreign matter at all times. Pipe shall not be stacked higher than the limits recommended by its manufacturer. The bottom tier shall be kept off the ground on timbers, rails or concrete. Pipe in tiers shall be alternated. At least two rows of 4-in by 4-in timbers shall be placed between tiers and chocks affixed to each end in order to prevent movement.

B. INSTALLING DUCTILE IRON PIPE AND FITTINGS

All pipe and fittings shall be examined before installing, and no pipe shall be installed which is found to be defective. All damage to the interior and exterior pipe coatings shall be repaired according to the manufacturer's recommendations and in a manner acceptable to the Engineer.

All ductile iron pipe shall be installed in accordance with requirements of AWWA Standard Specification C-600 except as otherwise specified herein. As soon as the excavation is completed to grade as indicated on the Drawings, the Contractor shall immediately place bedding material as specified in Section 1150 in the trench. The pipe shall be firmly bedded in AASHTO No. 57 stone to conform accurately to the line and grade indicated on the Drawings. Embedment of pipe shall conform to the Details. Bell holes shall be excavated so that after installation, only the pipe barrel shall bear upon the trench bottom. Proper selection and placement of bedding and backfill materials are necessary to minimize deflection of the pipe diameter. No blocking under the pipe will be permitted.

All pipe and fittings shall be sound and shall be clean before installation.

Pipe shall be laid to the true lines and grades shown on the Drawings with bedding and backfill as shown in Standard Detail No. 100 and as specified in Section 1150. Each section of pipe shall be laid to true alignment and grade as shown and specified on the Drawings. Pipe elevations and location shall be checked immediately upon setting the pipe in the trench, and the location and elevation of each pipe shall be adjusted to meet the true alignment and grade specified. If the pipe is not installed to the true lines and elevations, the Engineer shall decide on

appropriate corrective measures. Such corrective measures may require that the installed sewer be removed and re-installed correctly. The Engineer's decision shall be final and no additional payment or time shall be due the Contractor to comply with the Engineer's decision.

Under no circumstances shall the pipe be dropped into the trench.

Jointing Ductile-Iron Pipe

1. Push-on joints and restrained joints shall be made in strict accordance with the manufacturer's instructions. Pipe shall be laid with bell ends looking upstream. A rubber gasket shall be inserted in the groove of the bell end of the pipe, and the joint surfaces cleaned and lubricated. The plain end of the pipe is to be aligned with the bell of the pipe to which it is to be joined, and pushed home with a jack or by other means. After joining the pipe, a metal feeler shall be used to make certain the rubber gasket is correctly located.
2. Mechanical joints shall be in accordance with the "Notes on Method of Installation" under ANSI Specification A21.11 and the instructions of the manufacturer. To assemble the joints in the field, thoroughly clean the joint surfaces and rubber gasket with soapy water before tightening the bolts. All mechanical joint hardware shall be stainless steel. Bolts shall be tightened to the specified torques. Under no condition shall extension wrenches or pipe over the handles of ordinary ratchet wrenches be used to obtain greater leverage.

Before any joint is made, the pipe shall be checked to assure a close joint with the next adjoining pipe has been maintained, and the inverts are matched and conform to the required grade. The pipe shall not be driven down to grade by striking it.

When cutting pipe is required, the cutting shall be done by machine, leaving a smooth cut at right angles to the axis of the pipe. Cut ends of pipe to be used with a push-on bell shall be beveled to conform to the manufactured spigot end. Damaged interior and exterior coatings shall be fully repaired according to the manufacturer's recommendations and in a manner acceptable to the Engineer. At a minimum, the disturbed area shall be given one coat of 5 mils (dry) thickness of epoxy coating Tnemec Series 20 Pota-Pox (Polyamide) or equal.

When installation is not in progress, or the potential exists for dirt or debris to enter the pipe, the open ends of the pipe shall be closed with a plug or other approved means.

Refer to Section 1150 for additional requirements.

C. ACCEPTANCE TESTS

The following acceptance tests shall be performed to verify proper installation of the new ductile iron pipes.

1. All new main sewers installed from manhole to manhole shall be tested via low pressure air testing in accordance with ASTM C-828 and C-924 except that the maximum allowable pressure drop during the test shall be 0.5 psi as further defined herein. The tests shall be performed from manhole to manhole and include any service laterals connecting to the main sewer. To perform the test, plugs shall be installed at each manhole and at cleanouts installed at the edge of the property line and road or sewer right-of-way, and the isolated sewers shall be tested as a system. The Owner will provide the pressure gauges to use for the testing. The Owner/Engineer must witness all testing.

The air test pressure specified in ASTM C-828 shall be increased by 0.5 psi for every foot of ground water above the crown of the sewer pipe. If ground water levels cannot be determined in the field, the test pressures shall be increased by a minimum of 1 psi.

The air testing shall be performed by plugging all main sewers at the manholes and service laterals at the cleanouts. Add air to the isolated section of sewer until the internal pressure of the line is raised to approximately 4.0 psi (plus 0.5 psi for every foot of water above the sewer). After the pressure is reached, allow the pressure to stabilize. The pressure will normally drop as the air temperature stabilizes. This usually takes 2 to 5 minutes depending on the pipe size. The pressure may be reduced to 3.5 psi (plus 0.5 psi for every foot of water above the sewer) before starting the test.

When the pressure has stabilized and is at or above the starting test pressure of 3.5 psi (plus 0.5 psi for every foot of water above the sewer), start the test. If the pressure drops more than 0.5 psi during the test duration shown in Table 1 below, the line is presumed to have failed the test. If a 0.5 psi drop does not occur within the required test duration, the line has passed the air test. Table 1 is an excerpt from ASTM C-828 and C-924 and shall be included on the Contractor's test reports. The length of sewer for the test durations shall be the total length tested including service laterals. Refer to ASTM C-828 and C-924 for additional requirements.

TABLE 1. MINIMUM AIR TEST DURATION FOR VARIOUS PIPE DIAMETERS (ASTM C-828 AND C-924)	
NOMINAL PIPE SIZE (inches)	TIME (minutes per 100 feet of pipe tested)
4	0.3
6	0.7
8	1.2
10	1.5
12	1.8
15	2.1
18	2.4
21	3.0
24	3.6
27	4.2
30	4.8
33	5.4
36	6.0
39	6.6
42	7.3
48	8.0
54	8.7
60	9.4
66	10.1
72	10.8

EXAMPLE: Testing 8" main sewer 275 feet long with one 4" service lateral 25 feet long

$$\begin{aligned}
 \text{Test Time} &= 8" \text{ sewer} + 4" \text{ sewer} \\
 &= [1.2 \times (275 \text{ ft}/100)] + [0.3 \times (25 \text{ ft}/100)] \\
 &= 3.4 \text{ minutes}
 \end{aligned}$$

2. Service laterals connecting to manholes shall be tested via low pressure air testing in accordance with ASTM C-828 and C-924 as specified above. The test shall be performed by installing a plug in the lateral at the manhole and at the cleanout installed at the edge of the property line and road or sewer right-of-way. Contractor shall provide complete testing equipment, but Owner reserves the right to provide the pressure gauges to use for the testing. The Owner/Engineer must witness all testing.

3. All new main sewers and service laterals shall be inspected via closed circuit television (CCTV) inspection in accordance with Specification Section 1500 - Television Inspection.

D. REPAIRING NEW PIPE INSTALLATIONS Any defective pipe or unacceptable installations as determined from the acceptance testing and/or field inspections shall be repaired by the Contractor at no additional cost to the Owner. The repair method shall be acceptable to and approved by the Engineer/Owner. The Contractor shall submit all proposed repair procedures to the Engineer/Owner for review and approval prior to performing any repair work. At a minimum, mechanical joint couplings will be required to connect any short repair sections to the new sewers. No rubber sleeve style couplings will be acceptable.

END OF SECTION

TOWN OF THURMONT
STANDARD SPECIFICATIONS

SECTION 1250

POLYVINYL CHLORIDE (PVC) GRAVITY SEWER PIPE AND FITTINGS

I. GENERAL

A. DESCRIPTION

1. This section covers polyvinyl chloride (PVC) gravity sewer pipe for main sewers and service laterals. PVC pipe shall be furnished complete with all fittings, jointing materials, blocking, encasement and other necessary appurtenances. PVC pipe shall be acceptable for sewers up to 12 inches in diameter with depths of cover not less than 4 feet or more than 20 feet. In some instances, the Engineer/Owner may approve the use of C-900 PVC (as specified herein) at depths of cover less than 4 feet and more than 20 feet.

B. RELATED SECTIONS

1. Section 1150 - Excavation, Backfill and Compaction
2. Section 1200 - Ductile Iron Gravity Sewer Pipe and Fittings
3. Section 1300 - Cured-in-Place Pipe Lining (CIPP)
4. Section 1350-Precast Concrete Manholes
5. Section 1400- Manhole Rehabilitation
6. Section 027 60 - Maintenance of Sewer Flow
7. Section 1500 - Television Inspection
8. Section 1550 - Sewer Line Cleaning

C. SUBMITTALS

1. Shop Drawings and Product Data: Furnish completely dimensioned shop drawings, catalog cut or other data as required to provide a complete description of piping and piping specialties proposed to be used on the Contract work.

2. Certificates:

- a) Certified records or reports of results of shop tests, such records or reports to contain a sworn statement that shop tests have been made as specified, if required.

b) Manufacturer's sworn certification that pipe will be manufactured in accordance with specified reference standards for each pipe type.

3. Manufacturer's Installation Instructions - Indicate special procedures required to install products specified.

D. REFERENCE SPECIFICATIONS, CODES AND STANDARDS

1. American Society for Testing and Materials.

a) ASTM D 2321, Recommended Practice for Underground Installation of Flexible Thermoplastic Sewer Pipe.

b) ASTM D 2564, Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings.

c) ASTM D 3034, Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer pipe and Fittings.

d) ASTM D 3212, Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.

e) ASTM F 477, Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

f) ASTM F 789, Specification for Type PS-46 Poly (Vinyl Chloride) (PVC) Plastic Gravity Flow Sewer Pipe and Fittings.

g) ASTM F 794, Standard Specification for Poly (Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter.

2. American Water Works Association

a) AWWA C-900, "Polyvinyl Chloride (PVC) Pressure Pipe, 4-inch through 12-inch, for water. AWWA C-905, "Polyvinyl Chloride (PVC) Pressure Pipe, 14-inch through 30-inch, for water.

E. QUALITY ASSURANCE

1. Manufacturer's Qualifications: All PVC pipe and fittings shall be furnished by manufacturers who are fully experienced, reputable and qualified in the manufacture of the material to be furnished. The pipe and

fittings shall be designed, constructed and installed in accordance with the best practices and methods and shall comply with these Specifications.

The Contractor shall furnish in duplicate to the Engineer, prior to each shipment of pipe unless otherwise approved by the Engineer, manufacturer's certification and certified test report that the pipe was manufactured and tested in accordance with the ASTM and ANSI/AWWA Standards specified herein.

The manufacturer is responsible for the performance of all inspection requirements as specified in the ASTM and ANSI/ AWWA Standards. In addition, all pipe and fittings to be installed under this Contract may be inspected at the plant for compliance with these Specifications by an independent testing laboratory selected by and paid for by the Owner. Inspection of the pipe and fittings will also be made by the Engineer or representative of the Owner after delivery. The pipe shall be subject to rejection at any time on account of failure to meet any of the Specification requirements, even though sample pipes may have been accepted as satisfactory at the place of manufacture. Pipe rejected after delivery shall be marked for identification and shall be removed from the job.

All pipe and fittings shall be permanently marked with the following information:

- a) Manufacturer, date;
- b) Size, type, class or wall thickness;
- c) Standard produced to (ANSI/AWWA, etc).

II. PRODUCTS

A. MATERIALS

1. **PVC Pipe:** PVC pipe shall be solid wall pipe. PVC pipe may be any of the pipe types listed below. The pipe type shall be as specified by the Engineer on the Drawings or shall be the Contractor's option.

- a) PVC pipe with a Standard Dimension Ratio (SDR) of 35 meeting all requirements of ASTM D-3034, Cell Classification 12454-B. Fittings shall be in accordance with ASTM D-3034, F-679 and/or D-3212 as applicable with stiffness and wall thickness equal to or greater than the pipe.

- b) PVC pipe and fittings conforming to A WWA C-900, "Polyvinyl Chloride (PVC) Pressure Pipe, 4-inch through 12-inch, for Water". The pressure class shall meet the requirements of 150 psi (minimum) and shall comply with a SDR of 18 (minimum).
- c) PVC pipe and fittings conforming to A WWA C-905, "Polyvinyl Chloride (PVC) Pressure Pipe, 14-inch through 36-inch, for Water". The pressure class shall meet the requirements of 165 psi (minimum) and shall comply with a SDR of 25 (minimum).
- d) Schedule 40 or 80 PVC pipe (for 4" and 6" service lateral pipes only).

Pipe joining (except for solvent welded joints) shall be push-on elastomeric joints only. Joints shall be manufactured in accordance with ASTM D-3212. The pipe shall be furnished with integral bells with gaskets that are permanently installed at the factory. The pipe shall be furnished in nominal lengths of 13 feet. All fittings and accessories shall be furnished to one pipe supplier and shall have bell and/or spigot configurations compatible with the pipe. All fittings shall have the same or greater SDR and stiffness as the main pipe.

2. **Pipe Couplings:** Pipe couplings will be required whenever the Contractor is connecting new PVC service laterals to existing services. Pipe couplings shall only be allowed in these specific circumstances for PVC pipe. Couplings will not be allowed on new main sewers being installed from manhole to manhole or on new service laterals between the main sewer and cleanout. Pipe couplings shall be rubber sleeve couplings with stainless steel shear rings and compression bands as manufactured by Mission Products or approved equal. Refer to Detail No. 111 for additional requirements.

3. **Service Lateral Connections:** All service lateral connections being installed as part of the new main sewer construction shall be connected to the main sewer using a tee-wye connection. Saddles shall not be allowed. Where PVC lateral pipe is connected to DIP main sewer, transition gaskets (MJ x SDR 35) shall be used. Gaskets shall be as manufactured by Harrington Corporation or equal.

III. EXECUTION

A. PREPARATION

1. Pipe bedding shall be prepared in accordance with Specification Section 1150 and Detail No. 100.

B. INSTALLATION/APPLICATION

1. **Installing PVC Pipe and Fittings:** All pipe and fittings shall be examined before installing, and no pipe shall be installed which is found to be defective. All pipe and fittings shall be sound and shall be clean.

All PVC pipe shall be installed in accordance with the manufacturer's specifications and as specified herein. As soon as the excavation is completed to grade, as indicated on the Drawings, the Contractor shall immediately place bedding material as specified in Section 1150 in the trench. The pipe shall be firmly bedded in #57 stone to conform accurately to the line and grade indicated on the Drawings. Embedment of pipe shall conform to the Details and ASTM D-2321, "Recommended Practice for Underground Installation of Flexible Thermoplastic Sewer Pipe". Bell holes shall be excavated so that after installation, only the pipe barrel shall bear upon the trench bottom. Proper selection and placement of bedding and backfill materials are necessary to minimize deflection of the pipe diameter. No blocking under the pipe will be permitted.

Pipe shall be laid to the true lines and grades shown on the Drawings with bedding and backfill as shown in the Standard Detail No. 100 and as specified in Section 1150. Each section of pipe shall be laid to true alignment and grade as shown and specified on the Drawings. Pipe elevations and locations shall be checked immediately upon setting the pipe in the trench, and the location and elevation of each pipe shall be adjusted to meet the true alignment and grade specified. If the pipe is not installed to the true lines and elevations, the Engineer shall decide on appropriate corrective measures. Such corrective measures may require the installed be removed and re-installed correctly. The Engineer's decision shall be final and no additional payment or time shall be due the Contractor to comply with the Engineer's decision. No single piece of pipe shall be laid unless it is straight. If a piece of pipe is not straight, it shall be rejected and removed from the site.

Under no circumstances shall the pipe be dropped into the trench.

Push-on joints shall be made in strict accordance with the manufacturer's instructions. Pipe shall be laid with bell ends looking upstream. The interior of the pipe and the jointing seal shall be free from sand, dirt and trash before installing in the line. Extreme care must be taken to keep the bells of the pipe

free from dirt and rocks, so joints may be properly assembled without overstressing the bells. Each length of the pipe shall be shoved home against the pipe previously laid and held securely until enough backfill has been placed to hold the pipe in place. Joints shall not be "pulled" or "cramped". Before any joint is made, the pipe shall be checked to assure that a close joint with the next adjoining pipe has been maintained, and the inverts are matched and conform to the required grade. The pipe shall not be driven down to grade by striking it.

The Contractor shall cut PVC pipe with appropriate cutting equipment where necessary to cut and machine all PVC pipe in the field. A "full insertion mark" shall be provided on each field cut pipe end.

When installation is not in progress, or the potential exists for dirt or debris to enter the pipe, the open ends of the pipe shall be closed with a plug or other approved means.

Refer to Section 1150 for additional requirements.

C. FIELD QUALITY CONTROL

1. **Delivery, Storage and Handling:** Care shall be taken in loading, transporting and unloading to prevent injury to the pipe. Under no circumstances shall the pipe be dropped or skidded against each other. Slings, hooks or pipe tongs shall be padded and used in such a manner as to prevent damage. Materials, if stored, shall be kept safe from damage. The interior of all pipe, fittings and other appurtenances shall be kept free from dirt or foreign matter at all times. Pipe shall not be stacked higher than the limits recommended by its' manufacturer. The bottom tier shall be kept off the ground on timbers, rails or concrete. Pipe in tiers shall be alternated. At least two rows of 4-inch by 4-inch timbers shall be placed between tiers and chocks affixed to each end in order to prevent movement.

D. INSPECTION

1. **ACCEPTANCE TESTS:** All PVC sewers shall be air tested and inspected via closed circuit television.

The following acceptance tests shall be performed to verify proper installation of the new polyvinyl chloride (PVC) pipes:

- a) All new main sewers installed from manhole to manhole shall be tested via low pressure air testing in accordance with ASTM C-828

and C-924 except that the maximum allowable pressure drop during the test shall be 0.5 psi as further defined herein. The tests shall be performed from manhole to manhole and include any service laterals connecting to the main sewer. To perform the test, plugs shall be installed at each manhole and at cleanouts installed at the edge of the property line and road or sewer right-of-way, and the isolated sewers shall be tested as a system. The Owner will provide the pressure gauges to use for the testing. The Owner/Engineer must witness all testing.

The air test pressure specified in ASTM C-828 shall be increased by 0.5 psi for every foot of ground water above the crown of the sewer pipe. If ground water levels cannot be determined in the field, the test pressures shall be increased by a minimum of 1 psi.

The air testing shall be performed by plugging all main sewers at the manholes and service laterals at the cleanouts. Add air to the isolated section of sewer until the internal pressure of the line is raised to approximately 4.0 psi (plus 0.5 psi for every foot of water above the sewer). After the pressure is reached, allow the pressure to stabilize. The pressure will normally drop as the air temperature stabilizes. This usually takes 2 to 5 minutes depending on the pipe size. The pressure may be reduced to 3.5 psi (plus 0.5 psi for every foot of water above the sewer) before starting the test.

When the pressure has stabilized and is at or above the starting test pressure of 3.5 psi (plus 0.5 psi for every foot of water above the sewer), start the test. If the pressure drops more than 0.5 psi during the test duration shown in Table 1 below, the line is presumed to have failed the test. If a 0.5 psi drop does not occur within the required test duration, the line has passed the air test. Table 1 is an excerpt from ASTM C-828 and C-924 and shall be included on the Contractor's test reports. The length of sewer for the test durations shall be the total length tested including service laterals. Refer to ASTM C-828 and C-924 for additional requirements.

**TABLE 1. MINIMUM AIR TEST DURATION FOR VARIOUS PIPE DIAMETERS
(ASTM C-828 AND C-924)**

NOMINAL PIPE SIZE (inches)	TIME (minutes per 100 feet of pipe tested)
4	0.3
6	0.7
8	1.2
10	1.5
12	1.8
15	2.1
18	2.4
21	3.0
24	3.6
27	4.2
30	4.8
33	5.4
36	6.0
39	6.6
42	7.3
48	8.0
54	8.7
60	9.4
66	10.1
72	10.8

EXAMPLE: Testing 8" main sewer 275 feet long with one 4" service lateral 25 feet long

$$\begin{aligned}
 \text{Test Time} &= 8" \text{ sewer} + 4" \text{ sewer} \\
 &= [1.2 \times (275 \text{ ft}/100)] + [0.3 \times (25 \text{ ft}/100)] \\
 &= 3.4 \text{ minutes}
 \end{aligned}$$

b) Service laterals connecting to manholes shall be tested via low pressure air testing in accordance with ASTM C-828 and C-924 as specified above. The test shall be performed by installing a plug in the lateral at the manhole and at the cleanout installed at the edge of the property line and road or sewer right-of-way. Contractor shall provide complete testing equipment, but Owner reserves the right to provide the pressure gauges to use for the testing. The Owner/Engineer must witness all testing.

c) All new main sewers and service laterals shall be inspected via closed circuit television (CCTV) inspection in accordance with Specification Section 1500 -Television Inspection. In addition, all main PVC sewers (D-3034, C-900 or C-905 PVC pipe) may be tested for

deflection with a 5% mandrel at the Town's/Engineer's request at no additional cost. The Town will provide the mandrel for the test. The mandrel test shall not be performed until at least 30 days after the pipe has been backfilled. The Contractor shall pull the mandrel through each section of pipe from manhole to manhole. The mandrel must slide freely through the pipe with only a nominal hand force applied. No mechanical device shall be used in pulling the mandrel. Any pipe which refuses the mandrel shall be repaired in a manner approved by and/or required by the Engineer. The Engineer/Owner shall witness all tests. During the warranty period, the Town may elect to perform a follow-up mandrel pull at the Town's expense. The Contractor will be required to connect any deficiencies found during the warranty period testing.

E. REPAIRING NEW PIPE INSTALLATION

1. Any defective pipe or unacceptable installations as determined from the acceptance testing and/or field inspections shall be repaired by the Contractor at no additional cost to the Owner. The repair method shall be acceptable to and approved by the Engineer/Owner and shall be in compliance with Details shown on the Contract Drawings unless otherwise approved by the Town/Engineer. The Contractor shall submit all proposed repair procedures to the Engineer/Owner for review and approval prior to performing any repair work. The Contractor must obtain approval from Town/Engineer in writing before performing any repair work. At a minimum, mechanical joint fittings will be required to connect any short repair sections to the new sewers - no rubber sleeve style coupling will be acceptable.

END OF SECTION

TOWN OF THURMONT
STANDARD SPECIFICATIONS
SECTION 1300
CURED-IN-PLACE PIPE LINING (CIPP)

I. GENERAL

A. DESCRIPTION

1. Work Included:

a) The purpose of this work is to provide for the lining of a portion of the Town of Thurmont sanitary sewer system. The work covered by this Contract also includes connection of existing laterals to the new liner and all restoration work. The location of all work to be performed will be as detailed on the Contract Drawings. The acceptable method of lining shall be the cured-in-place lining method.

b) The Work included under this Contract consists of furnishing all equipment, supplies, labor, transportation, fuel and power; and performing all Work as required by the Contract, in strict accordance with the Specifications, which are made a part hereof. The Work shall be complete, and all work, materials and services not expressly called for in the Specifications which may be necessary for complete and proper services to carry out the Contract in good faith, shall be performed, furnished and installed by the Contractor at no additional cost to the Owner. Qualified, careful and experienced workers shall perform the Work in the best and most workmanlike manner. All Work must be performed without disrupting the operation of the sewer system.

2. Extent of Lining Work:

a) The Work includes the following items, which are to be performed in accordance with these Specifications

(1) Relining of the pipe sections from manhole to manhole - total length as shown on the plans and specifications (Bid Form).

(2) Reconnection of laterals to the relined sewer.

(3) All restoration work.

b) All Work must be performed without disrupting the operation of the sanitary sewer system or unnecessarily disrupting traffic through streets or highways. The Owner will have an inspector on-site during the Contractor's performance of the Work.

c) All Work must meet with the approval of the Engineer/Owner. The Contractor shall be completely responsible for restoring to original condition all areas where this equipment has caused damages of any type.

d) All Work must be done without disrupting the operation of the sanitary sewer system. Therefore, the Contractor shall be responsible for any necessary by passing of sewage flows during the course of this Work. Each Bidder should visit the project site to determine special problems or requirements and take such factors into account when preparing his Bid.

3. Cured in Place Pipe Installation:

a) The intent of the cured-in-place installation is to rehabilitate the sanitary sewer lines with flexible polyester felt tubes that are saturated with a thermosetting resin that is cured with hot water/steam or seamless spirally-wound fiberglass tubes saturated with resin that is cured with ultraviolet light. When cured and complete, the installed pipe should extend from one manhole to the next in a continuous, tight-fitting, watertight pipe-within-a-pipe.

b) If so desired by the Town, and at the expense of the Contractor, the Contractor shall furnish, prior to use of the materials, satisfactory evidence from an approved testing laboratory or approved source, the results of testing the proposed materials in conformance with these specifications. Any material failing to meet any of the requirements of this specification may be rejected.

c) All CIPP will be installed in one sewer segment (manhole to adjacent manhole) at a time. Contractor may request approval to line up to two segments at one time for specific lines. Engineer/Town will review and determine if this is acceptable on a case by case basis. All determinations by the Engineer/Town will be final.

B. RELATED SECTIONS

1. Section 1200 - Ductile Iron Gravity Sewer Pipe and Fittings
2. Section 1250-PVC Gravity Sewer Pipe and Fittings
3. Section 1350 -Precast Concrete Manholes
4. Section 1400 - Manhole Rehabilitation
5. Section 1450-Maintenance of Sewer Flow
6. Section 1500 - Television Inspection

C. SUBMITTALS

1. Shop Drawings and Product Data: Furnish completely dimensioned shop drawings, cuts or other data as required to provide a complete description of Products to be installed.
2. Certificates: Certified records or reports of results of shop tests, of which such records or reports are to contain a sworn statement that shop tests have been made as specified.
3. Written certification from the manufacturer that the Contractor has been trained by the manufacturer to handle/install, and apply their products. The Contractor shall submit complete shop drawings of CIPP to demonstrate compliance with these specifications, to show materials of construction (including resins, catalysts, etc.) and to detail installation procedures. Installation procedures shall include acceptable inversion heads and pressures, heating ("cooking") and cool-down procedures and temperatures, times for each stage of the process, and cure logs for the resin/resin system used. The Contractor shall provide this information without delay or claim to any confidentiality. Testing procedures and quality control procedures shall also be submitted. Certifications that the CIPP was manufactured in accordance with these specifications and the appropriate ASTM standards shall be submitted with each shipment. The certifications shall include a signed statement by the wet-out manager/supervisor that no fillers were added to the resin system during manufacture of the CIPP. In addition, wet-out forms documenting the wetout shall be submitted for each section of CIPP manufactured. The wet-out forms shall be submitted prior to requesting payment and shall be provided without delay or claim to any confidentiality.

The wet-out forms shall document the date and time of wet-out, the wet-out supervisor, the wet-out facility address, the location where the CIPP will be installed (by manhole numbers), the CIPP diameter, the length of wet-tube and dry-tube, the thickness of the CIPP, the roller gap setting for establishing the liner thickness, the felt manufacturer, the resin used (by product name and batch/shipment number) and quantity, the catalyst(s) used (by product name) and quantity, quality control samples taken and all else pertinent to the wet-out process.

D. REFERENCE SPECIFICATIONS, CODES AND STANDARDS

1. American Society for Testing and Materials (ASTM) The following American Society for Testing and Materials (ASTM) standards are referenced herein:

ASTM D790- Standard Test Method for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.

ASTM D2412- Standard Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading

ASTM F1216- Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin-Impregnated Tube

ASTM D-453- Standard Test Methods for Chemical Resistance of Plastics

ASTM D-638- Standard Test Methods for Tensile Properties of Plastic

ASTM F2019- Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Pulled in Place Installation of Glass Reinforced Plastic (GRP) Cured-in-Place Thermosetting Resin Pipe (CIPP). The ASTM F1417 testing should be replaced by APS Water Porosity testing.

ASTM D3567- Standard Practice for Determining Dimensions of "Fiberglass" (Glass-Fiber-Reinforced Thermosetting Resin) Pipe and Fittings

ASTM D2990- Standard Test Methods for Tensile, Compressive and Flexural Creep and Creep-Rupture of Plastics. The DIN EN 761

Plastic Piping Systems shall be used for Determination of Creep Factor Under Dry Conditions for Glass-Reinforced Thermosetting Plastic (GRP) Pipes

APS Water Porosity Standard

Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

E. QUALITY ASSURANCE

1. Installer's Qualifications:

The Contractor performing the CIPP lining work shall be fully qualified, experienced and equipped to complete this work expeditiously and in a satisfactory manner. The Contractor shall be certified and/or licensed by the manufacturer as an Installer of the type of CIPP proposed on this Project for a minimum of two years. The full-time on-site superintendent/foreman that will supervise the CIPP installation must be personally trained and certified/licensed by the manufacturer for installation of their product. A list of product installations by the Contractor and proposed superintendent including quantities installed, dates of installation and references (name, address and phone numbers) shall be submitted.

2. Design Criteria:

- a) The pipe lining shall be installed prior to manhole lining and both materials shall be compatible.
- b) The line shall be installed once open cut section replacement has been tested and accepted, if applicable to that pipe section.
- c) The lining system must be designed to withstand the structural loading of the ground and groundwater stresses, assuming a fully deteriorated gravity sewer pipe condition.
- d) The lining system must fit tight against the interior of the existing sewer pipe with no annular space allowed. The lined sewer must be capable of carrying at least 90% of the original sewer pipe capacity. Calculations of the carrying capacity of the line pipe shall be included in the shop submittals for the lining system.

e) Sealing Pipe in Manholes: If, due to broken or misaligned sewer pipe at the manhole, the installed pipe fails to make a tight seal, the Contractor shall apply a sealant at that point. The sealant shall be of a resin mixture compatible with that used in the inversion process. Also install an Insignia End Seal by LMK Technologies at each sewer main entry point to manhole. Reference Detail 120. In some cases, CIPP will need to be sealed to manholes that were lined under previous contracts. Contractor shall recommend and submit a sealant that is compatible with the CIPP and existing liner and application shall result in a watertight seal.

f) Service Connection: After curing (and after the pressure test specified below), the Contractor shall reinstate the existing live building sewer laterals. This shall generally be done without excavation, from the interior of the pipe by means of a television camera and cutting device that reinstates the building sewers to not less than 100% of their original capacity.

F. WARRANTY

The liner system shall be free from defects and/or infiltration resulting from product defects or installation workmanship. Contractor/Manufacturer shall provide a two-year guarantee that the liner will remain free of these defects and/or infiltration.

II. PRODUCTS

A. MATERIALS

1. Transport, handle and store materials and products specified herein in a manner recommended by the respective manufacturers of such to prevent damage and defects.
2. The liner shall be fabricated to be uniform in thickness and conform to the interior of existing pipes as shown on the Contract Drawings.
3. The liner shall consist of the minimum following ASTM properties:

Property	Minimum Values	Test Method
Tensile Strength	3,000 psi	ASTMD-638
Flexural Strength	4,500 psi	ASTM D-790 Mod

Modulus of Elasticity	250,000 psi	ASTM D-790 Mod
Chemical Resistance	Loss not to exceed the above values	ASTMD-453

4. The liner tube shall be homogenous across the entire wall thickness and shall not contain intermediate or encapsulated elastomeric layers. The tube shall not be made up of materials that may cause delamination in the cured-in-place process.

5. The wall color of the interior pipe surface after installation shall be a light reflective color, so that a clear detail examination with closed circuit television inspection equipment may be made.

6. The resin shall meet the requirements of ASTM F-1216.

7. Approved line systems are as follows:

- a) Premier-Pipe USA;
- b) Insituform Technologies, Inc., Memphis, Tennessee;
- c) In Liner USA, Houston, Texas,
- d) Blue Tek,
- e) Or approved equal cured-in-place pipe system.

The above products shall adhere to all requirements specified herein and shall be modified as necessary to meet these requirements.

8. Flexible Polyester Felt Tube Saturated with Thermosetting Resin

The liner shall be composed of tubing material consisting of one or more layers of a flexible non-woven polyester felt with or without other additives such as fiberglass or other reinforcing additives. The felt tubing shall be impregnated with a thermosetting isothalic polyester resin and catalyst or vinyl ester and catalyst. The liner material and resin shall be completely compatible. The inside and/or outside layer of the tube shall be coated with an impermeable material compatible with the resin and fabric. The liner shall cure in the presence of water at the required temperature for the resin system. Steam-cure shall not be allowed.

The felt material shall be manufactured by companies specializing in felt production for CIPP. The manufacturer shall have manufactured felt material for CIPP for at least 2 years as documented by references. The felt manufacturer, references and location of the manufacturing facility shall be

submitted to the Engineer for review and approval. The felt material manufacturer and facility shall not change throughout the duration of the Contract unless specifically approved by the Engineer in writing.

The polyester or vinyl ester resin shall be PREMIUM, NON-RECYCLED resin only. PET resins or those containing fillers, additives or enhancement agents shall not be used. The resin manufacturer shall not include any old resin or rework in the product shipped to the wet-out facility. The resin shall be manufactured under ISO 9002 certified procedures. Such certification shall be submitted to the Engineer for each shipment of resin to the wet-out facility. The proposed resin shall equal or exceed the published properties of Reichhold PolyLite 33420 resin (for isothalic polyester resin) or Reichhold Atlac 580-20 (for vinyl ester resin).

The exact makeup of the resin shall be submitted to the Engineer including chemical resistance information, cure logs and temperatures. Polyester resins shall have a minimum Heat Distortion Temperature of 212 degrees Fahrenheit per ASTM D648. Vinyl ester resins shall have a minimum Heat Distortion Temperature of 220 degrees Fahrenheit per ASTM D648.

The exact mixture ratio of resin and catalyst shall also be submitted. The catalyst system shall be identified by product name. The resin/catalyst ratio shall be approved by the resin manufacturer in writing. The catalyst system shall be made up of a primary catalyst and a secondary catalyst. The primary catalyst shall be Akzo Perkadox 16 or approved equal and shall be added at a maximum of 1 % of the resin volume by weight unless otherwise approved by the Engineer. The secondary catalyst shall be Akzo Trigonox or approved equal and shall be added at a maximum of 0.5% of the resin volume by weight unless otherwise approved by the Engineer. The resin/catalyst system shall be formulated so the CIPP will cure as specified below. Quick-cure or accelerated resin systems that cure in half the specified time or substantially quicker than the minimum 3 hours specified below will not be allowed. Quick-cure resin systems include those formulated by substantially increasing the amount of catalysts from that specified above. Resins, catalysts and resin/catalysts mixing ratios shall not be changed during this Contract unless specifically approved by the Engineer in writing.

The cure schedules for the CIPP shall be submitted to the Engineer for review. The curing process/schedules shall be approved by the resin manufacturer in writing. The cure schedules shall include specific information on stepping the temperature up to "cooking" temperatures, "cooking"

temperatures and durations, and cool-down procedures, all of which are to be approved in writing by the resin manufacturer. The CIPP shall cure in the presence of water only. The minimum cure/"cook" time shall be 3 hours at 180 degrees F. The cure time shall be increased as deemed necessary by the Contractor/resin manufacturer, including but not limited to, longer CIPP installations, active ground water infiltration into the existing sewers, pipe type, pipe location, etc.

The resin shall be shipped directly from the resin manufacturer's facility to the CIPP wet-out facility. The resin shall not be sent to any intermediate mixing facility. Copies of the shipment documents from the resin manufacturer shall be submitted to the Engineer showing dates of shipment, the originating location and the receiving location.

The resin shall be used to manufacture the CIPP as shipped. No fillers or additives shall be added at the wet-out facility except for the required catalyst as recommended by the resin manufacturer. The Contractor shall submit a Certificate of Authenticity from the resin manufacturer for each shipment to the wet-out facility (to include the date of manufacture and the Heat Distortion Temperature). This information shall be submitted prior to manufacturing any CIPP.

The Contractor shall identify the wet-out facility where all CIPP under this Contract will be manufactured. All CIPP shall be manufactured from this designated wet-out facility throughout the entire Contract unless specifically approved otherwise by the Engineer in writing. Multiple wet-out facilities shall not be allowed.

When cured, the CIPP shall form a continuous, tight-fitting, hard, impermeable liner which is chemically resistant to any chemicals normally found in domestic sewage. The liner shall be chemically resistant to trace amounts of gasoline and other oil products commonly found in municipal sewerage and soils adjacent to the sewer pipe to be lined.

The CIPP shall be fabricated to a size that will tightly fit the sewer being rehabilitated after being installed and cured. The line shall be capable of fitting into irregularly shaped pipe sections and through bends and dips within the pipeline. Allowance for longitudinal and circumferential expansion shall be taken into account when sizing and installing the liner. All dimensions shall be verified in the field by the Contractor prior to fabrication of the liner. Field measurements shall be used to ensure maximum closure between the new liner and the existing sewer pipe. There shall be no

leakage of groundwater between the existing pipe and the CIPP at the manhole connection or service lateral connections. Any leakage found shall be eliminated by the Contractor at no additional cost to the Owner.

The application of the resin to the felt tubing (wet-out) shall be conducted under factory conditions and the materials shall be fully protected against UV light, excessive heat and contamination at all times.

The length of the liner shall be the length deemed necessary by the Contractor to effectively carry out the insertion of the liner and sealing of the liner at the outlet and inlet manholes. The required length of liner shall be verified in the field by the Contractor prior to fabrication of the liner.

a) Liner Thickness: The Contractor shall submit liner thickness calculations to the Engineer for review. The CIPP shall be designed in accordance with the applicable provisions of ASTM F1216 and D2412 for "fully deteriorated gravity pipe conditions" and shall meet the following design conditions.

- (1) AASHTO H-20 Live Load with two trucks passing for CIPP in streets (16,000 lbs)
- (2) A soil modulus of elasticity of 1,000 psi, soil weight of 120 pounds per cubic foot and a coefficient of friction of $K_u=0.130r$.
- (3) Short-term flexural modulus of 250,000 psi and long-term flexural modulus of 125,000 psi. Flexural strength of 4,500 psi.
- (4) Safety factor of 2.0 shall be used.
- (5) Groundwater elevation at the ground surface.
- (6) Pipe ovality of 2%.
- (7) Poisson's ratio of 0.3.
- (8) Enhancement factor (K) of 7.
- (9) Service temperature range shall be 40-140 degrees F
- (10) Maximum long term deflection shall be 5 percent.

(11) The installed, cured thickness shall be the largest thickness as determined by calculations for deflection, bending, buckling and minimum stiffness.

The minimum installed, cured liner thickness shall be as follows, regardless of what the calculations indicate as the required minimum thickness.

- 8" sewer: 6 mm up to 17 feet deep
7.5 mm up to 25 feet deep
- 10" sewer 6 mm up to 11 feet deep
7.5 mm up to 18 feet deep
9 mm up to 25 feet deep
- 12" sewer 7.5 mm up to 12 feet deep
9 mm up to 18 feet deep
10.5 mm up to 25 feet deep

The installed thickness shall be measure as specified elsewhere herein. The Contractor shall submit his proposed plan for ensuring that the installed CIPP meets the above minimum thickness requirements. The plan shall include the proposed CIPP thickness to be installed (pre-installation thickness) and detailed inversion or pull-in procedures to reduce stretching and to reduce migration of resin.

9. Fiberglass Tube Saturated with Ultraviolet Light Curing Resin

The fiberglass tubing shall be seamless and spirally wound, including an inner-film and outer-film that protects and contains the resin used in the liner. The outer-film will also serve as an ultraviolet blocking material.

- a) The tube shall consist of a seamless, spirally wound fiberglass that is flexible and has strain values (expandable) of up to ten (10) percent. The tube will not have a longitudinal seam, including a stitched seam, stitch-free-weld or bond, or stitch-free overlap. The tube shall be constructed to withstand installation pressures and have sufficient strength to bridge missing pipe.
- b) The impregnated tube shall have a thickness that when compressed at installation pressures and cured will meet or exceed the design thickness in accordance with ASTM F2019.

c) The tube shall be sized such that when installed, it will tightly fit the internal circumference and length of the original pipe. Allowance for longitudinal and circumferential expansion shall be taken into account when sizing and installing the liner. All dimensions shall be verified in the field by the Contractor prior to fabrication of the liner. Field measurements shall be used to ensure maximum closure between the new liner and the existing sewer pipe. There shall be no leakage of groundwater between the existing pipe and the CIPP at the manhole connection or service lateral connections. Any leakage found shall be eliminated by the Contractor at no additional cost to the Owner.

d) The fiberglass tube shall be saturated with the appropriate resin using a resin bath to allow for the lowest possible amount of air entrapment. The liner will then be formed into a spirally wound shape for the purpose of being seamless in its cured state. An inner-film and outer-film material will be added that are both impervious to airborne styrene, with the outer-film also having UV blocking characteristics. The inner membrane will be removed after the installation and curing processes are completed.

e) The wall color of the interior pipe surface of CIPP after installation shall be a light reflective color so that a clear, detailed examination with closed circuit television (CCTV) inspection equipment can be made.

f) Fiberglass materials must be "direct sized" to enhance the fiberglass/resin bond. Certification of this coating and its compatibility with the resin system used is required.

g) The liner shall be chemically resistant to trace amounts of gasoline and other oil products commonly found in municipal sewerage and soils adjacent to the sewer pipe to be lined.

h) The liner shall be constructed to withstand installation pressures and have sufficient strength to bridge missing pipe.

10. Substitutions and Product Options: This Section includes specific product names that are approved for installation on this Contract. Other manufacturer's or vendor's products not named will be considered as substitutions or "or equal" products if a written request for such is made in accordance with the General Conditions. The requests shall include

complete data (including product literature, reference standards and third party performance and test data) substantiating compliance of the proposed substitution with the requirements stated in these Specifications. A list of product installations by the Contractor and proposed superintendent including quantities installed, dates of installation and references (name, address and phone numbers) shall be submitted. The Engineer's decision regarding evaluation and acceptance of substitutions shall be considered final and binding.

III. EXECUTION

A. PREPARATION

1. All sewer mains and lateral to be lined must first be cleaned using high-velocity cleaning equipment. The interior of the pipe must be free of grit, grease, roots, protruding joint gaskets, debris, etc., to provide a suitable surface for the lining system. The cleaning of the sewers to be lined shall be included in the cost of the work and no additional payment will be allowed.
2. The pipe to be lined must then be inspected by closed-circuit television inspection to assure it is suitable for lining.

B. INSPECTION

C. INSTALLATION/APPLICATION

1. Liner System

a) The pipe lining system must be a "no-dig" technology. The only excavation allowed will be to replace specific pieces of the pipe, which currently are broken or sagging, and reconstruct the laterals. No process, which requires an insertion pit or damage to the manholes, will be considered. Deformed pipe or fold and form pipe line systems will not be considered.

2. Bypass Pumping:

a) Bypass pumping of the wastewater in the sewer main to be lined shall be included in the bid and no additional payments will be allowed. See Specification Section 1450: MAINTENANCE OF SEWER FLOW.

3. Lining:

- a) The pipe liner shall be installed by an authorized installer in accordance with the manufacturer's installation instruction. The pipe shall be expanded and/or cured to fit tight inside the existing pipe with no annular space. Watertight seals shall be provided at the ends of the lining in each manhole and at lateral connections.
- b) The liner shall be cleanly and squarely cut inside the manhole, protruding no more than 2" inside the manhole wall, and no creating a ramp for solids and debris to collect to impede flow.
- c) Insignia End Seal by LMK Technologies at each sewer main entry point to manhole. Reference Detail 120.

4. Reinstating Laterals:

- a) Contractor is fully responsible at his own expense to repair to the satisfaction of the Owner/Engineer any overcutting of the liner or damage to the main or lateral that occurs during the reinstatement of the lateral.

D. FIELD QUALITY CONTROL

1. Testing:

- a) The liner shall be inspected and tested to the satisfaction of the Owner/Engineer.
- b) Air Testing: The Contractor shall test each section of sewer between manholes and all laterals (if any) to the limit of this contract using low pressure air. Testing shall not be performed until all backfilling has been completed. The Contractor may, at his option, test the section of sewer for his own purposes, prior to completion of backfilling; however, the requirements of this subsection shall not be deemed to be completed until the lines have been tested after the backfilling has been completed and trench settlement has been minimized. The costs of any testing incurred prior to authorization from the Engineer after backfilling has been completed shall be borne by the Contractor.
- c) A minimum of two minutes shall be provided at a pressure 0.5 psi above that calculated below to allow equilibrium of the air temperature with pipe wall, and then reduced to the calculated value before test readings shall commence. The rate of air loss shall be

determined by measuring the time interval required for the average internal pressure to decrease by 1.0 psig or 0.5 psig.

d) The initial test pressure to be developed in the sewer and laterals shall be determined as follows:

(1) The internal pressure in psi shall be calculated as the sum of 3.5 plus the maximum depth of groundwater over the pipe in feet, divided by 2.3 between the crown of the sewer at the lower end and the groundwater elevation at the section of sewer to be tested. (For example, if the water height (depth) is determined to be 9.2 feet, the added pressure would be 4.0 psig. The initial test pressure in the sewer would then be 7.5 psig. The allowable drop would be to 6.5 psig within the time indicated elsewhere in this subsection.) If the groundwater level is 2 feet or more above the top of the pipe at the upstream end, or if the pressure required is more than 9.0 psi gage, the groundwater should be lowered by dewatering before the air test method is used.

(2) In no case shall the test pressure in the sewers or laterals be greater than the maximum internal differential pressure recommended by the manufacturer of the pipe. Consult with pipe and related appurtenance manufacturers for maximum test pressure prior to testing. If maximum pressure is less than that calculated above, reduce groundwater by dewatering until calculated pressure does not exceed manufacturers' maximum.

(3) Provide bracing as needed to prevent blow-out of plugs or caps.

e) The pipe shall be considered acceptable if the air loss rate does not exceed 0.0015 cubic feet per minute per square foot of internal pipe surface when tested at the initial pressure previously defined in this subsection. The time for the air pressure to decrease 0.5 psig shall not be less than the time indicated below:

Time in Minutes: Seconds for the Pipe Test Section Length in Ft. (')

Pipe Diameter (in.)	100'	150'	200'	250'	300'	350'	400'	450'	500'
4	3:46	3:46	3:46	3:46	3:46	3:46	3:46	3:46	3:46
6	5:40	5:40	5:40	5:40	5:40	5:40	5:42	6:24	7:07
8	7:34	7:34	7:34	7:34	7:36	8:52	10:08	11:24	12:40
10	9:26	9:26	9:26	9:53	11:52	13:51	15:49	17:48	19:45
12	11:20	11:20	11:24	14:15	17:05	19:56	22:47	25:38	28:38
15	14:10	14:10	17:48	22:15	26:42	31:09	35:36	40:04	44:31
18	17:00	19:13	25:38	32:03	38:27	44:52	51:16	57:41	64:03
21	19:50	26:10	34:54	43:37	52:21	61:00	69:48	78:31	87:11
24	22:47	34:11	45:34	56:58	68:22	79:46	91:10	102:33	114:03
27	28:51	43:16	57:41	72:07	86:32	100:57	115:22	129:48	144:20
30	35:37	53:25	71:13	89:02	106:50	124:38	142:26	160:15	177:53
33	43:05	64:38	86:10	107:43	129:16	150:43	172:21	193:53	215:34
36	51:17	76:55	102:34	128:12	153:50	179:29	205:07	230:46	256:33

Note: When length of test section falls between the lengths shown in the table heading, use the specified time for the longer of the two lengths.

f) If the above time for pressure drop leakage is exceeded, the Contractor shall, at its expense, determine source of leakage and make all necessary corrections and retest.

g) The Contractor shall submit to the Engineer for approval the detailed test procedure and list of test equipment he proposes to use prior to testing.

2. Continuous with the liner being installed, a section of pipe shall be prepared under the same exact conditions as the liner inside the sewer. This section shall be cut apart from the permanent liner, after all final curing/installation is complete, without causing any damage to the permanent liner. It shall be sent to an independent third-party laboratory to be tested. A detailed report form shall be generated by the laboratory on their letterhead and shall include (as a minimum) the following:

- a) Sample description (where the sample was taken, date).
- b) Minimum wall thickness.
- c) Tensile Strength- ASTM D-638.

- d) Flexural Strength - ASTM D-790.
- e) Modules of Elasticity-ASTM D-790.

3. Acceptance: Observation of successful testing of manholes, sewers or force mains by the Engineer does not constitute acceptance of the system or any portion thereof. Upon completion of any determined portion of a total system and successful testing thereof, the Engineer may recommend final acceptance to the Owner. Only upon final inspection by the Owner or Engineer, and upon written acceptance for same, will the system or portion thereof be considered substantially completed. Upon such acceptance, the warranty period as specified for the manholes, sewers or force main will commence.

- a) If, during this final inspection, any irregularities are observed, the condition must be corrected at the Contractor's expense prior to acceptance. All repair methods shall be submitted to the Engineer for review and approval prior to repair work being performed.

END OF SECTION

TOWN OF THURMONT
STANDARD SPECIFICATIONS

SECTION 1350

PRECAST CONCRETE MANHOLES

I. GENERAL

A. DESCRIPTION

1. This section covers standard and drop sewer manholes. Refer to Detail No.101 for direction on when specific manhole types are required and for additional requirements. Manholes shall be constructed complete with covers, steps, fittings and other appurtenances specified herein and in accordance with Detail Nos. 102 through 107, 115, 116 and 117.
2. See Manhole Table at the end of Specification Section 1400 for additional information.

B. RELATED SECTIONS

1. Section 1150 - Excavation, Backfill & Compaction
2. Section 1400 - Manhole Rehabilitation
3. Section 1700- Concrete & Grouts

C. SUBMITTALS

1. Submit shop drawings of typical manufactured wall sections and bases proposed for this project, including joint design and related details for field assembly. Include Certification of Conformance with Contact Documents and the appropriate ASTM Specification.
2. Submit detailed shop drawings of each new manhole to be provided under the Contract. For doghouse manholes, Contractor shall verify all existing conditions and include these in submittal.
3. Submit shop drawings of typical cast iron frames and covers proposed for this project.
4. Anti-Flotation Design: Structure shall be designed by a registered professional engineer.

a) Design shall include anti-flotation collar to withstand flotation under full hydrostatic head with a 1.25 factor of safety for all manholes.

(1) 4-Foot Inner Diameter: Flotation collar shall be a minimum of 4-inches.

5. Make submittals prior to start of construction. Make submittals to Engineer.

6. The Contractor shall submit to the Engineer shop drawings showing details of construction for each manhole including: dimensions for each manhole and manhole section, step locations, reinforcing size, spacing and location, joint construction and details, invert channels and benching details, waterproofing, pipe connection details, concrete mix and design strength, wall thickness, H-20 wheel load confirmations, etc.

D. REFERENCE SPECIFICATIONS, CODES AND STANDARDS

ASTMA-536	Ductile Iron Castings
ASTM C-90	Hollow Load Bearing Concrete Masonry Units
ASTM C-144	Aggregate for Masonry Mortary
ASTM C-150	Portland Cement
ASTM C-207	Hydrated Lime for Masonry Purposes
ASTM C-478	Precast Reinforced Concrete Manhole Sections

E. QUALITY ASSURANCE

1. **Manufacturer's Qualifications:** All precast concrete manholes shall be furnished by manufacturers who are fully experienced, reputable and qualified in the manufacture of the material to be furnished. The manholes shall be designed, constructed and installed in accordance with the best practices and methods and shall comply with these Specifications.

The precast manufacturer shall have a recognized Quality Improvement Process installed at the manufacturing facility. Concrete compressive strength testing shall be performed in a laboratory inspected by the CCRL of the National Bureau of Standards or approved MDSHA laboratory. Testing shall be performed by the Grade I ACI Certified Laboratory Technicians or by Level I PCI Certified Technicians.

2. Precast reinforced concrete wall sections and bases for manholes shall be manufactured in a plant approved by the Engineer and the Maryland Department of Transportation (DOT) for manufacture of concrete pipe.
3. Aggregate used in producing concrete shall be from Maryland DOT-approved sources.
4. Completed manholes shall be watertight.

II. PRODUCTS

A. MATERIALS

1. **PRODUCT REQUIREMENTS:** All new manholes shall be precast concrete manholes except in special circumstances as approved by the Engineer. All precast concrete manholes shall conform to Detail Nos. 101 through 109, 115 through 117 and to ASTM C-478. The following minimum standards also apply.
 - a) Wall Thickness shall be 1/12 of the inside diameter with a minimum thickness of 5 inches.
 - b) Concrete shall be in accordance with ASTM C478, C890, C891 and C923. Compressive strength to be minimum 4,000 psi at 28 days. Air content to be a maximum of 4%. Air entraining admixtures shall be in accordance with ASTM C260. Chemical admixtures shall be in accordance with ASTM C494 and shall not contain any calcium chloride. Refer to Section 1700 for additional requirements.
 - c) Aggregate shall be sound, crushed, angular granite stone only, substantially in accordance with ASTM C-33, except that the requirement for gradation in that standard shall not apply. Smooth or rounded stone (river rock) shall not be acceptable.
 - d) Cement shall be Type II with a maximum tricalcium aluminate content of 8%. In lieu of Type II cement and granite aggregate, Type III cement with calcareous (limestone) aggregate may be used. The manhole manufacturer shall submit lab tests certifying the amount of Alkalinity (minimum 78%) present in the concrete mix. Cement shall be minimum 564 pounds per cubic yard.

- e) Steel reinforcement shall be in accordance with ASTM A615 Grade 60 deformed bar, ASTM A82 or ASTM A185 welded wire fabric (WWF).
- f) Base sections shall include the bottom slab and the first wall section to include the factory-formed pipe openings. The base sections shall be cast monolithically unless otherwise approved by the Engineer and shall be circular with uniform outside diameter. The thickness of the bottom slab shall be not less than that of the manhole riser sections or top slab or 6 inches, whichever is great.
- g) Riser sections shall be circular with uniform outside diameter. Riser sections/joints shall be limited to the maximum extent possible.
- h) Cone sections shall be eccentric with the inside face of one side vertical and flush with the inside face of the barrel section - same wall thickness as the base and riser sections.
- i) Joints between sections shall be tongue and groove joints manufactured in accordance with ASTM C-443. Joints may be sealed with rubber gaskets in accordance with ASTM C-443 or with two pieces of butyl rubber sealant conforming to Federal Specification SS-S-210A and AASHTO M-198, Type B. The cross-sectional area of the butyl rubber sealant shall be no less than the annular space times the height of the joint.
- j) Below grade exterior joints shall be sealed externally with minimum 6-inch-wide, 1/8-inch-thick butyl rubber sealant.
- k) All above grade exterior joints and all interior joints shall be sealed with an approved non-shrink grout.
- l) All markings required by ASTM C-478 shall be clearly stamped on the inside of each section. Manhole riser sections, flat top slabs and cone sections shall be designed for H-20 loadings per ASTM 890.
- m) Manhole benching and invert channels shall be precast by the manhole manufacturer. Formed and poured in place benches and inverts may be approved in certain situations by the Engineer and shall be used where specifically required such as for doghouse manhole. Precast inverts shall be constructed using minimum 4,000 psi concrete as specified for the manhole sections above. Poured-in-

place benching and invert channels shall be minimum 4,000 psi with fiber reinforcing. Full-pipe invert channels shall be provided for all manholes per Detail No. 115.

The Contractor shall be responsible for determining exact invert elevations and furnishing the information to the manhole manufacturer prior to the manufacture of the manhole and precast bench and invert. All benching and invert channels shall conform to Detail No. 115 and 117.

n) Lifting device shall be ASTM steel strand. Lifting loops made from deformed bars are not acceptable.

Lifting holes may be on the inside or outside faces of the walls to facilitate handling. The depth of the lifting holes shall not be deeper than the wall thickness minus 2 inches. Lifting holes that penetrate through the wall are not acceptable. Lifting holes shall be filled with non-shrink grout.

o) The manhole manufacturer shall furnish the Engineer with test results on compressive strength and absorption for one section in every fifteen sections poured, and certification from cement manufacturer and aggregate supplier certifying chemical content. The Engineer reserves the right to pick random samples for testing. The manufacturing facility shall be made available for the Engineer at all times for inspections.

p) Pipe Connections to Manholes: Pipes shall be connected to new manholes via flexible rubber boot connectors/seals. Where required and/or necessary and where approved by the Engineer, cored holes may be used. For cored holes, fill all voids with non-shrink grout and pour a concrete collar outside of the manhole per Detail No. 116. Refer to Detail No. 115 for bench and invert requirements. Pipe shall be pushed to the designed stop and no further.

Flexible rubber boot connectors shall conform to ASTM C-923 and shall be A-Lok or Contour Seal. Rubber boots shall be integrally cast into the base section or installed in cored openings with stainless steel compression bands. Openings around the rubber boot connectors shall be filled with non-shrink grout.

The locations of the pipe openings shall vary from the locations shown on the Drawings by no more than 1/2-inch vertically and 5 degrees horizontally. Pipe openings shall provide clearance for pipe projecting a minimum of 2 inches inside the manhole.

q) Manhole steps shall be copolymer polypropylene plastic and shall be in accordance with ASTM C-478 and current OSHA regulations. Steps shall be driven into tapered holes in precast manhole sections, not grouted into the walls. Testing requirements to be as specified in ASTM C-478 plus each step shall be tested to resist a 1,000 lb pullout. The manhole manufacturer shall furnish certification of each test with each shipment showing manhole location, date of test and results.

r) Manhole Frames and Covers: Manhole frames and covers shall be as specified and shown in Detail Nos. 104 through 107. Manhole covers on private sewer systems shall be the same as shown in the Details.

Alternate frames and covers for certain applications may be considered. Use of alternate frames and covers must be approved by the Engineer. Any change from the frames and covers specified in this Manual must be approved by the Engineer in writing prior to the beginning of construction.

This specification addresses the traffic rated frames and covers shown in Standard Details 104 and 105 only. Frames and covers shall be ASTM A48 Class 35 gray iron per Section 3.1 of AASHTO M306. Frames and covers shall be of uniform quality, free from sand holes, gas holes, shrinkage, cracks and other surface defects. Castings shall be ground smooth and well cleaned by shot blasting. Bearing surfaces shall be cast or machined with such precision to prevent rocking.

Frames and covers shall be rated for traffic loading and shall have first article proof load tests conducted in accordance with AASHTO M306, Section 7, Proof Load Testing. The results of these tests shall be made available to the Engineer upon request. The casting shall be tested on a suitable load testing machine and the casting shall hold a 40,000 pound load for one minute without experiencing any cracks or detrimental permanent deformation.

Each frame and cover shall be clearly marked to show, at a minimum, the name of the producing foundry, country of manufacture, ASTM material designation, individual part number and cast or heat date. Covers shall also be lettered per Standard Detail No. 104.

If corrosion protection of the manhole is specified, the frame and cover shall be protected from corrosion by sandblasting and coating the entire frame and cover at the factory with coal tar epoxy, Koppers 300M or equal, 2 coats at minimum 8-mil dry film thickness each. Any damage to the coating shall be repaired in the field in a manner approved by the Engineer. If the frame and cover are not coated at the factory, all field-applied coating must be applied to the Engineer's approval.

(1) Frames: Refer to Standard Detail No. 105. All frames shall be equipped to accept a cam-lock cover. Frames may be:

- (a) standard height or low profile for use with cone sections and flat top sections below grade or
- (b) slab-type for all above grade flat top sections.

Frames shall be as manufactured by East Jordan Iron Works or approved equal. See Standard Detail No. 105 for approved model numbers.

(2) Covers: Refer to Standard Detail No. 104. All covers shall have a neoprene O-ring or T-gasket permanently installed in a machined groove under the lid. Side or wiper gaskets are not approved.

Watertight covers shall have two 5/8" stainless steel pentagon head bolts and brass cam lock devices to engage the locking ramps on the frame and provide the watertight seal.

As the standard, the opening device on covers shall be two non-penetrating pickholes.

Covers are to have a nominal opening diameter of 24 inches. Larger openings/covers may be specified by the Engineer for specific installations and/or for large diameter sewers.

Covers may be solid or vented (two 1" holes in cover). Covers shall be as manufactured by East Jordan Iron Works or approved equal. See Standard Detail No. 104 for approved model numbers.

Alternate frames and covers to those specified and shown in Standard Detail Nos. 104 and 105 must be approved by the Engineer. A sample of the alternate frame and cover must be delivered to Engineer as part of the review and approval process.

s) Manhole Adjustment: Manholes shall be ordered such that minimum grade adjustments will be required to achieve the final rim elevation. The manhole base, riser and cone heights shall stack out the manhole as close as possible to the final rim elevation. The maximum allowable height adjustment shall be six inches unless approved otherwise. Adjustments may be made with concrete grade rings and/or a maximum of one course of brick, as specified below. The Contractor shall submit detailed shop drawings for each manhole showing all dimensions and elevations. The Contractor shall identify any required height adjustments on the shop drawings. Adjustments must be approved by the Engineer prior to manufacturing the manholes.

Bricks used for adjusting cover elevations shall meet the requirements of ASTM C32 Grade MS and shall have minimum dimensions of 2¼-inches by 3½-inches by 7 ½-inches. Brick shall be new, solid, sound, hard-burned throughout and uniform in size and quality. Bricks shall be set in a bed of non-shrink grout, minimum 1 inch thick. The outside of all bricks shall also be coated with minimum 1 inch thick non-shrink grout. The exterior grout shall overlap the cone section at least 6 inches and shall extend to above the frame flange to provide a complete exterior coating. Refer to Standard Detail No. 106.

Precast concrete grade rings for setting cast iron frames over manholes shall be circular, 2 inches thick minimum, and have on No. 2 continuous reinforcing steel bar and shall be manufactured in accordance with ASTM C478. Leveling rings shall be set in a bed of non-shrink grout, minimum 1 inch thick. The outside of all rings shall also be coated with minimum 1 inch thick non-shrink grout. The exterior grout shall overlap the cone section at least 6 inches and shall extend to above the frame flange to provide a complete exterior coating. Refer to Standard Detail No. 106.

t) Non-shrink grout shall be Quikrete Commercial Grade Non-Shrink Grout, Master Builders "Masterflow 713 Grout" or "Set-Grout",

Sauereisen Cements "F-100 Level Fill Grout", U.S. Grout "Five Star Grout" or approved equal.

u) Epoxy grout shall be a two-component, solvent free, moisture insensitive, high modulus, high strength, Type I and II, Grade 3, Class Band C, Epoxy Resin Adhesive meeting the requirements of ASTM C-881.

v) Manhole Pressure Restraints: Manholes with watertight covers are subject to internal water pressure which could unseat the tops. Therefore, the tops shall be anchored to the first barrel section (which must be at least 5 feet long) with three anchor bars spaced 120 degrees around the manholes unless otherwise approved by the Engineer. The anchor bars shall be 3/8-inch x 3-inch x 24 inches long stainless steel with a 7/8-inch hole 1-1/2 inches from each end. Each bar shall be anchored to the outside of the barrel and top slab with 3/8-inch x 6-inch long stainless steel adhesive anchor bolts. Refer to Standard Detail No. 107 for additional requirements.

w) Corrosion Protection: The Engineer will specify specific manholes to be protected against hydrogen sulfide corrosion. The manholes will be in high corrosion areas, where the potential for corrosion exists or is predicted for the future and at the discharge of force mains into the gravity sewer.

The corrosion protection shall be accomplished by spray coating the manhole walls and benches with epoxy. The material must be approved by the Engineer.

The specialized cementitious mortar product shall be High Performance by Strong Seal Systems, Aluminaliner by Quadex, Sewpercoat PG by LaFarge Calcium Aluminates, Permacast MS-10,000 with Conshield or CR-5000 by Action Products Marketing Corp. The mortar shall be spray-applied to a minimum thickness of 1-inch and troweled smooth after application. For this option, the invert channels and other exposed surfaces shall be coated with Koppers 300M coal tar epoxy or equal, 2 coats at 8 mil dry film thickness each.

As an alternate, the manhole walls, benches and inverts can be coated with a specialized spray-applied polyurethane coating (Spray Roq or equal). The Engineer will specify the required thickness.

III. EXECUTION

A. INSPECTION

1. The quality of all materials, the process of manufacture and the finished products shall be subject to inspection and approval by the Engineer. Such inspection may be made at the place of manufacture, or at the site after delivery, or at both places, and the products shall be subject to rejection at any time on account of failure to meet any of the Specification requirements, even though sample sections may have been accepted as satisfactory. Products rejected after delivery to the job shall be marked for identification and shall be removed from the job at once. All products which have been damaged after delivery will be rejected, and if already installed, shall be repaired or removed and replaced, as directed by the Engineer, and at no additional cost to the Owner.

At the time of inspection, the products will be carefully examined for compliance with the ASTM designation specified herein and these Specifications, and with the approved manufacturer's shop drawings. All projects shall be inspected for general appearance, dimension, honeycomb, blisters, cracks, roughness, soundness, etc. The surfaces shall be dense and close-textured.

Imperfections in the concrete may be repaired, subject to the approval of the Engineer, after demonstration by the manufacturer that strong and permanent repairs result. Repairs shall be carefully inspected before final approval. Cement mortar used for repairs shall have a minimum compressive strength of 4,000 psi at the end of seven days and 5,000 psi at the end of 28 days, when tested in 3-inch by 6-inch cylinders stored in the standard manner. Epoxy mortar may be utilized for repairs subject to the approval of the Engineer. Repair material must be approved by the Engineer. A minimum of three coats of mortar material shall be applied for all repair work.

The Contractor shall furnish in duplicate to the Engineer, prior to each shipment of manholes unless otherwise approved by the Engineer, manufacturer's certification and certified test reports that the manholes were manufactured and tested in accordance with the ASTM Standards specified herein.

All precast manholes shall be permanently marked with the following information:

- a) Manufacturer, date;

- b) Manhole diameter, manhole number, where appropriate;
- c) Standard produced to (ASTM, etc).

B. INSTALLATION/APPLICATION

1. **INSTALLING PRECAST MANHOLES:** Manholes and other precast structures shall be constructed to the dimensions as shown on the Drawings and as specified in these Specifications. Excavation, bedding and backfilling shall be as specified in Section 1150.

Manhole bases shall be placed on a foundation mat at least 12 inches of compacted No. 57 crushed stone (6 inches when placing bedding on solid rock that extends to a minimum of 2 feet beyond the outside diameter of the base). The surface of the bedding material shall be carefully graded and the base section accurately set so the connecting pipes will be on proper line and grade. The elevation of the bedding shall be adjusted as required until proper grade and alignment of the base section has been attained. Precast concrete bases and barrel sections shall be set so as to be vertical and with sections in alignment. No wedging or blocking under precast bases shall be allowed.

Precast bases shall have properly sized and oriented pipe openings. The connecting pipes shall be carefully adjusted to the proper line and grade, and the pipe bedding shall be compacted under the pipe completely for support during installation of the manhole. The joints of precast barrel sections shall be sealed with preformed flexible joint butyl sealant used in sufficient quantity to completely fill the joint cavity (minimum 2 pieces per joint as shown in the Details) or O-rings. The inside of each joint and the outside of above-grade joints shall be filled with a non-shrink grout resistant to hydrogen sulfide and finished flush with the adjoining surfaces. The outside of below grade joints shall be sealed with a 6-inch wide, 1/8-inch thick exterior butyl rubber seal strip as shown on the Details. Allow completed joints to set for 24 hours before backfilling, unless approved to be backfilled earlier by the Engineer. Backfilling shall be done in a careful manner, bringing the fill up evenly on all sides, as specified in Section 1150. The Contractor shall install the precast sections in a manner that will result in watertight joints.

Holes in the concrete required for handling or other purposes shall be plugged with a non-shrinking grout.

Where additional holes may be cut in the precast sections to accommodate pipes, cutting shall be done prior to setting them in place to prevent any

subsequent jarring which may weaken the joints. Any such cutting shall be performed with appropriate sized concrete coring machines. Epoxy mortar or non-shrink grout shall be used to form smooth openings where rubber connectors are used.

Manhole frames and covers shall be installed as specified and shown in Standard Detail Nos. 104 and 105. All frames shall be bolted to cones as shown unless otherwise approved by the Engineer/Owner.

Interior coatings for corrosion protection shall be installed where specified. All internal coatings shall be applied in strict accordance with the manufacturer's recommendations. The Contractor shall first clean each sewer manhole to be surfaced and shall dispose of any resulting material. The cleaning shall be performed using a high power jet wash at a minimum of 3500 psi water pressure to remove all dust, biological growths, grease, oil, paint or any other surface contaminants or coatings. Coatings that cannot be removed shall be sand-blasted to ensure adequate bonding of the coating. The walls and benches shall be coated monolithically to the required thickness by spray-on methods. Cementitious coatings shall be minimum 1" thick and shall be troweled smooth after application. If epoxy is installed, the coating shall be at least 80 mils thick. The invert channel and any other exposed surface not protected from corrosion shall be coated with Koppers 300M coal tar epoxy or approved equal, 2 coats, minimum 8 mil dry film thickness each.

Install stainless steel pressure restraints across manhole sections where specified and as shown in Detail Nos. 102, 103 and 107. Pressure restraints are required for all flat-top manholes with watertight covers unless otherwise approved by the Engineer.

It shall be the Contractor's responsibility to protect the structure against flotation regardless of elevation of the groundwater table, until structure excavation or backfill is completed.

Concrete benching and invert channels shall be installed and/or finished to meet the requirements shown in Detail No. 115.

When installation is not in progress, or the potential exists for dirt or debris to enter the manhole, the manhole shall be covered with wood or other protection. At no time shall surface water or ground water be allowed to enter manholes during construction.

C. FIELD QUALITY CONTROL

1. DELIVERY, STORAGE AND HANDLING: Care shall be taken in loading, transporting and unloading to prevent injury to the manholes. Under no circumstances shall the manholes be dropped. Hooks shall not be allowed to come in contact with the joints. Materials, if stored, shall be kept safe from damage. Precast concrete sections shall not be delivered to the job until representative concrete control cylinders have attained a strength of at least 80% of the specified minimum.

2. ACCEPTANCE TESTS: All manholes shall be tested via vacuum testing per ASTM C-1244, except that the minimum test times shall be as defined in the Table 1 (test times modified from those in ASTM C-1244). Vacuum testing shall not be performed until the manhole is completely finished, including applying any protective coating where specified. Manholes shall be thoroughly cleaned of all silt, debris and foreign matter of any kind prior to the vacuum testing and then again prior to final inspection as required.

The vacuum test unit shall be placed at the top of the manhole structure to include the frame/cone interface/seal in the test. A plate test unit will likely be required to perform the test. Bladder units can be used as long as the bladder does not cover the interface of the frame and the cone section.

Vacuum tests shall be performed by placing the testing unit at the top of the manhole in accordance with the manufacturer's recommendations. A vacuum of 10 inches of mercury shall be drawn on the manhole, the valve on the vacuum line of the test unit closed, and the vacuum pump shut off. The time shall be measured for the vacuum to drop to 9 inches of mercury. The manhole shall pass, if the time for the vacuum reading to drop from 10 inches of mercury to 9 inches of mercury meets or exceeds the test times indicated in Table 1 below. The test times in Table 1 are modified from those in ASTM C-1244. Table 1 shall be included on the Contractor's test reports. Refer to ASTM C- 1244 for further requirements.

Any leaks found during the vacuum testing shall be repaired by the Contractor in a manner approved by the Engineer. If a waterproofing compound is approved by the Engineer to repair leaks (such as Thoroseal or approved equal), a minimum of three (3) coats shall be applied in accordance with the manufacturer's recommendations and as approved by the Engineer/Owner. The manhole shall be vacuum tested again after such

repairs are made, until the manhole passes the vacuum test at no additional cost to the Owner.

TABLE 1: MINIMUM VACUUM TEST TIMES FOR VARIOUS MANHOLE DIAMETERS									
Manhole Depth (feet)	Manhole Diameter (inches)								
	36	42	48	54	60	66	72	84	96
	Test Time (seconds)								
8	60	60	60	60	60	60	66	72	78
10	60	60	60	60	66	72	82	98	114
12	60	60	60	70	78	86	98	118	138
14	60	60	70	82	92	102	114	136	158
16	60	68	80	92	104	116	134	160	188
18	64	76	90	104	118	130	146	178	208
20	70	84	100	116	130	144	162	194	226
22	78	92	110	128	144	158	178	212	246
24	84	102	120	140	156	174	194	232	270
26	92	110	130	150	170	188	210	250	290
28	98	118	140	162	182	202	226	270	314
30	106	126	150	174	196	216	242	288	334

Cementitious Coating for Corrosion Protection: Whenever a cementitious mortar coating is applied for corrosion control, samples shall be taken of the installed liner each day that cementitious lining is installed with at least one test for every five manholes coated that day. Samples shall be cube samples. At least six cubes shall be taken for each sample for testing. The samples shall be tested in accordance with the applicable ASTM standards to verify that the installed liner meets the compressive strength requirements specified herein and the lining manufacturer's published data on the product. Tests shall include 7 day and 28 day strength tests (3 tests/cubes for each time period for each sample). Shrinkage and bond strength tests shall be performed on each batch or lot of material shipped to the Contractor as directed by the Engineer. The tests shall be performed by an independent testing laboratory. All costs associated with the tests shall be paid for by the Contractor. The test results shall be submitted to the Engineer immediately when available, no later than 30 days after the coating is installed.

D. REPAIRS TO NEW PRECAST CONCRETE MANHOLES

There shall be no groundwater infiltration or other leakage (active or evidence of being previously active) through the manhole walls, benches,

inverts or pipe connections at the manholes. If leakage is found, it shall be eliminated with an appropriate non-shrink cement mortar, grout or sealant as recommended by the manufacturer and approved by the Engineer at no additional cost to the Owner. Injection grouting (Avanti-AV-202 Multigrout or approved equal) may be required to stop leaks around the pipe connections or in the invert channel or benches. Grout material must be submitted to and approved by the Engineer. If a waterproofing compound is approved by the Engineer to repair leaks (such as Thoroseal or approved equal), a minimum of three (3) coats shall be applied in accordance with the manufacturer's recommendations. The Engineer's decision on how defective manholes are repaired shall be final. If any defective manholes are discovered after they have been installed or during the warranty period, they shall be repaired or replaced in a satisfactory manner at no additional cost to the Owner. Repaired manholes, including those repaired during the warranty period, shall be vacuum tested again at no additional cost to the Owner.

END OF SECTION

TOWN OF THURMONT
STANDARD SPECIFICATIONS
SECTION 1400
MANHOLE REHABILITATION

I. GENERAL

A. DESCRIPTION This specification includes all work, materials and equipment required for the structural or corrosion rehabilitation of wastewater structures utilizing epoxy based resin technology. The purpose is to eliminate infiltration, repair voids, restore structural integrity and provide corrosion protection by the application of a spray applied monolithic manhole liner to the wall, bench and invert surfaces of brick/concrete structures or structures produced with any other masonry construction material. The Table provided at the end of this Section provides additional detail on Project Manhole Requirements.

B. RELATED SECTIONS

1. Section 1100 - Maintenance of Traffic
2. Section 1300- Cured-In-Place Pipe Lining (CIPP)
3. Section 1450 - Maintenance of Sewer Flow
4. Section 1500 -Television Inspection
5. Section 1550 - Sewer Line Cleaning

C. SUBMITTALS

1. Shop drawings for all proposed materials.
2. Certification documentation of Installer Qualifications.
3. Third party verification of product physical requirements.
4. Installation instructions from the Manufacturer.
5. Recommendations on methods to rehabilitate or seal to manholes previously lined.
6. Copy of all structural lining design calculations. The calculation shall include a calculated weight of product to be applied to achieve the required mil thickness.

7. Contractor shall submit a copy of the Draft Field Log that provides sufficient information to verify that required application rates were met or exceeded during installation. The Log will be submitted, reviewed and approved prior to any payment being approved for these manholes.

8. Detailed Schedule.

9. Bypass Pumping Plan to isolate each manhole.

10. Traffic Control Plan around each specific manhole.

D. REFERENCE SPECIFICATIONS, CODES AND STANDARDS

1. ASTMD638: Test Method for Tensile Properties of Plastics.

2. ASTMD790: Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics.

3. ASTMD695: Test Methods for Compressive Properties for Plastics.

4. ASTMD4060: Test Methods for Abrasion.

5. ASTMD2240: Test Method for Hardness, Shore D.

6. ASTMD4541: Adhesion to Concrete.

7. ASTMD2990: Test Methods for Tensile, Compressive and Flexural Creep and Creep Rupture in Plastics.

8. ASTMD543: Resistance of Plastics to Chemical Reagents.

9. ASTM C109: Compressive Strength of Hydraulic Cement Mortars.

10. ASTM C307: Tensile Strength of Hydraulic Cement Mortars.

E. QUALITY ASSURANCE

1. Manufacturer's Qualifications

a) Furnish materials of quality required by the American Society for Testing and Materials (ASTM) standards or other approved standards and specifications.

b) Provide guarantee against defective materials and workmanship in accordance with the requirements of these specifications. The manufacturer shall provide written certification that the Applicator has been trained and certified by the manufacturer to handle and apply their products, as well as appropriate re-certification documentation, as necessary, by the manufacturer.

2. Installer's Qualifications

a) Applicator shall initiate and enforce quality control procedures consistent with applicable ASTM, NACE and SSPC standards and the manufacturer's recommendation.

b) Materials are to be kept dry, protected from weather and stored under cover.

c) Resin materials are not to be stored below 50 degrees F. Care should be taken to not store near open flame, heat or strong oxidants.

d) Resin materials are to be handled according to their material safety data sheets.

e) Applicator shall conform to all local, state and federal regulations including those set forth by OSHA, RCRA and the EPA and any other applicable authorities. Traffic control, confined space entry, and work site protection shall be the responsibility of the Contractor and incidental to the project. The Contractor must make any necessary notifications to appropriate agencies regarding any road closures or major disruption to traffic flow. Any access to work areas shall be the Contractor's responsibility. Should any fencing, guiderail or other appurtenances need temporarily dismantled, Contractor shall immediately replace these items upon completion of work in the applicable area.

f) The containment of sewage and site cleanliness is the responsibility of the Contractor. Fines levied by State and Federal agencies in the event of a spill or unapproved discharge shall be paid by the Contractor. Spill cleanup as well as site cleanup shall be conducted by and paid for by the Contractor. All cleanup and costs are part of acceptance of the project, without which, final payment will not be made.

3. Grouting mix:

a) A polyurethane grout shall be used for stopping very active infiltration, filling voids and shall be mixed /applied according to manufacturer's recommendations.

b) Approved Manufacturers/Products

- (1) Deneef Hydroactive Cut
- (2) Sealguard II
- (3) Approved Equal

4. Resin Based Liner:

a) The resin based material shall be used to form the sprayed structurally enhanced monolithic liner covering all interior surfaces of the structure, including benches and inverts of manholes.

b) The finished liner shall be:

- (1) SprayWall®, as manufactured by Sprayroq, Inc., or
- (2) Approved Equal must conform to the minimum physical requirements listed below. The physical requirements must be verified by an independent, certified, third party testing laboratory.

The following are minimum physical requirements:

<u>Parameter</u>	<u>Design Requirement</u>
Compressive strength	ASTM D 695 > 7,500 psi
Tensile strength	ASTM D 638 > 7,200 psi
Flexural strength	ASTM D 790 > 12,000 psi
Bond	Shall exceed tensile strength of substrate
Flexural modulus (initial)	ASTM D 790 > 600,000 psi
Long Term Flexural Modulus	ASTM D2990 > 500,000 psi
Density	87 ± pcf

Tensile Modulus

ASTM 638 > 400,000 psi

The finished structure shall be corrosion resistant to: Hydrogen Sulfide; 20% Sulfuric Acid; 17% Nitric Acid; 5% Sodium Hydroxide as well as other common ingredients of the sanitary sewage environment.

(3) For manholes designated to receive structural manhole lining, the required thickness of the lining shall be calculated in accordance with the design methodology in ASTM F1216 using the following design conditions:

(a) Fully deteriorated gravity pipe condition.

(b) Groundwater elevation is one half the height of the manhole.

(c) Safety factor= 2.0. The minimum coating thickness for structural rehabilitation shall be 250 mil. The initial flexural modulus of elasticity (short term) of the submitted resin material will be utilized with the long term 1m deformation percentage as determined by ASTM D2990 (see below). The value of the long term flexural modulus of the proposed product will be certified by an independent, certified, third party testing lab, independent of the Manufacturer and submitted with the bid package. The definition of long term value will be identified as initial flexural modulus of elasticity less the reduction in value caused by Creep over a fifty (50) year minimum period and verified by third party testing (ASTM D2990).] All design submittals will include this certified third party testing (ASTM D2990) value in their respective design calculations.

(d) When groundwater loading is not an issue and only a corrosion barrier is required, the rehabilitation lining shall be installed to the thickness necessary to qualify as a monolithic (void free) liner. The roughness of the substrate will dictate the thickness needed to create the monolithic liner and eliminate any opportunity for voids in the lining. The minimum value for coating

thickness for corrosion protection for non-structural rehabilitation shall be 150 mils.

III. EXECUTION

A. PREPARATION

1. All pipe work between two manholes must be completed before those manholes are rehabilitated.
2. All required interruptions of flow through manholes, wet wells, pump stations or any other portion of the sanitary sewer system shall be coordinated with and approved by the Owner or Engineer before work can commence. This will be accomplished by submitting a complete bypassing flow plan to the Owner/Engineer before said work commences in accordance with Section 1450 - Maintenance of Sewer Flow.
3. Place screens over all pipe openings to prevent extraneous material from entering the sewer system.
4. All foreign material shall be removed from the structures' wall and bench/floor using a pressure water spray (minimum 3000 psi). The use of acid for cleaning purposes, no matter how dilute, will not be allowed. Loose or protruding brick, mortar and concrete shall be removed by using a mason's hammer and chisel. Fill any large voids with quick setting patch mix as described in Section II (A.1). The surface to be repaired must be clean and free of any loose materials.
5. Minor leaks shall be stopped using the quick-setting specially formulated infiltration control mix (Section II (A.2)) and shall be mixed and applied per manufacturer's recommendations. When severe infiltration is present, drilling may be required in order to pressure grout outside the structure using either a cementitious or chemical grout (Section II (A.3)). Manufacturer's recommendations shall be followed when pressure grouting is required.
6. Tape off all manhole steps with masking tape to prevent them from getting sprayed. Remove all masking tape from manholes after spraying is complete.

B. INSPECTION Evaluation of Atmosphere: Prior to entering structures, an evaluation of the atmosphere will be conducted to determine the presence of toxic, flammable vapors or possible lack of oxygen. The evaluation shall be in accordance

with local, state or federal safety regulations. Appropriate confined space procedures and equipment will be used while accessing the structure.

C. INSTALLATION/ APPLICATION

1. Application Temperatures: No application of liner shall be made unless the ambient temperature inside the structure is 50° For higher or as recommended in writing from the manufacturer.

2. Bench/Invert Rehabilitation:

a) The manhole bench and invert shall always be rehabilitated. The Contractor needs to insure that a monolithic system is achieved. Before rehabilitation, and after proper cleaning, the substrate must be dried. This is to insure maximum adhesion of the lining to the substrate. This drying is accomplished by the use of a heated, forced air blower. The drying shall be to the specification dictated by the resin manufacturer and its trained applicator.

b) After blocking or bypassing the flow through the structure and thorough cleaning/preparatory work has been achieved, the sprayed liner shall be applied to the invert, bench and wall areas with the same monolithic material and in the same manner as specified for the liner application below. The spray shall be applied such that the entire structure receives a structurally enhanced monolithic liner. The invert, bench and floor liner thickness shall be the same as that required at the bottom of the structure walls. If an additional application is required to meet structural rehabilitation levels, the initial application must be allowed to fully cure before applying the second coat. This is to protect the repair profile from exhibiting any effects of sagging or sloughing from overly applied material. The bypass pumping shall remain in service as to allow for a stable environment for the first application to cure properly.

c) The finished wall surfaces and invert surfaces shall be smooth, free of ridges wrinkles and sags. Special care shall be used to insure a smooth transition between the new manhole invert and intersecting pipeline inverts such that flow will not be impaired. Should any of the above conditions occur, liner shall be repaired according to manufacturer's standards or liner shall be rejected and removed at Contractor's expense.

d) The flow through the structure shall be re-established as soon as practical, following the liner manufacturer's recommendation for appropriate curing.

3. Liner Application: The resin based liner shall be manually sprayed onto all surfaces by a trained crew who are experienced in the application of spray applied rehabilitation systems and has been certified by the manufacturer. Appropriate personal protection equipment shall be utilized, but in every case when applying the rehabilitation system, the personnel in direct contact with the spray atmosphere will always be protected as recommended by the manufacturer.

4. Curing: Active flow may be re-established within the rehabilitated structure immediately following the proper curing time as outlined by the manufacturer. However, before performing a holiday test on the structure, a minimum curing time is needed to allow all rehabilitated surfaces within the interior of the structure to return to ambient temperature. In extremely cool weather, the structure shall be protected while curing is in process to maintain temperatures within the range specified in section C paragraph 1 above.

D. FIELD QUALITY CONTROL

1. The following test/inspection will be performed by the Owner or the Owner's Agent:

a) Visually verify the absence of leaks from infiltration or inflow.

2. The following test shall be performed by the Contractor on each rehabilitated manhole. The cost for this testing shall be included in the vertical foot (VF) unit price for the manhole lining. Holiday Detection Test ASTM 062-87: A high voltage holiday detection system may be used to determine if any holidays (voids) exist in the lining. Follow the guidelines of the holiday manufacturer for correct control settings. One such source is the Tinker & Rasor Holiday Tester Model APW. Should a holiday be detected, it shall be marked and the lining installation contractor will repair the void according to the correct procedure determined by the system manufacturer.

E. MANHOLE REQUIREMENTS TABLE

1. For this project, new manhole installation and existing manhole rehabilitation shall be conducted as specified in the attached Table and as shown on the Contract Drawings.

END OF SECTION

TABLE ATTACHMENT

TOWN OF THURMONT
STANDARD SPECIFICATIONS

SECTION 1450

MAINTENANCE OF SEWER FLOW

I. GENERAL

A. DESCRIPTION

1. This specification includes by-pass pumping for sewer flow control to allow sewer line and manhole improvements to be made without any disruption in service to system users.
2. When the sewer line depth of flow at the upstream manhole of the manhole section being worked on is above the maximum allowable for television inspection, joint testing and/or sealing, the flow shall be reduced to the level shown below by operation of pump stations, plugging or blocking of the flow or by pumping and bypassing of the flow as specified.

B. RELATED SECTIONS

1. Section 1200 - Ductile Iron Gravity Sewer Pipe and Fittings
2. Section 1250 - PVC Gravity Sewer Pipe and Fittings
3. Section 1300 - Cured-in-Place Pipe Lining (CIPP)
4. Section 1350-Precast Concrete Manholes
5. Section 1400-Manhole Rehabilitation
6. Section 1500 - Television Inspection
7. Section 1550 - Sewer Line Cleaning

C. SUBMITTALS

1. Provide product data describing conformance to ASTM and ANSI Codes of the bypass pipe material.
2. Sanitary Sewer Flow Control Plan

- a) The Contractor shall submit to the Engineer plans and descriptions pertaining to the bypass pumping provisions to be taken by the Contractor regarding the handling of peak flows. No construction shall begin until all submittals have been reviewed by the Engineer and are determined to be complete.
- b) The plan shall include, but not be limited to, details of the following:
- (1) Sewer plugging plan, including type, location and manufacturer of plugs and emergency release procedures.
 - (2) Locations and number of pumps.
 - (3) Compliance with permits required by the Owner.
 - (4) Staging areas for pumps. Sewer plugging method and types of plugs.
 - (5) Number, size, material, location and method of installation of suction piping.
 - (6) Number, size, material, method of installation and location of installation or discharge piping.
 - (7) Bypass pump sizes, capacity, number of each size to be on site and power requirements. An installed back-up pump capable of handling peak expected flow must be included.
 - (8) Calculations of static lift, friction losses and flow velocity (pump curves showing pump operating range shall be submitted).
 - (9) Downstream discharge plan.
 - (10) Method of protecting discharge manholes or structures from erosion and damage.
 - (11) Thrust and restraint block sizes and locations, if necessary.
 - (12) Sections showing suction and discharge pipe depth, embedment, select special backfill, if necessary.

(13) Method of noise control for each pump and/or generator for overnight operation.

(14) Any temporary pipe supports and anchoring requirements.

(15) Design plans and computation for access to bypass pumping locations indicated on the drawings.

(16) Calculations for selection of bypass pumping pipe size.

c) The Engineer's and Owner's receipt of flow bypass plan does not relieve Contractor from responsibility for means, methods and sequences of construction, requirement to pump peak flows and for safety.

D. PROJECT RECORDS

1. The Contractor shall maintain records which indicate the following:

a) Dates and times of any flow loss from the bypass pumping system.

b) Dates and times of any backups of flow into private property and contractor action with corrective actions taken.

c) Date of any public complaints with corrective actions taken.

E. REGULATORY REQUIREMENTS

1. Conform to regulatory agencies having jurisdiction over the work.

F. FIELD MEASUREMENTS

1. Prior to start of construction, verify by field measurements that existing conditions are as shown on Drawings. Notify Engineer of differences.

G. COORDINATION

1. Coordinate field work under provisions of Section 01039, including maintenance of traffic, access to private driveways, sidewalks and emergency 911 services.

2. Coordinate work with local utility companies (private and municipal) for location of existing utilities and protection thereof.
3. Coordinate flow bypassing with Owner/Engineer.
 - a) The Contractor shall time the installation of the work around climatological conditions that ensure bypass pumping capacity or the capability of returning the sewer to service upon elevated flow conditions.
 - b) The Contractor shall coordinate all pumping setups with the Owner/Engineer.

H. SCHEDULING

1. Contractor shall have an approved Sanitary Sewer Flow Control Plan for the bypass pumping station one week prior to beginning mobilization on any sections requiring bypass pumping.
2. Contractor shall be responsible for the installation, operations and removal of all flow bypass facilities and surface restoration.

I. OVERNIGHT OPERATION

1. If overnight bypass pumping is necessary, the pumps must be silent pack type and reduce the noise to at least 70 dBa at 30 feet from pump.
2. The system shall be tended by a qualified representative of the Contractor on a 24/7 basis.

II. PRODUCTS

A. MATERIALS

1. High Density Black Polyethylene Pipe - ANSI/ ASTM D 1248 butt heat fusion type joint fittings shall conform to ASTM D2657 and D3261.
2. Lay-flat bypass hose with associated joint fittings.
3. Quick-connect galvanized steel pipe.

B. EQUIPMENT

1. All bypass pumping systems shall be designed to pump a minimum of 1.0 MGD flowrate.
2. All pw11ps used shall be fully automatic self-priming units that do not require the use of foot valves or vacuum pumps in the priming system. The pumps may be gas, electric or diesel powered, but at least one of peak capacity shall be gas or diesel. All pumps must be constructed to allow dry running for long periods.
3. The Contractor shall provide the necessary stop/start controls for each pump.
4. Sewer plugs shall be capable of accommodating the maximum allowable surcharge heads that may be experienced during the construction of this project. The plugs shall also be tied off and readily removed from the system during emergency shutdown of the system.

III. EXECUTION

A. DESIGN REQUIREMENTS

1. Maintenance of Flow
 - a) The Contractor shall pump or divert flows that occur during the installation of the work, or provide prompt removal of plugs on the sewer to allow gravity operation as may be required to prevent surcharging of adjacent sewers.
 - b) The design of the bypass pW11ping system must allow for prompt dewatering of the system during periods of non-use or if leakage occurs.
 - c) The sewer system shall be returned to gravity flow during periods when not necessary for the installation or work.
2. Siting of Facilities
 - a) Contractor shall maintain traffic flow on public streets and in accordance with the MDSHA. In all instances, traffic flow must be maintained to all businesses.
 - b) Ramps may be installed to permit access to private driveways. Ramp slopes shall be appropriate for property owners' vehicles.

B. PERFORMANCE REQUIREMENTS

1. Before placing the system in operation, it shall be tested fully.
2. The bypass pump pipe shall be rated for at least twice the operating pressure.
3. It is essential to the operation of the existing sewerage system that there be no interruption in the flow of sewage throughout the duration of the project. The Contractor shall provide, maintain, and operate all temporary facilities such as dams, plugs, pumping equipment, conduits, all necessary power and all other labor and equipment necessary to intercept the sewage flow, before it reaches the point where it would interfere with work; carry it past this work; and return it to the existing sewer system downstream of work.
4. The bypass system shall meet the requirements of all codes and regulatory agencies having jurisdiction.
5. The Contractor will not be permitted to stop or impede the sewer flow under any circumstances without having the bypass pumping system fully operational.
6. The Contractor shall maintain sewer flow around the work area in a manner that will not cause surcharge or damage to tributary sewers and that will protect public and private property from damage.
7. **Plugging or Blocking:** A sewer line plug shall be inserted into the line upstream of the section being worked. The plug shall be so designed that all or any portion of the sewage can be released. During TV inspection, testing and sealing operations, flow shall be reduced to within the limits specified below. After the work has been completed, flow shall be restored to normal.
8. **Plumbing and Bypassing:** When pumping and bypassing is required, the Contractor shall supply the pumps, conduits and other equipment to divert the flow of sewage around the manhole section in which work is to be performed. The bypass system shall be of sufficient capacity to handle existing flow plus additional flow that may occur as a result of precipitation. The Contractor will be responsible for furnishing the necessary labor and supervision to set up and operate the pumping and bypassing system. If pumping is required on a 24-hour basis, engines shall be equipped in a manner to keep noise to a minimum. The normal hours of operation shall be

7:00 a.m. to 5:00 p.m., unless approval is given by the Town/Engineer to modify this schedule or unless restricted by MDSHA or other authority.

C. FIELD QUALITY CONTROL AND MAINTENANCE

1. Routine Inspection and Maintenance

a) The Contractor shall inspect all operable bypass pumping systems every two hours or more frequently to ensure their proper operation. Flow bypass pumping operations shall be manned by a qualified contractor representative familiar with pump operation and emergency procedures.

b) The Contractor shall insure the bypass pumping system is properly maintained.

2. Extra Materials

a) Spare parts for pumps and piping shall be kept on site.

3. In the event the sewage drains into the storm drainage system, private property or street, the Contractor shall immediately stop the overflow, notify the Inspector, and take the necessary action to clean up and disinfect the spillage to the satisfaction of the Engineer/Owner. If sewage is spilled onto public or private property, the Contractor shall wash down, clean up and disinfect the spillage to the satisfaction of the Engineer/Owner.

4. Depth of flow shall not exceed that shown below for the respective pipe sizes as measured in the manhole when performing television inspection, joint testing and/or sealing.

a)	Maximum Depth of Flow	Television Inspection
	6" - 10" Pipe	10% of pipe diameter
	12" -24" Pipe	15% of pipe diameter
	27" and up Pipe	20% of pipe diameter

b)	Maximum Depth of Flow	Joint Testing/Sealing
	6" - 10" Pipe	25% of pipe diameter
	12" -24" Pipe	30% of pipe diameter
	27" and up Pipe	35% of pipe diameter

5. Flow Control Precautions: When flow in a sewer line is plugged, blocked or bypassed, sufficient precautions must be taken to protect the

sewer lines from damage that might result from sewer surcharging. Further, precautions must be taken to ensure that sewer flow control operations do not cause flooding or damage to public or private property being served by the sewers involved. Any fine resulting from or damage caused by sewage backing up shall be the responsibility of the Contractor. Any damage or destruction to private property caused by sewage backup or overflows shall be the responsibility of the Contractor to correct at his expense.

D. PREPARATION

1. Precautions

a) The Contractor is responsible for locating any existing utilities in the area selected for installation of the bypass pipelines. The Contractor shall minimize the disturbance to existing utilities and shall obtain approval from the Owner and Engineer for any relocation of the bypass pipeline. All costs associated with the relocation of utilities and obtaining of approvals shall be paid by the Contractor.

b) During all bypass pumping operations, the Contractor shall protect the bypass pumping facilities and existing collection system from damage inflicted by equipment. The Contractor shall be responsible for all intentional or accidental physical damage to the bypass pumping system caused by human or mechanical failure or interference.

c) During installation of the bypass pumping pipes, the Contractor shall make every effort to minimize the disruption of private property and the inconvenience for neighborhood residents.

d) The Contractor shall protect all mature vegetation and structures or other obstacles in the path of the pipeline from damage through use of shields and buffering devices. All private property that must be relocated to construct the work must be stored at a location acceptable to the property owner.

e) In instances where fences must be disturbed for the construction of the pipeline, the property owner shall be consulted to see if the installation of temporary fencing shall be required.

f) The Contractor shall generate preconstruction videotapes to document the preconstruction condition of the pipeline route.

E. INSTALLATION AND REMOVAL

1. If the Contractor elects to route pipe through box culverts or large diameter storm drains to traverse under roads, HDPE pipe is required. Neither lay flat hose nor quick disconnect pipe will be permitted for these applications. To the maximum extent practical, the pipe shall be out of the stream flow path and to the side of the culvert where visible at all times.
2. If the piping must cross driveways, bypass pump ramps shall be used such that vehicular access can be maintained to the property.
3. The Contractor shall remove manhole sections or make connections to the existing sewer and construct temporary bypass pumping structures only at the access locations indicated on the Contract Drawings and as may be required to provide adequate suction conduit.
4. The pipeline must be located off streets (when not closed to traffic) and sidewalks and on shoulders of the roads.
5. Upon completion of the bypass pumping operations, the Contractor shall remove all the piping, restore all property to pre-construction condition or better and shall restore all pavement and sidewalks.
6. The Contractor is responsible for obtaining any approvals for placement of the temporary pipeline within public ways.
7. Upon system removal, all wastewater must be discharged into the wastewater collection system and pipes flushed.
8. Should bypass pumps or associated piping need relocating during construction, the Contractor shall coordinate with and gain approval of Owner prior to moving equipment and piping.

END OF SECTION 1450

TOWN OF THURMONT
STANDARD SPECIFICATIONS
SECTION 1500
TELEVISION INSPECTION

I. GENERAL

A. DESCRIPTION

1. After cleaning the sewer main from manhole to manhole, the sections shall be visually inspected by means of closed-circuit television. The inspection will be done one manhole section at a time, and the flow in the section being inspected will be suitably controlled as specified in Section 1450: MAINTENANCE OF SEWER FLOW.
2. For pipes to be lined with CIPP: Prior to the start of any CIPP work, Contractor shall submit to Engineer/Owner for approval, complete CCTV recordings, photos and related logs that demonstrate that all required repairs have been successfully completed, and that the line has been properly cleaned and prepped per the manufacturer's recommendations.
3. Owner will perform CCTV work for all completed lines (CIPP or new) that the Contractor submits in writing as being ready for final inspection. If any problems are found during this inspection and repairs and follow-up CCTV work are required, Contractor shall pay Owner at the Contractor's Unit Price for Base Bid Item 6a for the second and any subsequent re-inspections.
4. Owner will perform CCTV work necessary during Warranty period. If any problems are found during this inspection and repairs and follow-up CCTV work are required, Contractor shall pay Owner at the Contractor's Unit Price for Base Bid Item 6a for the second and any subsequent re-inspections.

B. RELATED SECTIONS

1. Section 1300 - Cured-in-Place Pipe Lining (CIPP)
2. Section 1450 - Maintenance of Sewer Flow
3. Section 1550 - Sewer Line Cleaning

C. SUBMITTALS

1. A sample of video footage photos and log entries shall be submitted prior to the start of any lengthy recording to be reviewed by the Engineer/Owner and approved as standard for the quality of these items for this Project.
2. Each month prior to submitting Application for Partial Payment, the Contractor shall submit one copy of the complete set of video segments (correctly labeled) performed that month, a three-ring binder of the related television inspection logs and any photographs that were taken by the Contractor.
3. Submit written documentation showing current P ACP certification for all CCTV technicians to be used on this project.

D. REFERENCE SPECIFICATIONS, CODES, STANDARDS AND CERTIFICATIONS

1. CCTV work will be performed in accordance with NASSCO's Pipeline Assessment and Certification Program (P ACP) recommended procedure.
2. All camera technicians performing CCTV inspection for the Contractor under this Contract must be P ACP certified. Documentation showing current certification for each CCTV technician must be submitted.

II. PRODUCTS

A. MATERIALS

1. Equipment: The television camera used for the inspection shall be one specifically designed and constructed for such inspection and shall be 5-years old or newer. Lighting for the camera shall be suitable to allow a clear color picture of the entire periphery of the pipe. The camera shall be operative in 100% humidity conditions. The camera should have the ability to pan and tilt for the inspection of the sewer laterals. The cameras, television monitor and other components of the video system shall be capable of producing picture quality to the satisfaction of the Owner/Engineer, and if unsatisfactory, equipment shall be removed and no payment will be made for an unsatisfactory inspection.

III. EXECUTION

A. PREPARATION

1. Sewers must be properly cleaned prior to any CCTV work being performed.
2. The pipes shall be dry and free of standing water during the television inspections, so the entire pipe may be clearly seen. The Contractor may have to remove standing water from sags to complete the inspections and meet this requirement. Inspections that do not meet this requirement shall be re-performed by the Contractor at no additional cost to the Owner.

B. INSPECTION

1. All inspection shall be performed in accordance with P ACP standard practices.
2. Television Inspection Logs: Printed location records shall be kept by the Contractor and will clearly show the location in relation to an adjacent manhole of each infiltration point observed during inspection. In addition, other points of significance, such as locations of building sewers, unusual conditions, roots, storm sewer connections, broken pipe, presence of scale, and corrosion and other discernible features will be recorded, and a copy of the records will be supplied to the Owner.
3. Photographs: Digital photographs taken digitally with a 3.1 megapixel or better, or other standard-size photographs of the television picture of problems shall be taken by the Contractor upon request of the Owner/Engineer, as long as such photographing does not interfere with the Contractor's operations.
4. Videotape Recordings: The purpose of DVD recording shall be to supply a visual and audio record of problem areas of the lines that may be replayed. Recording playback shall be at the same speed that it was recorded. Slow motion or stop-motion playback features may be supplied at the option of the Contractor. The Contractor shall have all DVD and necessary playback equipment readily accessible for review by the Owner during the project, and shall submit to Engineer/Owner complete sets of progress recordings and photos each month.

C. INSTALLATION/APPLICATION

1. The camera shall be moved through the line in either direction at a moderate rate, stopping when necessary to permit proper documentation of

the sewer's condition. In no case will the television camera be pulled at a speed greater than 30 feet per minute. Manual winches, power winches and powered rewinds or other devices that do not obstruct the camera view or interfere with proper documentation of the sewer conditions shall be used to move the camera through the sewer line. If an obstruction exists to prevent the camera from entering the pipe, the Contractor shall make such point repairs or remove protruding laterals to allow the camera free access through the pipe.

D. FIELD QUALITY CONTROL

1. When manually operated winches are used to pull the television camera through the line, telephones or other suitable means of communication shall be set up between the two manholes of the section being inspected to insure good communications between members of the crew.
2. The importance of accurate distance measurements is emphasized. Distance measurements will be automatically tracked on the video camera via the automatic distance measurement. Distance tracking will begin at 0 feet at the manhole wall where the sewer pipe begins.
3. Pan sewer laterals and any defects found.
4. Contractor is advised that DIP lined with 401 Protecto epoxy coating is extremely dark and additional or auxiliary lighting may be required.

E. ACCEPTANCE

1. The Owner/Engineer will review submitted videos, photos and logs to determine if they are acceptable. If the line cleaning was inadequate, Contractor shall re-clean and re-televise the line and re-submit for approval. Cleaning and televising will only be paid for once acceptable to Owner/Engineer.

END OF SECTION

TOWN OF THURMONT
STANDARD SPECIFICATIONS
SECTION 1550
SEWER LINE CLEANING

I. GENERAL

A. DESCRIPTION

1. This section covers requirements for cleaning sewer lines and manholes.
2. The intent of the sewer line cleaning is to remove all foreign materials from the lines and restore the sewer to the original carrying capacity. Since the success of the other phases of work depends a great deal on the cleanliness of the lines, the importance of this phase is emphasized. Should conditions exist to prevent cleaning, repairs will be made to those sections to allow completion of cleaning.

B. RELATED SECTIONS

1. Section 1300- Cured-In-Place Pipe Lining (CIPP)
2. Section 1450 - Maintenance of Sewer Flow
3. Section 1500 - Television Inspection

C. SUBMITTALS

1. Summary of proposed equipment and procedures to be used for line cleaning, debris removal and disposal.

II. PRODUCTS

A. MATERIALS

1. High-Velocity Jet (Hydrocleaning) Equipment: All high-velocity sewer cleaning equipment shall be constructed for ease and safety of operation. The equipment shall have a selection of two or more high-velocity nozzles. The nozzles shall be capable of producing a scouring action from 15 to 45 degrees in all size lines designated to be cleaned. Equipment shall also include a high-velocity gun for washing and scouring manhole walls and floor. The gun shall be capable of producing flows from a fine spray to a solid

stream. The equipment shall carry its own water tank, auxiliary engines, pumps and hydraulically driven hose reel.

2. **Mechanically Powered Equipment:** Bucket machines shall be in pairs with sufficient power to perform the work in an efficient manner. Machines shall be belt operated or have an overload device. Machines with direct drive that could cause damage to the pipe will not be allowed. A power rodding machine shall be either a sectional or continuous rod type capable of holding a minimum of 750 feet of rod. The rod shall be specifically heat-treated steel. To insure safe operation, the machine shall be fully enclosed and have an automatic safety clutch or relief valve.

III. EXECUTION

A. INSPECTION

1. **Final Acceptance:** Acceptance of sewer line cleaning shall be determined after television inspection tapes have been submitted to the Owner/Engineer and have been approved. If television inspection shows the cleaning to be unsatisfactory, the Contractor shall be required to reclean and reinspect the sewer line until the cleaning is shown to be satisfactory.

B. INSTALLATION/APPLICATION

1. **Sewer Cleaning:** The designated sewer sections shall be cleaned using high-velocity jet, or mechanically powered equipment. Selection of the equipment used shall be based on the conditions of lines at the time the work commences. The equipment and methods selected shall be satisfactory to the Owner/Engineer. The equipment shall be capable of removing dirt, grease, rocks, roots, sand and other materials and obstructions from the sewer lines and manholes. If cleaning of an entire section cannot be successfully performed from one manhole, the equipment shall be set up on the other manhole and cleaning again attempted. All debris must be removed from the sewer and properly disposed of by the Contractor at no additional cost to the Town.

2. **Root Removal:** Roots shall be removed in the designated sections where root intrusion is a problem. Procedures may include the use of mechanical equipment such as rodding machines, bucket machines and winches using root cutters and porcupines and equipment such as high-velocity jet cleaners. Chemical root treatment may be used at the option of the Owner.

3. **Material Removal:** Sludge, dirt, sand, rocks, bricks, grease and other solid or semisolid material resulting from the cleaning operation shall be removed at the downstream manhole of the section being cleaned. Passing material from manhole section to manhole section, which could cause line stoppages, accumulations of sand in wet wells or damage to pumping equipment, shall not be permitted.

4. For lines to be lined with CIPP or manholes to be spray-lined, cleaning shall meet all of the requirements of the manufacturers of those systems.

C. FIELD QUALITY CONTROL

1. Sewer cleaning shall proceed from upstream sewers to downstream sewers unless otherwise approved by the Engineer. No cleaning shall take place in a particular sewer segment until all upstream pipe segments have been cleaned. If cleaning is done in a downstream pipe segment in order to facilitate overall cleaning operations, the segment shall be re-cleaned at no additional cost, after all pipe upstream of that segment has been cleaned.

2. The Contractor shall take precautions to avoid damage or flooding to public or private property being served by the line being cleaned. The Contractor shall be responsible for all flooding and pay for cleanup from flooding to the satisfaction of the property owner. The Contractor shall have a local cleaning service under contract to immediately address any backups prior to commencing any sewer cleaning work. The Contractor shall take care in cleaning old sewers and shall protect existing sewers from damage caused by improper use of cleaning equipment.

3. **Disposal of Materials:** The Contractor shall be responsible for properly disposing of all the debris removed from the sewers during the cleaning operation in accordance with local, state and federal regulations.

END OF SECTION

TOWN OF THURMONT
STANDARD SPECIFICATIONS

SECTION 1600

RESTORATION OF PAVED AND GRASSED AREAS

I. GENERAL

A. DESCRIPTION

This section covers restoration of paved areas and grassed areas. Restoration shall be performed in general conformance with these requirements. However, pavement restoration shall be in strict compliance with MDSHA requirements whether specifically referenced herein or in the Details or not, and grassed areas shall be ultimately restored to the satisfaction of the individual property owner. Refer to the Standard Details on the Contract Drawings for additional requirements for pavement restoration.

B. RELATED SECTIONS

1. Section 1150 - Excavation, Backfill and Compaction

C. QUALITY ASSURANCE

1. Areas and Features to be Restored:

- a) All areas, including natural features occurring thereon, which are damaged or disturbed by the Contractor's operations, shall be restored, repaired or replaced to the same or superior condition which existed prior to construction or as modified herein or as shown on the Drawings.

- b) Artificial features shall be restored equal to a new condition or as modified herein or as shown on the Drawings.

2. Source Quality Control:

- a) Use materials conforming to requirements of the Maryland Department of Transportation, State Highway Administration Standard Specifications for Construction and Materials, Latest Edition.

- b) Use products of a bituminous concrete producer regularly engaged in production of bituminous concrete conforming to the standards referenced herein.
- c) Maintain quality of work by using products of a qualified bituminous concrete producer and qualified plant operating workmen.

D. REFERENCES

- 1. The MDOT noted herein refer to sections contained in the Maryland Department of Transportation State Highway Administration Specifications for Construction and Materials. The references pertain only to materials, construction, equipment, methods and labor.
- 2. Maryland Standard Method of Tests.
- 3. American Society for Testing and Materials:
 - a) ASTM D 1557, Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 10 lb. (4.5 Kg) Rammer and 18-inch (457 mm) Drop, Test Methods for.
 - b) ASTM D 2167, Density of Soil in Place by the Rubber-Balloon Method, Test Method for
- 4. American Association of State Highway and Transportation Officials:
 - a) AASHTO T 80, Moisture-Density Relations of Soils Using a 10 lb. Rammer and an 18-inch Drop.

E. SUBMITTALS

- 1. Topsoil - Submit sieve analysis and characteristics of topsoil as listed in PART 2 - MATERIALS.
- 2. Seed mixture data.
- 3. Source and certification data for all sod types needed on Project.
- 4. Certificates: Furnish certification from bituminous and aggregate producer attesting that materials conform to requirements of Maryland Department of Transportation State Highway Administration Specifications.

F. PACKING AND SHIPPING

1. All seed furnished for this project shall be delivered in standard size unopened bags of the vendor, showing weight, mixture, vendor's name and guaranteed analysis.

G. STORAGE

1. Seed shall be properly stored in dry conditions at the site of the work.
 - a) Any seed damaged or spoiled during storage shall be replaced by the Contractor.
2. All sod (new and existing to be reused) must be carefully stockpiled and kept lightly and uniformly damp.

H. ENVIRONMENTAL CONDITIONS

1. Topsoil shall not be delivered or placed in a frozen or muddy condition.
2. Seeding is to be done on dry or moderately dry soil.
 - a) Seeding is to be done when the wind velocity does not exceed 5 miles per hour.

I. PROJECT CONDITIONS

1. Protection:
 - a) Protect paved surfaces outside of the limits of work. Repair pavement outside limits damaged by construction operations at no additional expense to the Owner.
 - b) The Contractor shall be liable for damages to municipal roads caused by his equipment. The repairs may include lane or full roadway width overlays as directed by the Owner. No additional payment will be made for repairs to municipal roads damaged by the Contractor.

J. SCHEDULE

1. The Contractor is advised to do all seeding during the periods of March 15th to May 1st or August 15th to October 15th.

- a) Seeding may be conducted under unseasonable conditions without additional compensation and at the option and full responsibility of the Contractor.

K. WARRANTY

- 1. Any new, reestablished, replaced or disturbed plant material that fails to respond properly within the one-year guarantee period shall be replaced as specified above at the Contractor's expense.

II. PRODUCTS

A. MATERIAL

1. Topsoil

- a) Topsoil shall be natural, fertile, friable agricultural soil capable of sustaining healthy vegetative growth.

- b) Topsoil shall meet the following gradation requirements free of stones, roots, sticks and other foreign substances.
GRAIN SIEVE PERCENT PASSING DIAMETER SIZE BY WEIGHT
6.3mm 6.3mm 100
4.75mm No.4 60-85
0.075 mm No. 200 20-45
0.002 mm -- 7 -27

- (1) Topsoil shall contain less than 52 percent sand.

- c) The pH of topsoil shall be between 6.0 and 7.6.

- d) Topsoil shall contain no less than 6.0 percent organic matter.

- e) Topsoil may be from previously excavated, stockpiled and protected materials, provided the materials meet the requirements for topsoil.

2. Fertilizer

- a) General Fertilizer

- (a) Refer to Contract Drawings. Other commercially available fertilizers, such as 20-10-10 and 12-6-6, may be utilized provided the spreading rates are adjusted to provide the minimum requirements for nitrogen.

3. Seed

- a) All seed shall be fresh, recleaned and of the latest crop year.
 - b) Each component shall meet or exceed the minimum State and Federal requirements for purity and germination for that component.
 - c) The weed content of each component shall not exceed 0 .1 percent.
 - d) Refer to Contract Drawings for recommended seed mixtures.
 - (1) Variations may be recommended by qualified personnel but shall not be used without approval by the Engineer.
 - e) For uncultivated areas furnish perennial rye grass seed.
4. Mulch for Tree or Shrub Plantings -Mulch shall consist of dry, clean, hardwood chips.
5. Mulch for Seeded Areas - Mulch shall be oat, wheat or rye straw or hay, free from noxious weeds and other materials which may interfere with the establishment of a healthy stand of grass.
6. Peat Moss - As recommended by the supplier of nursery stock.
7. Coarse Aggregate Base Course:
- a) Type B Select Material.
8. Bituminous Materials and Pavements:
- a) Bituminous Tack Coat: MDOT Section 904.04.
 - b) Surface Course: Hot mixed, hot laid, Bituminous Surface Course, conforming to MDOT Section 904.06.
 - c) Base Course: Hot mixed, hot laid, Bituminous Base conforming to MDOT Section 904.06.

III. EXECUTION

A. TRENCH BACKFILL

- 1. Backfill of the trench shall be accomplished immediately after the pipes and manholes have been installed. Backfill and compaction shall be specified in Section 1150, as shown in the Details and as presented below.

- a) In paved MDSHA roads and Town/County roads, the Contractor shall remove all excavated soil from the site and import backfill and install it as shown on Detail No 100. Costs associated with removing and disposing of the excavated soil and supplying and importing the stone shall be included in the various unit costs bid.
- b) In grassed or easement areas, the excavated soil may be used for backfill material provided the soil is acceptable as defined in Section 1150.

B. RESTORATION OF PAVED AREAS

1. Pavement restoration in MDSHA and Town/County roads shall be in accordance with the Details on the Contract Drawings and all MDSHA and Town/County requirements. The costs for restoring MDSHA and Town/County roads including all requirements specified herein shall be included in the various bid items unless a separate pay item for pavement restoration is include. The Contractor or his subcontractor performing excavation in MDSHA and Town/County roads may perform the pavement restoration as long as the work is to the satisfaction of the MDSHA, Town/County and Engineer. If the work is not satisfactory, the Contractor shall hire a pavement contractor to perform the restoration work at no additional cost to the Owner. Parking lots, asphalt driveways, sidewalks, and curbs and gutters impacted by the work shall be restored per Details on the Contract Drawings. Install #57 stone under all new concrete work for bedding and support prior to placing concrete. The pavement restoration work shall be completed immediately after the trenches are backfilled and compaction results are approved unless otherwise approved by the Engineer and MDSHA.
2. Subbase Construction: Install coarse aggregate base course in accordance with MDT. Install base course to after-compaction thickness indicated on Drawings.
3. Bituminous Pavement Construction: Method of preparing mixture, placing mixture, compaction and protection of in-place bituminous concrete for paving shall comply with MDT Section 504. Minimum thickness of bituminous concrete base and surface courses as indicated on the drawings.
 - a) Use Bituminous Tack Coat material to seal joints in wearing courses as specified in MDT Section 504.03.07.

b) Dust Control: Provide effective dust control by sprinkling water, by the use of calcium chloride or by any other methods approved by the Engineer. Use dust control measures where, when and in a manner required by the Engineer.

4. In some instances, the MDSHA may require that the existing roadway be milled down, and an overlay be installed with a paving machine over all pavement patches installed. In this case, the overlay shall be installed per the Details. The Engineer and MDSHA will determine which patches require the overlay and will determine the limits of each overlay. The final elevation of new manholes shall accommodate the overlay when required.

C. RESTORATION OF GRASSED AREAS

1. The Contractor shall be responsible for restoring all grassed areas affected by the work to equal or exceed pre-construction conditions. Restoration shall be performed at the end of each day unless otherwise approved by the Engineer. Work will not be allowed to continue if the restoration is not up-to-date. The costs for restoring grassed areas, including all requirements specified below, shall be included in the various bid items, unless a separate pay item for grass restoration is included. Payment will not be made for the various work items until the restoration is complete and satisfactory to the Engineer or unless otherwise approved by the Engineer. The Engineer will consider in such a decision whether the Contractor is using the subject areas for accessing the upstream work, in which case the area cannot be restored. Final payment will not be made until all areas are completely restored to the satisfaction of the Engineer and property owner.

The Contractor or his subcontractor performing excavation work in grassed areas shall initially be considered acceptable to perform the restoration work. However, if the Contractor's work is not satisfactory to the Engineer, Owner or property owners, the Contractor shall hire a local, professional landscaping company to perform the work at no additional cost to the Owner. The Contractor should consider retaining a local landscaping company during the warranty period to handle all complaints and warranty issues.

The general requirements for grass restoration work are detailed below. In general, the Contractor shall match the species of the existing grass and plants and shall plant such species in a manner and at times as recommended by local nurseries and authorities over grass planting and growing. If the existing species cannot be planted at the time of year when the restoration work is required, the Engineer may approve the temporary

restoration of the area with grass that can grow at that time of year. The property owner must be advised of the plan and approve it. Any such temporary restoration shall be removed and the proper restoration performed during the proper growing season. The Contractor is encouraged to plan for varying restoration conditions at different times of the year and to schedule the work in a manner for the best possible restoration conditions. It will not be acceptable to unduly delay restoration until proper growing conditions exist. The Contractor must keep restoration up-to-date as specified above.

a) *Restoration of Manicured Areas and Lawn Areas* - Manicured and lawn areas shall be as defined by the Engineer and shall generally be considered any yard area of a residence or business that is routinely mowed, is well landscaped, has an established, thick stand of grass and/or has been sodded in the past. In manicured and lawn areas, the Contractor shall sod all grassed areas disturbed by the work, shall re-plant or install new bushes, ornamentals, shrubs, etc. as impacted by the work, shall restore disturbed beds including re-mulching and replacing borders, and shall restore any and all other plants and area disturbed to equal or exceed pre-construction conditions. The Contractor shall match the species of existing grass and plants. The Contractor may strip the existing grass and use it as sod for grass restoration or shall provide new sod.

If the existing sod is stripped and used for restoration, the Contractor shall neatly strip the sod (minimum 2 inches below the surface) and the top 4 inches of soil and carefully stockpile the soil and sod for later installation. Sod shall be professionally stripped in neat, even strips with square corners. Uneven and jagged strips of existing sod shall not be permitted to be reused. New sod will be required. The Contractor may have to strip existing sod for use, if the existing species of grass is not available. The Contractor shall be responsible for checking on the availability of new sod to match all grass species in the project area and submitting the list of species and sod availability to the Engineer prior to disturbing any grassed area.

If new sod is used for restoration, the Contractor shall match exactly the species of the existing grass including providing strongly rooted (2" minimum thick root mat), certified sod not less than 2 years old and free of weeds and undesirable native grasses. Sod must be capable of growth when planted.

For all sodding work, the Contractor shall provide clean, finely graded topsoil for the top 4 inches below the sod. The Contractor may strip the top 4 inches of soil prior to excavation and stockpile this topsoil in a separate pile for use. If the existing soil is not separated and stockpiled, the Contractor shall import approved, clean topsoil for use at no additional cost to the Owner.

The Contractor shall grade lawn areas to be a smooth, even surface with loose, fine textured soil. The area shall be rolled and raked. High spots shall be removed, and low spots shall be filled with suitable topsoil to meet finish grades. Fine grading should be limited to areas which can be planted in the immediate future.

After fine grading and prior to planting, restore prepared areas to the above specified condition if eroded or otherwise disturbed. Prepared areas shall be moistened before planting lawn. Lime and fertilize as recommended by local nurseries. It is recommended that the Contractor take soil samples so proper lime and fertilizer rates can be determined.

The Contractor shall lay sod within 24 hours from time of stripping. The sod shall be laid to form a solid mass with tightly fitted joints with ends and sides of sod strips butted - not overlapped. Strips shall be staggered to offset joints in adjacent courses. Work shall be performed from boards to avoid damage to subgrade or sod. The sod shall be tamped or rolled lightly to ensure contact with subgrade. The Contractor shall work sifted soil into minor cracks between pieces of sod, remove excess to avoid smothering adjacent grass and water sod with fine spray immediately after planting, so the entire sod blocks are moist but not soggy.

Begin maintenance of lawns immediately after planting and continue for at least 30 days and until completely established. Maintain lawn by watering and other operations such as rolling, regrading and replanting as required to establish a smooth, acceptable lawn, free of eroded or bare areas. Watering schedule shall be as recommended for that type of sod by local nurseries and shall be at least 1 inch of water per week including rainfall. Contractor is to submit watering schedule to Engineer. Water used shall be provided by the Contractor. Property owners shall not be involved in watering

operations, unless the property owner requires that they be allowed to water the grass and the Engineer approves.

Sodded lawns will be acceptable provided requirements, including maintenance, have been complied with and healthy, well rooted, even colored, viable lawn is established, free of weeds, open joints, bare areas, and surface irregularities to the satisfaction of the Engineer and property owner. All bare areas shall be resodded.

b) *Restoration of Easement Areas and Non-Manicured Areas* - For the purposes of these Specifications, easement areas and non-manicured areas include any area outside of the areas described above for manicured and lawn areas. In general, the easement areas will be outside of any regularly maintained lawn/yard areas, but in some cases may be considered a yard with patchy or spotty grass where thick sod would not blend in with the surrounding grass.

All easement and non-manicured areas may be restored with sod as specified above or by planting new grass. If new grass is planted, the grass variety/species shall match the existing grass and shall be new seed and free of weeds and contamination. The Contractor shall submit the proposed seed mix along with the seed manufacturer's recommendations for liming, fertilizing, planting, watering and maintaining. All such recommendations shall be strictly followed.

Prior to any planting, the Contractor shall grade all easement areas (non- yard areas) smooth as approved by the Engineer/Owner in the field. The Owner must be able to drive heavy sewer maintenance equipment along the sewer route to access every manhole unless otherwise approved. In addition, slopes of easements shall be such that the Owner can mow the easements with their bushhog equipment. There shall be no ruts or wash-out areas in the easements and no exposed rock or debris. The Contractor shall install culvert pipes or large stone (such as Maryland SHA Class I rip-rap) for draining easement areas as necessary and as required by the Engineer/Owner. All exposed tree roots shall be cut, all trees completely removed or stumps ground to 24 inches below grade (where approved by the Owner), and all damaged tree limbs cut and removed. The final grading of all easement areas must be approved by the Engineer/Owner prior to planting any grass. The top 4 inches of

soil shall be clean, fine graded topsoil either stripped and stockpiled or imported.

For yard/lawn areas, the Contractor shall grade areas to be a smooth, even surface with loose, fine textured soil. The area shall be rolled and raked. High spots shall be removed, and low spots shall be filled with suitable topsoil to meet finish grades. As specified above, the top 4 inches of soil shall be clean, fine graded topsoil, either stripped and stockpiled or imported.

Fine grading should be limited to areas which can be planted in the immediate future. After fine grading and prior to planting, restore prepared areas to the above specified condition if eroded or otherwise disturbed. Prepared areas shall be moistened before planting lawn.

The Contractor shall lime and fertilize the soil prior to planting as recommended by the seed manufacturer, spread seed at the recommended rates, mulch area with clean wheat straw and water area immediately after planting as recommended. It is recommended that the Contractor take soil samples so that proper lime and fertilizer rates can be determined.

Contractor shall maintain the planted area for at least 30 days and until completely established. Maintenance shall include watering per the seed manufacturer's recommendations (as least 1 inch of water per week including rain), re-fertilizing as recommended and required, and cutting the grass to continue healthy growth as required. Contractor to submit watering and maintenance schedule to Engineer. Water used shall be provided by the Contractor. Property owners shall not be involved in watering operations unless the property owner requests that they be allowed to water the grass and the Engineer approves.

Grassed areas will be acceptable provided requirements, including maintenance, have been complied with and healthy, well rooted, even colored, viable grass is established that is free of weeds, bare areas, and surface irregularities, to the satisfaction of the Engineer and property owner. All bare areas shall be re-seeded and maintained until accepted by the property owner and approved by the Engineer.

D. CLEAN-UP AND MAINTENANCE

1. During construction, surfaces of all area including, but not limited to, roads, streets and driveways shall be maintained on a daily basis to produce a safe, desirable and convenient conditions.
 - a) Surfaces shall be swept and flushed after backfilling, and recleaned as dust, mud, stones and debris caused by the work, or related to the work again accumulates.
 - b) Failure of the Contractor to perform this work shall be cause for the Engineer to order the work to be done by others and backcharge all costs to the Contractor.
2. Repair or Correction of Unsatisfactory Conditions: All unsatisfactory conditions resulting from the work shall be corrected.
3. Continuously maintain temporary pavement without additional compensation until it is replaced with permanent pavement.
4. Any subnormal or dangerous condition caused by the work, on any surface, shall be repaired or corrected within two hours of observance or notification of its existence. If repairs or corrections are not made within this period, the Owner shall cause to have the work completed with the resulting cost subtracted from the Contractor's next monthly payment request. Any such costs shall be deemed a reduction in the total amount due the Contractor under the contract and no subsequent reimbursement shall be made to the Contractor by the Owner for these costs.

END OF SECTION 1600

TOWN OF THURMONT
STANDARD SPECIFICATIONS

SECTION 1650

SEWER MAIN AND LATERAL CONNECTION SEALING

I. GENERAL

A. DESCRIPTION Section includes requirements for sealing of all sewer line joints, defects and leaking sewer lateral connections by chemical grouting.

B. QUALITY ASSURANCE

1. Follow ASTM F2304 and F2554-05.
2. Test sealed joints and lateral connections by air pressure.

C. SUBMITTALS

1. Submit following Section 01330.
 - a) Catalog data showing manufacturer's clarifications and updates, ASTM references, material composition, specifications, and physical and chemical properties of the grout.
 - b) Manufacturer's recommended procedures for handling, storing, mixing and injecting the grout.
 - c) Method of Construction
 - (1) Access manholes and site locations.
 - (2) Work dimensions.
 - (3) Existing utilities.
 - (4) Size of working area.
 - (5) Impacted portions of existing sewer.
 - (6) Site access points.
 - (7) Bypass pumping plan showing:

- (a) Intake manhole.
 - (b) Service over pumping.
 - (c) Receiving manhole.
 - (d) Expected flows.
 - (e) Pump size.
 - (f) Pipe layout.
 - (g) Backup equipment.
- (8) Procedures to monitor upstream mains for backup impacts.
- (9) Procedures for setup and breakdown of pumping operations.
- d) Emergency plan detailing procedures in event of pump failures, sewer overflows, service backups, and sewage spillage.
- (1) Maintain copy of emergency plan on site for duration of project.
 - (2) Submit following Section 01450.
 - (a) Grout manufacturer's certification that Contractor is approved installer of their system and certificates of training in handling, mixing, and application of grout for sanitary sewer line and joint and lateral connection sealing for each crew member involved in sealing process.
 - (b) ASTM certified lab test results for field installations in USA of same grout system as proposed for actual installation.
 - (i) Test results must verify grout physical and chemical properties specified herein have been achieved in previous field applications.

(ii) Third party is defined as ASTM or equivalent accredited materials testing firm with no financial or directorial link to grout manufacturer or Contractor.

(c) CCTV inspection reports, and electronic downloads made before and following sewer main's joint sealing, and original copies of CCTV inspections color DVDs furnished to Engineer within 5 days.

(d) Documentation for products and installers will receive Engineer's approval before acceptance or injection of grout.

D. DELIVERY, STORAGE, AND HANDLING

1. Protect, store, and handle during transportation and delivery, while stored on-site, and during installation following manufacturer's recommendations.

2. Grout Material Found to be Defective or Damaged Due to Manufacture or Shipment:

a) Remove from Contract site and replace materials found defective or damaged following Engineer's direction, at no cost to the Town.

II. PRODUCTS

A. MATERIALS

1. Grouting.

a) Properties and characteristics.

(1) Will perform in the presence of infiltrating water, during injection.

(2) Packaged for field storage, handling requirements with minimum spillage and worker safety.

(3) Mixed with proper equipment and personnel thoroughly familiar with the chemicals involved following manufacturer's

recommendations, chemical safety data sheet, and safety regulations.

b) Cured grout:

- (1) Submersible in water without degrading.
- (2) Not biodegradable.
 - (a) Additives may be used to meet this requirement, without effecting long term strength.
- (3) Chemically stable and resistant to concentrations of acids, alkalis, and organic materials found in normal sewage.

c) Composition.

- (1) Acrylamide gel:
 - (a) Minimum of 10 percent acrylamide base material by weight in the total grout mix.
 - (b) Higher concentration percent of acrylamide base material may be used to increase strength or offset dilution during injection.
 - (c) Able to tolerate some dilution and react in moving water during injection.
 - (d) Approximately 2 centipoise viscosity, which can be increased with additives.
 - (e) Constant viscosity during reaction period.
 - (f) Controlled reaction time from 10 seconds to 1 hour.
 - (g) Curing reaction producing a homogenous, chemically stable, non-biodegradable, firm, flexible gel.
 - (h) Able to prevent dehydration and increase-mix viscosity, density and gel strength by use of additives.

- (i) Diatomaceous earth (Celite 209 or equal) can be added to a concentration of five percent.
 - (ii) Use of other additives following manufacturer's recommendation and Engineer's approval.
- (i) Root control additive 2, 6-Dichlorobenzonitrile, which may be added following manufacturer's recommendation and Engineer's direction.
- (2) Urethane gel:
 - (a) One part urethane prepolymer thoroughly mixed with between 5 and 10 parts water by weight.
 - (i) Recommended mix ratio is 1 pmi urethane prepolymer to 8 parts of water (11 percent prepolymer).
 - (b) Liquid prepolymer having a solids content by weight of 77 percent to 83 percent, specific gravity of 1.04 (8.65 pounds per gallon), and flash point of 200 degrees F; and viscosity of 600 to 1,200 centipoises at 70 degrees F.
 - (c) Water in pH range of 6.5 to 8.0 for correct prepolymer reaction.
 - (d) Cure time of 80 seconds at 40 degrees F, 55 seconds at 60 degrees F, and 30 seconds at 80 degrees F when 1 part prepolymer is reacted with 8 parts of water only.
 - (e) Viscosity with increases from about 10 to 60 centipoises in first minute for 1 to 8 prepolymer/water ratio at 500 degrees F.
 - (f) Curing reaction producing a chemically stable, non-biodegradable, tough, flexible gel.

- (g) Able to increase mix viscosity, density, gel strength and resistance to shrinkage by using additives in water component of grout.
 - (h) Root control additive 2, 6-Dichlorobenzonitrile, may be added following manufacturer's recommendation and Engineer's direction.
 - (i) Minimum of 15 percent shrink control agent supplied by same manufacturer.
- (3) Acrylate gel:
- (a) Minimum of 11 percent acrylate base material by weight.
 - (i) In total grout mix, a higher concentration (percent) of acrylate base material may be used to increase strength or offset dilution during injection.
 - (ii) If acrylate base material is in a 40 percent solution 27.5 percent by weight of total grout mix to have 11 percent base material.
 - (b) Low toxicity of the acrylate base material.
 - (c) Able to tolerate some dilution and react in moving water during injection.
 - (d) Viscosity of approximately 2 centipoises which can be increased with additives.
 - (e) Constant viscosity during the reaction period.
 - (f) Controlled reaction time from 10 seconds to 1 hour.
 - (g) Curing reaction producing a homogeneous, chemically stable, nonbiodegradable, flexible gel.
 - (h) Able to, prevent dehydration and to increase-mix viscosity, density and gel strength by use of additives.

(i) Diatomaceous earth (Celite 209 or equal) can be added to a concentration of five percent.

(ii) Use of other additives following manufacturer's recommendations and Engineer's approval.

(i) Root control additive 2, 6-Dichlorobenzonitrile, may be added following manufacturer's recommendation and Engineer's direction.

B. EQUIPMENT

1. May consist of a CCTV system, necessary chemical grout containers, pumps, regulators, valves, hoses, joint sealing packers for various sizes of sewer pipes, and lateral bladders.

2. Grouting packer.

a) Diameter less than pipe size, with cables attached at each end to pull it through the line.

b) Designed to allow a restricted amount of sewage to flow through device, in lines where sewage flows do not exceed maximum depth for joint testing/sealing following manufacturer's recommendation.

c) Approved Manufacturers:

(1) American Logiball, Inc.

(2) Submit "or Equal".

III. EXECUTION

A. PUBLIC NOTIFICATION

1. Maintain service usage throughout duration of project.

a) Public Notification Program: Delivered written notices to each home or business immediately after sealing operation.

B. PREPARATION

1. Access: Through existing manholes.
2. Sewer Cleaning and Surface Preparation.
 - a) Cleaning of the Main Line Sewers.
 - (1) Hydraulic high pressure jetting of reaches is permitted.
 - (2) Before sealing work, lightly clean each line section.
 - (a) Lightly clean is defined as less than 3 passes of hydraulic cleaner.
 - (3) Remove sludge, dirt, sand, grease, root, and other materials from pipe and collect and remove resulting debris from downstream manhole of sewer section being cleaned.
 - (4) Collect debris and remove from site.
 - (a) Transportation and disposal of cleaning debris: Following jurisdiction requirements and Engineer's approval.
 - (5) Sewers damaged as a result of improper use of cleaning equipment will be promptly repaired by the Contractor at no additional cost to the Commission.
 - (6) Provide equipment, devices, and tools required for this Contract.
 - (7) Clean sewer main within 72 hour immediately preceding chemical grouting of sewer house connections.
 - b) Re-cleaning: If Engineer finds main is not sufficiently cleaned, CCTV and sealing equipment will be removed and main re-cleaned at no additional cost to the Commission.
3. Pre-sealing Reaming:
 - a) Ream or trim protruding taps following Specification Section 02955.

C. SEALING OPERATION

1. Joint or Lateral Connection Sealing.
 - a) Seal by internal chemical methods grout joints, defects or leaking lateral connection that have been specified to be sealed, or show sign of visible leaks, under Engineer's direction.
 - b) After sealing of joint, defect or connection, perform a post air test.
 - c) Sewers that Engineer deems damaged as result of Contractor's operations will be promptly repaired to Engineer's satisfaction at no cost to the Commission.
 - d) Grouting materials that set to a hard, rigid product capable of intrusion into sewer line is not acceptable.
 - e) Remove roots detected during the initial CCTV inspection immediately before any sealing operation.
2. Procedure for Application.
 - a) Force chemical grouting material into or through faulty joints, defects or lateral connection by a system of pumps, hoses, and sealing packers.
 - (1) Position packer over faulty joint or lateral connection by means of measuring device and CCTV camera in line.
 - (2) Expand packer end bladders using controlled pressure and for lateral connections, use lateral packer equipped with lateral bladder.
 - (a) If a tight seal is not obtained, remove the equipment and make adjustments, obtain a tight seal.
 - (b) In this isolated area, pump grout material through hose system at controlled pressures which are in excess of groundwater pressures.
 - b) Design pumping unit, metering equipment, and packer devices so proportions and quantities of materials can be regulated following type and size of leak being sealed.

- c) Set chemical mixing ratios following manufacturer's recommendations and Engineer's adjustments, never less than 30 seconds.
- d) Operate void pressure monitoring equipment, described herein, during sealing operations.
- e) Integrate CCTV, grout pumping, and air pressure monitoring equipment; so proportions, quantities, and void pressure for materials and sealing can be instantly monitored and regulated following type and size of joint, break, or leak.
- f) Base amount of chemical being pumped on number of pumped strokes delivered for each sealed sewer main joint, defect or leaking connection.
 - (1) Record and make results available to the Engineer.
 - (2) Use maximum pump outlet settings as follows:

Pump Ratio	Hose Diameter Outlet	Pressure (lbs)
10:1	½ inch	27
10:1	⅛ inch	23
5:1	½ inch	40
5:1	⅝ inch	35

- g) In the event large voids are encountered on outside of sewer, including the possibility of "piping" holes to ground surface which could cause excessive use of grout material, at Engineer's direction change operating pressures and pumping rates.
 - (1) Accomplish changes in operating procedures by reducing pressures and pumping rates followed by termination of pumping until temporary "set" of the gel is obtained on the outside of pipe, and then, after sufficient lapse of time, followed by an increase in pressure and resumption of pumping until proper seal of the joint, defect or connection is obtained.

h) Grout injection is completed when the void pressure monitoring equipment displays pressure 8 PSI or higher that does not drop more than 1 PSI after 30 second holding time.

(1) Engineer may require on any sealed defects a move of the packer forward or backward, wiping away excess grouting material and allowing CCTV camera to move to suitable position for inspection and /or air test.

(2) Air test each sealed joint, defect or connection after grout injection, reseal failed joints and air test again.

i) Flush or push forward excess grouting material to next downstream manhole, and removed from sewer system.

(1) Dispose of debris following Section 02512, chemical grout manufacturer's recommendation, and local, State, and Federal regulations.

(2) In no case is excess grout material from upstream section(s) allowed to accumulate and be flushed down the sewer.

j) In the event that sewage back-up occurs and enters a dwelling, respond within 2 hours of being notified and be responsible for cleanup, repair, property damage costs and claims.

k) Provide approved plug and/or by-pass pumping if grouting operations restrict or prevent simultaneous sewage flow passage.

(1) Manage sanitary sewer overflow following Section 02530.

l) Place a door tag, supplied by the Commission, at each address affected by sealing operation.

3. Joint, Defect or Lateral Connection Sealing Verification.

a) Deflate packer bladders after completing each seal until a zero void pressure is shown on the monitoring equipment.

b) Re-test the joint, defect or lateral connection as described herein.

- (1) If a zero void pressure is not achieved, clear residual grout material from packer or make needed equipment adjustments allowing a true pressure reading.
- (2) Re-seal joints, defects, or connections that do not meet specified test criteria and re-test until test criteria are met.
- (3) Additional testing and sealing will be at no additional cost to the Commission.

4. Residual Sealing Material.

- (1) Leave no residual grout material capable of reducing the pipe diameter or restricting flow.

5. Records.

- a) Keep complete, accurate, and legible records of the operation for each joint, defect or connection sealed.
- b) Failure to fill out logs completely will result in non-payment for the questioned mainline joint, defect or connection.
- c) The work site will not be accepted until Engineer receives original record.
 - (1) Show on record of operation:
 - (a) Identification of the work site: Complete component, address, county page & grid, 200 foot sheet.
 - (b) Station of each seal measured from upstream manhole, test pressures, verified address of lateral, estimated visible leakage (gpm) from connection or lateral, number of pump strokes and amount of grout in place, beginning, ending, pressure loss, re-test pressures and verification that lateral is clear after sealing process.

6. Air Testing.

- a) Testing procedures for equipment consist of applying Engineer's designated pressure into each void area created by testing device.
- b) Continuously monitor test pressure during test with digital pressure gage reading in 1/10 psi units and CCTV inspection system.
- c) If specified test pressure is not achieved release pressure, make adjustments with equipment, and test again.
 - (1) Repeat procedure sealed feature passes test.
 - (2) Additional sealing and re-testing after initial sealing and re-testing at no cost the Commission.
- d) Once specified pressure in test area has been displayed on meter above ground, stop application of pressure and commence 10 second stabilization period.
- e) Observe meter for 20 seconds and if pressure in test area drops to below 2.1 psi, the connection has failed the test.

AIR TEST TABLE	
INITIAL AIRTEST PRESSURE	AFTER 20 SECONDS AIR TEST PRESSURE
12-11	7.2-6.6
10.9-10.0	6.6-6.0
9.9-9.0	6.0-5.4
8.9-8.0	5.4-4.8
7.9-7.0	4.8-4.2
6.9-6.0	4.2-3.6

7. Obstructions.

- a) During course of sealing operations obstructions may be encountered preventing travel of packer and camera.
 - (1) Should obstruction not be passable, begin sealing operations from opposite end of sewer reach.

b) If additional obstructions are encountered after re-employment and no means are available for passing obstructions without damage to equipment, then remaining sections of sewer main not sealed may be temporarily excluded from work requirements of Contract, until point repair is completed.

D. POST- SEALING INSPECTION

1. Internally CCTV sewer mains involved in the sealing operation following Section 02956.

E. ACCEPTANCE

1. When sealed joint, defect, and lateral connections pass the post air test.

IV. MEASUREMENT AND PAYMENT

A. SEALED JOINT

1. Measurement: By each successfully sealed joint or defect.

2. Payment: At unit price for each size listed in Bid Schedule.

a) Payment includes plugging or by-pass pumping, pre-sealing cleaning, reaming taps, removal of extraneous materials from sewer main, labor and equipment necessary to seal joints, defects, and post sealing air test,

B. SEALED LATERAL CONNECTION

1. Measurement: By each lateral connection sealed and air tested.

2. Payment: At unit price for each size listed in Bid Schedule.

a) Payment includes plugging or by-pass pumping, pre-sealing cleaning, removal of extraneous materials from sewer main and lateral, labor and equipment necessary to seal connection, post sealing air test, and test to ensure that lateral is clear.

C. SEALING MATERIAL

1. Measurement: By gallon of grout used.

2. Payment: At unit price listed in Bid Schedule.
 - a) Payment includes materials, additives, storage, calculations, mixing, testing for in place percentage and gel time tests.

END OF SECTION

TOWN OF THURMONT
STANDARD SPECIFICATIONS
SECTION 1700
CONCRETE AND GROUTS

I. GENERAL

A. DESCRIPTION

This section covers all cast-in-place concrete, including reinforcing steel, forms, finishing, curing and appurtenant work. All concrete shall be air-entrained. All cast-in-place concrete shall be accurately formed and properly placed and finished, as indicated on the Drawings, in the Details and/or specified herein. The Contractor shall inform the Engineer at least 24 hours in advance of the times and places at which he intends to place concrete.

B. RELATED SECTIONS

The publications listed below form a part of this specification to the extent referenced.

1. American Concrete Institute (ACI):
 - ACI 211.1 Selecting Proportions for Concrete
 - ACI 301 Specifications for Structural Concrete
 - ACI 304 Measuring, Mixing, Transporting and Placing Concrete
 - ACI 305 Hot Weather Concreting
 - ACI 306 Cold Weather Concreting
 - ACI 308 Standard Practice for Curing Concrete
 - ACI 309 Practice for Consolidation of Concrete
 - ACI 315 Details and Detailing of Concrete Reinforcement
 - ACI 315R Manual of Engineering and Placing Drawings for Reinforced Concrete Structures
 - ACI 318 Building Code Requirements for Structural Concrete
 - ACI 347 Recommended Practice for Concrete Formwork

2. American Society for Testing and Materials (ASTM):
 - ASTMA615 Deformed and Plain Billet Steel Bars for Concrete Reinforcement
 - ASTMC31 Making and Curing Concrete Test Specimens
 - ASTM C33 Concrete Aggregates

ASTMC39	Compressive Strength of Concrete Specimens
ASTMC88	Soundness of Aggregates
ASTMC94	Ready-Mixed Concrete
ASTM C136	Sieve Analysis of Fine and Coarse Aggregates
ASTM CI43	Slump of Portland cement Concrete
ASTM C150	Portland cement (Rev. B)
ASTM C231	Air Content of Freshly Mixed Concrete
ASTMC494	Chemical Admixtures for Concrete
ASTM C618	Fly Ash and Pozzolan for Use in Concrete
ASTM C989	Iron Blastfurnace Slag for Use in Concrete

C. SUBMITTALS

Submit shop drawings and catalog cuts for the following.

1. Concrete Mix Design: Concrete mixes used on this project shall be either established mixes verified by "Field Test Data" or new customer laboratory designed "Trial Mixtures". Requirements for either option are as follows.

All data shall be dated within the last year. Partial submittal will not be reviewed.

- a) List amount and source of mix ingredients.
 - Cement
 - Fly ash
 - Fine aggregate
 - Coarse aggregate
 - Water
 - Admixtures including superplasticizer
- b) Certified tests of fine and coarse aggregates meeting the requirements of ASTM C33.
- c) Certified statement from source of fine and coarse aggregates pertaining to history of alkali-aggregate reactivity (ASR) or DOT confirmation that ASR issues are not evident at the aggregate source.
- d) Strength Test Reports: The average strengths shall be higher than the required average compressive strengths (f/cr) as per ACI 301, paragraph 4.2.3.3.

- e) Typed letter signed by officer of supplier stating that all ingredients for proposed mix(es) are identical and from the same source as ingredients used for concrete in provided test reports.
 - f) Certified mill test of cement and fly ash or slag.
 - g) One-page admixture catalog cuts.
- 2. Submit one-page catalog cut for bonding agent.
 - 3. Submit one-page catalog cut for retarding admixture and surface-applied hot weather evaporation reducer.
 - 4. Submit catalog cuts for slab sealer and adhesive system used to install dowels and bolts into concrete and masonry.
 - 5. Reinforcing Steel: Submit shop drawings in accordance with ACI 301, ACI 315 and ACI 318R as modified below.
 - a) Drawings shall be clearly drawn and show enough detail to locate every bar without the need to refer to the Contract Drawings. All construction and control joints must be shown. Photocopies of Contract Drawings, in whole or in part, will not be acceptable.
 - b) No fabrication shall commence until shop drawings are approved. All bars shall be shop fabricated.

D. COORDINATION

- 1. Coordinate all concrete placement with mechanical, electrical, plans and specifications.

E. QUALITY ASSURANCE

- 1. Bar Identification and Mill Test Reports: All steel shall have the manufacturer's mill marking rolled into the bar which shall indicate the producer, size, type and grade.
- 2. Concrete testing prior to placement.

II. PRODUCTS

A. MATERIALS

1. Cement: ASTM C150, Type I or II.
2. Fine Aggregate: Clean natural sand, ASTM C33. Artificial or manufactured sand will not be acceptable
3. Coarse Aggregate: Crushed rock, washed gravel, or other inert granular material conforming to ASTM C33, except clay and shale particles shall not exceed one percent. Smooth or rounded stone will not be acceptable.
4. Water: Clean and free from deleterious amounts of oil, acids, alkalies or organic materials.

5. Admixtures:

Water-Reducing: ASTM C494, Type A or D

Air-Entraining: ASTMC260

6. Reinforcing Steel:

Bars: ASTM A615, Grade 60, deformed in accordance with ASTM A305, except ¼" bars may be plain.

Welded Wire Fabric: ASTM A185

Bar Supports: CRSI Class 1 plastic protected or Class 2 stainless steel protected.

7. Fiber Reinforcement: Where fiber reinforced concrete is shown or specified, the concrete shall have added at the time of initial mixing at least 5 pounds of glass fiber per cubic yard of concrete.

8. Forms:

Plywood: Product Standard PSI, waterproof, resin-bonded, exterior type, Douglas fir

Lumber: Straight, uniform width and thickness, free from knots, offsets, holes, dents and other surface defects

Form Oil: Light colored paraffin oil or other acceptable non-staining material

Polyethylene Film: Product Standard PS 17, 6 mils or thicker

9. Membrane Curing Compound: ASTM C-309, Type 2

10. Non-Shrink Grout: Quikrete Commercial Grade Non-Shrink Grout, Master Builders "Masterflow 713 Grout" or "Set-Grout", Sauereisen Cements "F-100 Level Fill Grout", U. S. Grout's "Five Start Grout" or approved equal.

11. Epoxy Grout: Two-component, solvent free, moisture insensitive, high modulus, high strength, Type I and II, Grade 3, Class Band C, Epoxy Resin Adhesive meeting the requirements of ASTM C-881 by Sika, Master Builders, Sauereisen or equal.

III. EXECUTION

A. LIMITING REQUIREMENTS

Concrete shall be watertight, resistant to freeze-thaw cycles and moderate sulfate attack, abrasion resistant, workable and finishable. Unless otherwise specified, concrete shall be controlled within the following limiting requirements.

1. Minimum Cement Factors: The quantity of Portland cement, expressed in pounds per cubic yard, shall be not less than that indicated in the following table.

Concrete Slump	Course Aggregate Size from No4 Sieve to			
	3/8"	1/2"	3/4"	1"
3 inches	629	592	564	536
4 inches	639	611	583	555
5 inches	658	630	602	573

2. Ratio of Fine to Total Aggregates: The ratio of fine to total aggregates based on solid volumes (not weights) shall be:

Course Aggregate Size	Minimum Ratio	Maximum Ratio
3/8 inch	0.45	0.60
1/2 inch	0.40	0.55
3/4 inch	0.35	0.50
1 inch	0.30	0.46

3. Total Water Content: Total water content of concrete shall not exceed 5.4 gallons of water per hundred pounds of cement in the mix.

4. Slump: Concrete slump shall be kept as low as possible consistent with proper handling and thorough compaction. Unless otherwise authorized by the Engineer, slump shall be a minimum of 3 inches and a maximum of 5 inches.

5. Total Air Content: The total volumetric air content of concrete after placement shall be 5 percent plus or minus one percent.

6. Admixtures: The admixture content, batching method and time of introduction to mix shall be in accordance with the manufacturer's recommendations. A water-reducing admixture and an air-entraining admixture shall be included in all concrete. No calcium chloride or admixture containing chloride from other than impurities from admixture ingredients will be acceptable.

7. Strength: The minimum acceptable compressive strength as determined by ASTM C39 unless otherwise specified shall be:

Age	Minimum Compressive Strength
7 days	3,000 psi
28 days	4,000 psi

B. STORAGE OF MATERIALS

Cement shall be stored in suitable moisture-proof enclosures. Cement that has become caked or lumpy shall not be used.

Aggregates shall be stored so segregation and the inclusion of foreign materials are prevented. The bottom 6 inches of aggregate piles in contact with the ground shall not be used.

Reinforcing steel shall be carefully handled and shall be stored on supports that will keep the steel from contact with the ground.

C. BATCHING AND MIXING

Concrete shall be furnished by an acceptable ready-mixed concrete supplier and shall conform to ASTM C94.

1. Consistency: The consistency of concrete shall be suitable for the placement conditions. Aggregates shall float uniformly throughout the mass, and the concrete shall flow sluggishly when vibrated or spaded. The slump shall be kept uniform.

2. Delivery Tickets: A delivery ticket shall be prepared for each load of ready-mixed concrete. A copy of each ticket shall be handed to the Engineer by the truck operator at the time of delivery. Tickets shall show the quantity delivered, the amount of each material in the batch, the outdoor temperature in the shade, the time at which the cement was added and the numerical sequence of the delivery.

D. FORMS

Forms shall be designed to produce hardened concrete having the shape, lines and dimensions indicated on the Drawings or in the Details. Forms shall be substantial and sufficiently tight to prevent leakage of mortar and shall be maintained in proper position and accurate alignment.

Forms for pavement, curbs or gutters shall be made of steel and shall be supported on thoroughly compacted earth. The top face of pavement forms shall not vary from a true plane more than 1/16 inch in 10 feet.

Forms shall be thoroughly cleaned and oiled before concrete is placed.

Where concrete is placed against gravel or crushed rock which does not contain at least 25 percent material passing a No. 4 sieve, such surfaces shall be covered with polyethylene film to protect the concrete from loss of water. Joints in the film shall be lapped at least 4 inches. Film shall not be used under roads.

1. Form Ties: Form ties shall be of the removable end, permanently embedded body type, and shall have sufficient strength and rigidity to support and maintain the form in proper position and alignment without the use of auxiliary spreader.
2. Edges and Corners: Chamfer strips shall be placed in forms to bevel all salient edges and corners, except the top edges of walls and slabs which are to be tooled, and edges which are to be buried. Unless otherwise noted, bevels shall be $\frac{3}{4}$ inch wide.
3. Form Removal: Forms shall not be removed or disturbed until the concrete has attained sufficient strength to safely support all dead, live and construction loads. Care shall be taken in form removal to avoid surface gouging, corner or edge breakage and other damage to the concrete.

E. REINFORCEMENT

Reinforcement shall be accurately formed and positioned and shall be maintained in proper position, while the concrete is being placed and compacted. Unless otherwise indicated on the drawings, the details of fabrication shall conform to ACI 315 and 318. In case of conflict, ACI 318 shall govern. Mechanical connections shall be used only as indicated on the Drawings.

All reinforcing bars and supplies shall be stored off the ground and protected from oil, paint, grease, rusting or scale. Bending of bars shall be done in accordance with the requirements of ACI 315. All bars shall be bent cold and in the shop.

Steel reinforcing shall be accurately positioned and secured against displacement by using concrete or metal chairs, spacers or other devices to properly support and fasten the reinforcing. Splices shall not be made at points of maximum stress, nor shall all bars be spliced at the same location. All bars shall be a splice of a minimum 30 bar diameters.

Metal accessories shall include all spacer, ties, chairs, bolsters and other devices required to support, fasten and hold the reinforcing steel in place and shall meet the requirement of ACI 315.

Wire mesh reinforcing shall have the spacing and gage shown on the Drawings or in the Details. Mesh shall be pulled taut and furnished with sufficient support to hold it in position during placing of the concrete. Mesh shall be lapped one space at all splices and wired together at every other interval.

F. PLACEMENT

Concrete shall be conveyed to the point of final deposit and placed by methods which will prevent segregation or loss of ingredients. During and immediately after placement, concrete shall be thoroughly compacted and worked around all reinforcement and embedment and into the corners of the forms. Concrete shall be compacted by immersion-type vibrators, vibrating screeds or other suitable mechanical compaction equipment. The use of jitterbug tampers to compact concrete flatwork will not be permitted.

Concrete shall not be placed in any forms until all reinforcing steel, pipes, sleeves, inserts, anchors and other appurtenances have been installed and inspected.

Concrete that has contained its mixing water for more than 45 minutes shall not be placed. Concrete shall not be placed when the temperature is 20 degrees F and falling, or when freezing temperatures are predicted for the next 24 hours. All concrete placed in weather above 90 degrees F shall be covered by shading, sprinkling or other approved means for a minimum of 24 hours. Construction joints shall be made where shown on the Drawings or in the Details. When replacing existing concrete, the concrete shall be sawed, thoroughly cleaned and all laitance removed.

G. TESTING

1. Air Content: An air content test shall be made from each batch of concrete from which concrete compression test cylinders are made. The Contractor shall provide all equipment and supplies necessary for the testing. Air content shall be determined in accordance with ASTM C173 or ASTM C231.
2. Slump: A slump test shall be made from each batch of concrete from which concrete compression test cylinders are made. Slump shall be determined in accordance with ASTM C143.
3. Test Cylinders: Compression test specimens shall be made, cured, stored and delivered to the laboratory in accordance with ASTM C31 and C39.

One set of concrete test cylinders shall be cast for each concrete pour. A set of test cylinders shall consist of four cylinders, two to be broken and to have compressive strengths averaged at 7 days, and two to be broken and to have compressive strengths averaged at 28 days. All concrete required for testing shall be furnished by the Contractor. No additional compensation will be paid to the Contractor for concrete so used.

Testing of the cured cylinders shall be performed by an independent testing laboratory at the expense of the Owner. The Contractor shall deliver the cylinders to the Engineer at the end of each day that concrete pours are made.

H. FINISHING

Recesses from fo1m ties shall be filled flush with mortar. Fins and other surface projections shall be removed from all formed surfaces, except exterior surfaces that will be in contact with earth backfill.

Unless otherwise specified, unformed surfaces shall be screened and given an initial float finish, as soon as the concrete has stiffened sufficiently for proper working. Any piece of coarse aggregate which is disturbed by the float or which causes a surface irregularity shall be removed and replace with mortar. Initial floating shall produce a surface of uniform texture and appearance with no unnecessary working of the surface.

Initial floating shall be followed by a second floating at the time of initial set. The second floating shall produce a finish of uniform texture and color. The completed finish for unformed surfaces shall be the finish produced by the second floating.

1. Pavement: Following placement, consolidation and the disappearance of bleed water, the concrete surface shall be broom finished with a broom acceptable to the Engineer. The broom shall be not less than 18 inches wide and made from good quality bass or bassine fibers not more than 5 inches long. The broom finishing shall produce regular corrugations not over 1/8 inch deep. The broom shall be pulled square across the surface from edge to edge, with adjacent strokes slightly overlapped and shall not tear the concrete surface.

The surface of pavements shall not vary more than 1/8 inch under a 10 foot straightedge placed parallel to the center line.

2. Curb and Gutter: Curb and gutter shall be finished to the shape indicated on the Drawings, in the Details or to match existing shapes. After the forms have been removed, all exposed edges shall be rounded using an edging tool having a 1/8 inch corner radius. Exposed surfaces shall be float finished and given a light broom finish at the time of initial set, using a horsehair broom applied at right angles to the length of curb and gutter.

3. Sidewalks: Concrete surfaces shall be screeded to the proper elevation and contour. All aggregates shall be completely embedded in mortar. Screeded surfaces shall be given an initial float finish as soon as the concrete has stiffened sufficiently for proper working. Any piece of coarse aggregate which is disturbed by the float or which causes a surface irregularity shall be removed and replaced with mortar. Initial floating shall produce a surface of uniform texture and appearance, with no unnecessary working of the surface. Initial floating shall be followed by a second floating at the time of initial set.

Floated surfaces shall be given a light broom finish, using a horsehair broom to provide a non-slip surface. Brooming shall be done at right angles to the length of the walk.

Sidewalks shall be edged using a 3 or 4 inch wide edging tool having a 1/8 inch corner radius. Edger lap marks at corners of each slab shall be carefully removed. False joints shall be provided at right angles to the length of the walk using a grooving tool with 1/8 inch radius. The finished edge on each side of the joint shall be the same width as the edging tool used. False joints shall divide each sidewalk into sections having a length equal to the width of the walk unless specified otherwise.

The finished surface of all sidewalks shall match the existing surfaces, shall be neat in appearance, shall be sloped to drain and shall not pond water.

I. CURING

Concrete shall be protected from loss of moisture by water saturation or by membrane curing for at least 7 days after placement.

Water saturation of concrete surfaces shall begin as quickly as possible after initial set of the concrete. Unformed surfaces shall be covered with polyethylene film tarpaulins or sand to retain the water. Water shall be applied as often as necessary to keep the concrete saturated for the entire curing period.

Membrane curing compound may be used in lieu of water curing on concrete which will not be covered later with mortar or additional concrete. Membrane curing compound shall be spray applied at coverage of not more than 300 square feet per gallon. Unformed surfaces shall be covered with curing compound within 30 minutes after final finishing. If forms are removed before the end of the specified curing period, curing compound shall be immediately applied to the formed surfaces before they dry out. Curing compound shall be suitably protected against abrasion during the curing period.

Concrete shall be protected against freezing for at least 7 days after placement.

J. REPAIRING DEFECTIVE CONCRETE

Defects in concrete surfaces shall be repaired to the satisfaction of the Engineer. All concrete which is honeycombed or otherwise defective shall be cut out and removed to sound concrete with edges square cut to avoid feathering.

Concrete repair work shall conform to Chapter 9 of ACI 301 and shall be performed in a manner that will not interfere with thorough curing of surrounding concrete. Repair work shall be adequately cured.

K. CONCRETE FOR MANHOLES

Concrete for manholes shall conform to the requirements specified herein.

L. CONCRETE FOR PIPE BLOCKING AND PIPE ENCASEMENT

Concrete for buried blocking and encasement of pipe shall conform to the limiting requirements specified herein, except that the cement factor and total water content may be adjusted to provide a minimum compressive strength of 3,500 psi at 28 days. Concrete shall have a slump of not less than 3 inches or more than 5 inches when placed. Prior to placing concrete, the excavation shall be dry and free of standing water.

END OF SECTION

TOWN OF THURMONT
STANDARD SPECIFICATIONS
SECTION 2000
WATER SYSTEM

I. General

A. Description

1. This section includes construction, testing and disinfecting of permanent water supply, fire protection and distribution piping to the limits indicated in accordance with the Contract Documents.

B. Quality Assurance

1. Chlorination and Field Tests

a) The Contractor shall chlorinate and field test all new main installation before connecting them to the existing system. The Engineer shall determine the amount of main to be chlorinated and tested at any one time and reserves the right to separate the installation into several test sections, in the event of long extensions, or installation of pipe designed for different head conditions, or for other reasons.

b) The Contractor shall cap and buttress the new main between the sections of the existing pipe.

c) The Contractor shall furnish at his own cost and expense all necessary bulkheads, caps, plugs or other fittings required to stop off, temporarily, the main for test purposes.

d) After the main is satisfactorily tested according to the requirements of the specifications, the Contractor shall remove the buttresses and caps and connect the new main with the existing main by means restrained mechanical joint solid sleeve and 3³/₄" wide ductile iron spacer or other Engineer approved method.

e) Use continuous feed method or slug method for chlorination as outlined in AWWA for disinfecting water mains. All chlorine shall be introduced in solution and fed at a constant rate using a force pump. At the end of the 24 hour period, the treated water shall contain no less than 10 mg/L (10 parts per million) chlorine throughout the main being tested.”

f) Test restrictions.

Test pressure shall not be less than 150 psi pressure at the highest point along the test section or more than 200 PSI at the low point.

Test pressure shall not exceed pipe or thrust-restrain design pressures.

The hydrostatic test shall be of at least 2-hour duration.

Test pressure shall not vary by more than 5 psi (35 KPa or 0.35 bar) for the duration of the test.

Valves shall not be operated in either direction at differential pressure exceeding the rated valve working pressure. (Use of a test pressure greater than the rated valve pressure can result in trapped test pressure between the gates of a double-disc gate valve. For tests at these pressures, the test setup should include provision, independent of the valve, to reduce the line pressure to the rated valve pressure on completion of the test. The valve can then be opened enough to equalize the trapped pressure with the line pressure, or fully opened if desired.)

Test pressure shall not exceed the rated pressure of the valves when the pressure boundary of the test section includes closed, resilient-seated gate valves or butterfly valves.

g) Pressurization.

After the pipe has been laid, all newly laid pipe or any test section thereof shall be subjected to a hydrostatic pressure of at 150 psi at the point of testing. Each test section of pipe shall be slowly filled with water, and the specified test pressure, based on the elevation of the lowest point of the line or section under test and corrected to the elevation of the test gauge, shall be applied by means of a pump connected to the pipe in a manner satisfactory to the owner. Valves shall not be operated in either the opening or closing direction at differential pressures above the rated pressure. It is good practice to allow the system to stabilize at the test pressure before conducting the leakage test. [Formula for calculating head pressure is 2.3' head = 1 psi/1' head = 0.43 psi]

h) Air removal.

Before applying the specified test pressure, air shall be expelled completely from the pipe, valves and hydrants. If permanent air vents are not located at all high points, the contractor shall install corporation cocks at such points so the air can be expelled as the line is filled with water. After all the air has been expelled, the corporation cocks shall be closed and the test pressure applied. At the conclusion of the pressure test, the corporation cocks shall be removed and plugged with approved brass plugs.

i) Examination.

Any exposed pipe, fittings, valves, hydrants and joints shall be examined carefully during the test. Any damaged or defective pipe, fittings, repaired or replaced with sound material, and the test shall be repeated until it is satisfactory to the Construction Manager.

j) Leakage defined.

Leakage shall be defined as the quantity of water that must be supplied into the newly laid pipe or any valved section thereof to maintain pressure within 5 psi (35 MPa . or 0.35 bar) of the specified test pressure after the pipe has been filled with water and the air has been expelled. Leakage shall not be measured by a drop in pressure in a test section over a period of time.

k) Allowable leakage.

No Pipe installation will be accepted if the leakage is greater than that determined by the following formula:

$$L = \frac{S \times D \times \sqrt{P}}{133000}$$

133000

Where:

L = allowable leakage, in gallons per hour

S = length of pipe tested, in feet

D = nominal diameter of the pipe, in inches

P = average test pressure during the leakage test, in pounds per square inch (gauge)

(1) No testing is allowed against closed metal-seated valves or butterfly valves. Testing may be allowed against new resilient seated valves if written approval is received from the Engineer.

(2) When hydrants are in the test section, the test shall be made against closed hydrant valves.

l) The newly installed main shall be disinfected in accordance with the AWWA C651. Following chlorination and testing, the main should be flushed as soon as possible (within 24 hours), since prolonged exposure to high concentration of chlorine might damage the asphaltic seal coating.

m) The procedure for testing should not be applied to air-pressure testing because of the safety hazards involved.

2. Quality assurance for precast concrete utility structures is specified in Section 2250.

C. Submittals

1. Submit certified test reports and certificates of compliance before delivery of materials as specified in Section 2050 for all pipe furnished by the Contractor under this Section. Certifications shall include Contract Number, job location, Contractor's name, types, classes and strengths of pipe and pipe manufacturer's name.

2. Submit certificates of compliance for all material furnished by the Contractor under this Section, in accordance with Section 2050.

3. A packing list shall accompany every shipment and shall contain the following information: contract number, truck number, kind and class of pipe, fittings and valves and appurtenances, length of pipe and other pertinent information.

4. Submit shop drawings in accordance with Section 1200 and Section 2250 where applicable.

5. Submit manufacturer's certified drawings of the valve including valve operators, gear ratios and design flows and pressure differential, performance charts and parts list. Furnish manufacturer's certified test reports for all tests specified in the referenced standards and all tests performed on valve operators. Submit a manufacturer's affidavit stating that valves furnished comply with all applicable provisions of the referenced standards and modifications thereto described herein.

6. Fittings shall be marked with weight, manufacturer's mark, year, month, and date cast, and number of lot. Couplings shall be marked in accordance with MSS SP-25 Standard Marking System for Valves, Fittings, Flanges and Unions.

D. Inspection

1. All items furnished by the Contractor under this section shall be inspected by the Town personnel before installation. Notify the Engineer three working days before proposed inspection, as specified in Section 2050

II. Materials

A. General

1. The Contractor shall furnish all pipe, fittings, fire hydrants, valves, valve boxes, meter yokes and vaults, and manhole or vault frames, covers and steps and all glands, gaskets, nuts and bolts for mechanical joint pipe and all other necessary materials for proper completion of the work.
2. The Town will furnish all $\frac{3}{4}$ " x $\frac{5}{8}$ ", 1" and 2" meters.

B. Materials Requirements

1. Pipe and fittings
 - a) General- all pipe of the same material and size shall be furnished by the same manufacturer. Each pipe length and fitting shall be clearly marked with the manufacturer's name and trademark.
 - b) Ductile iron pipe shall meet the requirements of AWWA C151 with mechanical joint or push on joint conforming to the requirements of AWWA C111. Pipe shall be bituminous coated outside and cement lined with double thickness inside in accordance with AWWA C104. Cure cement lining with a bituminous seal coat.

c) All pipe and fittings, with the exception of glass lined pipe and sleeves, shall be cement mortar lined. Linings shall conform to American Standard Specifications for Cement Mortar Lining for Cast Iron Pipe and Ductile Iron Pipe and Fittings, ANSI A21.4 (AWWA C104) and shall be standard thickness. The mortar lining shall be protected with the bituminous seal coat. All buried DIP and fittings shall have a bituminous coating on the exterior surfaces in accordance with ANSI A21.51 (AWWA C151). All exposed DIP and fittings shall have a shop applied prime coat.

(1) 3" through 6" size pipe shall be class 54

(2) 8" and larger size pipe shall be class 52

(3) Thickness class of large diameter (24" and larger) transmission mains shall be approved by the Engineer on a case-by-case basis. Ductile iron fittings shall meet the requirements of AWWA C153.

(4) Fittings for use with ductile iron pipe shall be Class 250 gray cast iron conforming to AWWA C110 and C151, or Class 350 ductile iron. Ductile iron shall conform to ASTM A536, minimum grade 70-50-05. Nominal thickness of DI fittings shall be equal to or exceed Class 53 ductile iron pipe thickness. Radii of curvatures shall conform to AWWA C110. Provide accessories as required to connect with plain end of slip joint pipe or cut pipe. Bolts shall be of the size and length called for and in accordance with the "American Standard" and comply with the requirements of the ANSI/AWWA Standards. The bolts for flanged joints shall be a minimum ASTM A307; Grade B carbon steel and be in accordance with ANSI A21.10, (AWWA C110). The bolts shall have hexagonal heads and nuts, no washers shall be used. Gaskets shall be the "Ring Gasket" type, 1/8-inch minimum thickness, cloth inserted rubber, red rubber or neoprene and shall be suitable for the service intended. Gaskets for glass lined pipe shall be TORUSEAL flange gasket, or equal.

- (5) Fittings shall be of uniform quality, true to pattern, strong, tough, of even grain, sound, smooth, without cold shuts, swells, scabs, blisters and sand holes, cracks or other defects. Plugs, filled holes and welds will not be allowed. Fittings shall be clean and entirely free from grease and oil, substantially free of blacking, dirt, sand, rust, and slag and fluxing. Remove rough spots in sockets or on plain ends or walls before lining and coating.
- (6) Fittings shall be bituminous coated outside and cement lined with double thickness inside in accordance with AWWA C104.
- (7) Flanges shall be cast integrally with body and shall have the same thickness over their entire circumference. Faces shall be perpendicular to axis of pipe.
- (8) Flanged joints and fittings shall have a minimum pressure rating of 250 psi with 125 lb. American Standard flanges. All flanges and fittings shall conform to the requirements of ANSI B16.1. Flanges shall be ductile iron and shall be of the threaded or screw on type. The face of the flanges shall be machined after installation of the flange to the pipe. No raised surface shall be allowed on flanges. Flanged pipe shall conform to the requirements of ANSI Specification A21.15, (AWWA C115). Pipe lengths shall be fabricated to meet the requirements of the Drawings.
- (9) Bolt holes in fitting flanges shall straddle the vertical centerline when the fitting is positioned to change the fluid flow in a horizontal direction. Drill or core bolt holes completely through flanges so as to be free of sand and projections. Gage to assure dimensional bolt circle control, location and size of holes and concentricity with the socket or gland lip.

d) Copper pipe shall be seamless, type K and meet requirements of ASTM B88. No "K" soft copper larger than 2" inch shall be allowed. Fittings shall be copper meeting requirements of ASTM B62, free and injurious blowholes, porosity, shrinkage, cracks or other injurious defects, smooth and well cleaned, and shall meet requirements of AWWA C800 and the following:

(1) Corporation Stops and Couplings:

Copper tube outlets of all corporation stops shall be of the flare or pack joint type and shall be fitted with a coupling nut threaded according to AWWA C-800, which shall have a machine bearing in the skirt part equal to or greater than the outside diameter of the corresponding size type K copper pipe, in inches. Protect inlet threads with a plastic coating in shipment.

Materials shall meet requirements of preapproved materials list. Test certificates shall be furnished by the Contractor certifying that all corporation stops have been subjected to a production line test by the manufacturer of 85 PSIG air pressure while submerged in water, in both open and closed position of the key, and shall show no leakage. Period of observation shall be 10 second minimum. Stops shall be subjected to a 300 PSIG hydrostatic test and shall not leak top or bottom and shall not show signs of structural failure.

(2) Water Meter Vault and Meter Setter Specifications

Water meter housing shall be heavy walled plastic, Old castle Precast 00182003 18" x 30" for ¾" services. Oldcastle Precast 00242003 24"x30" with a Ford Ext-1 18" cover to 24" tile steel extension ring adapter for 1" services.

Concrete water meter housings of the same dimensions to be used in pre-approved traffic bearing locations with heavy duty traffic bearing covers and lids. Concrete shall be fabricated in accordance with ASTM 014, lightweight aggregate concrete having a 28 day strength of not less than 3500 psi. If substituting with concrete pipe it shall have the same dimensions as indicated with one end notched 4" high x 3" wide at two points 180 degrees apart so as to accommodate service piping when set up on its notched end.

FORD METER BOX CO.

¾"	VBHC72-15W-44-33-Q-NL
1"	VBHC74-15W-44-44-Q-NL
1½"	VBHH76-15B-44-66-G-NL
2"	VBHH77-15B-44-77-G-NL

2. Concrete buttresses and anchors shall meet requirements of Section 1700 and shall be of the strength indicated on the Plans and Standard Details.
3. Masonry work shall meet requirements of Section 1700.
4. Precast concrete shall meet requirements of sections 1700 and 2250.
5. Granular Bedding is specified in Section 2200 Earthwork.
6. Steel for connections shall meet requirements of ASTM A36 and ASTM A301.
7. Joint Material.

Mechanical Joints shall conform to requirements of AWWA. Push on joints shall conform to requirements of AWWA C111.

Flanged joints shall conform to requirements of AWWA C110.

Mechanical couplings shall be as indicated, manufactured by Dresser, Smith Blair or equal.

8. Valves

Gate valves 4-inch through 16-inch shall be iron body, bronze mechanical joint, resilient seat with non-rising stem and a 2-inch open left square operating nut conforming to AWWA C509 or C515. Gate valves larger than 16-inch shall be built and tested in accordance with AWWA C515 and shall be iron body, bronze mounted, resilient seat, valves with non-rising stems and a standard 2-inch open left operating nut and of ample strength to withstand and operate under the following working pressures. Valves 12 Inches in diameter and smaller shall meet a working pressure of 250 psi. Valves larger than 12-inch diameter shall meet 200 psi plus the water hammer. Use of gate valves larger than 16-inch shall be approved by the Engineer.

Gearing and bypass are not required on smaller than 30-inch diameter valves. Gate valves 30-inch diameter and larger shall be equipped with bypass and bevel gearing enclosed in a grease filled gear case, tracks and scrapers for horizontal or spur gearing for vertical installation. Unless otherwise specified, or indicated, all valves shall be mechanical joint. Flanged ends shall be specified if the valves are to be placed in valve vaults. Furnish valves complete with required joint materials. Extension stems shall be provided for valves where operating nut is more than 4 feet below finished grade.

- a) Butterfly valves, if specified on contract documents, 42-inch and smaller shall be Class 150B and shall conform to the requirements of AWWA C504. Ground level indicators with extension stems are required on all butterfly valves.
- b) All internal ferrous components and surfaces of the valves, with the exception of stainless steel and finished or bearing surfaces, shall be shop painted with two coats (10 mils min. dry film thickness) of the manufacturer's premium epoxy for corrosion resistance. Damaged surfaces shall be repaired in accordance with the manufacturer's recommendations.
- c) Air release valves shall be two inch, universal, with surface diameter 1/4 inch, range of working pressure from 0 to 165 pounds, stainless steel float, resilient seat and screwed connection; Crispin Model U-20, Apco combination air release valve model 145-C, or equal.

d) Pressure relief valves 1 inch and under shall have bronze bodies and above 1 inch shall have cast iron bodies, bronze fitted with grey iron diaphragm base and straight chamber and phosphorus bronze diaphragm. The ratio of the diaphragm area to the seat area shall be adequate to overcome sticking. The seat disc shall be of non-corrodible, non-sticking material capable of withstanding extreme temperatures. Valves shall permit dismantling for repairs and cleaning without being removed from the line. Valves shall conform to the ASME Boiler Construction Code as approved by both the Underwriters Lab., and the National Board of Boiler Pressure Vessel Inspectors. All valves shall be designed for a minimum working pressure at least equal to the working pressure of the corresponding pipeline and shall have adjustment over a range of at least 20 percent above or below the required setting pressure of the installation.

(1) Pressure relief valves (non-potable water service) shall be diaphragm activated, single seat, pilot operated and shall maintain a constant upstream pressure by relieving excess pressure. The valve shall be normally closed and shall open to maintain the required back pressure when the valve inlet pressure reaches the pilot control set point. The initial pilot control setting shall be 78 psi. The stem shall be stainless steel and shall be guided through the center for 100% of the stem travel. The main valve throttling plug shall be provided with V-port sections to insure precise control at low flow rates. All internal metal parts shall be bronze or stainless steel. The control pilot shall be direct acting, spring loaded, and adjustable with bronze body and stainless steel trim. The diaphragm and seat disc shall be BUNA-N. The valve shall be of the angle or globe pattern as shown on the Drawings and shall be fully repairable in the line. The pressure relief valve shall be the Model 428CP as manufactured by Bailey, Fresno, California, or equal.

(2) Sewage air and vacuum/pressure air release valve assemblies shall be installed at all the locations specified herein or indicated on the Drawings and shall be installed complete with all appurtenant piping and valves as required for a complete and operable installation. The valves shall be constructed of cast iron with stainless steel float, and all working parts shall be bronze, brass, stainless steel, or other corrosion resistant material. The valves shall be designed for a minimum working pressure of 150 psi and a test pressure of 300 psi. The valves shall include isolation valve and backflushing attachments which shall consist of blow-off valves, quick disconnect couplings, and a minimum of 5 feet of rubber hose suitable for backflushing without dismantling the valve. All air and vacuum valves shall be provided with "soft seating" material to provide drip tight closure at 1 to 65 psig. The exhaust from the valve shall be piped to a suitable disposal point. All valves 1-inch diameter and larger shall have a ¼ inch min. diameter drain plug.

(3) The pressure air release valve (potable water only) shall be constructed of cast iron with stainless steel trim and stainless steel float, and all working parts shall be bronze, brass, stainless steel, or other corrosion resistant material. The valves shall be designed for a minimum working pressure of 150 psi and a test pressure of 300 psi. All valves shall be provided with "soft seating" material to provide drip-tight closure at 1 to 65 psig. All valves shall be provided with a vacuum check.

e) All internal and external ferrous components and surfaces of the valves, with the exception of stainless steel and finished or bearing surfaces, shall be shop painted with two coats (10 mils min. dry film thickness) of the manufacturer's premium epoxy for corrosion resistance. Damaged surfaces shall be repaired in accordance with the manufacturer's recommendations.

f) Globe valves shall be two inches, Class B meeting requirements of FS WW-51A, 150 lbs screwed. Globe valves (service/compressed air) shall be bronze body and bonnet with brass stem and stainless steel regrindable disc plug. Valves shall be Jenkins Valve Fig. 546-P, Crane Co., or equal with minimum 300 psi non-shock cold water pressure rating and screwed ends.

g) Backflow preventer shall be the size shown on the Drawings and shall be of the double check valve principle. Backflow preventer installation shall include isolation valves and four test cocks, furnished as an assembly. Valve body shall be galvanized cast iron with bronze working parts and springs, plastic coated carbon steel valve discs, neoprene coated cotton duck diaphragm. For backflow preventers less than 2 ½", the installation assembly also shall include a strainer. Isolation valves for backflow preventers shall be ball valves, except for size 2 ½" and larger which shall be resilient seat gate valves. Test cocks shall be located as recommended by the manufacturer to facilitate functional testing of the assembly.

Valve shall be designed to suction a maximum working pressure of 175 psi and a hydrostatic test pressure of 350 psi.

Valve shall be Hershey Products, Inc., Model Bosco, Cla-Val Co., or equal.

h) Valve boxes shall be of cast iron or combination of cast iron and PVC, complete with cover marked WATER. Valve boxes shall be extension type, with screw adjustment, and with flared base boxes shall be of such length to permit adjustment in both directions, to the depth of cover required over the pipe at the valve location. Boxes shall not be set so as to transmit surface loads to the valve. (See Standard Detail)

i) All valve boxes shall be placed so as not to transmit shock or stress to the valve and shall be centered and plumb over the operating nut of the valve. The ground in the trench upon which the valve boxes rest shall be thoroughly compacted to prevent settlement. The boxes shall be fitted together securely and set so that the cover is recessed ¼- ½" below the final grade of the adjacent material per detail 114.1.

j) All valves will be furnished and installed with stainless steel hardware.

9. Fire hydrants shall be American Model #B-62-B, 3-way, dry top, and compression type with safety flange, painted safety yellow, conforming to AWWA C502. Each hydrant shall have one 4 ½ inch diameter pumper (steamer) nozzle and two 2 ½ inch hose nozzles, nozzle gaskets, 5 ¼ inch valve, 1 ½ inch pentagonal operating nut, open left. Both the hose nozzles and pumper (steamer) nozzle shall have National Standard Thread. Hydrants shall be designed for 4 ½ foot bury (unless otherwise indicated on the plans) and six (6) inch mechanical joint inlet. Fire hydrants installed during the contract, but not yet accepted into the Town's system shall be flagged as out of service. Taping a dark colored plastic bag over the hydrant will indicate that these hydrants are out of service.

a) Indicate depth of bury by the following methods:

(1) Raised figures on the barrel to show depth in feet. The figure shall be on the barrel, just below the swivel flange so that it is visible when installed. The figure shall be raised at least 1/8 inch above the barrel and surface and the height of the figure shall be at least one inch and shall be integrally cast with the barrel.

b) The inlet connection shall be a 6-inch, Class 250, mechanical joint bell and shall meet the general requirements for Standard Mechanical Joint Cast Iron Pipe and Fittings, furnished with necessary accessories for each such mechanical joint. The bolts shall be made of low alloy steel such as Corten or Usalloy. The gaskets shall be made of rubber. Glands shall be made of high strength cast iron consistent in design and strength with the elbows with which they are to be used. Elbow or inlet connection shall be shipped assembled with hydrant.

c) The outside of the hydrant above the finished ground line to a height just above the hydrant nozzles (or to the hydrant bonnet if so construed) shall be thoroughly cleaned, primed and then painted with two coats of Rhinamel Gray No. 202-31-00 paint as manufactured by the Grow Chemical Coating Corp., Tropical Plant Div., or equal. Top section of hydrant above the nozzles (on the hydrant bonnet, if so construed) shall be likewise cleaned and then painted with two coats of safety yellow as manufactured by the previously mentioned vendor, or Derusto #AO-40 or equal. Proposed paint substitution shall be presented to the Engineering Department with complete details, painting design, paint color chips and at least one pint of the proposed paint.

Paint the inside and the outside of the barrel below the ground line and the cast iron elbow inside and outside with bituminous coating; ANSI A-21.10 for potable water.

The bituminous coating shall be of such composition as to make a smooth, tough and tenacious coating, neither so soft as to flow when exposed to the sun nor so brittle as to crack and scale off when exposed to temperature below freezing.

The Bituminous coating may be applied hot or cold either by brushing, dipping or by spraying. The coating materials may be subjected to chemical and physical testing to confirm its uniformity and quality.

At no time shall there be any evidence of general peeling or scaling of the coating. Any serious damage to the coating because of rough handling in shipment or hauling shall be repaired to its original condition by the manufacturer at no cost to the Engineering Department.

d) External operating and cap nuts shall be of pentagonal shape. The pentagon shall measure 1 ½ inches from point to flat at the base of the nut and 1-⁷/₁₆ inches at the top.

Hydrant shall be open by turning operating nut left (counter clockwise). Direction of opening shall be indicated on the top of operating nut by means of a raised arrow.

10. Stuffing box packing shall be the "O" ring seal.

a) The following parts are to be bronze as specified in AWWA C-502.

Drain Valve, Valve Seats or Seat Rings Stuffing Box (Bronze- brushed Cast Iron) Stuffing Box Parts Hold down Nut Threaded Stem Nut (sleeve).

b) The barrel of the hydrant shall be in two cast iron or ductile iron sections, designed to break at or near the finished grade; the cast iron shall conform to American Standard Specifications ANSI- A21.-51. The nozzle section shall be attached to the lower barrel section by means of a tapered flange ring held in place by suitable "hydrant head" bolts and nuts. The flange and flange rings shall be so designed that the top or upper barrel section, including the bonnet and operating nut, may be revolved 360 degrees for facing without disturbing the bottom section of the barrel. (The use of a split bronze insert ring will not be permitted).

c) Fire hydrant connection appurtenances shall be as follows:

(1) Anchor coupling shall be from 12 to 13 inches long, weighing approximately 70 pounds, double thickness cement lined, and bituminous sealed as per AWWA C104, six inch cast iron mechanical joint, class 250, with integrally cast standard mechanical joint gland on one end and one loose end rotatable ductile iron gland on the other end. The plain end shall be of sufficient dimension to form a mechanical joint with a six inch mechanical joint bell.

(2) Straps, bolts and nuts shall meet requirements of ASTM A36 and A301, as specified in Section 2300.

11. Castings shall be grey iron as specified in Section 2300.

12. Bituminous coatings shall be coal tar epoxy conforming to requirements of MIL P 23236 P, class 2. Coatings on contact with potable water shall meet the requirements of AWWA C203 and jurisdictional Health Department requirements.

13. Connection Appurtenances

a) Ductile tapping sleeves shall be mechanical joint, furnished complete with sealing gaskets shall be "O" ring type, high quality molded rubber having an approximate seventy durometer hardness, placed into a groove on the curved surface of the tapping saddles., mechanical joint accessories, or armored tipped, and suitable for use on Ductile iron pressure pipe. Hub sleeves shall fit Class "D" pipe with maximum allowance for outside diameter. Connecting flange joint between sleeve and valve shall conform to MSS (Manufacturers Standardization Society of the Valve and Fittings Industry) Standard SP60, for pipe up to 12 inches in diameter. Outlet flanges for pipe larger than 12 inches shall be designed to receive the valves furnished. Ship complete with rings, gaskets, bolts in place and ends of sleeves covered. Mechanical joint tapping valves shall have inlet flanges by the mechanical joint outlets, be subjected to a test pressure of 300 psi, be designed for working pressure 200 psi, and shall meet other requirements specified hereinbefore for gate valves.

b) Tapping assemblies, saddles, and clamps shall be as per Interpace, Adams, Mueller or equal. Provided threaded outlet as required.

c) Service clamps shall be double strap galvanized with corporation stop thread of appropriate size, neoprene gasket cemented in place, cadmium plated nuts and straps (for ductile iron pipe) and shall be the diameter required. Clamps shall be as manufactured by Mueller, Skinner, Dresser or equal.

d) Service saddle for installation on Class 150 pressure pipe as shall be cast iron with AWWA threads sized as required, furnished with neoprene gaskets. Size shall be as required. Saddles shall be as manufactured by General Engineering Co., or equal. Use mastic supplied by, or approved by, the manufacturer.

e) Uniflange shall be manufactured from Ductile Iron ASTM A 536 Grade 65-45-12. Drilling to ANSI B16.1 125 Lb. design. The gasket supplied with the flange shall be suitable for water usage and be SBR (BUNA-S) with a temperature range of -65° to 212 °. The flange shall be capable of handling a working pressure of 200 psi and a test of 600 psi. The Uniflange shall be manufactured by Uniflange Corporation, Nortboro, Massachusetts, or equal.

III. Execution

A. Laying Pipe

1. A minimum of 3'6" cover shall be maintained over all mains. Additional depth may be required of large meter vaults or larger gate valves.
2. Lay pipe to a true uniform line and grade as indicated on plans and as recorded on cut sheets.
3. Trench excavation and backfill and test pits shall be specified in Section 2200. Excavate test pits as specified in Section 2200 sufficiently in advance of trench construction so that reasonable changes in line and grade can be made where the location of existing structures varies from that shown. The Contractor shall adjust pipeline profile as required at connections to existing mains subject to the approval of the Engineer. Completely excavate sufficient trench to assure that no unforeseen obstructions exist before commencing pipe installation. Work occasioned by failure to take such precautions shall be performed at no cost to the Town.
4. Only proper and suitable tools and appliances for the safe and convenient handling and laying of pipes and fittings shall be used. Pipe, fittings and valves shall be carefully handled and lowered into the trench. Under no circumstances should any pipe or fitting be dumped or rolled into the trench or be allowed to drop against the pipe or fitting already in the trench. Great care shall be taken to prevent the pipe lining and coating from being damaged, and any lining or coating damaged in any way shall be repaired by the Contractor to the satisfaction of the Engineer.

5. The pipe and fittings shall be thoroughly cleaned before they are laid and shall be kept clean until the acceptance of the completed work. Just before being lowered into the trench, each length of pipe or fitting shall be well swabbed with a water and chlorine solution to insure the removal of any dirt or foreign matter therefrom. After being placed in the trench, and prior to joining one tablespoon of HTH or Perchloron, shall be placed in each length of pipe or fitting. After the pipe has been "homed", the end shall be kept covered until the next length is laid. At the close of work each day the end of the pipe line shall be tightly closed with an expansion type stopper so that no dirt or foreign substance may enter the line and this stopper shall be kept in place until pipe laying is again resumed.

a) As an alternate, the pipe can be cleaned by flushing with chlorinated water with a high pressure hose. After cleaning the end of the pipe shall be closed or plugged for protection.

6. Installation

a) Align pipe so that no shoulder or unevenness results on the inside of the mains. Cutting where required to fit onto the line or to bring into the required location, shall be done in a satisfactory manner with an approved cutting tool or tools which will leave a smooth edge and at right angles to the axis of the pipe and not otherwise damage the pipe or lining. Such cuts shall be made at no cost to the Town.

b) Joint deflection of mechanical joint and tyton joint pipe shall be as indicated on Standard Details and the Plans, unless otherwise approved by the Engineer.

c) Special care shall be taken to ensure that the pipes are well bedded on a solid foundation in accordance with Standard Details and Section 2200. Any defects due to settlement shall be made good by the Contractor at no expense to the Town. Bell holes shall be dug sufficiently large to ensure the making of proper joints.

d) Springing of pipe to replace any section will not be allowed, except by permission of the Engineer.

e) Pipe fittings and valves shall be secured in place by concrete foundation or thrust blocks or by strapping as shown on the plans and in accordance with the Standard Details. As an alternate to securing by the use of concrete foundations and thrust blocks or strapping the contractor can use mechanical joint restraining glands meeting the requirements of AWWA C110 or C153 installed in accordance with AWWA C600 if the water main is designed for restrained joints.

B. Joints

1. Mechanical Joints

a) Mechanical joints consist of rubber gaskets, cast iron gland rings, bolts, and hexagonal nuts. Prior to assembling joint, both pipe sections to be in contact with the gasket shall be cleared with a wire brush so as to obtain a clean, smooth surface free of rust and foreign materials.

b) Mechanical joints shall be made up with gaskets, glands and bolts. When a joint is to be made up, the bell or socket and plain end shall be cleaned and washed with a solution of mild soap in water; the gland and gasket shall be slid onto the plain end and the end then entered into the socket until it is fully "home" on the centering ring. The gasket shall then be painted with soapy water and slid into position, followed by the gland. All bolts shall be inserted and made up hand tight and then tightened alternately to bring the gland into position evenly. Excessive tightening of the bolts shall be avoided. All nuts shall be pulled up using a torque wrench which will not permit unequal stresses in the bolts. Torque shall not exceed the recommendations of the manufacturer of the pipe and bolts for the various sizes. Care shall be taken to assure that the pipe remains fully "home" while the joint is being made. Joints shall conform to the applicable AWWA Specifications.

c) Assemble joints in accordance with AWWA C111 and C600 and as specified herein. Clean with soapy water and lubricate contact surfaces with vegetable oil soap. Slip the gasket over the spigot end in the bell. Complete the joint by alternate tightening of proper number, size, and length bolts 180 degrees apart with a torque wrench set at the range listed in the chart below, so that the gland and face of the flange present parallel faces during the procedure. The first bolt to be tightened shall be at the bottom of joint. Second shall be at the top of the joint, etc.

TORQUE RANGE

4" to 6"	50 to 60 foot pounds
8"	60 to 70 foot pounds
12"	70 to 80 foot pounds
Larger than 12"	75 to 90 foot pounds

d) Where satisfactory sealing of the joint is not attained at the maximum permissible torque, disassemble, re-clean, and reassemble the joint with a new gasket.

2. Push-on joints

a) Push-on joints consist of a circular rubber gasket which fits into a specially designed bell or socket end of the pipe and over the spigot end of the pipe using the manufacturer's recommended lubricant. File or grind the spigot on field cut pipe lengths to resemble the pipe as manufactured so that the spigot end will slip into the socket intact without hindrance or gasket damage. Place an identifying mark on pipe that is not furnished with a depth mark on the spigot to show the depth of the socket.

b) Assemble joints in accordance with AWWA C600 and as specified herein. Clean with soapy water the inside of the socket and outside of the spigot and the pipes to be jointed to obtain clean, smooth surfaces free of foreign materials. Apply a thin film of gasket lubricant furnished by the joint manufacturer to the inside surface of the gasket and to the outside surface of the spigot. Enter the spigot into the socket up to the depth mark, using equipment designed for the purpose.

C. Fittings and Valves

1. Install fittings and valves where indicated on the plans. Set fittings and valves and join to pipe as hereinbefore specified. Where valves occur on the end of a pipeline, place a cast iron plug or blind flange and secure in the exposed bell before backfilling the trench.
2. Provide a valve box and extension stem where required for the following: nut operated valves; valves on which the operating mechanism is enclosed in a grease case; valves 16 inch and larger in diameter; valves with exposed gearing or operating mechanism; air valves.
3. Set valve box at right angle to the water main, centered and plumb over the operating nut of the valve extension stem with nut from three to four feet below top of cover with the box cover flush with the surface of the finished grade, or set to the elevation shown on the drawings. Support as required to maintain nut in position. Before installation, ascertain that valves are in proper working order. If valves are not operating properly, notify the Engineer immediately. Backfill and compact under and around valve boxes to insure no vertical loads are transmitted to the valve operators. The flange at the bottom of the bottom section shall rest upon bricks as shown on the Standard Detail.

D. Hydrants

1. Install fire hydrants where indicated on the Plans in accordance with the Standard Details. Set plumb at the elevation directed by the Engineer. Place the steamer outlet normal to the street line. Restrain all joints from the tee on the main to the fire hydrant as shown on the Standard Details.
2. The hydrant shall be firmly set on a solid concrete block and a minimum of $\frac{1}{3}$ cubic yard of $\frac{1}{2}$ " to $\frac{3}{4}$ " size stone granular material which shall extend to a point approximately 4 inches above the waste opening in accordance with the Standard Details.
3. Lay fire hydrant connections level, in the manner specified hereinbefore for laying pipe.

E. Water House Connections

1. Provide water house connections from the water mains to property lines with one continuous piece of "K" copper pipe at the elevation indicated on the Plans, Standard Details, or directed by the Engineer. Install corporation stops, curb stops, and/or meter vaults where indicated. Mark the location of the end of the water connection pipe at the property line with a 2 x 4 pressure treated timber painted blue, placed vertically from the bottom of the trench and extending two feet above grade.

2. Except where otherwise specified herein tapping of the water main and insertion of the corporation stops shall be performed by qualified personnel. No tapping for these services shall be performed prior to the testing and acceptance of the main.

a) Direct tap 3-inch through 6-inch cast iron or, ductile iron pipe for $\frac{3}{4}$ -inch corporations. 1-inch services require the use of $\frac{3}{4}$ -inch by 1-inch corporations. For services larger than 1-inch the use of tapped tees is required. The use of saddles require the approval of the Engineer. Maintain a minimum of 18 inches from tap to the bell end of the pipe. After making the connection and completing the installation, open and leave open the corporation stop.

b) Do not tap dry unless directed by the Engineer. If so directed, make the tap as specified herein and leave the trench open at the tap until the water main has been placed in service and the taps have been inspected.

3. Install house connections with outside meters per Standard Detail.

4. Idler shall be installed in the meter yoke by the Contractor.

F. Corporation Stop for Chlorination Purposes

1. Provide one-inch corporation stop and coupling in water mains for chlorination purposes where directed by the Engineer. The corporation stop shall be removed after testing and the contractor shall install a standard corporation stop threaded brass plug per AWWA C800.

G. Valve Vaults and Manholes

1. Provide valve vaults and manholes where indicated on the Plans in accordance with Section 2250 of the Specifications and Standard Details. Do not complete to final grade until grading is complete and proper alignment is insured. Set frames to grade using brick as indicated on the Standard Details. Space steps as indicated on the Standard Details and the Plans.

H. Buttresses, Anchorage & Harnessing

1. Provide buttresses, anchorages and harnessing where indicated on the Plans or directed by the Engineer in accordance with the Standard Details. The Engineer will inspect and approve excavations before buttresses and anchorages are placed. The entire face of the excavation against which buttresses will bear shall be firm bearing, flat and at proper angle to the pipe connections. The concrete shall be cured seven days between placing concrete and pressurizing mains.

I. Connections to Existing Lines

1. Before the start of construction, dig test pits on all connections to existing work. The Engineer will examine test pits and establish line and grade and determine material required at connections.

2. Notify the Engineer at least three working days prior to proposed connection construction. Make connections at such time and in such manner as the Engineer directs.

3. The Town will notify the consumers and operate all valves necessary to shut off the mains. The Town will make every reasonable effort to have tight shut offs, but does not warrant that the mains will be dry. Complete the connections with the greatest possible speed.

4. Certain information is shown on the drawings relative to existing pipe and other construction. This information was transferred from existing records and is deemed to be reliable but the Town does not warrant or guarantee that either the locations, the dimensions or the type of material are exactly as shown.

5. Water House Connection Renewals

- a) Unless otherwise directed, utilize existing tap at main line water.
- b) Where directed by the Engineer, abandon the existing tap and retap the main line water pipe.
- c) Furnishing material for and tapping main line water pipe shall be performed by experienced personnel.
- d) Provide corporation stops, couplings and curb stops or meter vaults at each house connection in accordance with the Standard Details. Stops shall turned to "off" position prior to installation.
- e) Where directed by the Engineer, provide meter housing and meter yokes and valves in accordance with the Standard Details.

IV. Measurement and Payment

A. Pipe furnished by the Contractor

- 1. Furnishing and installing pipe shall be measured for payment by the linear foot of the various types and sizes provided, measured as recorded on cut sheets. No deductions will be made for the length of the fittings, connections or valves.
- 2. Payment will be made for the quantities measured for each size at the unit price per linear foot listed in the Bid Schedule.
- 3. Payment will include provision of fittings, branch connections, and connections to new and existing facilities and corporation stops and couplings for chlorination, and testing.
- 4. Payment will include excavation, backfill, and bedding as specified in Section 2200.

B. Valves

1. Providing and installing valves will be measured for payment by each of the various types and sizes installed complete in place as indicated on the plans or as directed by the Engineer in accordance with the Standard Detail.

Payment will be made on a unit price per each type and size on the Bid Schedule.

2. Payment will include provision of extension stems, ground lever indicator, valve boxes, strapping, etc.

3. Payment will include excavation, backfill, and bedding, as specified in Section 2200.

C. House Connections

1. Furnishing and installing house connections will be measured for payment by each of the various types and sizes installed complete in place indicated on the plans or as directed by the Engineer.

Payment will be made on a unit price per each size on the Bid Schedule.

2. Payment will include installation of piping, fittings, curb stops, corporation stops, valves, valve boxes, and connections to new and existing facilities.

3. Payment will include excavation, backfill, and bedding as specified in Section 2200.

D. House Connection with Outside Meters

1. Furnishing and installing house connection with outside meter will be measured for payment by each of the various types and sizes installed complete in place indicated on the plans or as directed by the Engineer in accordance with the Standard Detail.

Payment will be made on a unit price per each size on the Bid Schedule.

2. Payment will include installation of piping, fittings, corporation stops, meter yokes, meter idlers, branch pieces if applicable, meter housings, meter box covers and connections to new and existing facilities. Contractor is responsible for adjustment of the water meter vault to bring the cover to the finish grade within the one (1) year warranty period.

3. Payment will include excavation, backfill and bedding as specified in Section 2200.

E. Fire Hydrants, Standard and Dewatering Types

1. Installing fire hydrants of either type will be measured for payment by each type installed complete in place, per plans, including parts of connections as shown on the Standard Details, strapping and blocking, and buttresses, and incidental appurtenances. The fire hydrant valve and valve box shall be included with this pay item.

Payment will be made for the quantities measured at the unit price per each type listed in the Bid Schedule.

2. Payment will include excavation, backfill and bedding as specified in Section 2200.

F. Compound and Detector Meter

1. Providing compound and detector will be measured for payment by each of the various types and sizes installed complete in place indicated on the plans or as directed by the Engineer in accordance with the Standard Details.

Payment will be made for the quantities measured for payment by each of the various types and sizes as listed in the Bid Schedule.

2. Payment will include excavation and backfill as specified in Section 2200, installation of lead pipe from main tee and connection to meter vault with standard frame and cover, and installation of valve and valve box where it occurs.

G. Air Release Valve

1. Providing and installing air release valve in manhole will be measured for payment by each of the various sizes installed complete in place indicated on the plans or as directed by the Engineer in accordance with the Standard Detail.

Payment will be made on a unit price per each size on the Bid Schedule.

2. Payment will include excavation, backfill and bedding, as specified in Section 2200.

H. Cap and Blow-Off or Blow-Off

1. Providing and installing cap and blow-off will be measured for payment by each of the various types and sizes installed complete in place as indicated on the plans or as directed by the Engineer in accordance with the Standard Detail.

Payment will be made on a unit price per each type and size on the Bid Schedule.

2. Payment will include excavation, backfill and bedding as specified in Section 2200, furnishing and installing all fittings, pipe, valve and valve boxes.

I. Furnishing Pipe in Tunnels and Borings

1. Furnishing and installing pipe in tunnels and borings for water lines are measured and paid for under Section 2150 or 2200.

J. Structures

1. Structures including valve vaults, meter housings, blowoffs, and valve manholes are measured and paid for under other items of this section.

K. Non-Payment Items

1. The following items will not be measured for payment but the cost thereof will be considered as incidental to the contract.

a) Removal of existing facilities that interfere with the project.

b) Abandonment, plugging, blocking or bricking shut and disposal of existing facilities.

- c) Restoration and restabilization of disturbed areas.
- d) Erosion checks
- e) Concrete anchors
- f) Harnessing and Blocking
- g) Testing
- h) Chlorination
- i) Timber marking house connections
- j) Replacement of various appurtenant connections and devices required for watertight installations.

END OF SECTION

TOWN OF THURMONT
STANDARD SPECIFICATIONS

SECTION 2050

INSPECTIONS, TESTS, SCHEDULES AND REPORT

V. General

A. Description

This section includes requirements of a general nature related to the Contractor's responsibility for inspections, tests, schedules and reports.

B. Inspections

1. The Engineer, Inspector or Construction Manager has the right to inspect any materials or equipment at any stage of development or fabrication and shall be allowed access to the site and to the Contractor's and supplier's shops to conduct such inspection. Inspection by the Engineer does not release the Contractor from responsibility or liability with respect to material or equipment.

2. When specified inspections or tests are required by the Contract Documents, the work involved shall not proceed beyond that point until such inspections or tests have been approved by the Engineer. The Contractor shall inform the Engineer of progress of the work and shall give the Engineer a minimum of three working days' notice of appropriate times for specified inspections and tests. The Contractor shall ensure that a portion of the work to be inspected is in a safe, accessible, dry, ventilated and well-lit location.

3. When local laws and codes require approval and inspection of the work by other agencies or organization before installation or operation, the Contractor shall obtain such approval and submit one signed original and three copies of the approval to the Engineer.

C. Testing

The CONTRACTOR shall provide at his own expense, the services of an independent testing laboratory that is satisfactory to the OWNER

and the ENGINEER. The laboratory shall provide professional engineering services and technical services as required for compliance with the specified performance objectives identified in the specified sections. The contractor will be solely responsible to schedule and compensate the laboratory for their services. The laboratory will report directly to the ENGINEER on site and all reports are to be delivered directly to the ENGINEER. The testing laboratory shall be approved and a preconstruction meeting between the contractor, laboratory and Engineer shall be held prior to the start of work.

1. In-Place Field Compaction Testing:

a) Field compaction tests of the density and moisture content of fill and backfill will be performed by the contractor. Upon completion of each layer of fill in a designated area, the Contractor shall be required to allow time for the laboratory to perform the tests. A minimum of one compaction test is required for each layer of backfill at a structure and for each layer of backfill at a maximum spacing of every 100 linear feet of trench. The test results shall be provided to the Engineer daily for review and comment. The contractor and approved testing laboratory shall each furnish a certification of compliance at the completion of the project and prior to the issuance of Substantial completion verifying that the minimum in-place field compaction testing frequency stated above has been met. The testing laboratory certification of compliance shall be stamped by a Professional Engineer registered in the State of Maryland. The contractor certification of compliance shall be signed by an owner or officer of the company.

b) Where sheeps-foot rollers are used, the soil may be disturbed to a depth of several inches. Compaction tests shall be taken in the compacted material below the disturbed surface. The Contractor is to provide a smooth surfaced spot at any point requested by the testing agency on which to perform the test.

c) Where test results indicate, as determined by the Engineer, that compaction is not as specified; the material shall be re-excavated, replaced, re-compacted and re-tested to meet the specification requirements.

d) The Contractor is responsible for all testing including field compaction tests. The Contractor will perform field compaction tests to check their work. The CONTRACTOR shall be responsible to obtain and pay for all other testing and laboratory services as required by other Sections. Payment for tests shall not be paid for separately but be considered incidental to the contract.

2. The Contractor shall cooperate with the Engineer and the testing laboratory representative and provide at least 24 hours' prior to specified testing. The Contractor shall provide labor and materials, and necessary facilities at the site as required by the testing laboratory.

3. The Contractor shall provide a testing laboratory where so specified in the Contract Documents. The laboratory shall be operated by a member of the Independent Council of American Laboratories and shall be approved by the Engineer.

4. Equipment Testing

a) When an item of equipment which is designated for testing in the special conditions, has been completely erected, including controls and instrumentation, the Contractor shall notify the Engineer, who will designate a time for the witnessing of testing and operation of the item as required. All testing shall be performed in the presence of the Engineer, and the results of all tests shall be subject to his approval.

(1) "Completely erected" shall mean that the installation is erected, all necessary adjustments have been made, required lubricants have been applied as specified elsewhere, and that the following requirements have been met: Town operators have been trained and instructed in the operation of equipment; O&M Manuals, electrical system test procedures, spare parts lists, and manufacturers installation certificates have been furnished. The Contractor shall furnish labor, lubricants, and all other materials, equipment and instruments necessary for all Engineer's tests.

(2) The Contractor shall provide competent and experienced engineers or superintendents, who shall

represent the manufacturers of equipment furnished and installed under the Contract, to assist the Contractor, in the installation, adjustment, and testing of equipment in conformity with the Contract Documents.

b) The Contractor shall notify the Engineer once all work is complete in order to conduct operational tests and demonstrate to the Engineer's satisfaction that the equipment is ready for operation. A letter of substantial completion will then be issued and the Town will be responsible for all further maintenance and operation of same.

D. Reports

1. Certified Test Reports

a) Where certified test reports are required by the Contract Documents, they shall meet the following requirements:

(1) Before delivery of materials for which certified test reports are required, certified copies of the reports of all tests required in referenced publications or specified within the Contract Documents shall be submitted to the Engineer for approval. The testing shall have been performed in an approved independent laboratory, within one year of submittal of the reports for approval. Test reports shall be accompanied by a notarized certificate from the manufacturer or supplier certifying that the tested material meets the specified requirements and is of the same type, quality, manufacture make as those proposed to be supplied.

(2) Certificate of Compliance

(a) At the option of the Engineer, or where specified the Contractor may, in lieu of the specified tests and other tests required in the various reference documents, furnish a certificate of compliance from the manufacturer. The certificate shall state that the manufacturer has performed all required tests; that products to be supplied meet all test requirements; that tests have

been performed within one year of submittal of the certificate; that products tested were of the same type, quality, manufacture and make of those proposed to be supplied.

(3) Manufacturer's Certificates

(a) The Contractor shall submit manufacturer's certificates for the installation of those items of equipment listed in the special conditions.

(b) Manufacturer's certificates shall state that the equipment has been installed either under the continuous or periodic supervision of the manufacturer's authorized representative, that it has been adjusted and initially operated in the presence of the manufacturer's authorized representative, and that it is operating in accordance with the specified requirements, to the manufacturer's satisfaction.

II. Measurement and Payment

A. Providing for and complying with requirements set forth in this section will not be measured for payment but the cost thereof will be considered incidental to the Contract.

END OF SECTION

TOWN OF THURMONT
STANDARD SPECIFICATIONS

SECTION 2100

CONTRACTOR'S DRAWINGS AND SUBMITTALS

I. General

A. Description:

This section includes requirements related to the Contractor's responsibilities for drawings and submittals.

B. Technical Submittals:

1. Shop Drawings:

Original Submittal: The number of copies to be provided shall be determined at the preconstruction meeting.

2. Procedure for Review:

a) Submittals shall be transmitted in sufficient time to allow the Engineer at least ten (10) working days for review and processing.

b) Contractor shall transmit the set number of copies determined at the preconstruction meeting.

c) Each submittal shall be accompanied by a letter of transmittal containing date, project title, Contractor's name, number and titles of submittals, a list of relevant specification sections, and notification of departures from any Contract requirement, and any other pertinent data to facilitate review.

d) Submittals will be annotated by the Engineer in one of the following ways:

Accepted as Specified

Accepted as Noted

Revise and Resubmit

Rejected

e) Shop drawings will be returned stamped with the following classifications:

Accepted as Specified: No corrections, no marks.

Accepted as Noted: A few minor corrections. All items may be fabricated as marked up with no further resubmission. Resubmit a corrected copy to the Engineer.

Revise & Resubmit: Minor corrections. Items not noted to be revised and corrected may be fabricated at the Contractor's option. Resubmit drawings as per original submission with corrections noted. Fifteen days will be allowed for checking and appropriate action by the Engineer.

Rejected: Major corrections or not in accordance with the Contract Documents. No items shall be fabricated. Correct and resubmit drawings as per original submission, 20 days will be allowed for checking and appropriate action by the Engineer.

3. Samples

a) Original submittal shall be two (2) samples, unless otherwise specified, of each item for which samples are required, be furnished for approval. Approval shall be obtained prior to delivery of material to the project site. Such samples shall be representative of the actual materials proposed for use in the project and of sufficient size to demonstrate design color texture and finish when these attributes will be exposed to view in the finished work.

b) Resubmittals: All rejected samples will be returned upon request, and any or all resubmittals required shall consist of new samples.

c) Approval: Upon approval one sample so noted will be returned and the other will be retained by the Engineer until completion of the work. When requested all approved samples will be returned for installation provided their identity is

maintained in an approved manner until final acceptance of the project.

4. Catalog Data

a) Submittals: The number of submittals to be provided shall be determined at the preconstruction meeting. Catalog data shall be submitted and returned as specified for shop drawings. If approved, such additional copies as may be requested by the Engineer shall be furnished without additional cost.

b) Manufacturer's equipment data shall be certified and shall include materials type, performance characteristics, voltage, phase, capacity, and similar data. Provide wiring diagrams when applicable. Indicate catalog, model and serial numbers representing specified equipment.

c) Data Identification: Each submittal shall have all pertinent data contained therein that are applicable to the item submitted for approval, adequately and prominently designated.

5. Working drawings for changes substitutions or Contractor design items.

a) Working drawings and calculations as submitted shall be certified by a professional Engineer registered in the State of Maryland and shall convey or be accompanied by calculations or other sufficient information to completely explain the proposed method of construction, including but not limited to type of machinery and method proposed. Design calculations shall be submitted with the working drawings.

b) Engineer's Review

(1) Engineer's review of the Contractor's submittals shall in no way relieve the Contractor of any of his responsibilities under the Contract. An acceptance of a submittal shall be interpreted to mean that the Engineer has no specific objections to the submitted material, subject to conformance with the Contract Drawings and Specifications.

(2) Engineer's review will be confined to general arrangement and compliance with the Contract Drawings and Specifications only, and will not be for the purpose of checking dimensions, weights, clearances, fittings, tolerances, interferences, coordination of trades, etc.

6. Identification

a) Data: All submittals for approval shall have the following identification data, as applicable, contained thereon or permanently adhered thereto.

(1) Town Contract Number.

(2) Project name and location.

(3) Submittal Numbers. Resubmittals shall bear original submittal number and be lettered.

(4) Product identification.

(5) Shop drawing title, drawing number, revision number, and date of drawing and revision.

(6) Applicable contract drawings and specification section numbers.

(7) Subcontractor's, vendor's and/or manufacturer's name, address and phone number.

(8) Contractor's certification statement.

b) Catalog data: Each separate catalog, brochure, or single page submitted shall have the identification required hereinbefore.

(1) Catalogs or brochures submitted containing multiple items for approval need the identification only on the exterior. In such instances the identification shall include page and catalog numbers.

(2) In the event that one or more of the multiple items are not approved in any submittal, the additional copies

required shall not be requested until all items are approved.

- c) Space: Vacant space approximately 3-inches high by 4-inches wide shall be provided adjacent to the identification data to receive the Engineer's status stamp.

7. Contractor's Responsibility

- a) Each shop drawing, working drawing, sample and catalog data submitted by the Contractor shall have affixed to it the following certification statement signed by the Contractor:
"Certification Statement: By this submittal I hereby represent that I have determined and verified all field measurements, field construction criteria, materials, dimensions, catalog numbers and similar data and I have checked and coordinated each item with other applicable approved shop drawings and all Contract requirements."

- b) No portion of the work requiring a shop drawing, sample, or catalog data shall be started nor shall any materials be fabricated or installed prior to the approval or qualified approval of such item. Fabrication performed, materials purchased or on-site construction accomplished which does not conform to approved shop drawings and data shall be the Contractor's responsibility. The Town will not be liable for any expense or delay due to corrections or remedies required to accomplish conformity.

- c) All submittals from subcontractors, manufacturers or suppliers shall be sent directly to the Contractor for checking. Contractor shall thoroughly check all Drawings for accuracy and conformance to the intent of the Contract Documents. Drawings found to be inaccurate or otherwise in error shall be returned to the subcontractors, manufacturers, or suppliers by the Contractor for correction before submitting them to the Engineer.

- d) All submittals shall be bound, dated, properly labeled and consecutively numbered. Information on the label shall indicate Specification Section, Drawing number, subcontractors, manufacturer's or supplier's name and the name or type of item

the submittal covers. Each part of a submittal shall be marked and tabulated.

e) Working Drawings shall be submitted as a single complete package including all associated drawings relating to a complete assembly of the various parts necessary for a complete unit or system.

f) Shop Drawings shall be submitted as a single complete package for any operating system and shall include all items of equipment and any mechanical units involved or necessary for the functioning of such system. Where applicable, the submittal shall include elementary wiring diagrams showing circuit functioning and necessary interconnection wiring diagrams for construction.

g) ALL SUBMITTALS SHALL BE THOROUGHLY CHECKED BY THE CONTRACTOR FOR ACCURACY AND CONFORMANCE TO THE INTENT OF THE CONTRACT DOCUMENTS BEFORE BEING SUBMITTED TO THE ENGINEER AND SHALL BEAR THE CONTRACTOR'S STAMP OF APPROVAL CERTIFYING THAT THEY HAVE BEEN SO CHECKED. SUBMITTALS WITHOUT THE CONTRACTOR'S STAMP OF APPROVAL WILL NOT BE REVIEWED BY THE ENGINEER AND WILL BE RETURNED TO THE CONTRACTOR.

h) If the submittals contain any departures from the Contract Documents, specific mention thereof shall be made in the Contractor's letter of transmittal. Otherwise, the review of such submittals shall not constitute approval of the departure.

i) No materials or equipment shall be ordered, fabricated, shipped or any work performed until the Engineer returns to the Contractor the submittals, herein required, annotated "Accepted as Specified", "Accepted as Noted", "Revise and Resubmit", "Rejected," If a submittal is returned "Revise and Resubmit" or "Rejected" the portions of work covered by the submittal that require confirmation by the Engineer shall not be ordered, fabricated, shipped, or any work performed until those portions are approved in a subsequent submittal.

j) Where errors, deviations, and/or omissions are discovered at a later date in any of the submittals, the Engineer's prior review of the submittals does not relieve the Contractor of the responsibility for correcting all errors, deviations, and/or omissions.

C. Operation and Maintenance Manuals

1. Two (2) preliminary copies of Operation and Maintenance Manuals, prepared specifically for this Project, shall be furnished for each item of equipment furnished under this Contract. The preliminary manuals shall be provided to the Engineer not less than 60 days prior to the start-up of the respective equipment.

2. The preliminary manuals shall be reviewed by the Engineer prior to the Contractor submitting final copies for distribution to the Owner. Following review of the preliminary copies of the Operation and Maintenance Manuals, one (1) copy will be returned to the Contractor with required revisions noted, or the acceptance of the Engineer noted.

3. Manuals shall contain complete information in connection with assembly, operation, lubrication, adjustment, wiring diagrams and schematics, maintenance, and repair, including detailed parts lists with drawings or photographs identifying the parts.

4. Manuals furnished shall be assembled and bound in separate volumes, by major equipment items or trades, and properly indexed to facilitate locating any required information. In addition, manuals should be labeled in the front cover with the project, name, equipment description, and manufacturer contract information.

5. Engineer and the Owner shall be the sole judge of the acceptability and completeness of the manuals and may reject any submittal for insufficient information included, incorrect references and/or the manner in which the material is assembled.

6. The Contractor shall furnish manuals for the various systems, as required by the Contract Documents. The manuals for each piece of equipment shall be a separate document with the following specific requirements:

a) Contents

Table of Contents and Index

Description of each system and components

Starting and stopping procedures

Special operating instructions

Routine maintenance procedures

Schedule for periodic servicing

Manufacturer's printed operating and maintenance instructions, parts list, illustrations, and diagrams

One copy of each wiring diagram

One approved copy of each shop drawing and each

Contractor's working drawing

List of spare parts, manufacturer's price, and recommended quantity

Name, address and telephone number of nearest manufacturer's representative

b) Material

Loose leaf on 60 pound, punched paper

Holes reinforced with plastic cloth or metal

Page size, 8-1/2 inches by 11 inches

Diagrams and illustrations, attached foldouts as required

Of original quality, reproducible by dry copy method

Covers: Oil, moisture, and wear resistant

c) Submittals to the Engineer:

(1) Following the Engineer's review of the preliminary manuals, the Contractor shall submit three (3) paper

copies and two (2) electronic copies of the final Operation and Maintenance Manuals to the Engineer. The manuals shall reflect the required revisions noted during the Engineer's review of the preliminary documents. Failure of the final manuals to reflect the required revisions noted by the Engineer during a review of the Preliminary documents will result in the manuals being returned to the Contractor. Acceptable final Operation and Maintenance Manuals shall be provided not less than two weeks prior to equipment start-up. See section 2050 paragraph I.C.4.a.

D. Record Drawings

1. The Contractor shall keep one record copy of all Contract documents, drawings, reference documents, and all technical submittals at the site in good order and annotated to show all changes made during the construction process. Such annotations shall be kept current. These shall be available to the Engineer at all times during the life of the project.

2. The Contractor shall furnish the Engineer one set of red-lined documents reflecting the types of changes described herein. Record Drawings shall include changes made to locations and elevations of buried and exposed piping, structures, equipment changes, substitutions and all variations from the Contract Documents. Record Drawings shall include changes made to the contract drawings by addendum.

A surveyor obtained and paid for by the Contractor shall field locate all surface features of the project and certify the record drawings. The Contractor's surveyor shall be a Professional Land Surveyor or a Property Line Surveyor licensed to practice in the State of Maryland, and shall sign and seal the Engineer's approved signed project mylars (with as-built changes).

3. The Contractor and Engineer shall review and compare the Contractor's red-lined drawings to the Engineer's red-lined drawings and produce one agreed upon set of drawings. The Contractor shall deliver the aforesaid combined red-lined drawings to the Engineer-of-Record for approval. Once approved by the Engineer-of-Record the Contractor shall deliver the combined red-lined drawings along with the

approved original signed project mylars to a drafting firm. The drafting firm shall complete as-built changes shown on the combined red-lined drawings directly to the original project mylars. Changes shall be made in red ink using standard symbols shown in the Standard Details. Changes shall not obscure or interfere with the legibility of the existing design work. Lettering must be a minimum of 0.1 inches in height. Eradication or erasures of existing design work is not permitted in order to facilitate placement of as-built information.

4. The Contractor shall return the combined red-lined drawings, approved mylars (with as-built changes), and a letter of certification from the drafting firm attesting that the reproducible were not altered with the exception of adding Contractor/Engineer changes. Allow thirty (30) days for Engineer's review and approval of as-built mylars.

5. Before project Substantial Completion and any payment for record drawings, all work aforesaid in Part I.D. of this Section must be completed to the satisfaction of the Engineer.

E. Method of Construction

1. When so directed by the Engineer, the Contractor shall submit his proposed method of construction for specific portions of the work.

II. Measurement and Payment

A. Providing for and complying with requirements set forth in this section will not be measured for payment but the cost thereof will be considered incidental to the Contract.

B. Record Drawings

1. Record Drawings will not be measured for payment but will be paid for at the Contract lump sum price provided in the Proposal Form.

END OF SECTION

TOWN OF THURMONT
STANDARD SPECIFICATIONS

SECTION 2150

BORED PIPE

I. General

A. Description

This section includes provisions for boring and/or jacking carrier or casing pipes beneath roadways and railways, and preparation of bored holes for insertion of carrier pipe, as indicated on the plans in accordance with the Contract Documents.

B. Submittals

1. Submit working drawings in accordance with Section 2100, including proposed method of boring and advancing casing or proposed method of preparing bored hole for installation of carrier pipe and arrangement of equipment, method of dewatering, and the size and location of pit.
2. Submit shop drawings in accordance with Section 2100 including bulkhead details and proposed positive method of anchoring carrier pipe to prevent flotation.

C. Job Conditions

1. Bore so as not to interfere with, interrupt or endanger the roadway or railway operations.
2. Comply with all applicable jurisdictional codes and MOSHA requirements.

D. Additional criteria for work under railroads

1. For work under railroads, comply with specifications for pipeline occupancy and facility encroachment agreement.

II. Materials

A. Casing Pipe

1. Casing pipe shall be mill-type steel water pipe, Grade A, ends for field butt welding meeting requirements of AWWA C200. Wall thickness shall be as indicated on the standard detail and/or the plans.

a) Joints shall be fully welded around the circumference of the pipe.

B. Carrier Pipe

1. Carrier pipe for water lines shall be ductile iron as specified in Section 2550 or as directed by the Engineer.

2. Carrier pipe for sewer lines shall be PVC or ductile iron as specified in Section 2570 or as directed by the Engineer.

C. Spacers

1. The spacers for the ductile iron water or sewer lines shall be concentric support insulators manufactured by T. D. Williamson, or equal, and conform to the standard detail.

2. The spacers for the PVC sewer lines shall be wood skids which should extend for the full length of the pipe with the exception of the bell and spigot areas necessary for assembly. The leading edge of the skids shall be rounded and the skids shall be notched to allow strapping to prevent undue movement of the straps. The strapping arrangement of the skids shall conform to the standard detail.

D. Closure Seals

1. The seals for closing the ends of the casing pipes shall be U-Seals or ZSeals with all stainless steel bands from T.D. Williamson, Inc., or equal. (Representative - Kerr Engineering Sales Co., Pittsburgh, PA.)

E. Sand shall be composed of sharp, angular grains, coarse or graded from fine to coarse with the coarser grains predominating, and reasonably free from clay, loam, dirt mica, organic matter, or other impurities.

F. Flowable fill shall meet the requirements of the Maryland SHA and shall not contain elements harmful to the casing or carrier pipe material and may only be used after obtaining permission from the Engineer.

III. Execution

A. Preparation

1. Excavate pits as required in accordance with the working drawings and Section 2200.
2. Perform preliminary work including constructing backstop, placing guide timbers and placing boring apparatus.

B. General

1. If an obstruction is encountered during installation which stops the forward action of the pipe, notify the Engineer immediately. If it becomes evident that it is impossible to advance the pipe, operations will cease and the pipe will be abandoned in place and filled completely with grout.
2. When water is known or expected to be encountered, maintain at the site pumps of sufficient capacity to handle the flow on a 24-hour basis until in the judgment of the Engineer, their operations can be safely halted.
3. Maintain close observation to detect settlement or displacement of surface facilities. Should settlement or displacement be detected, notify the Engineer immediately and take such action as necessary to maintain safe conditions and prevent damage.

C. Boring

1. Use of water and other liquids to facilitate casing implement and spoil removal will be used only when approved by the Engineer.
2. When utilizing augers or similar devices, the front of pipe shall be provided with mechanical arrangements that will positively prevent the auger and cutting head from leading the pipe and allowing unsupported excavation ahead of the pipe.
3. Provide removable auger and cutting head arrangement.

4. Overcut by cutting head shall not exceed the outside diameter of the pipe by more than ½-inch.

5. Arrange face of cutting head to provide reasonable obstruction to the free flow of soft or poor material.

6. Push the pipe into the fill with boring auger rotating within the pipe to remove the spoil.

D. Field Quality Control

1. When boring casing pipe, or preparing bored hole for insertion of casing pipe, maintain the line and grade indicated on the plans.

E. Installation of carrier pipe in casing pipe

1. Install carrier pipe as specified.

2. Install oak skids or support insulators on carrier pipe in accordance with standard detail.

3. Fill complete void between carrier pipe and casing pipe with dry blown sand prior to completing the closing of the ends of casing pipe. Grout or flowable fill is NOT acceptable.

4. Close the ends of the casing pipe with closure seals in accordance with the standard detail.

IV. Measurement and Payment

A. Bored Pipe

1. Bored payment will be measured by the linear foot of each diameter measured as recorded on cut-sheets between inside faces of boring pits.

2. Payment will be made for the quantities measure at the unit prices per linear foot listed in the bid schedule.

3. Payment will include excavation, backfill, pits, casing pipe, carrier pipe and boring equipment.

B. Non-payment Items

1. The following items will not be measured for payment but will be considered as incidental to the Contract.

- a) Monitoring of Movement
- b) Dewatering
- c) Bored hole for insertion of carrier pipe.
- d) Skids
- e) Support insulators
- f) Closure seals
- g) Sand

END OF SECTION

TOWN OF THURMONT
STANDARD SPECIFICATIONS
SECTION 2200
EARTH TUNNELING

I. General

A. Description

This section includes construction of earth tunnels 60 inches and larger; furnishing and installing tunnel liners, necessary dewatering and monitoring of movement to the limits indicated in accordance with the Contract Documents.

B. Quality Assurance

1. Fabricator Qualifications

a) Where fabricated segments for tunnel lining are to be used, the segments shall be fabricated by a qualified firm with a minimum of five years' experience of similar type manufacturing and which has performed at least two representative jobs three years or older of comparable type of service and size to the project.

2. Tolerance

a) Variation in thickness of liner plates shall be + 0.01 inch maximum.

b) Fabricate similar segments with such accuracy and uniformity in dimensions that segments will be entirely interchangeable not only in individual rings but with similar segments of other rings. Space holes accurately so that any two rings can be bolted up in any relative hole.

c) Locate grout holes to a tolerance of + 0.50 inch. Provide bolt holes to a diameter tolerance of plus or minus 0.02 inches.

d) In making the taper offset ensure that the dimensions between the bolt pad and the flange face are not increased by more than 9/16 inch or decreased by more than 1/16 inch from the

dimensions indicated, provided bolt length is adjusted accordingly.

e) Replace or correct any segment which does not comply with the tolerance indicated.

C. Submittals

1. Submit working drawing as specified in Section 2100 with pertinent descriptions, soils data, methods of dewatering, methods of excavation and support system, and the proposed tunnel access pits for approval. Include all additional soils information and locations of surface and subsurface settlement markers if not indicated elsewhere.

2. Submit shop drawings as specified in Section 2100 for tunnel linings showing sizes, shapes, methods of attachment and connection details, and of grout holes.

3. Tunneling Method

a) Bids shall be based on tunneling by use of tunnel shields.

b) Submit complete detail drawings of the shield and an adequate description of the proposed method of erecting, placing and operating the shield.

c) The Contractor may submit an alternate method for performing tunneling operations on the substitution form to the Engineer for approval.

At the request of the Engineer, submit complete details of alternate method and pertinent calculations. Should the Engineer approve an alternate method, submit shop and working drawings as stipulated in the approval.

4. Submit certified test reports before delivery of materials as specified in Section 2050 for the list below.

a) Gravel Packing.

b) Linear plate segments for tunnel lining.

c) Tunnel liner plate connectors.

d) Protective coatings.

5. Access Shaft Design

a) When Contract Documents do not include access shaft design, submit working drawings for access shaft design for approval.

b) When Contract Documents include access shaft designs, the contractor may submit alternate access shaft designs equal to or greater in size than those indicated. Shaft redesign and resultant additional construction costs shall be at no expense to the Town.

D. Construction Criteria

1. Tunnel construction shall be performed in a manner that will minimize movement of the ground in front of and surrounding the tunnel, and prevent subsidence of the surface above and in the vicinity of the tunnel. During all stages of tunnel construction, the ground shall be continuously supported and controlled in a manner that will prevent loss of ground and keep the perimeters and face of the tunnel stable. The Contractor shall be responsible for all settlement resulting from tunnel operations and shall repair and restore damaged property to its original condition at no cost to the Town.

2. Comply with applicable ordinances, codes, statutes, rules and regulations of the State of Maryland, SHA, applicable Town building codes, affected railroad company, and applicable regulations of the Federal Government (OSHA 29CFR 1926).

E. Job Conditions

1. Maintain the tunnel air in a condition suitable for the health of the workers at all times.

2. Stop all tunneling operation and evacuate personnel from inside the tunnel under railroads prior to train passing over operation.

3. Maintain an adequate supply of straight and tapered linear segments at the site at all times.

4. Prevent damage to protective coatings during storage and delivery. Keep wire ropes, chains or hooks from direct contact with the coated surfaces.
5. Dewatering, if required, shall be performed in such a manner so that no soil particles are present after initial 12 hours of pumping and to eliminate settlement around surrounding structures. Dewater into a settlement trap and comply with applicable environmental protection criteria specified elsewhere in these Contract Documents.

II. Materials

A. Linear Plate

1. Steel liner skin shall conform to requirements of ASTM A 569. Linear plate shall have the minimum mechanical properties of flat plate before cold forming as follows:

Tensile strength	-42000 psi
Yield strength	-28000 psi
Elongation, 2 inches	-30%

2. Bolts and nuts shall conform to requirements ASTM A307. The bolts shall have rolled threads.

3. Coatings

- a) Liner plate shall be hot dipped galvanized to meet requirements of area specifications for corrugated structure plate pipe, pipe arches and arches. Bolts and nuts shall be galvanized to meet the requirements of ASTM A153.

- b) Liner plate shall be bituminous coated to meet requirements of area specification for bituminous coated corrugated metal pipe and arches. Provide prime coat as required to assure compatibility with galvanized surface.

- c) Delete coatings for tunnels which are to be filled with concrete after carrier pipe is in place.

B. Gravel Packing

1. Gravel packing shall be rounded gravel, clean and free from objectionable material graded as follows:

<u>U.S. Standard Sieve Passing</u>	<u>Total Percent</u>
¾	100
½	85-100
¾	70-100
#4	0-55
#8	0-15
#16	0-8

C. Grout

1. Cement shall conform to ASTM C150, Type 1.
2. Water shall be free from sulfates and other objectionable quantities of silt, organic matter and other impurities.
3. Sand shall conform to requirements of ASTM C404, Size no.1.
4. Design Mix
 - a) Grout shall have a minimum compressive strength of 100 psi attained within 24 hours. The grout shall remain fluid long enough to be injected through the lining and to fill the voids and shall set promptly enough to avoid grout flowing into the new annular space after the next advance.
 - b) The Contractor shall submit proposed grout mix composition and test results to the Engineer for approval prior to grouting. Test specimens of grout shall be made and tested in accordance with ASTM C109.

D. Concrete

1. Concrete for cast in place invert shall meet requirements of Section 1700, Mix #3.
2. Pumped concrete for filling annular spaces after carrier pipe is in place shall meet requirements of Section 1700, Mix #1.

E. Filter Materials

1. Filter materials for dewatering shall consist of material with grain size of the following requirements:

$R(50) = \frac{D(50) \text{ of filter}}{D(50) \text{ of protected soil}} = 12 \text{ to } 58$

Or

$R(15) = \frac{D(15) \text{ of filter}}{D(15) \text{ of protected soil}} = 12 \text{ to } 40$

Where R = ratio

Where D(50) = diameter at 50% passing by weight

Where D(15) = diameter at 15% passing by weight

F. Carrier Pipe

1. Carrier pipe shall be ductile iron as specified.

G. Access Shaft

1. Surface settlement markers within pavement areas shall be P.K. nails.

2. Surface settlement markers within non-paved areas shall be wooden hubs.

III. Execution

A. Equipment

1. Tunneling equipment shall be of U.S. Bureau of Mines approved type.

2. Tunnel shields shall have uniform exterior surface from leading edge of head or poling plates to the rear edge of the tail. A horseshoe shaped shield may have a closed or open bottom: a circular shield shall have a closed bottom.

3. Provide a substantially proportioned hood projecting not less than two feet beyond the shield with sufficient rear overhang of tail to provide at least 12 inches of overlap beyond the last element erected, when the shield has been shoved open to the fullest extent possible. The annular space between the tail and the lining shall be as small as

current practice indicates, but in no case shall it be greater than 1 ½ inches.

4. Provide each shield with suitably designed breast-jacks or breast-tables or both, and such other bracing as is necessary to support the face of the tunnel excavation without loss of ground.

5. Provide on each shield a propulsion system, capable of moving the shield in a forward direction, while maintaining the construction with respect to line, grade, and direction. The propulsion system shall be designed to prevent the shield from moving backward despite a failure of any element of the propulsion system and shall avoid overstressing and distortion of the lining.

6. Incorporate a seal in the tail of each shield to prevent leakage of grout into the tunnel space between the shield and lining.

7. Equip the shield with an erector arm or system capable of handling the largest sizes of lining and of erecting the sections of the lining to the required tolerances without damage to the lining.

B. Power Supply

1. All power machinery and tools, within the tunnel shall be operated by either electricity, compressed air, diesel with approved scrubber or other approved power. All electrical tools and equipment shall be grounded in accordance with the latest requirements of the National Electrical Code.

2. Provide temporary electric lights to properly and safely illuminate all parts of the tunnel construction area including special illumination at the working faces. Lighting circuits shall be thoroughly insulated and separated from power circuits. All lights shall be enclosed in wire cages. Secure all electrical permits necessary for successful completion of this work.

C. Operations by tunnel shields and machines

1. On initial set-up, support the tunnel shields or tunneling machines on a concrete cradle properly set at lines and grades which will permit the correct installation of the tunnel lining. During forward movement of the shield provide sufficient support at the excavation face

to prevent movement of any materials except such materials as are physically displaced by the elements of the shield itself.

2. Control the face sufficiently using such support procedures as breasting, poling plates, face jacks, sliding tables, either singly or in combination, spaced as necessary.

3. Advance excavation for the tunnel liner in increments sufficient for the erection of one ring of liners and install liner plates immediately after each increment of excavation. Carry on excavation in such a manner that voids behind the liner plate are held to a minimum. Completely fill such voids with grout or gravel followed immediately by grout placed under pressure.

4. Whenever tunnel excavation is suspended or shut down, the tunnel invert is below the level of groundwater; and there is danger of water infiltration from any source, maintain on duty qualified personnel to observe conditions that might threaten the stability of the heading. Contractor may substitute acceptable observation devices such as closed circuit TV that enables continuous monitoring of conditions at the face by qualified observers from outside the tunnel.

5. During shut down periods, support the face of the excavation by positive means; no support shall rely solely on hydraulic pressure.

D. Installation of tunnel linings

1. Install the tunnel lining in a manner that will not damage the lining or coating.

2. Ensure that the edges are clean and free from material that could interfere with proper bearing.

3. Install bolts for liner plates in accordance with liner plate manufacturer's recommendations and retention or replace if necessary any bolt which does not meet the requirements.

4. Assemble liners to the lines and grades shown on the Contract drawings or as directed by the Engineer.

E. Gravel packing and grouting

1. Where approved, gravel packing may be used to fill voids between the excavation and support system. For voids to be filled with gravel pack, place gravel in the voids behind liner plate by compressed air through a 1-½ inch or two inch hose. Provide a minimum pressure of 80 psi.
2. Filling of voids with gravel shall generally proceed from the bottom grout hole of each ring to the top hole.
3. Vent air through one of the upper holes.
4. Fill voids in the gravel pack between the tunnel excavation and the tunnel liner with grout mix.
5. The grout pump and injection system will be of a type that will deliver the grout in such a smooth even flow without surge. The grouting circuit shall contain a return line to allow return of the grout from the nozzle to the supply tanks. The grouting equipment shall be capable of developing a uniform pressure of 50 psi at the grout hole connection and equipped with hoses with a minimum inside diameter of 1-½ inches. The grouting equipment shall have a minimum capacity of ½ cubic yards.
6. Grouting between the liner plates and excavation shall follow progressively with each adjacent set of holes provided in the liner plates.
7. In general, grouting shall proceed from the lowest grout hole of each ring and proceed progressively upward. When going from lower to higher grout holes, do not make connection to the higher holes until grout has completely filled the space below. Fill all voids completely within the working day with grout, or as directed by the Engineer.
8. Continue grouting until grout appears in the next set of grout pipes, which shall be kept open during grouting to permit escape of air and water.

F. Concrete Invert

1. Place cast in place concrete invert to the limits shown on the contract drawings in accordance with Section 1700.

G. Installation of carrier pipe inside tunnel

1. Install pipe inside tunnel where indicated on the plans.
2. Pipe and joint requirements are specified elsewhere in the Contract documents.
3. Provide bedding and anchorage in accordance with the plans.
4. Provide wooden skids or other approved devices as required to eliminate damage to pipe.
5. Where so indicated, fill annular space between pipe and tunnel with concrete having a maximum aggregate size of $\frac{3}{8}$ inch. Provide positive means to prevent flotation.

H. Field Quality Control

1. Allowable tolerances
 - a) For segmented tunnel linings inside dimensions of the ring measured along any diameter shall not vary by more than three percent of the lining diameter.
 - b) Construct tunnel to the line or grade indicated on the plans to allow a minimum concrete cradle thickness of four inches.
 - c) Establish two permanent points in the access shaft for the checking alignment and grade.

I. Detection of Movement

1. Install, maintain and make observations on a regular pattern of surface settlement markers as shown on the contract drawings or as directed by the Engineer. Include a series of surface and subsurface control points along the centerline of the crossing alignment. Tie settlement markers to bench marks and indices sufficiently remote so as not to be affected by the Contractor's operations. Take readings and permanently record prior to start of excavation.
2. Report any settlement and horizontal movement immediately to the Engineer and take immediate remedial action, at no cost to the Town.

J. Access Shaft Construction

1. Provide for removal and disposal of all materials of whatever nature encountered, placing and maintaining temporary bracing, tunnel bullseyes, groundwater control, construction of access shaft, backfill as shown on the drawings, restoration of all disturbed areas, and all appurtenant work necessary to complete the excavation of the shaft.
2. Construct shafts in accordance with approved working drawings or details shown on the plans.
3. Perform excavation, backfill and grading in accordance with Section 2200 and to the requirements listed herein.
4. Bullseyes for tunnel construction shall be adequately braced prior to breaking out or holing through as approved or directed by the Engineer.

IV. Measurement and Payment

A. Tunnel liners for earth tunnel

1. Tunnel liners for earth tunnel will be measured for payment by the linear foot of each diameter measured along the centerline of the tunnel between interior faces of access shafts. Payment will be made for the quantities measured at the unit price per linear foot listed in the bid schedule.
2. Payment will include liner plate, access shafts, excavation, graveling, grouting and concrete invert, carrier pipe, timber bulkheads and filling annular spaces with concrete or sand where indicated.

B. Non-payment Items

1. The following items will not be measured for payment but will be considered as incidental to the Contract.
 - a) Monitoring of movement
 - b) Dewatering
 - c) Pipe restraints

END OF SECTION

TOWN OF THURMONT
STANDARD SPECIFICATIONS

SECTION 2250

PRECAST CONCRETE UTILITY STRUCTURES

I. General

A. Description

This section includes providing precast concrete utility structures including manholes, valve and meter vaults, to the configurations and extents indicated in accordance with the Contract Documents.

B. Quality Assurance

1. Precast concrete shall be supplied by a qualified firm with a minimum of three years of continuous operations and which has performed at least three jobs comparable to the precast work required for this contract, and which are incorporated into projects completed more than three years.

2. Inspection and testing

a) The Engineer may inspect and test all sections, fittings and joint material upon delivery to the site or at the factory. The supplier shall furnish materials to be tested and labor as required to assist the Engineer with the tests.

b) The Contractor shall provide ample space between rows of stockpiled sections to facilitate adequate inspection.

c) The Contractor shall provide the Town inspector, prior to inspection of sections for an order, with the complete Town Contract number, Contractor's name, section sizes and footage or number of pieces required to fill the order.

d) The Contractor shall provide evidence to the Town Inspector, prior to inspection, that there is an adequate quantity of sections available of the required sizes and designs for inspection.

e) Concrete compressive strength shall be determined from compressive tests made on concrete cylinders. Unless otherwise specified, the Contractor shall retain an independent testing facility approved by the Engineer for the purpose of molding and testing concrete cylinders in accordance with appropriate ASTM requirements. Results of all tests shall be submitted to the Engineer. The Engineer reserves the right to require core samples of finished products when he deems it necessary.

f) All concrete cylinders shall be cured under the same environmental conditions as the precast items of which they are representative.

g) The Contractor shall notify the Engineer at least three working days prior to casting any structure.

h) Based upon the above required notice, the Engineer reserves the right to perform random inspections of the manufacture of manholes, vaults, and other items being produced for the Town's use for the purpose of inspecting the following:

- (1) Steel placement,
- (2) steel size,
- (3) overall fabrication,
- (4) workmanship,
- (5) and any other general or specific aspect of production and specification compliance.

C. Submittals

1. Submit working drawings in accordance with Section 2100 including complete details, pertinent calculations, design loads, materials, strengths, sizes and thicknesses, joint and connection design and details.

II. Materials

A. Materials shall be in accordance with Section 1700 as supplemented herein.

1. Precast concrete manholes and vaults

a) Precast concrete manholes shall meet requirements of ASTM C-478 with configurations as shown on the Standard Details and shall be constructed of Type II cement per ASTM C150 having a compression strength of 4,000 psi.

(1) The joint design and gasket material shall be in accordance to the requirements of ASTM C 361.

(2) Precast manholes shall be supplied with either concentric cones or flat slab top as shown on Plans and the Standard Details.

B. Precast concrete manholes shall be furnished with waterstops, sleeves and openings as noted on the Drawings. Box out for wall pipes shall conform accurately to the sizes and elevations of the adjoining pipes. Precast manholes shall be watertight and conform to the requirements of ASTM C-478 with reinforcing steel of ASTM A615, Grade 60 bars and the following modifications there to:

1. The minimum wall thickness shall be 5 inches.

2. The date and time of manufacturer shall be marked inside each precast sections.

3. No more than two lift holes may be cast or drilled in each section.

4. Precast concrete vaults shall meet requirements and configurations indicated on the Plans and the Standard Details.

5. Each manhole section or other precast structure component shall be clearly marked on the outside near the top with the following information where applicable. ASTM designation, Standard Detail or drawing number, station location or manhole number designation, date of manufacture and name or trademark of manufacturer.

III. Execution

A. Execution shall be in accordance with Sections 2200, 2550 and 2570.

IV. Measurement and Payment

A. Precast Concrete Manholes and Vaults

1. Precast manholes and vaults are paid for under other sections of specifications.

END OF SECTION

TOWN OF THURMONT
STANDARD SPECIFICATIONS
SECTION 2300
MISCELLANEOUS METALS

I. General

A. Description

This section includes providing miscellaneous metal items including all anchors, fasteners, hardware and accessories necessary to complete the work as indicated, in accordance with the Contract Documents.

B. Submittals

1. Submit shop drawings in accordance with Section 2100 showing the following:

- a) Sizes, finishes, all materials, locations, attached hardware and fittings, and details for all items and fabricated metal work, threaded fasteners and welds. Indicate all welds, both shop and field, by symbols conforming to AWS standards.
- b) Furnish setting diagrams, erection plans, templates, and directions for the installation of backing plates, anchors, and other items.
- c) Submit catalogue descriptions of manufacturer's standard items.

C. Delivery, handling and storage

- 1. Identify, and match mark if applicable, all materials, items and fabrications, for installation and field assembly.
- 2. Wherever practicable, deliver items to job site as complete units, ready for installation or erection, with all anchors, hangers, fasteners and miscellaneous metal items required for installation.
- 3. Provide adequate storage facilities at the job site for the protection and storage of all delivered materials. Handle and store in

such a manner as to not damage factory finishes. Repair damaged finishes at no cost to the Town.

II. Materials

A. Standard items

1. Whenever practicable, items shall be standard products, meeting the requirements specified herein, of a manufacturer regularly engaged in production of such items.

B. Shapes and bars

1. Mild steel shall conform to requirements of ASTM A36, unless otherwise indicated.

2. Corrosion resistant steel shall conform to requirements of ASTM A242, 0.25 to 0.75 copper.

3. Stainless Steel shall conform to the requirements of ASTM A276, Type 304.

4. Aluminum shall conform to requirements of ASTM B221.

C. Plate, sheet, strip

1. Mild steel shall conform to the requirements of ASTM A36, or A283, Grade C.

2. High strength Steel shall conform to requirements of ASTM A242.

3. Corrosion resistant steel shall conform to requirements of ASTM A242, 0.25 to 0.75 copper.

4. Stainless Steel

a) Over $\frac{1}{8}$ inch shall conform to requirements of ASTM A264 with ASTM A240, Type 304 or ASTM A36 base.

b) Under $\frac{1}{8}$ inch shall conform to requirements of ASTM, A167, Type 304.

5. Aluminum shall conform to requirements of ASTM B209.

D. Mild steel forgings shall conform to the requirements of ASTM A235, Class F.

E. Castings

1. Grey iron shall conform to requirements of ASTM A48, Grade 30.
2. Malleable iron shall conform to requirements of ASTM A47, Grade 35018
3. Ductile iron pipe shall conform to requirements of ASTM A536, Grade 60-40-18.
4. Nodular iron shall conform to requirements of ASTM A220, Grade 45008.
5. Steel shall conform to requirements of ASTM A27, Grade 65, 3,5.
6. Aluminum shall conform to the requirements of ASTM B108, alloy 356.0, TC.

F. Pipe and Tube

1. Mild Steel

a) For welding shall conform to requirements of ASTM A53, Type S, Grade B, Schedule 40, Black. Provide Schedule 80 for handrail posts.

b) For screwed connections shall conform to requirements of ASTM A120 or ASTM A53, Type E or S, Grade B, schedule 40. Provide schedule 80 for handrail posts.

2. Stainless

a) For welding shall conform to requirements of ASTM A312, Grade TP 2041, schedule 105 minimum.

b) For screwed connections shall conform to requirements of ASTM A312, TP 304, schedule 405.

c) For press fits shall conform to requirements of ASTM A312, Grade TP 304, schedule 55 minimum.

3. Aluminum shall conform to requirements of ASTM B221, alloy 6061.

G. Bolts, Nuts, Washers

1. General

- a) Provide galvanized for use with galvanized material.
- b) Provide stainless for use with corrosion resistant and stainless material.
- c) Provide cadmium plated for use with all other materials.

2. Stainless

- a) Bolts shall conform to requirements of ASTM A193, Grade B8, Type 2.
- b) Nuts shall conform to requirements of ASTM A194, Grade 8.
- c) Washers shall conform to requirements of ASTM 290, Type 304.

3. Expansion bolts shall be the metal shield type.

4. Steel drive bolts shall be the split shank type.

5. Headed steel anchors shall be fabricated from cold finished carbon steel conforming to requirements of ASTM A108.

H. Checkered Safety Plate

1. Steel shall conform to requirements of FS QQ F 461, Class K, flat back, standard four-way raised pattern, rolled from ASTM A36, Grade A, thickness and a span for 16 KSI maximum fiber stress.

2. Aluminum shall conform to requirements of ASTM B221, alloy 6063 T6.

I. Safety treads shall conform to requirements of FS RR T650, Type C.

J. Grafting

1. Aluminum shall conform to requirements of ASTM B221.

K. Coatings

1. Metal coatings

- a) Galvanized Sheet shall conform to requirements of ASTM A446. All other galvanizing shall conform to requirements of ASTM A123 or ASTM 153 or both ASTM 385 and ASTM 386, as applicable.

- b) Cadmium shall conform to requirements of ASTM A165, Type NS.

2. Galvanize touch up shall be zinc dust coating conforming to requirements of MIL P 26915.

3. Bituminous corrosion protection shall conform to requirements of MIL P23236 P, Class 2.

4. Coat aluminum accessories and items embedded in concrete with and inert compound capable of effecting isolation of the deleterious effect of the aluminum on concrete.

III. Execution

A. Fabrication

1. General

- a) Fabricate all work as indicated in the Contract Documents and approved shop and working drawings. Straighten work bent by shearing or punching.

- b) Press exposed edges and ends of material smooth, with no sharp edges and with corners slightly rounded. Construct connections and joints exposed to weather to exclude water.

- c) Provide sufficient quantity and size of anchors for the proper fastening of the work.

2. Fabricated Products

- a) Pipe sleeves in concrete construction shall be standard weight, black steel pipe, with anchors welded to exterior, size as required to accommodate passage of conduits, pipes, ducts and similar items with proper clearance.
- b) Railings
 - (1) Fabricate railings and handrails as indicated in accordance with OSHA from aluminum alloy or steel, hot dip galvanized after fabrication.
 - (2) Fabricate pipe handrails with all intersections and joints neatly fitted, fully welded and ground smooth and flush. Heat and bend smoothly, without distortion. Fabricate posts and stand-offs for pipe railing of the same material as the railing, evenly spaced as shown, with anchor flanges. Handrails along walls shall return to the wall at ends with quarter round bends and welded flanges.
 - (3) Fabricate flanges for posts from $\frac{3}{8}$ inch minimum thickness plate, and for stand-offs from not less than $\frac{3}{16}$ inch thickness plate. Coat contact side of flanges with bituminous corrosion protection.
 - (4) For fastening aluminum pipe railing and handrails, use stainless steel stud bolts with heavy aluminum washers and nuts. For fastening steel pipe railing and handrail, use galvanized high tensile strength stud bolts, nuts and washers.
- c) Trench Covers
 - (1) Provide checkered safety plate not less than $\frac{1}{4}$ inch thick, having accurately formed steel angle frames, with provisions for firm anchorage to structural floor or curb. Cut plates to convenient lengths for handling, and provide finger holes for lifting.
- d) Metal stair systems, ladders and cages
- e) All clips, anchors, and necessary appurtenances shall be provided for a complete and rigid installation.

- f) Closure plates shall be provided for all exposed ends of stringers.
- g) All exposed connections shall be welded and ground smooth, unless otherwise indicated on the Drawings.
- h) Stairs and landings shall be designed to support a 100 psf live load, minimum, unless otherwise indicated on the Drawings.
 - (1) Fabricate metal stair systems and landings from structural shapes and plate with a minimum clear width in no case less than 22 inches with a rise angle between 30 and 50 degrees and with a rise to tread run conforming to Table D of OSHA (1910.24) 31.4806. Provide treads and platforms with a non-slip surface.
 - (2) For metal stairs at angles greater than 45 degrees provide open riser type with open grating type treads.
 - (3) For galvanized metal stair systems provide solids treads of checkered safety plate and landing kick plates of four inches by ¼ inch thick plate.
 - (4) For permanent ladders; fixed type provide all steel all welded construction galvanized designed, fabricated, and installed in accordance with OSHA (1910.27) 31:4815-7 requirements for fixed ladders.
- i) Backing Plates
 - (1) Provide 16-gauge minimum galvanized steel backing plates as necessary for installation of lavatories, fixtures, equipment and all other items requiring such support. Secure plates in position by welding to studs or with bolts in expansion shields as appropriate.
- j) Stair Nosings
 - (1) Form abrasive safety nosings for concrete stair treads and landings from FS RR T650, nonskid tread, three inches wide by eight inches less than the concrete width, with suitable approved anchoring devices. Provide bolted-on nonskid treads for all plain metal stair treads.

k) Gratings

(1) Provide gratings of the type and size indicated. Provide bearing bars not less than $\frac{1}{8}$ inch thick. Provide structural supports for gratings, of the shapes indicated, fastened to the structure with anchors. Unless otherwise indicated, provide gratings which are removable but with locking legs and means of bolting in place.

(2) Provide serrated edges on the grating bars, or other means to provide non-skid surface. Provide solid perimeter banding.

(3) Fabricate walkway grating by the electro-pressure welding method to form a sound welded joint at intersections of all bars, with the top surfaces of all bars in the same plane or in accordance with the manufacturer's standard practice.

3. Connections

a) Shop connections in weldable materials, not designated for service removal, shall be welded. All welding shall conform to AWS D1.1 requirements. Weld behind finished surfaces whenever possible. Grind all exposed welds smooth. Remove weld, brazing, and solder spatter, flux, slag and oxides from finished surfaces. Use sheet metal lock seams only when indicated on the Contract drawings or approved shop and working drawings.

b) Complete all provisions for bolted field connections in the shop unless otherwise indicated.

c) Match exposed work to create continuity of line and design. Fabricate and fasten metal work so that the work will not be distorted, the finish impaired, nor the fasteners overstressed from the expansion and contraction of the metal. Conceal fastenings whenever practicable. Use fastenings exposed to public view of the same color and appearance as the surrounding metal.

4. Assemblies shall be fabricated such that bolts and other fastenings do not appear on finished surfaces.
5. All joints shall be true and tight, and connections between parts shall be light-proof tight.
6. Castings and Forgings
 - a) Fabricate castings and forgings as indicated. Castings and forgings shall be of uniform quality, true to pattern, strong, tough, of even grain, sound, smooth, without cold sheets, scabs, blisters and sand holes, cracks or other defects. Plugs, filled holes and welding will not be allowed. Castings shall be of thickness and configurations shown on the standard details. Sand blast as required to remove scale and sand and achieve a uniform smooth clean surface. Paint with asphaltum or coal tar paint meeting requirements of AWWA C203, where indicated. Provide raised letters where indicated.
 - b) Valve boxes shall be round head, screw type consisting of snug fitting top, bottom section and screw type extension. Lid shall be removable only by lifting straight up from the shaft shoulder.
 - c) Curb box assembly shall be Class 30, with bronze pentagonhead screws having tensile strength at least 65,000 psi, yield strength at least 38,000 psi. Assembly shall be two piece buffalo type with foot piece sized to accept proper size curb stop. Rods shall be of $\frac{9}{10}$ inch hot rolled steel. Lids, screws, tops and extensions shall be standard size interchangeable with those of other manufacturers.
 - d) SETTER PER STANDARD DETAILS.
 - e) Sewer manhole frames and inner lid covers shall be in accordance with the standard details.
 - f) Lamphole frames and covers shall be in accordance with the standard detail.
 - g) Meter housing frame and covers for the 1 $\frac{1}{2}$ " and over water meters shall meet the requirements of the standard

manhole frame and cover, they shall be lettered to read "Thurmont Water".

7. Galvanizing

a) Galvanize in accordance with reference standards set forth hereinbefore.

b) Items to be shop painted which are fabricated without welding entirely from galvanized shapes, hardware and sheet shall not be galvanized after fabrication. All other fabrications to be galvanized shall be hot dipped after fabrication.

B. Erection and Installation

1. Erection work shall be in accordance with the AISC Specification for the Design, Fabrication and Erection of Structural Steel for Buildings and the AISC Code of Standard Practice for Steel Buildings and Bridges, where applicable.

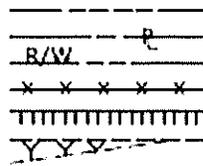
2. Upon completion of installations re-examine all work and provide additional shims, washers, anchors and corrective work as required to ensure that installation is firm, tight, anchored, in true alignment with neat fits, without distortions, unsightly fastenings, raw edges or protrusions.

IV. Measurement and Payment

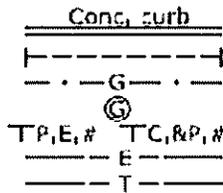
A. Measurement of miscellaneous metal work for payment will not be made under this section. Miscellaneous metal work is considered supplemental material required in the construction of specific items of work that will be measured and paid for under various other items in the bid schedule.

END OF SECTION

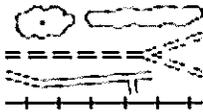
County Boundary Lines
 Prop. lines (except R/W)
 R/W lines
 Fences
 Walls (Conc., stone, etc.)
 Slopes



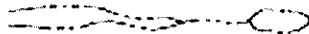
Conc. curb and sidewalk
 Existing drains and culverts
 Gas mains
 Gas meter
 Utility poles
 Electric lines - buried
 Telephone lines - buried



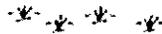
Trees and Brush
 Earth and Stone roads
 Bituminous and Conc. roads
 Railroads (per set of rails)



Streams, Ponds, Ditches



Marsh



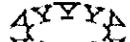
Sign post



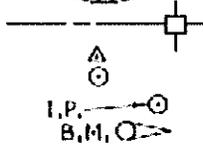
Excavation or Cut



Sink holes



Prop. man, or stone
 Triang. sta., Traverse sta.
 Hub and tack
 Iron pipe
 Bench mark
 Nail, spike or iron rod



Vitrified Clay Pipe Extra strength
 Cast Iron Pipe
 Ductile Iron Pipe
 Corrugated Metal Pipe
 Reinforced Conc. Pipe
 Poly (Vinyl Chloride)
 Acrylonitrile Butadiene Styrene

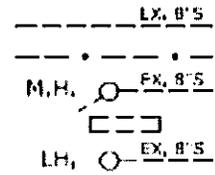
V.C.P.X
 C.I.P.
 D.I.P.
 C.M.P.
 R.C.P.
 P.V.C.
 A.B.S.

Pay Width
 Excavation
 First floor
 Footing
 Cellar
 Right of Way

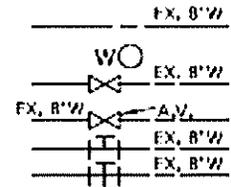
P.W.
 Exc.
 F.F.
 Ftg.
 C.
 R/W

Existing Work

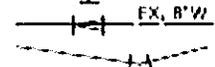
Sewers
 Storm water drains
 Sewer Manhole
 Rectangular Vaults
 Lampholes



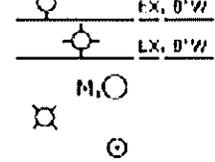
Water mains
 Water Manholes
 Valves
 Air valve
 Tee
 Cross



Reducer
 Bend

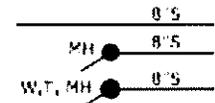


Blow-off
 Fire hydrant and valve
 Meter Boxes
 Elevated tank
 Stand pipe

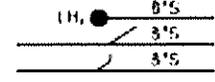


Proposed Work

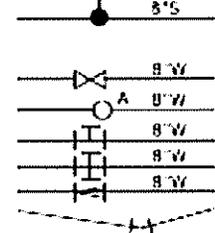
Sewers
 Manholes
 Water-tight Manhole



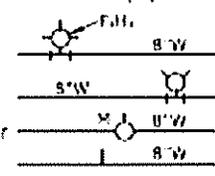
Lamphole
 Y branch
 Sewer Service Conn. - S.S.C.



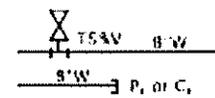
Drop Sewer Service
 Conn. - D.S.S.C.
 Water main w/ valve
 Automatic air-release valve
 Tee
 Cross
 Reducer
 Bend



Fire hydrant w/ valve
 Blow-off
 House water service and meter
 House water service - W.S.C.



Tapping sleeve & valve
 Plug or Cap



Town of Thurmont

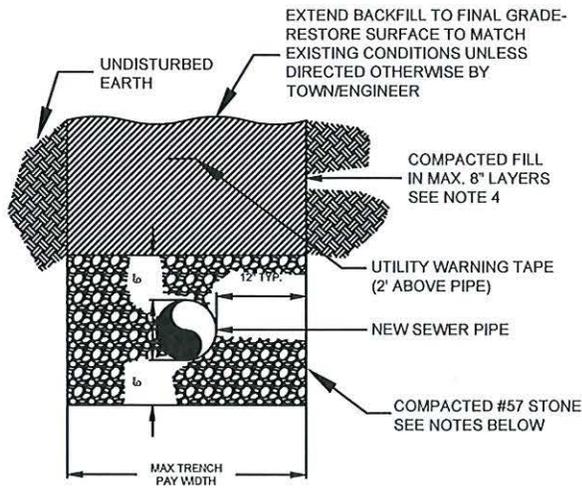
Department of
 Public Works

Revisions

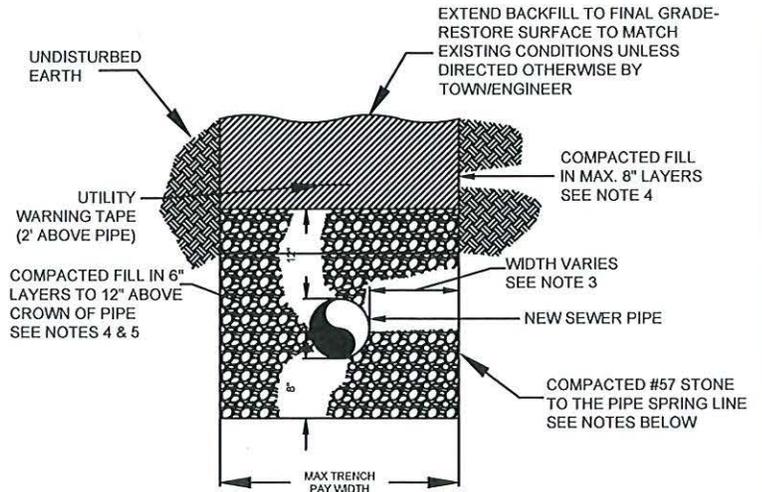
Date	Note

Standard Symbols for Water and Sewer

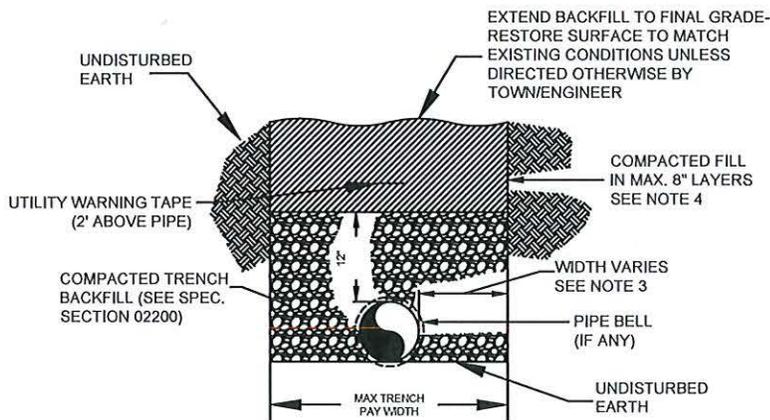
March 2020



**FOR SERVICE LATERALS
(4" & 6" PIPE, ANY PIPE MATERIALS)**



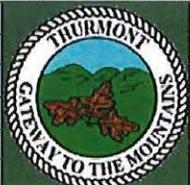
**FOR 8" AND LARGER
SEWER PIPE**



**FOR D.I.P.
WATER MAIN**

NOTES:

1. PIPE BEDDING DETAIL APPLIES TO ALL NEW WATER & SEWER PIPES INSTALLED.
2. THE CONTRACTOR SHALL USE A TRENCH BOX OR SHEETING AND SHORING IN ACCORDANCE WITH OSHA REGULATIONS WHILE INSTALLING NEW SEWERS. THE CONTRACTOR WILL NOT BE ALLOWED TO SLOPE TRENCH WALLS.
3. TRENCH WIDTH SHALL BE LIMITED TO AND THE CONTRACTOR SHALL ONLY BE PAID FOR THE FOLLOWING UNLESS OTHERWISE APPROVED PRIOR TO THE START OF WORK IN WRITING BY TOWN/ENGINEER:
 - 4" AND 6" PIPE - 12" EACH SIDE
 - 8" TO 15" PIPE - 15" EACH SIDE
 - 16" TO 30" PIPE - 18" EACH SIDE
4. IN GRASSED AREAS, COMMON FILL MAY BE USED AS BACKFILL. IN MD SHA, COUNTY AND TOWN PAVED ROADS, CR-6 SHALL BE IMPORTED AND USED AS BACKFILL. TRENCHES THAT LEAVE ANY ROADWAY SHALL BE BACKFILLED WITH CR-6 TO 12" BEYOND ANY ASPHALT/CONCRETE WORK. REMOVE ALL EXCAVATED MATERIAL AND DISPOSE OFFSITE.
5. COMPACTION OF STONE AND COMMON FILL TO 12" ABOVE PIPE TO BE WITH "JUMPING JACK" HAND MECHANICAL TAMPS ONLY.
6. MAINTAIN GROUND WATER LEVEL AT LEAST 1 FOOT BELOW TRENCH BOTTOM OF THE STONE BEDDING AT ALL TIMES.
7. IN ROCK, REDUCE STONE BEDDING UNDER PIPE AND STRUCTURES TO 6 INCHES.

Town of Thurmont Public Works Department Frederick County, MD	Revisions			PIPE TRENCH DETAILS		
	Date	Notes		Approved By:	Date	DETAIL NO.
						100

MANHOLE SCHEDULES

MH DIAMETER	LARGEST PIPE DIAMETER	PIPE DIAMETER	MAX MH SPACING
4 FEET	8" TO 15"	8" TO 12"	400 FEET
5 FEET	16" TO 27"	15" TO 27"	450 FEET

DETAIL NO.	MANHOLE TYPE	WHEN IN USE
102	PRECAST WITH CONE SECTION	<ol style="list-style-type: none"> 1. USE FOR 4-FOOT AND 5-FOOT DIAMETER MANHOLES ONLY. 2. MANHOLES WILL TERMINATE AT GRADE IN LANDSCAPED AREAS AND 16 TO 24 INCHES ABOVE GRADE IN EASEMENT AREAS AS DIRECTED BY OWNER/ENGINEER.
103	PRECAST WITH FLAT TOPS	<ol style="list-style-type: none"> 1. USE FOR SHORT MANHOLES (4-FOOT AND 5-FOOT) WHERE A CONE SECTION WILL NOT WORK, OR AS DIRECTED BY OWNER/ENGINEER.

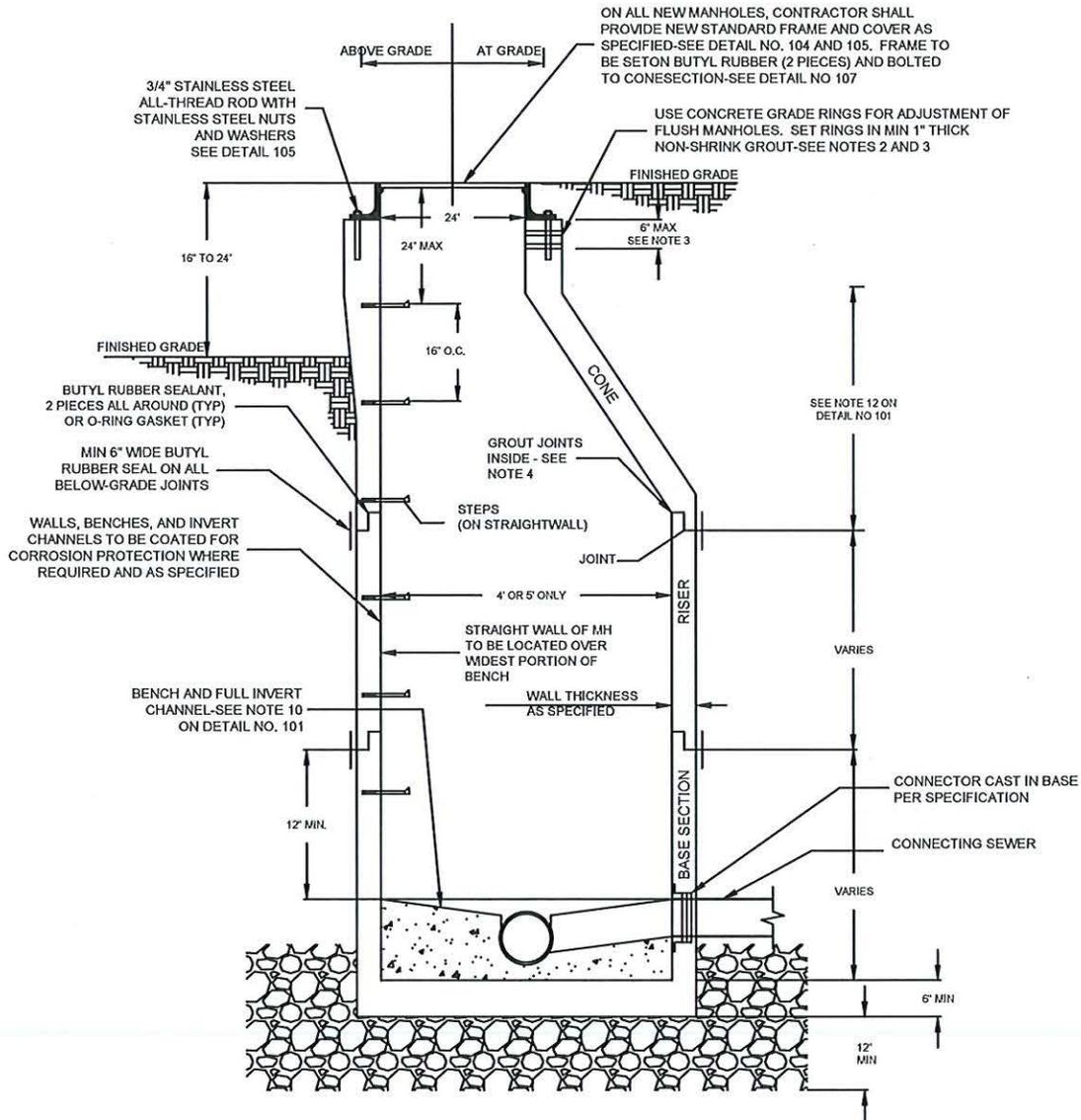
MANHOLE COVER ELEVATIONS

1. 1/2" BELOW FINAL PAVED SURFACES.
2. FLUSH WITH FINISHED GRADE IN LANDSCAPED/LAWN AREAS UNLESS OTHERWISE SPECIFIED.
3. 16 INCHES ABOVE GRADE IN EASEMENTS EXCEPT TO ACCOMMODATE FLOOD ELEVATIONS.
4. COVERS TO TERMINATE AT LEAST 1 FOOT ABOVE THE 100-YEAR FLOOD ELEVATION BUT NO GREATER THAN 4 FEET ABOVE GRADE TOTAL. WHERE THE FLOOD ELEVATION IS 4 FEET OR MORE ABOVE GROUND, WATERTIGHT COVERS SHALL BE USED. THE MANHOLE COVER SHALL TERMINATE 2 FEET ABOVE GRADE, AND A VENT PIPE SHALL BE INSTALLED TO 2 FEET ABOVE THE 100-YEAR FLOOD ELEVATION.

GENERAL SPECIFICATIONS AND REQUIREMENTS

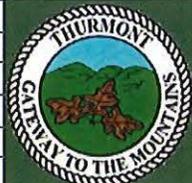
- | | |
|---|--|
| <ol style="list-style-type: none"> 1. MANHOLE TO CONFORM WITH ASTM C478 EXCEPT AS MODIFIED BELOW. 2. MANHOLE BASE TO BE REINFORCED WITH A MINIMUM OF 0.20 SQUARE INCHES PER LINEAR FOOT EACH WAY. WALL REINFORCING TO BE MINIMUM OF 0.12 SQUARE INCHES PER LINEAR FOOT. EITHER TONGUE OR GROOVE SHALL HAVE REINFORCING EQUAL IN AREA TO MINIMUM WALL SECTION. 3. ALL JOINTS SHALL CONFORM WITH ASTM C443. 4. STEPS TO BE PLASTIC PER SPEC SECTION 1350. 5. ALL PIPE OPENINGS TO BE NO GREATER THAN 3" LARGER THAN OUTSIDE DIAMETER OF PIPE ALL AROUND AND ADDITIONALLY REINFORCED WITH A MINIMUM OF 0.20 SQUARE INCHES OF STEEL AT 90 DEGREES (ADDITIONAL REINFORCING NOT REQUIRED FOR CORED OPENINGS). 6. ALL SURFACES SHALL BE SMOOTH, EVEN TEXTURED WITH A MINIMUM OF HONEYCOMB, FINS, AND OTHER IMPERFECTIONS. THE ENGINEER OR OWNER REPRESENTATIVE RESERVES THE RIGHT TO REJECT MANHOLES. 7. NON-PENETRATING LIFTING HOLES SHALL BE PLUGGED WITH EXPANSION GROUT. PENETRATING LIFTING HOLES SHALL NOT BE ALLOWED. 8. FOR BACKFILL REQUIREMENTS, REFER TO SPECIFICATION SECTION 1150. 9. STEPS TO BE OVER WIDEST PORTION OF BENCH. 10. BENCHING AND INVERT CHANNELS SHALL BE PRECAST BY THE MANHOLE MANUFACTURER. FORMED AND POURED IN PLACE BENCHES AND INVERTS MAY BE APPROVED IN CERTAIN SITUATIONS BY THE ENGINEER AND SHALL BE USED WHERE SPECIFICALLY REQUIRED. CONCRETE SHALL BE MIN. 4000 PSI AND FIBER REINFORCING FOR POURED-IN-PLACE BENCHING. BENDS IN BENCH SHALL BE DESIGNED TO ALLOW A 3 FOOT LONG CAMERA TO EASILY ENTER THE SEWER PIPE. FOR PRECAST INVERTS, THE CONTRACTOR SHALL BE RESPONSIBLE FOR DETERMINING EXACT INVERT ELEVATIONS PRIOR TO MANUFACTURING THE MANHOLE INCLUDING WHERE CONNECTING TO EXISTING SEWERS. | <ol style="list-style-type: none"> 11. ALL MANHOLE SECTIONS SHALL BE DESIGNED FOR H-20 LOADING. 12. MINIMUM HEIGHT FOR CONCENTRIC CONES ON MANHOLES WITH BOLT DOWN FRAME AND COVER IS 36". 13. MATCH PIPE CROWN ELEVATIONS OF CONNECTING/INFLUENT SEWERS AND MAIN SEWER. 14. VACUUM TEST MANHOLES PER THE SPECIFICATIONS. 15. ALL FRAMES SHALL BE BOLTED TO THE FLAT TOP OR CONE SECTION PER DETAIL NO. 107. TWO (2) COMPLETE CIRCLES OF MASTIC SHALL BE INSTALLED UNDER THE FRAME BEFORE SETTING ON THE CONE SECTION OR FLAT TOP. 16. ADD ONE BAG OF BENTONITE CLAY AT EACH PIPE PENETRATION ON EVERY MANHOLE. 17. DOGHOUSE MANHOLE INSTALLATIONS ARE NOT ALLOWED. 18. ALL NEW MANHOLES SHALL HAVE NEW FRAME AND COVERS INSTALLED PER DETAILS NO. 104, 105, 106, AND 107. 19. 6" GATOR WRAP, OR EQUIVALENT, SHALL BE INSTALLED ON EVERY OUTSIDE JOINT. 20. ALL THE INSIDE JOINTS AND OUTSIDES OF PIPE PENETRATIONS SHALL BE FULL COATED WITH GROUT. |
|---|--|

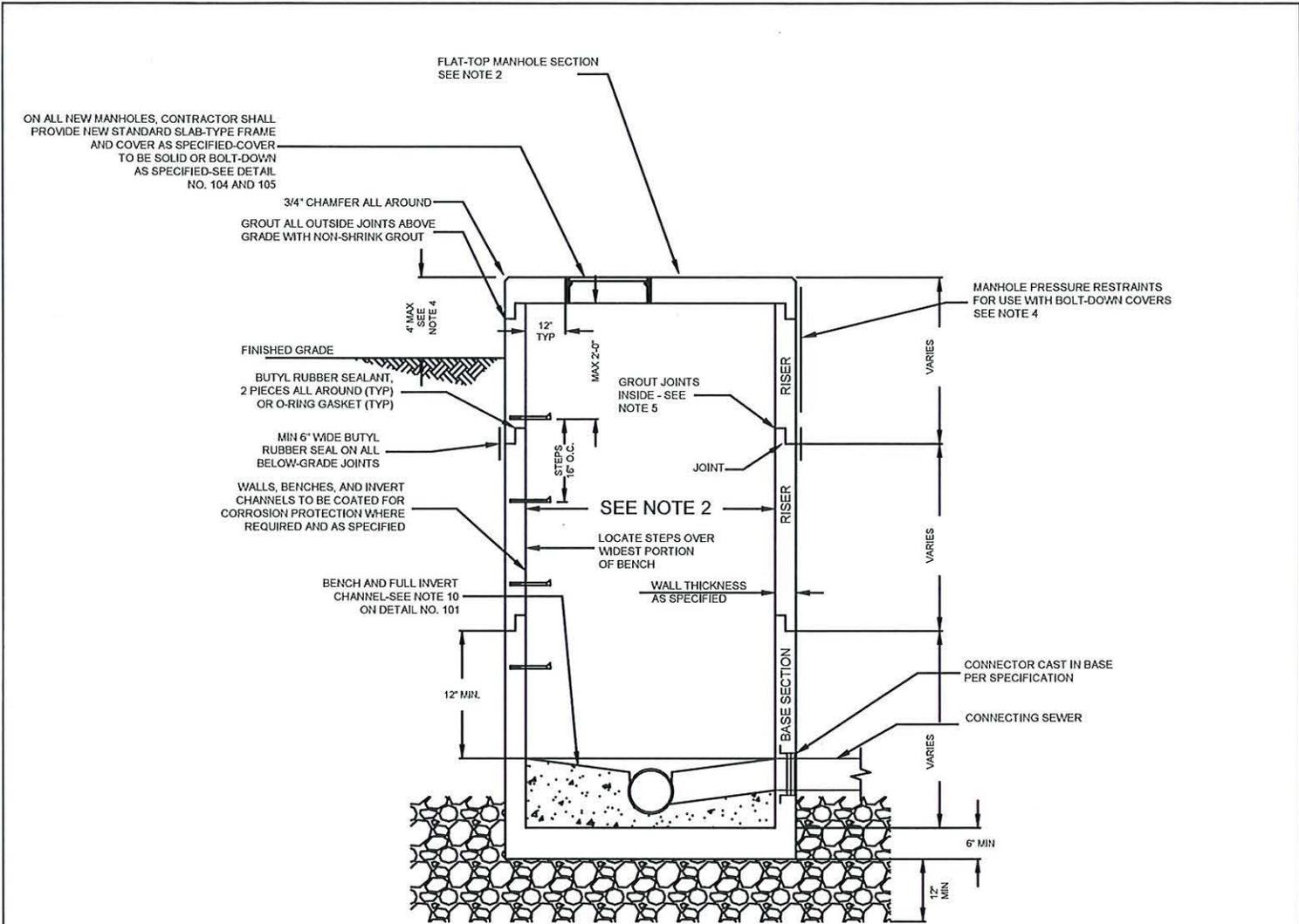
Town of Thurmont Public Works Department Frederick County, MD	Revisions			MANHOLE SCHEDULES AND GENERAL REQUIREMENTS		
	Date	Notes		Approved By:	Date	DETAIL NO.
	3/4/18	ADDED NOTE 18				101
	9/12/23	REVISED NOTE 4, 8, AND 10. ADDED NOTE 19, 20.				



NOTES:

1. REFER TO DETAIL 101 FOR ALL MANHOLE REQUIREMENTS AND SCHEDULES.
2. NON-SHRINK GROUT SHALL COMPLETELY COVER THE BRICK/GRADE RINGS ON THE OUTSIDE, SHALL OVERLAP THE CONE SECTION A MINIMUM OF 6 INCHES AND SHALL COVER THE FRAME FLANGE COMPLETELY. SEE DETAIL NO. 107.
3. MANHOLE SHALL BE ORDERED WITH MINIMUM GRADE ADJUSTMENT. ORDER BASE, RISER, AND CONE HEIGHTS TO STACK OUT MANHOLE AS CLOSE AS POSSIBLE TO GRADE. CONTRACTOR TO SUPPLY ENGINEER WITH A SCHEDULE OF EACH MANHOLE SHOWING THE HEIGHTS OF EACH SECTION. MAXIMUM ADJUSTMENT SHALL BE 6 INCHES UNLESS APPROVED OTHERWISE. CONCRETE GRADE RINGS SHALL BE USED AS SPECIFIED. WHEN GRADE RINGS ARE USED, A SINGLE GRADE RING SHALL BE INSTALLED TO ACHIEVE THE REQUIRED ADJUSTMENT, WHEREVER POSSIBLE.
4. MATCH PIPE CROWN ELEVATIONS OF CONNECTING/INFLUENT SEWERS AND MAIN SEWER.
5. ALL JOINTS SHALL BE GROUTED INSIDE THE MANHOLE WITH NON-SHRINK, HYDROGEN SULFIDE RESISTANT GROUT. ALL OUTSIDE JOINTS SHALL BE WRAPPED WITH 6" GATOR WRAP OR EQUIVALENT.
6. FOR INSTALLING NEW MANHOLES ON EXISTING CIPP LINED LINES, USE DETAIL NO. 117.

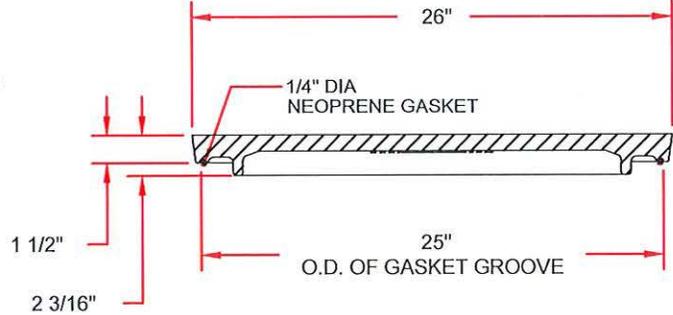
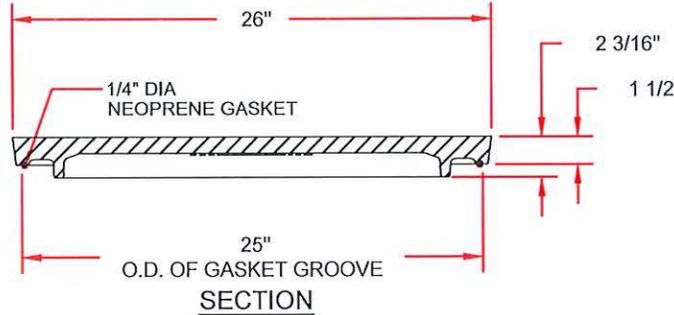
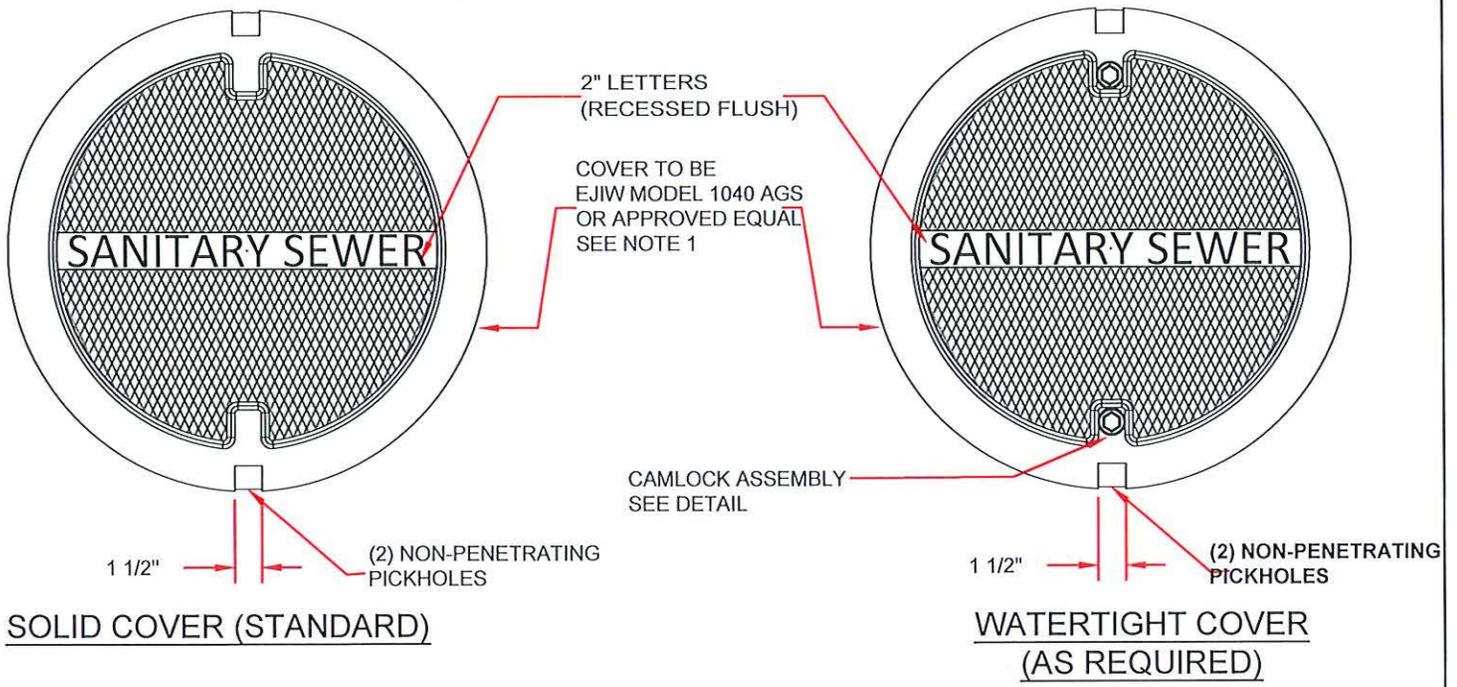
<p>Town of Thurmont Public Works Department Frederick County, MD</p>	Revisions			STANDARD PRECAST MANHOLES WITH CONE SECTIONS (4' AND 5' DIAMETER MANHOLES)		
	Date	Notes		Approved By:	Date	<p>DETAIL NO. 102</p>
	9/12/23	REVISED NOTE 5				



NOTES:

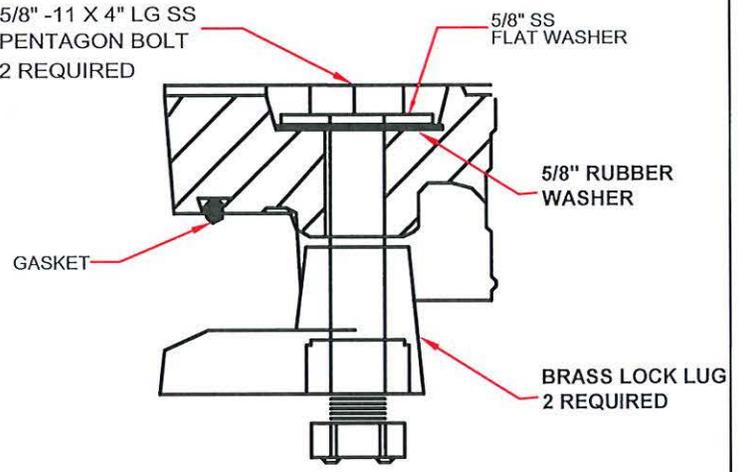
1. REFER TO DETAIL NO. 101 FOR ALL MANHOLE REQUIREMENTS AND SCHEDULES.
2. ALL 4-FOOT AND 5-FOOT MANHOLES TERMINATING MORE THAN 2 FEET ABOVE GRADE SHALL HAVE FLAT TOPS-SEE SCHEDULES ON DETAIL NO. 101. SLAB TYPE FRAMES AND COVERS SHALL BE THE STANDARD FOR FLAT TOPS-SEE DETAILS NO. 104 AND 105. MINIMUM THICKNESS OF FLAT-TOPS SHALL BE 8" FOR 4-FOOT AND 5-FOOT DIAMETER MANHOLES. IN SOME INSTANCES, FLAT TOP MANHOLES WITH COVERS FLUSH WITH THE FINAL GRADE WILL BE REQUIRED, SUCH AS WHEN INSTALLING SHORT MANHOLES. IN THIS CASE, THE TOP SLAB ELEVATION SHALL BE BELOW THE FINAL GRADE ELEVATION AND A BUILT-UP TYPE FRAME AND COVER SHALL BE USED AND INSTALLED PER DETAIL NO. 107.
3. PRESSURE RESTRAINTS ARE REQUIRED FOR ALL FLAT TOPS WITH WATERTIGHT COVERS UNLESS APPROVED OR DIRECTED. THREE RESTRAINTS SHALL BE EQUALLY SPACED AROUND THE MANHOLE. RESTRAINTS SHALL BE STAINLESS STEEL PLATES 3/8" X 3" X 24" LONG WITH A 7/8" HOLE 1-1/2" FROM EACH END. ANCHOR WITH 3/4" X 4" LONG STAINLESS STEEL ADHESIVE ANCHORS OR APPROVED EQUAL.
4. REFER TO MANHOLE SCHEDULES ON DETAIL NO. 101 FOR SPECIFIED COVER HEIGHTS ABOVE GRADE.
5. MATCH PIPE CROWN ELEVATIONS OF CONNECTING/INFLUENT SEWERS AND MAIN SEWERS.
6. ALL JOINTS SHALL BE GROUTED INSIDE THE MANHOLE WITH NON-SHRINK, HYDROGEN SULFIDE RESISTANT GROUT. OUTSIDE JOINTS SHALL BE WRAPPED WITH 6" GATOR WRAP OR EQUIVALENT.

<p>Town of Thurmont Public Works Department Frederick County, MD</p>	Revisions			STANDARD PRECAST MANHOLES WITH FLAT TOP SECTIONS		
	Date	Notes		Approved By:	Date	DETAIL NO.
	9/12/23	REVISED NOTE 6, REMOVED SECTION 02700 NOTE IN DETAIL				103



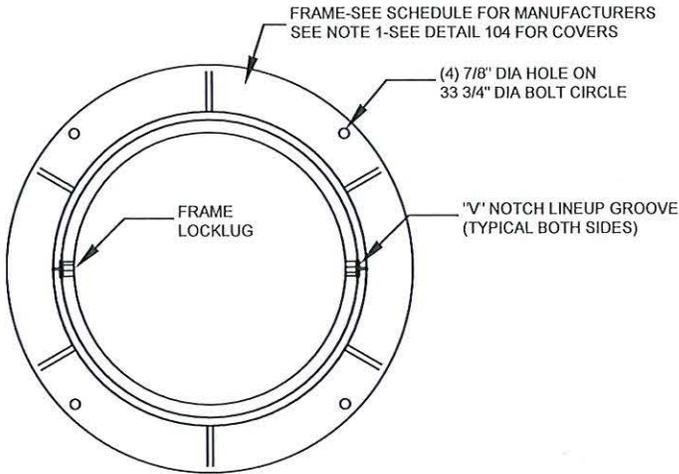
NOTES:

1. ALTERNATE COVERS TO THOSE SHOWN MUST BE APPROVED BY ENGINEER/TOWN. A SAMPLE OF THE FRAME AND COVER MUST BE DELIVERED TO TOWN AS PART OF THE REVIEW AND APPROVAL PROCESS.
2. COVERS MUST FIT ANY FRAME SHOWN IN DETAIL 105.
3. EJIW = EAST JORDAN IRON WORKS (1-800-626-4653)
4. COVERS TO BE ASTM A48 CLASS 35 GRAY IRON WITH A MINIMUM WEIGHT OF 144 POUNDS.
5. NOMINAL DIMENSIONS SHOWN TYPICALLY MEAN PLUS OR MINUS 1/4" UNLESS OTHERWISE APPROVED BY ENGINEER.
6. THE NON-PENETRATING PICKHOLE IS THE STANDARD OPENING DEVICE.
7. ALL COVERS TO BE FURNISHED WITH GASKETS AS SHOWN. SIDE/WIPER GASKETS ARE NOT APPROVED.



**CAMLOCK ASSEMBLY
DETAIL**

Town of Thurmont Public Works Department Frederick County, MD	Revisions			STANDARD MANHOLE COVERS		
	Date	Notes		Approved By:	Date	DETAIL NO.
						104

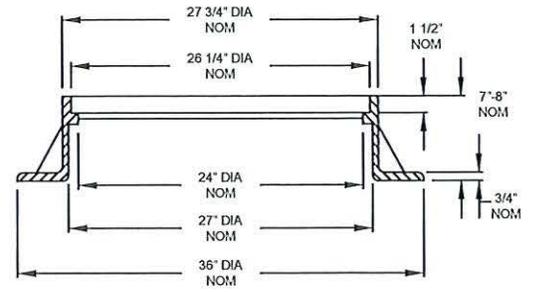


FRAME SCHEDULE

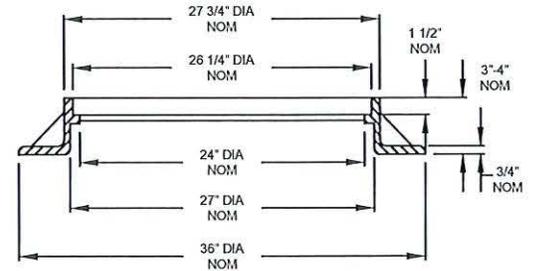
- STANDARD HEIGHT: EJIW MODEL 104010, OR EQUAL-SEE NOTE 1
MIN. WEIGHT 205 POUNDS
- LOW PROFILE: EJIW MODEL 104610, OR EQUAL-SEE NOTE 1
MIN. WEIGHT 115 POUNDS
- SLAB-TYPE: EJIW MODEL 280010 TOP FLANGE, OR EQUAL-SEE NOTES 1 AND 4

NOTES:

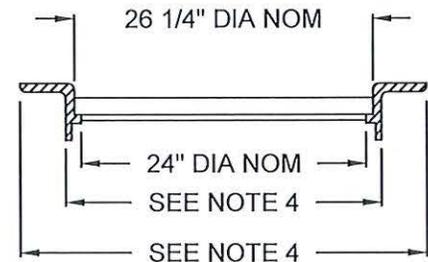
1. ALTERNATE FRAMES TO THOSE SHOWN MUST BE APPROVED BY TOWN OR ENGINEER. A SAMPLE OF THE FRAME AND COVER MUST BE DELIVERED TO TOWN/ENGINEER AS PART OF THE REVIEW AND APPROVAL PROCESS. FRAMES MUST BE SUITABLE FOR USE WITH ANY COVER SPECIFIED IN DETAIL 104.
2. COVERS TO BE ASTM A48 CLASS 35 GRAY IRON WITH MINIMUM WEIGHTS SPECIFIED IN THE FRAME SCHEDULE.
3. NOMINAL DIMENSIONS SHOWN TYPICALLY MEAN PLUS OR MINUS 1/4" UNLESS OTHERWISE APPROVED BY OWN/ENGINEER.
4. FRAME MANUFACTURER TO PROVIDE FINAL DIMENSIONS AS A SHOP DRAWING PRIOR TO FABRICATION.



STANDARD HEIGHT



LOW PROFILE



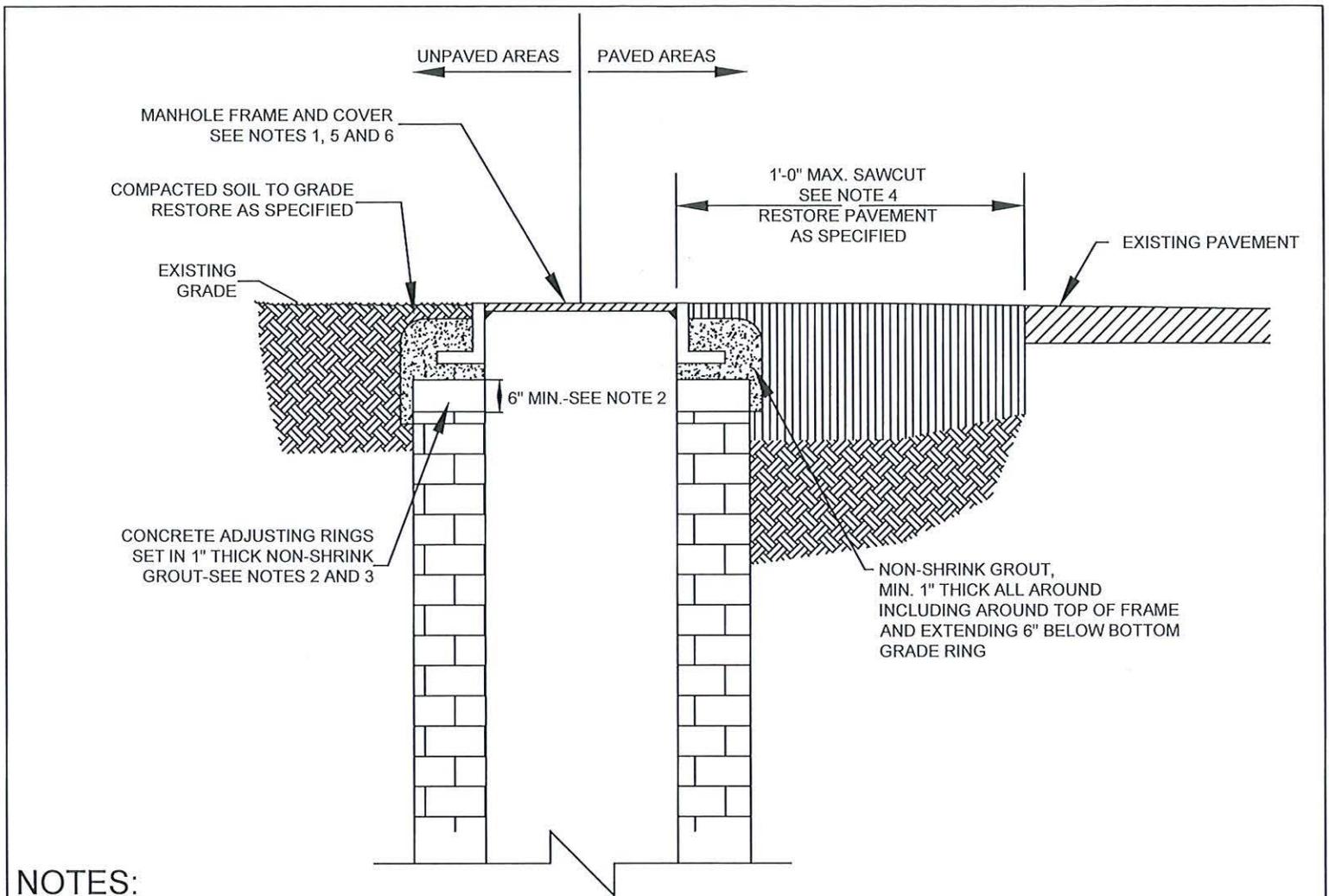
SLAB-TYPE
SEE NOTE 4

Town of Thurmont
Public Works Department
Frederick County, MD

Revisions	
Date	Notes



STANDARD MANHOLE FRAMES FOR COVERS		
Approved By:	Date	DETAIL NO. 105

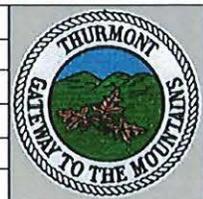


NOTES:

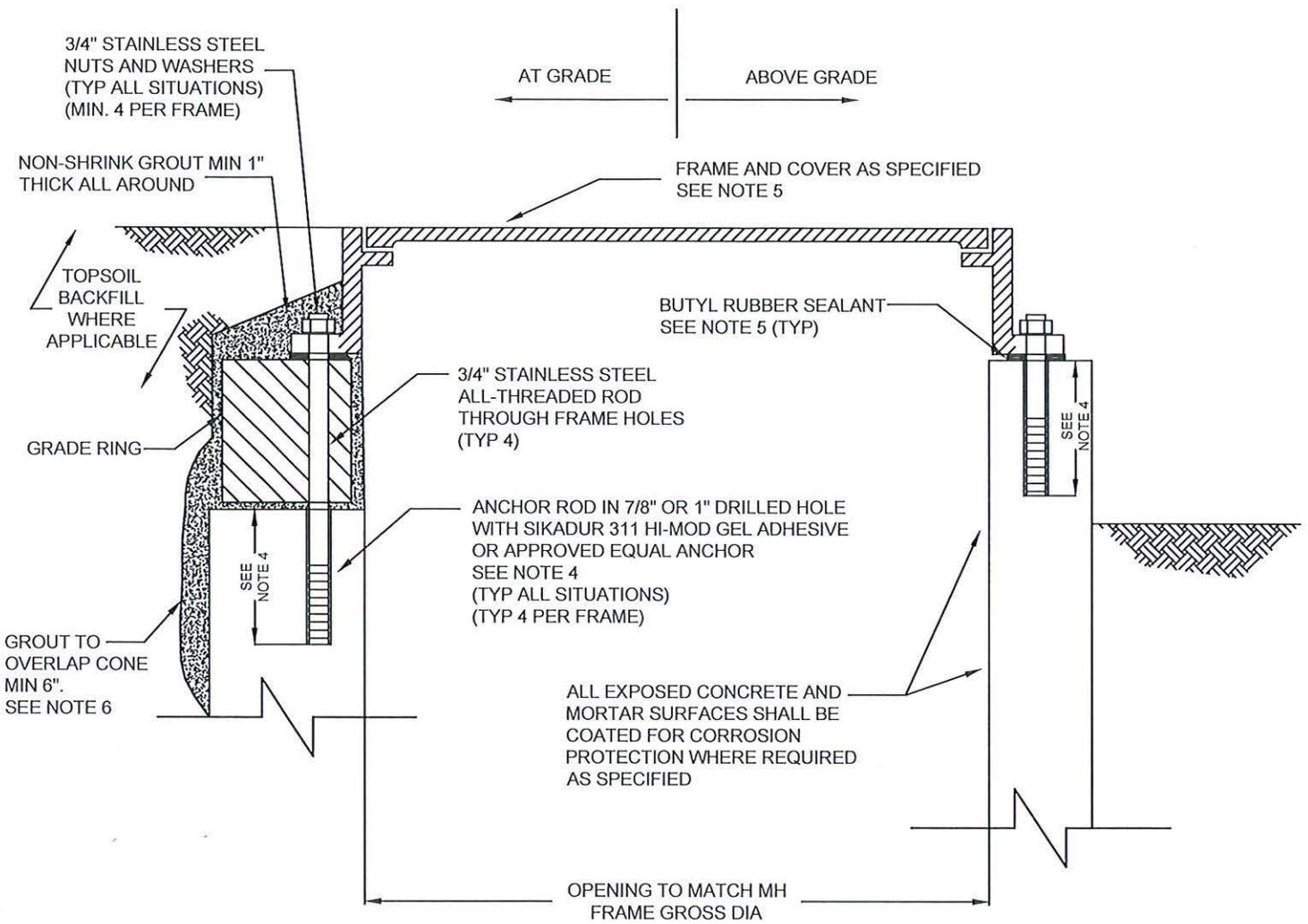
1. CONTRACTOR SHALL REFER TO THIS DETAIL WHEN RAISING MANHOLES AND WHEN RESETTING OR REPLACING EXISTING FRAMES AND COVERS. ALL REHABILITATION OF FRAMES AND COVERS SHALL BE COMPLETED PRIOR TO OTHER MANHOLE REHABILITATION WORK.
2. CONTRACTOR TO REMOVE AT LEAST 6" OF EXISTING BRICK AND/OR WALL MATERIAL PRIOR TO INSTALLING CONCRETE ADJUSTING RINGS TO PROVIDE A NEW SOLID SURFACE FOR SEATING THE FRAME AND TO PROVIDE A LEAK-TIGHT SEAL UNLESS OTHERWISE APPROVED BY TOWN/ENGINEER.
3. REMOVE ALL LOOSE BRICKS AND MORTAR AND PROVIDE A SMOOTH LEVEL SURFACE PRIOR TO INSTALLING CONCRETE ADJUSTING RING. BRUSH SURFACE WITH STIFF WIRE BRUSH PRIOR TO PLACING NON-SHRINK GROUT.
4. IN PAVED AREAS, PAVEMENT SHALL BE SAW-CUT NEATLY IN A SQUARE AROUND EXISTING MANHOLES. PAVEMENT SHALL BE IN ACCORDANCE WITH DETAIL AND MEET ALL MD SHA REQUIREMENTS. PROVIDE TACK COAT ALL AROUND AT SAWCUT/JOINT WITH EXISTING PAVEMENT.
5. FINAL ELEVATION OF MANHOLE COVER TO BE EQUAL TO THE EXISTING COVER ELEVATION UNLESS NOTED OTHERWISE. SET FRAME AND COVER TO 1/2" BELOW GRADE.
6. NEW FRAMES AND COVERS WHERE REQUIRED SHALL BE AS SPECIFIED AND SHOWN IN STANDARD DETAIL NO. 104 AND 105.
7. WHEN ADJUSTING HEIGHT WITH RISER RINGS, USE ONLY EAST JORDAN SOLID RISER RINGS (OR APPROVED EQUAL) ON ALL MANHOLE FRAME ADJUSTMENTS.
8. NO RISER RINGS SHALL BE USED ON BOLTED DOWN COVERS. FRAME TO BE EXCAVATED AND USE CONCRETE GRADE RINGS TO ACHIEVE DESIRED ELEVATION.

Town of Thurmont
Public Works Department
Frederick County, MD

Revisions	
Date	Notes



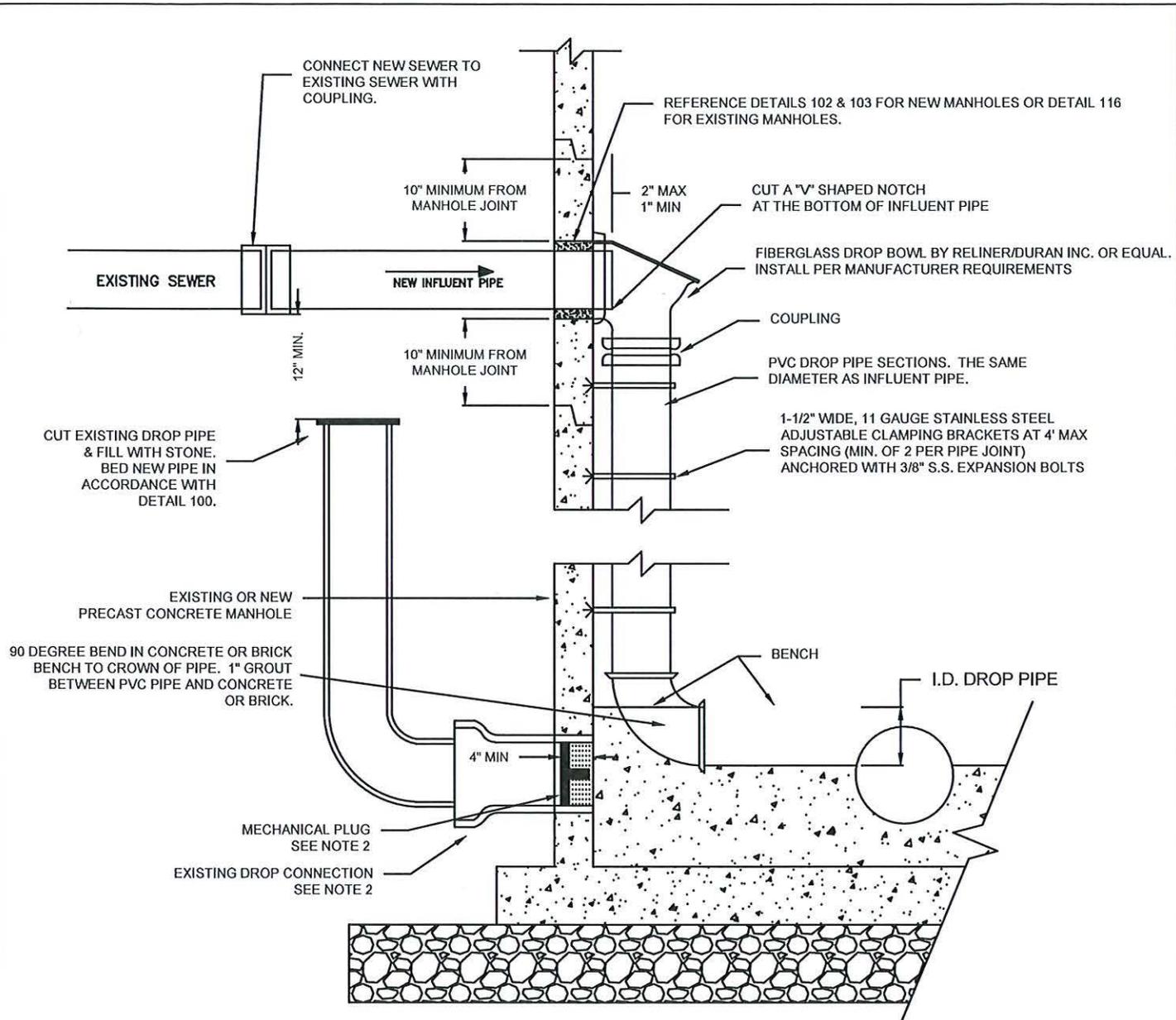
REHABILITATION AND HEIGHT ADJUSTMENT OF EXISTING MANHOLE FRAME AND COVER		
Approved By:	Date	DETAIL NO.
		106



NOTES:

1. ALL FRAMES INSTALLED SHALL BE ANCHORED TO MANHOLE CONE SECTIONS PER THIS DETAIL. FOR FLAT TOP SECTIONS, THIS DETAIL ONLY APPLIES WHEN THE COVER IS TERMINATING FLUSH WITH THE GRADE (WHEN A NON-SLAB TYPE FRAME IS USED).
2. THIS DETAIL DEPICTS ANCHORING FRAMES AND COVERS TO CONE SECTION. THE DETAIL ALSO APPLIES TO FLAT TOP SECTIONS PER NOTE 1.
3. FOR FLAT-TOP SECTIONS, ANCHOR ROD MIN 3/4 OF THE SLAB THICKNESS. FOR CONE SECTIONS, ANCHOR ROD MIN 4" INTO CONE. SUBMIT PROPOSED ANCHORING TO ENGINEER FOR REVIEW AND APPROVAL
4. INSTALL BUTYL RUBBER (MASTIC) SEALANT UNDER FRAME-2 COMPLETE CIRCLES.
5. PARGE OVER TRANSITION BETWEEN TOP OF MASONRY AND FRAME.

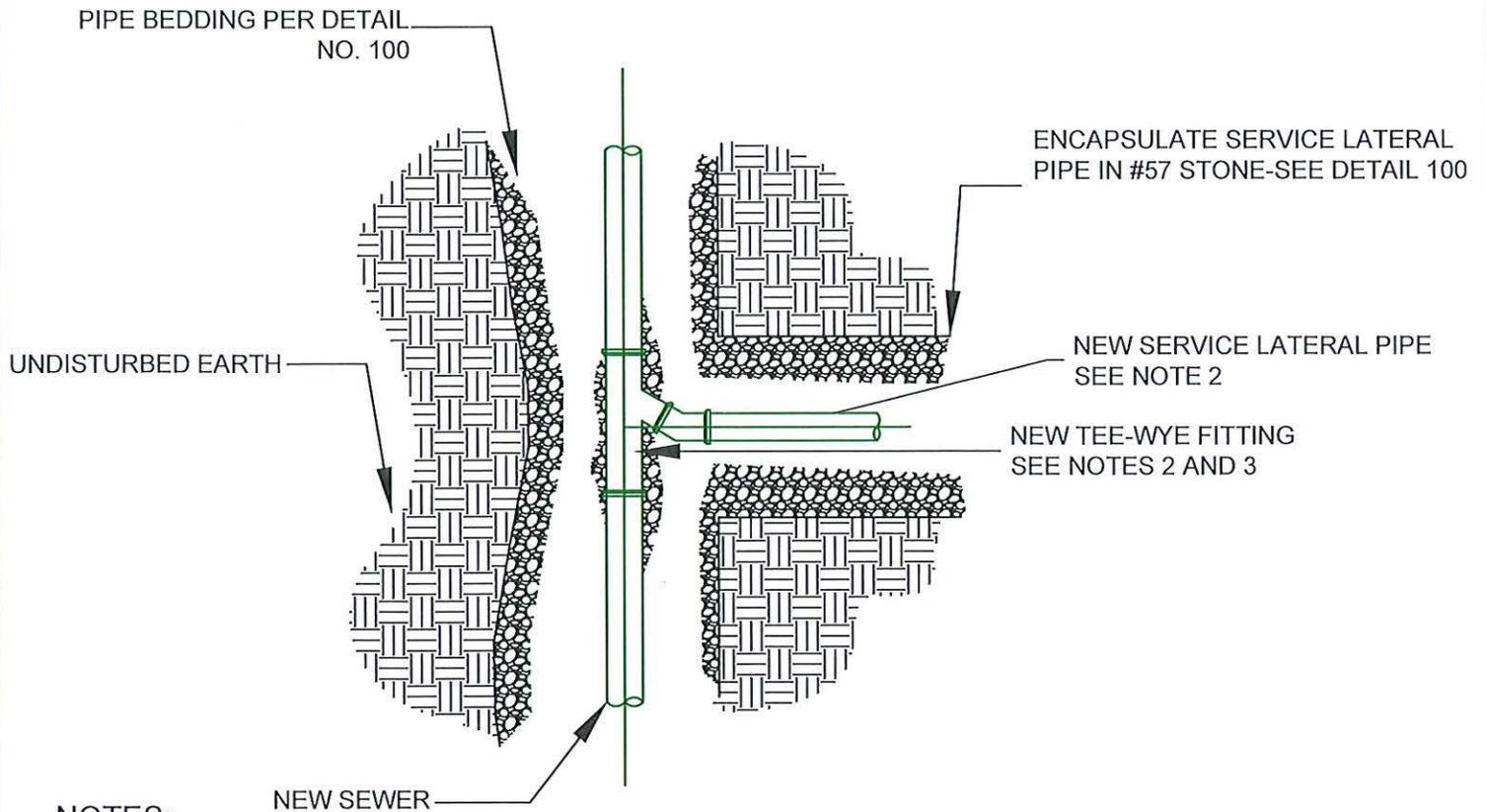
Town of Thurmont Public Works Department Frederick County, MD	Revisions			INSTALLATION OF MANHOLE FRAMES AND COVERS		
	Date	Notes		Approved By:		Date
						DETAIL NO. 107



NOTES:

1. THE DROP BOWL SHALL NOT EXTEND INTO THE AREA THAT IS DEFINED BY THE PROJECTION OF THE MANHOLE ENTRANCE VERTICALLY DOWN TO THE MANHOLE BOTTOM. IF NECESSARY, MANHOLE FRAME, COVER, CONE SECTION, AND STEPS SHALL BE REMOVED AND PLACED TO ALLOW FOR UNOBSTRUCTED ENTRY AND EXIT.
2. WHEN INSIDE DROP CONNECTION REPLACES EXISTING OUTSIDE DROP, PROVIDE MECHANICAL PLUG AND FILL CAVITY SPACE WITH NON-SHRINK GROUT FLUSH WITH INSIDE FACE OF MANHOLE.
3. INSTALL NEW INFLUENT PIPE TO MATCH GRADE OF EXISTING SEWER AND PROVIDE POSITIVE DRAINAGE INTO MANHOLE.
4. USE THIS DETAIL ONLY WHEN THE DIFFERENCE BETWEEN THE TOP AND BOTTOM INVERT IS GREATER THAN 2.5 FEET.
5. FOR ALL PIPE CONNECTIONS, EXCEPT DIP, USE RUBBER SLEEVE COUPLING WITH STAINLESS STEEL COMPRESSION BANDS AND SHEAR RINGS BY MISSION PRODUCTS OR APPROVED EQUAL. COUPLING TO BE ONE PIECE CONSTRUCTION EVEN WHEN THERE IS A CHANGE IN PIPE SIZE. NO BUSHING ARE TO BE USED FOR DIP PIPE. HYMAXX COUPLINGS ARE TO BE USED FOR PIPE CONNECTIONS.

Town of Thurmont Public Works Department Frederick County, MD	Revisions			INSIDE DROP CONNECTION FOR PRECAST CONCRETE MANHOLES-DETAIL VIEW		
	Date	Notes		Approved By:	Date	DETAIL NO.
	9/12/23	ADDED NOTE 5				109

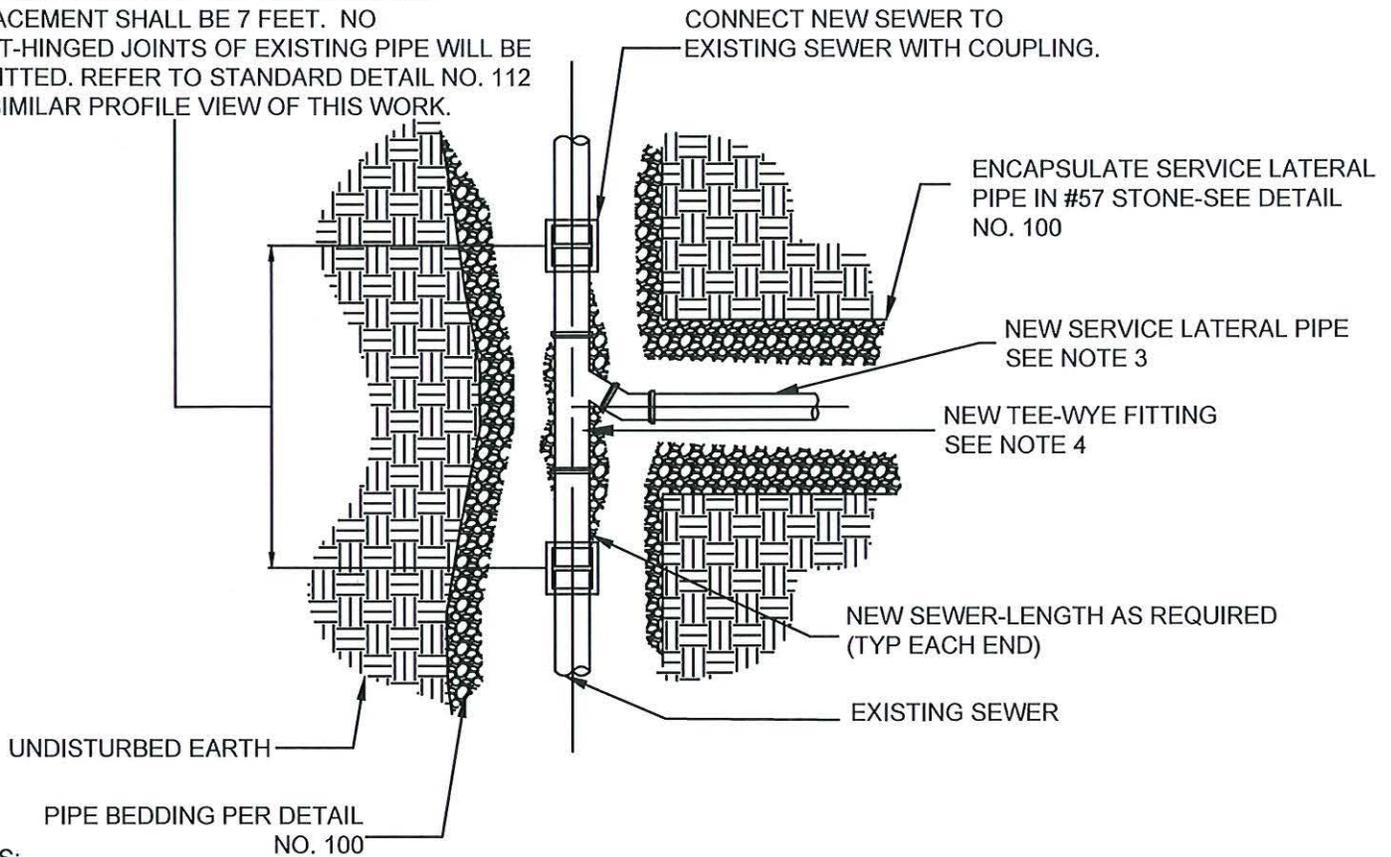


NOTES:

1. REFER TO THIS DETAIL WHEN CONNECTING NEW SERVICE LATERALS TO NEW SEWERS WITH A TEE-WYE FITTING. TEE-WYE CONNECTIONS ARE REQUIRED FOR CONNECTING NEW LATERALS TO NEW SEWERS. TEE-WYE FITTINGS SHALL BE INSTALLED AS THE NEW SEWER IS LAID TO SERVE ALL PROPERTIES. INSTALLING THE NEW SEWER AND THEN TAPPING THE SEWER WITH A SADDLE CONNECTION SHALL NOT BE ALLOWED
2. INSTALL FITTINGS AND ADAPTERS AS NECESSARY TO CONNECT NEW TEE-WYE AND SERVICE LATERAL. 90° BENDS ARE NOT ALLOWED. NEW MAIN SEWER, TEE-WYE AND SERVICE LATERAL SHALL BE PVC UNLESS OTHERWISE APPROVED OR REQUIRED.
3. ROTATE NEW TEE-WYE 45 DEGREES FROM HORIZONTAL TO THE LEFT OR RIGHT AS APPROPRIATE AND INSTALL FITTINGS/BENDS AS NECESSARY TO ROUTE LATERAL ALONG DESIRED ELEVATION. SERVICES SHALL NOT ENTER THE TOP OF THE SEWER.
4. REFER TO DETAIL NO 112 FOR PROFILE VIEW OF THIS WORK.

Town of Thurmont Public Works Department Frederick County, MD	Revisions			SERVICE LATERAL TEE-WYE CONNECTION TO NEW SEWER		
	Date	Notes		Approved By:	Date	DETAIL NO. 110

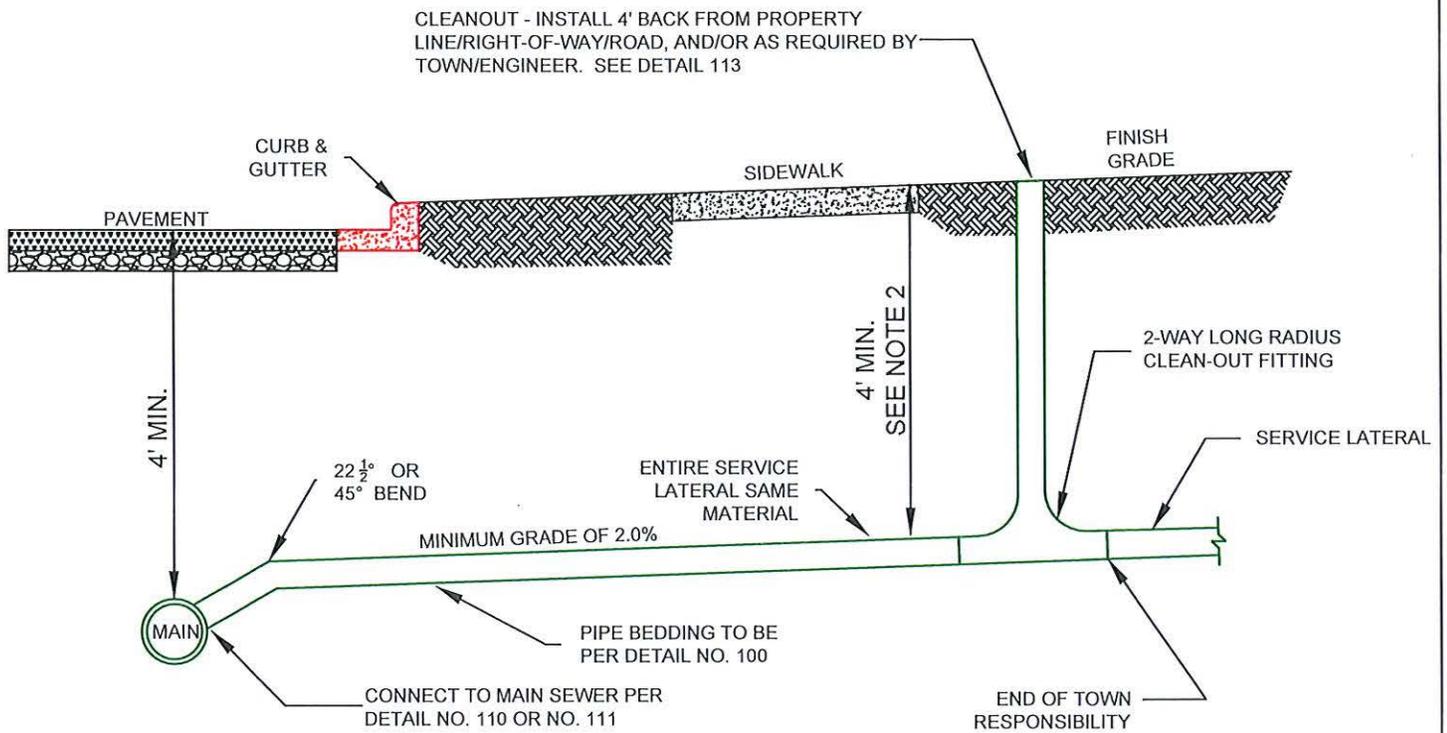
CUT AND REMOVE EXISTING SEWER AND REPLACE WITH NEW PVC PIPE AND PVC TEE-WYE SERVICE CONNECTION-SEE NOTE 2. MIN LENGTH OF REPLACEMENT SHALL BE 7 FEET. NO SHORT-HINGED JOINTS OF EXISTING PIPE WILL BE PERMITTED. REFER TO STANDARD DETAIL NO. 112 FOR SIMILAR PROFILE VIEW OF THIS WORK.



NOTES:

1. REFER TO THIS DETAIL WHEN CONNECTING NEW SERVICE LATERALS TO EXISTING SEWERS. SADDLE CONNECTIONS WILL NOT BE ALLOWED UNLESS DIRECTED BY THE ENGINEER.
2. INSTALL THE NEW SEWER AT A CONSTANT SLOPE BETWEEN THE TWO EXISTING PIPE ENDS.
3. INSTALL FITTINGS, ADAPTERS AND COUPLINGS AS NECESSARY TO CONNECT NEW PIPE AS SHOWN. NEW SEWER PIPE SHALL BE PVC. NEW LATERALS AND TEE-WYE BRANCHES SHALL BE THE SAME SIZE AS THE EXISTING LATERAL.
4. ROTATE NEW TEE-WYE 45 DEGREES FROM HORIZONTAL TO THE LEFT OR RIGHT AS APPROPRIATE AND INSTALL FITTINGS/BENDS AS NECESSARY TO ROUTE LATERAL ALONG DESIRED ELEVATION. 90° BENDS ARE NOT ALLOWED. SERVICES SHALL NOT ENTER THE TOP OF THE SEWER PIPE.
5. REFER TO DETAIL NO. 112 FOR PROFILE VIEW OF THIS WORK.
6. USE EXISTING PVC TEE-WYE IF AVAILABLE. IF THERE IS NO TEE-WYE AVAILABLE OR ONE IS PRESENT BUT IT IS A DIFFERENT MATERIAL, INSTALL NEW TEE-WYE PER THIS DETAIL.
7. LATERALS SHALL BE A MINIMUM OF 6" DIAMETER PIPE TO PROPERTY CLEANOUT AND THERE SHALL BE NO MORE THAN 2 SERVICE CONNECTIONS PER 6" LATERAL.
8. FOR ALL PIPE CONNECTIONS, EXCEPT DIP, USE RUBBER SLEEVE COUPLING WITH STAINLESS STEEL COMPRESSION BANDS AND SHEAR RINGS BY MISSION PRODUCTS OR APPROVED EQUAL. COUPLING TO BE ONE PIECE CONSTRUCTION, EVEN WHEN THERE IS A CHANGE IN PIPE SIZE. NO BUSHINGS ARE TO BE USED. FOR DIP PIPE, HYMAXX COUPLINGS ARE TO BE USED FOR PIPE CONNECTIONS.

Town of Thurmont Public Works Department Frederick County, MD	Revisions			SERVICE LATERAL TEE-WYE CONNECTION TO EXISTING SEWER		
	Date	Notes		Approved By:	Date	DETAIL NO. 111
	9/12/23	ADDED NOTE 7 AND 8				

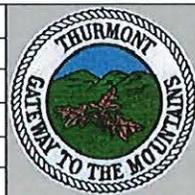


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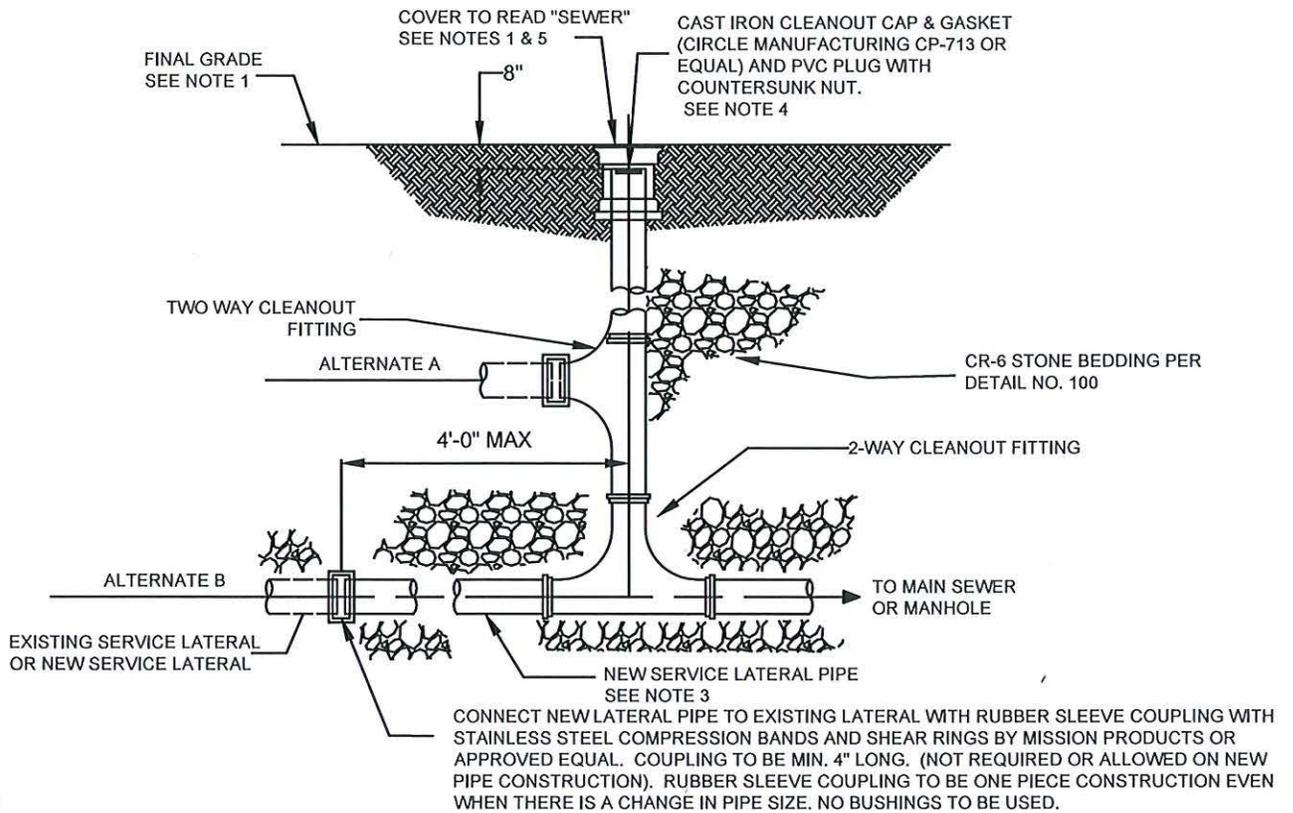
1. THIS DETAIL ILLUSTRATES A TYPICAL SERVICE LATERAL INSTALLATION FROM THE MAIN SEWER (EITHER NEW OR EXISTING) TO THE PROPERTY LINE OR EDGE OF THE ROAD/SEWER RIGHT-OF-WAY.
2. WHEN SERVICE LATERALS ARE INSTALLED TO THE HOUSE OR BUSINESS, THE NEW LATERAL SHALL REMAIN AT A MINIMUM SLOPE OF 2% AND SHALL MAINTAIN AT LEAST 4 FEET OF COVER WITHIN THE ROAD R/W. THERE IS NO SPECIFIED MINIMUM DEPTH OF COVER FOR LATERALS ONCE THEY ENTER PRIVATE PROPERTY BUT A MINIMUM OF 3' OF COVER IS RECOMMENDED. PIPE TYPES MAY NOT CHANGE FROM THE MAIN SEWER TO THE HOUSE/BUILDING UNLESS TOWN/ENGINEER APPROVES OTHERWISE.
3. IF 4 FEET OF COVER CAN NOT BE PROVIDED WITHIN THE ROAD R/W, SPECIAL INSTALLATION MAY BE REQUIRED BY TOWN/ENGINEER OR MDSHA.
4. CLEANOUTS SHALL BE INSTALLED AT ALL BENDS IN THE LATERAL, AT LEAST EVERY 75 FEET AND/OR AS REQUIRED BY TOWN/ENGINEER. CLEANOUTS SHALL BE IN ACCORDANCE WITH DETAIL 113.
5. REFER TO OTHER REFERENCED DETAILS FOR ADDITIONAL REQUIREMENTS.

Town of Thurmont
Public Works Department
Frederick County, MD

Revisions	
Date	Notes



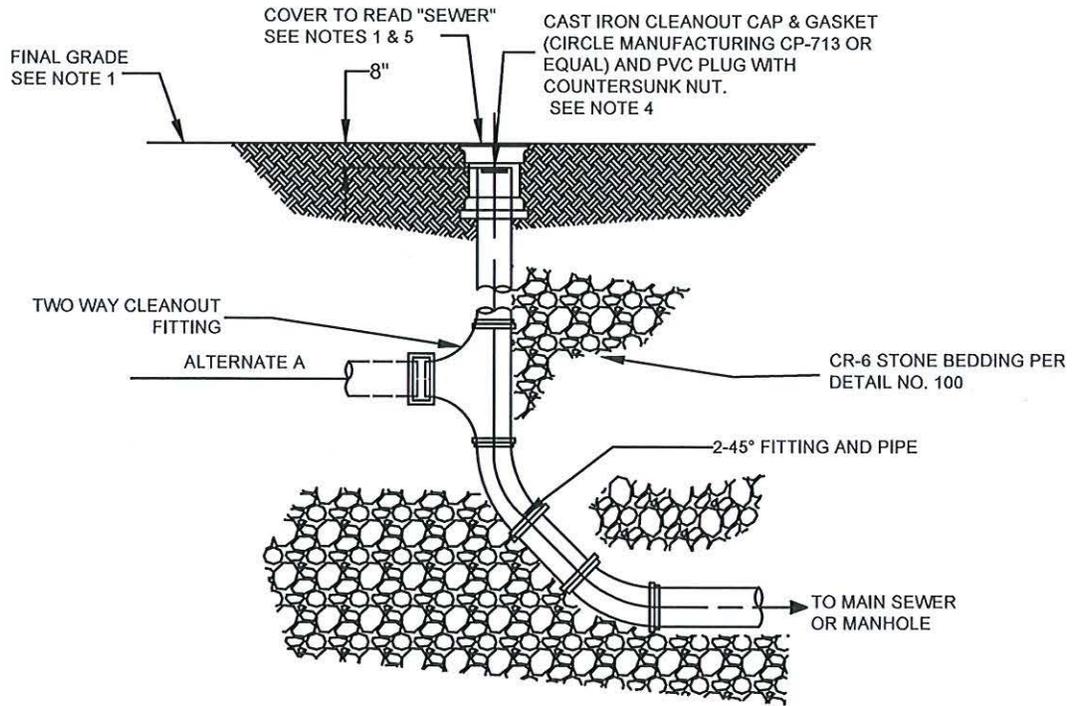
STANDARD SERVICE LATERAL INSTALLATION		
Approved By:	Date	DETAIL NO.
		112



NOTES:

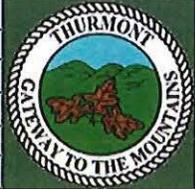
1. CLEANOUT COVER TO BE FLUSH WITH THE FINAL GRADE.
2. LOCATION OF CLEANOUT TO BE FIELD APPROVED BY TOWN/ENGINEER. CLEANOUTS SHALL BE INSTALLED AT ALL BENDS IN THE LATERAL, AT LEAST EVERY 75 FEET AND/OR AS REQUIRED BY TOWN/ENGINEER.
3. LATERAL PIPE AND FITTINGS SHALL BE THE SAME PIPE MATERIAL UNLESS APPROVED OTHERWISE BY TOWN/ENGINEER.
4. ALTERNATE CLEANOUT CAPS MUST BE APPROVED BY TOWN/ENGINEER.
5. VALVE BOXES SHALL BE GRAY IRON CONFORMING TO ASTM A48 CLASS 35 AND SHALL BE FULLY BITUMINOUS SEAL COATED, MIN. LENGTH OF TOP SECTION TO BE 16 INCHES.
6. WHEN CONNECTING TO EXISTING 4" PIPE, USE A ONE-PIECE ECCENTRIC PVC REDUCER.
7. FOR GRASSED AREAS, USE A PUSH-ON CAST IRON CLEANOUT & CAP.
8. FOR EITHER ALTERNATE A OR B LOCATIONS FOR HOUSE SEWER CONNECTION, THE MINIMUM DEPTH BELOW FINISHED GRADE SHALL BE 3'.
9. STAND PIPE TO BE 1 SOLID PIECE OF PIPE.
10. LATERALS SHALL BE A MINIMUM OF 6" DIAMETER PIPE TO PROPERTY CLEANOUT AND THERE SHALL BE NO MORE THAN 2 SERVICE CONNECTIONS PER 6" LATERAL.
11. WHEN LATERAL IS TO ENTER THE VERTICAL STAND PIPE, USE TWO 45° CONNECTIONS WITH A SECTION OF PIPE BETWEEN 45° FITTINGS TO CREATE A SWEEP AT THE BOTTOM OF THE STAND PIPE.

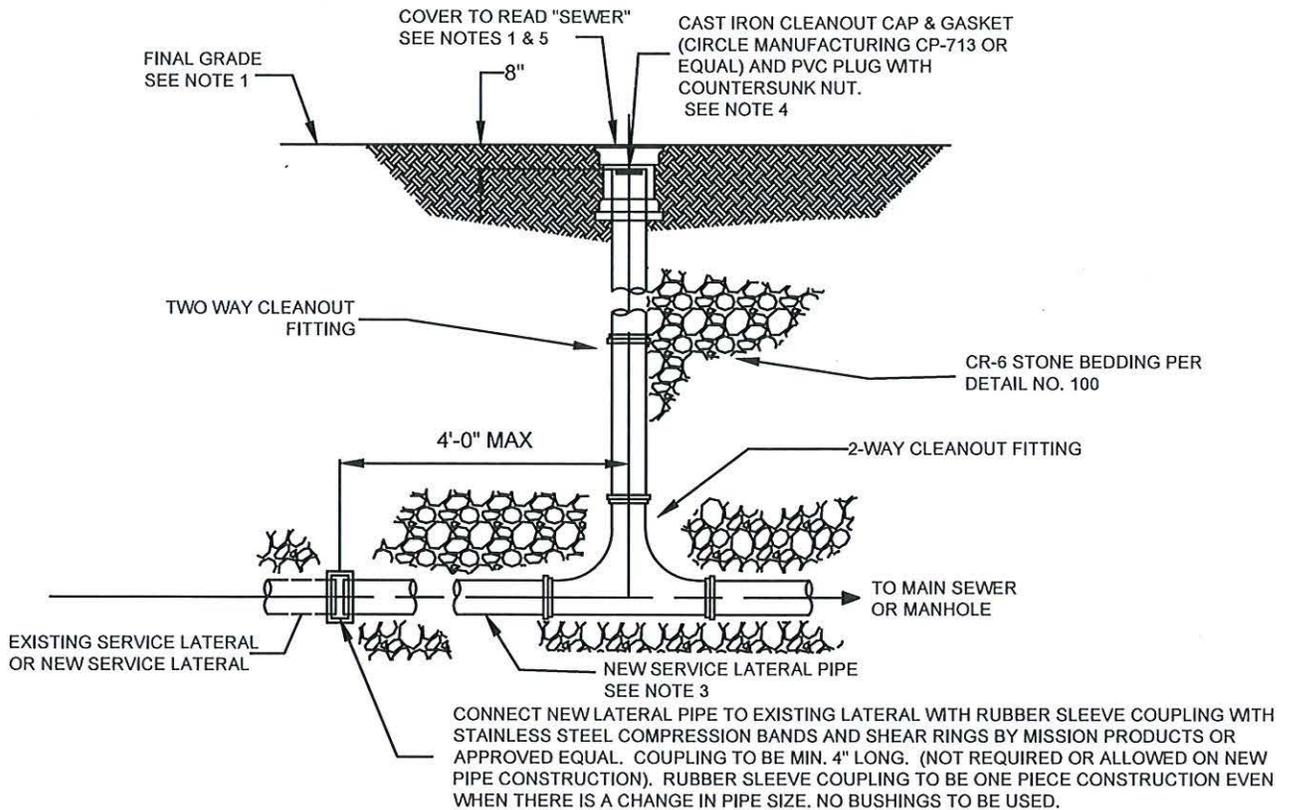
Town of Thurmont Public Works Department Frederick County, MD	Revisions			TYPICAL CLEANOUT DETAILS DOUBLE LATERAL CONNECTION		
	Date	Notes		Approved By:	Date	DETAIL NO. 113
	9/12/23	ADDED NOTE 10, REMOVED IRON VALVE BOX CALL OUT AND REVISED TITLE.				



NOTES:

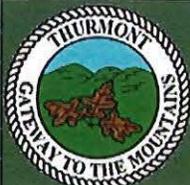
1. CLEANOUT COVER TO BE FLUSH WITH THE FINAL GRADE.
2. LOCATION OF CLEANOUT TO BE FIELD APPROVED BY TOWN/ENGINEER. CLEANOUTS SHALL BE INSTALLED AT ALL BENDS IN THE LATERAL, AT LEAST EVERY 75 FEET AND/OR AS REQUIRED BY TOWN/ENGINEER.
3. LATERAL PIPE AND FITTINGS SHALL BE THE SAME PIPE MATERIAL UNLESS APPROVED OTHERWISE BY TOWN/ENGINEER.
4. ALTERNATE CLEANOUT CAPS MUST BE APPROVED BY TOWN/ENGINEER.
5. VALVE BOXES SHALL BE GRAY IRON CONFORMING TO ASTM A48 CLASS 35 AND SHALL BE FULLY BITUMINOUS SEAL COATED, MIN. LENGTH OF TOP SECTION TO BE 16 INCHES.
6. WHEN CONNECTING TO EXISTING 4" PIPE, USE A ONE-PIECE ECCENTRIC PVC REDUCER.
7. FOR GRASSED AREAS, USE A PUSH-ON CAST IRON CLEANOUT & CAP.
8. FOR EITHER ALTERNATE A OR B LOCATIONS FOR HOUSE SEWER CONNECTION, THE MINIMUM DEPTH BELOW FINISHED GRADE SHALL BE 3'.
9. STAND PIPE TO BE 1 SOLID PIECE OF PIPE.
10. LATERALS SHALL BE A MINIMUM OF 6" DIAMETER PIPE TO PROPERTY CLEANOUT AND THERE SHALL BE NO MORE THAN 2 SERVICE CONNECTIONS PER 6" LATERAL.
11. WHEN LATERAL IS TO ENTER THE VERTICAL STAND PIPE USE TWO 45° CONNECTIONS WITH A SECTION OF PIPE BETWEEN 45° FITTINGS TO CREATE A SWEEP AT THE BOTTOM OF THE STAND PIPE.

Town of Thurmont Public Works Department Frederick County, MD	Revisions			TYPICAL CLEANOUT DETAILS DROP LATERAL CONNECTION		Approved By: _____ Date _____	DETAIL NO.
	Date	Notes		113A			
	9/12/23	REVISED TITLE, ADDED NOTE 10 AND 11, REMOVED IRON VALVE NOTE IN DETAIL.					



NOTES:

1. CLEANOUT COVER TO BE FLUSH WITH THE FINAL GRADE.
2. LOCATION OF CLEANOUT TO BE FIELD APPROVED BY TOWN/ENGINEER. CLEANOUTS SHALL BE INSTALLED AT ALL BENDS IN THE LATERAL, AT LEAST EVERY 75 FEET AND/OR AS REQUIRED BY TOWN/ENGINEER.
3. LATERAL PIPE AND FITTINGS SHALL BE THE SAME PIPE MATERIAL UNLESS APPROVED OTHERWISE BY TOWN/ENGINEER.
4. ALTERNATE CLEANOUT CAPS MUST BE APPROVED BY TOWN/ENGINEER.
5. VALVE BOXES SHALL BE GRAY IRON CONFORMING TO ASTM A48 CLASS 35 AND SHALL BE FULLY BITUMINOUS SEAL COATED, MIN. LENGTH OF TOP SECTION TO BE 16 INCHES.
6. WHEN CONNECTING TO EXISTING 4" PIPE, USE A ONE-PIECE ECCENTRIC PVC REDUCER.
7. FOR GRASSED AREAS, USE A PUSH-ON CAST IRON CLEANOUT & CAP.
8. FOR EITHER ALTERNATE A OR B LOCATIONS FOR HOUSE SEWER CONNECTION, THE MINIMUM DEPTH BELOW FINISHED GRADE SHALL BE 3'.
9. STAND PIPE TO BE 1 SOLID PIECE OF PIPE.
10. LATERALS SHALL BE A MINIMUM OF 6" DIAMETER PIPE TO PROPERTY CLEANOUT AND THERE SHALL BE NO MORE THAN 2 SERVICE CONNECTIONS PER 6" LATERAL.

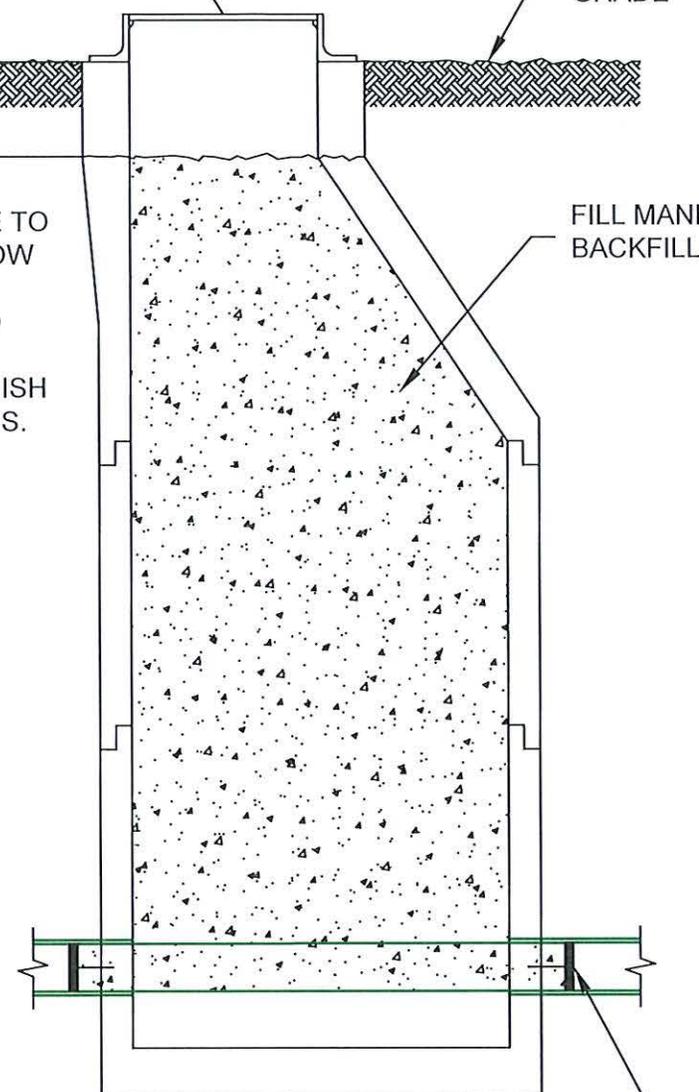
Town of Thurmont Public Works Department Frederick County, MD	Revisions			TYPICAL CLEANOUT DETAILS HORIZONTAL LATERAL CONNECTION		
	Date	Notes		Approved By:	Date	DETAIL NO. 113B
	9/12/23	REVISED TITLE AND ADDED NOTE 10				

REMOVE MANHOLE FRAME AND COVER AND RETURN TO TOWN.

EXISTING FINISH GRADE

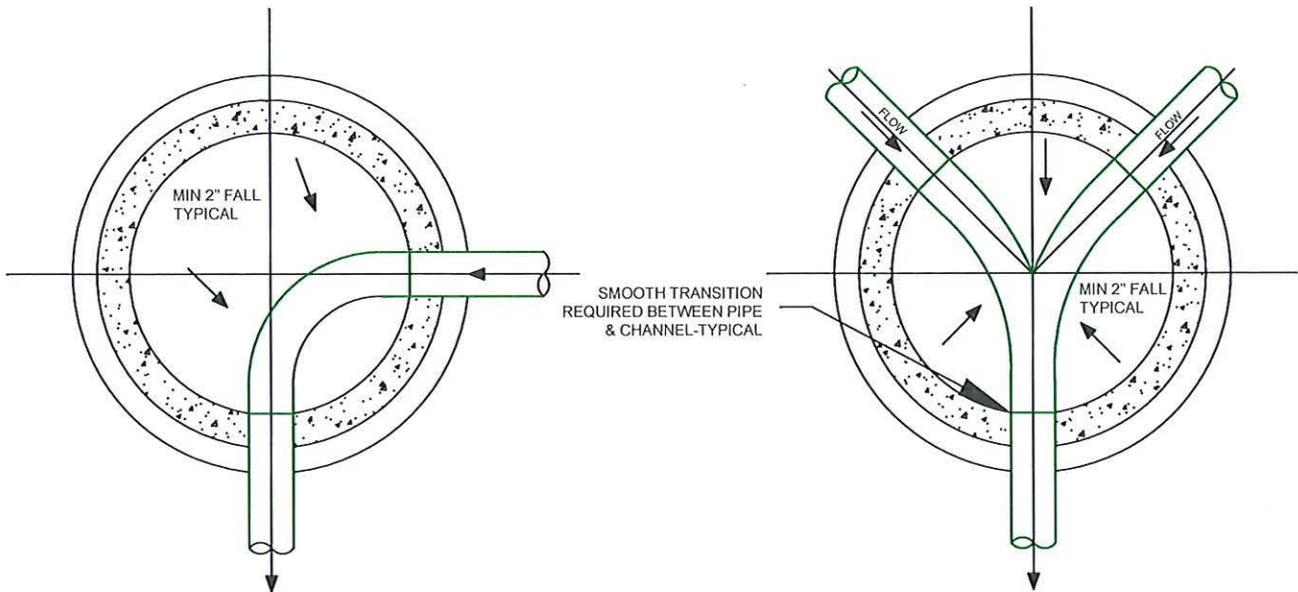
REMOVE MANHOLE TO 1'-0" MINIMUM BELOW FINISHED GRADE. RESTORE AREA TO MATCH WITH SURROUNDING FINISH GRADE CONDITIONS.

FILL MANHOLE SOLID WITH BACKFILL MATERIAL.



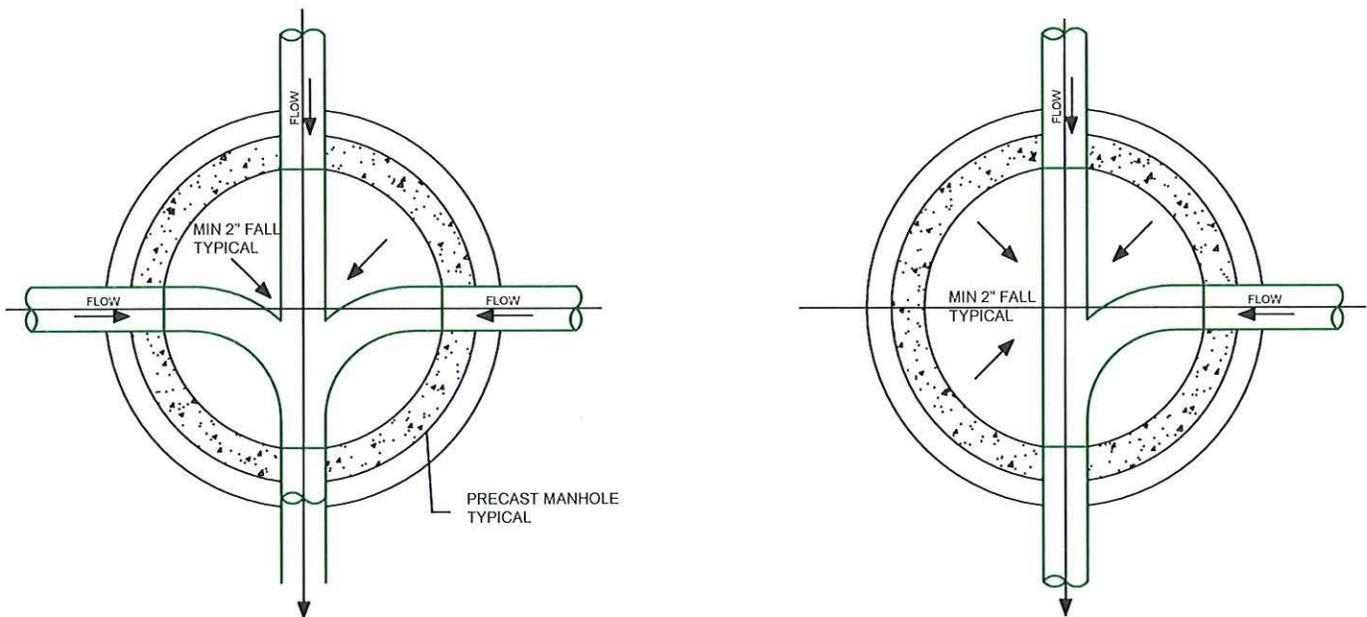
FOR SEWER 15" AND SMALLER DIAMETER, SET MECHANICAL PLUGS INTO ALL PIPES ENTERING MANHOLES AS SHOWN. FOR SEWERS 18" AND LARGER DIAMETER PROVIDE MASONRY BULKHEAD IN LIEU OF MECHANICAL PLUGS.

Town of Thurmont Public Works Department Frederick County, MD	Revisions			COMPLETE MANHOLE ABANDONMENT		
	Date	Notes		Approved By:	Date	DETAIL NO.
						114



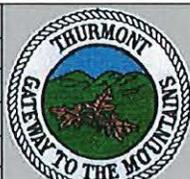
CHANNEL LINING NOTES:

1. BENCHING & INVERT CHANNELS SHALL BE PRECAST BY THE MANHOLE MANUFACTURER UNLESS DIRECTED OTHERWISE BY ENGINEER. BENCHING AND CHANNELS SHALL BE CONSTRUCTED OF MINIMUM 4,000 PSI CONCRETE WITH FIBER REINFORCING.
2. WIDTH OF CHANNEL SHALL MATCH INSIDE DIAMETER OF INCOMING AND OUTGOING PIPES. BLEND CHANNEL LINING FOR SMOOTH CONTOUR BETWEEN PIPES.
3. ALL INVERT ELEVATIONS SHALL BE AS SHOWN ON THE DRAWINGS.
4. AT LEAST 2 INCHES OF FALL SHALL BE PROVIDED ON THE BENCHING FROM THE MANHOLE WALLS TO THE TOP EDGE OF THE INVERT CHANNEL.



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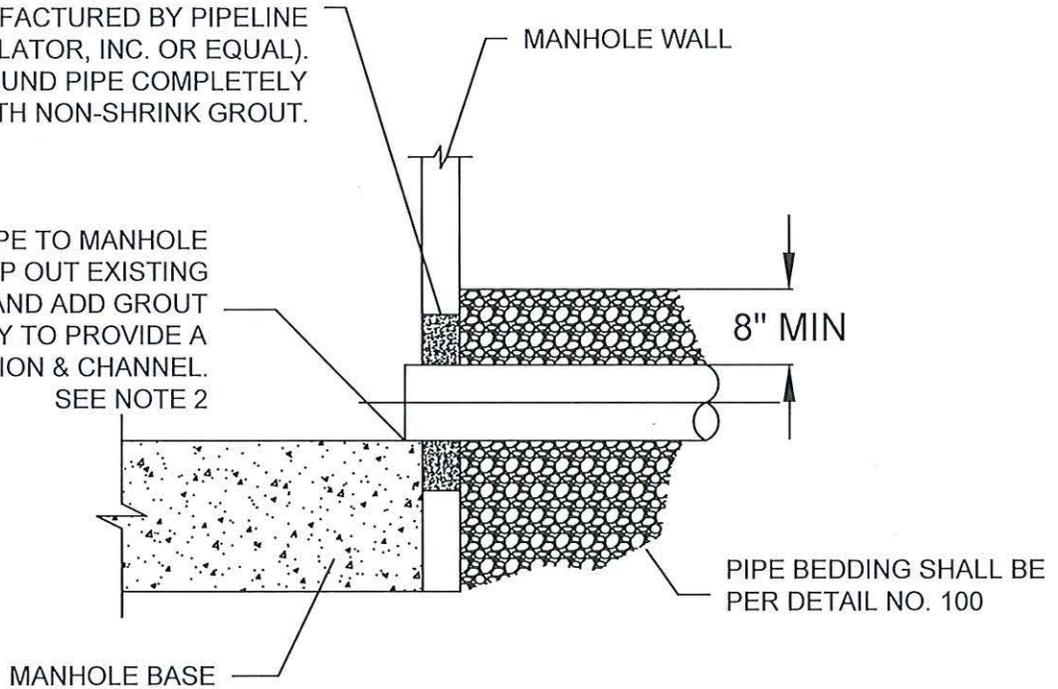
Revisions	
Date	Notes



PLAN OF TYPICAL CHANNELIZATION OF SEWER MANHOLES		
Approved By:	Date	DETAIL NO.
		115

CORE-DRILL HOLE IN WALL AS RECOMMENDED BY SEAL MANUFACTURER. INSTALL MODULAR MECHANICAL SEAL WITH RUBBER LINKS (LINK-SEAL AS MANUFACTURED BY PIPELINE SEAL & INSULATOR, INC. OR EQUAL). FILL VOIDS AROUND PIPE COMPLETELY WITH NON-SHRINK GROUT.

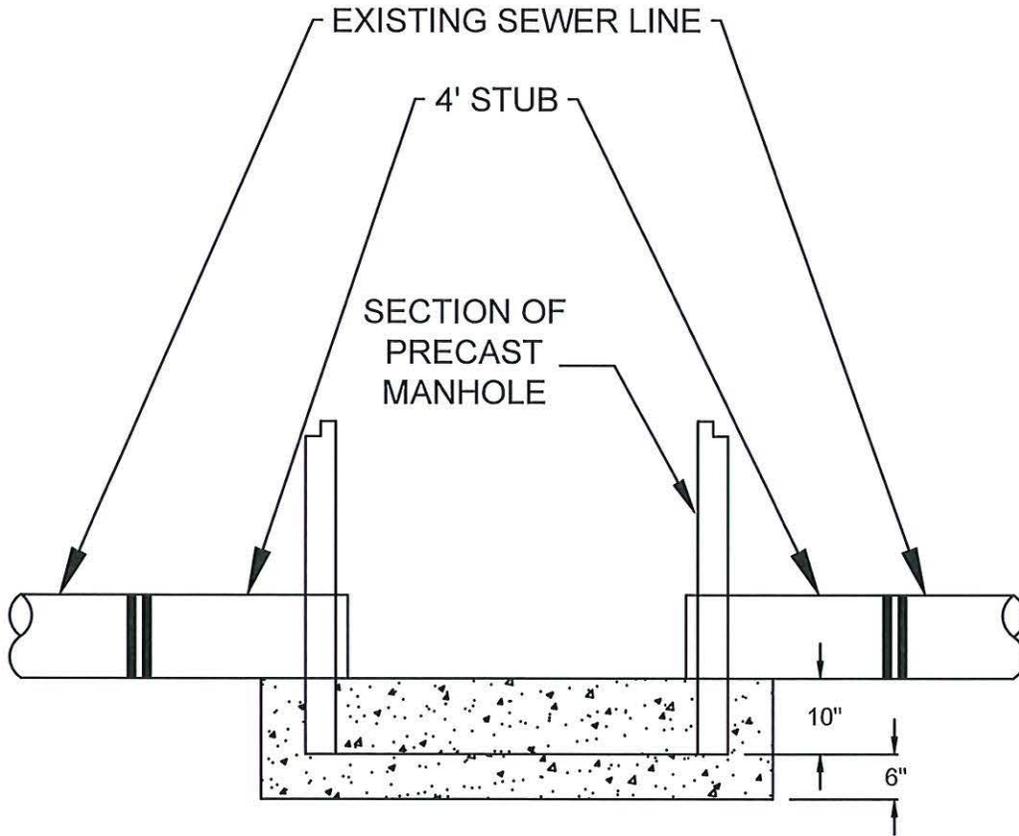
MATCH NEW PIPE TO MANHOLE INVERT ELEVATION. CHIP OUT EXISTING CHANNEL CONCRETE AND ADD GROUT AS NECESSARY TO PROVIDE A SMOOTH TRANSITION & CHANNEL. SEE NOTE 2



NOTES:

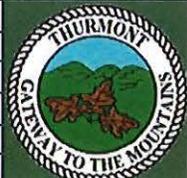
1. REFER TO THIS DETAIL WHEN CONNECTING NEW SEWER PIPES (INCLUDING SERVICE LATERALS) TO EXISTING MANHOLES.
2. THIS DETAIL DEPICTS THE NEW SEWER ENTERING AT THE EXISTING INVERT ELEVATION. THIS WILL NOT BE THE CASE FOR ALL MAIN SEWERS. PROVIDE A SMOOTH TRANSITION AND INVERT CHANNEL FOR ANY INCOMING ELEVATION PER DETAIL NO. 115.
3. PLACE ONE BAG OF BENTONITE CLAY AT EACH NEW PIPE PENETRATION.
4. WHERE PENETRATIONS ARE MADE IN A LINED MANHOLE, LINER IS TO BE TOUCHED UP AFTER INSTALLATION.
5. WHERE PIPE PENETRATIONS ARE ABANDONED AT A MANHOLE, PLUG LINE WITH MECHANICAL PLUG AND GROUT OVER PLUG. AFTER LINE IS PLUGGED, IF MANHOLE IS LINED, TOUCH UP LINER AFTER INSTALLATION.

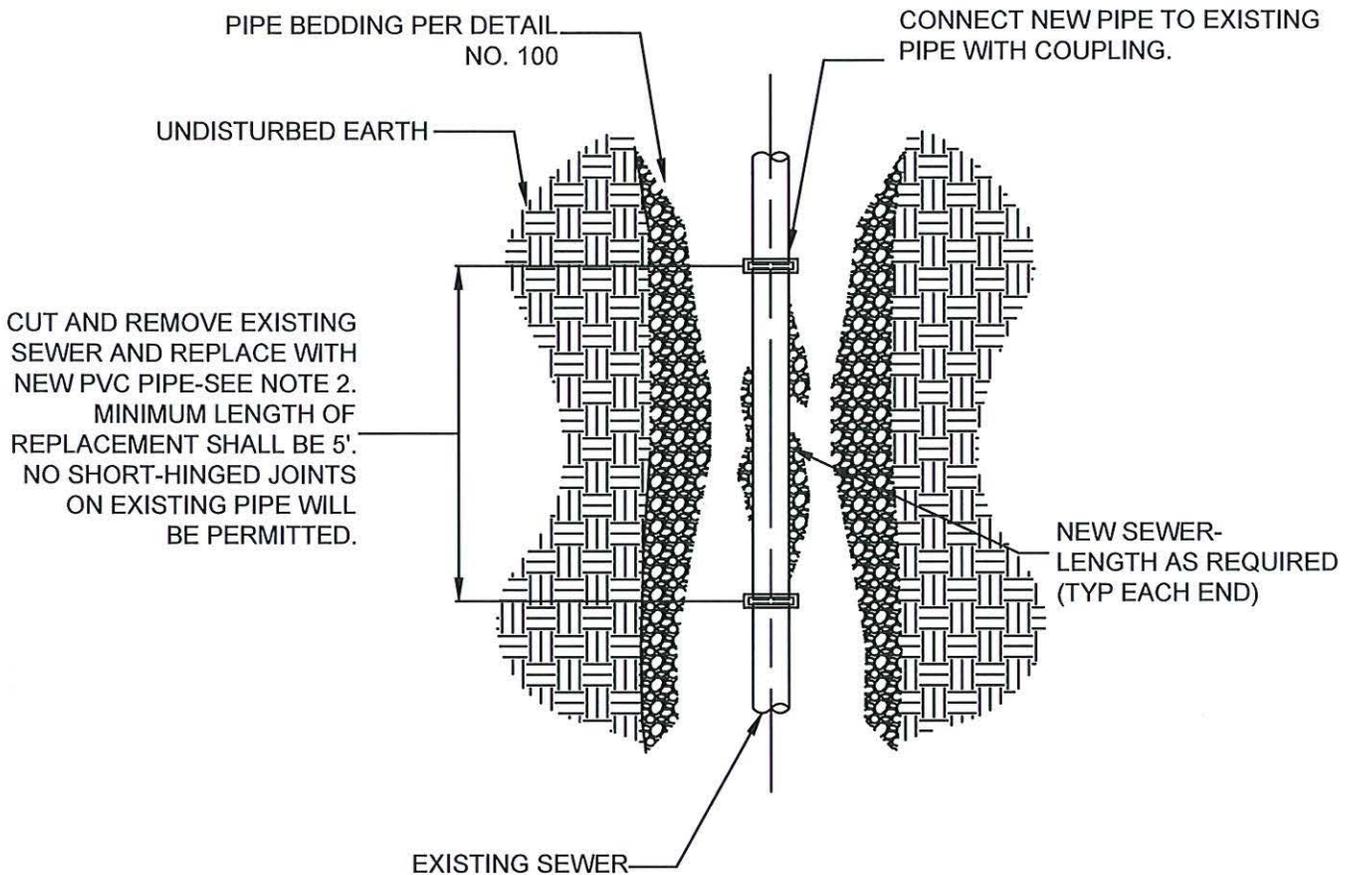
Town of Thurmont Public Works Department Frederick County, MD	Revisions			NEW PIPE CONNECTION AT EXISTING MANHOLE		
	Date	Notes		Approved By:	Date	DETAIL NO.
						116



NOTES:

1. PIPE NEEDS TO MATCH EXISTING PIPE SIZE.
2. STUBS TO BE A MINIMUM OF 4 FEET LONG.
3. IF INSTALLING ON PVC MAIN, USE PVC STUBS WITH BELL ENDS FACING OUT OF EACH PENETRATION SO THE SUBS CAN BE SLID OVER EXISTING MAIN.
4. IF INSTALLING ON EXISTING DUCTILE IRON MAIN, USE DUCTILE IRON STUBS AND HYMAXX COUPLINGS TO CONNECT TO EXISTING MAIN.
5. ON A CIPP LINED MAIN, USE PVC STUBS AND RUBBER SLEEVE CONNECTORS TO CONNECT TO MAIN. AFTER INSTALLATION, PIPE PATCH KITS ARE TO BE INSTALLED AT NEW PIPE CONNECTIONS TO CIPP MAIN LINER.
6. IF THE TOWN HAS TO INSTALL PATCHES, CONTRACTOR SHALL PROVIDE TRAFFIC CONTROL AND SEWER BYPASS PUMPING FOR THE DURATION OF THE PIPE PATCH INSTALLATION.
7. FOR ALL PIPE EXCEPT CONNECTIONS DIP USE RUBBER SLEEVE COUPLING WITH STAINLESS STEEL COMPRESSION BANDS AND SHEAR RINGS BY MISSION PRODUCTS OR APPROVED EQUAL. COUPLING TO BE ONE PIECE CONSTRUCTION EVEN WHEN THERE IS A CHANGE IN PIPE SIZE. NO BUSHING ARE TO BE USED. FOR DIP PIPE HYMAXX COUPLINGS ARE TO BE USED FOR PIPE CONNECTIONS.

Town of Thurmont Public Works Department Frederick County, MD	Revisions			PRECAST MANHOLE INSTALLED ON EXISTING SEWER		
	Date	Notes		Approved By:	Date	DETAIL NO.
	9/12/23	REVISED 3 AND 5. ADDED NOTE 7				117



NOTES:

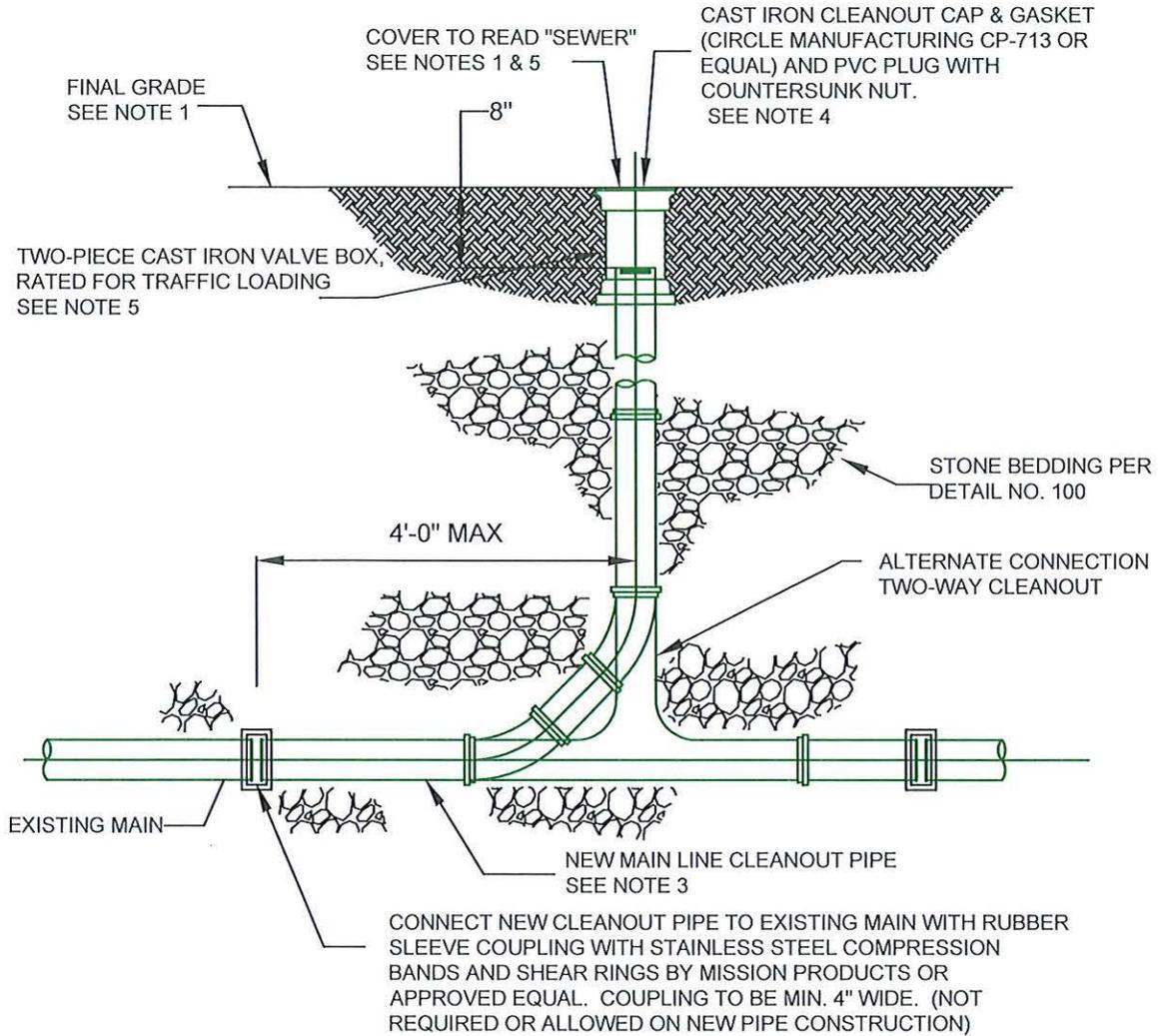
1. REFER TO THIS DETAIL WHEN CONNECTING POINT REPAIRS TO EXISTING SEWERS.
2. INSTALL THE NEW PIPE AT A CONSTANT SLOPE BETWEEN THE TWO EXISTING PIPE ENDS.
3. INSTALL COUPLINGS AS NECESSARY TO CONNECT NEW PIPE AS SHOWN. MAIN SEWER POINT REPAIR PIPE SHALL MATCH EXISTING SEWER PIPE IN SIZE AND MATERIAL (EXCEPT USE PVC ON EXISTING VCP LINES).
4. ON VCP MAIN, USE RUBBER SLEEVE COUPLINGS TO CONNECT NEW PIPE AS SHOWN.
5. FOR ALL PIPE CONNECTIONS, EXCEPT DIP, USE RUBBER SLEEVE COUPLING WITH STAINLESS STEEL COMPRESSION BANDS AND SHEAR RINGS BY MISSION PRODUCTS OR APPROVED EQUAL. COUPLING TO BE ONE PIECE CONSTRUCTION EVEN WHEN THERE IS A CHANGE IN PIPE SIZE. NO BUSHINGS ARE TO BE USED. FOR DIP PIPE, HYMAXX COUPLINGS ARE TO BE USED FOR PIPE CONNECTIONS.

Town of Thurmont
Public Works Department
Frederick County, MD

Revisions	
Date	Notes
9/12/23	REMOVE HYMAXX COUPLINGS FROM DETAIL AND NOTES, ADD NOTE 4



POINT REPAIR TO EXISTING SEWERS		
Approved By:	Date	DETAIL NO. 118

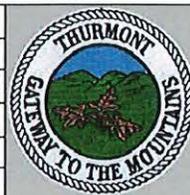


NOTES:

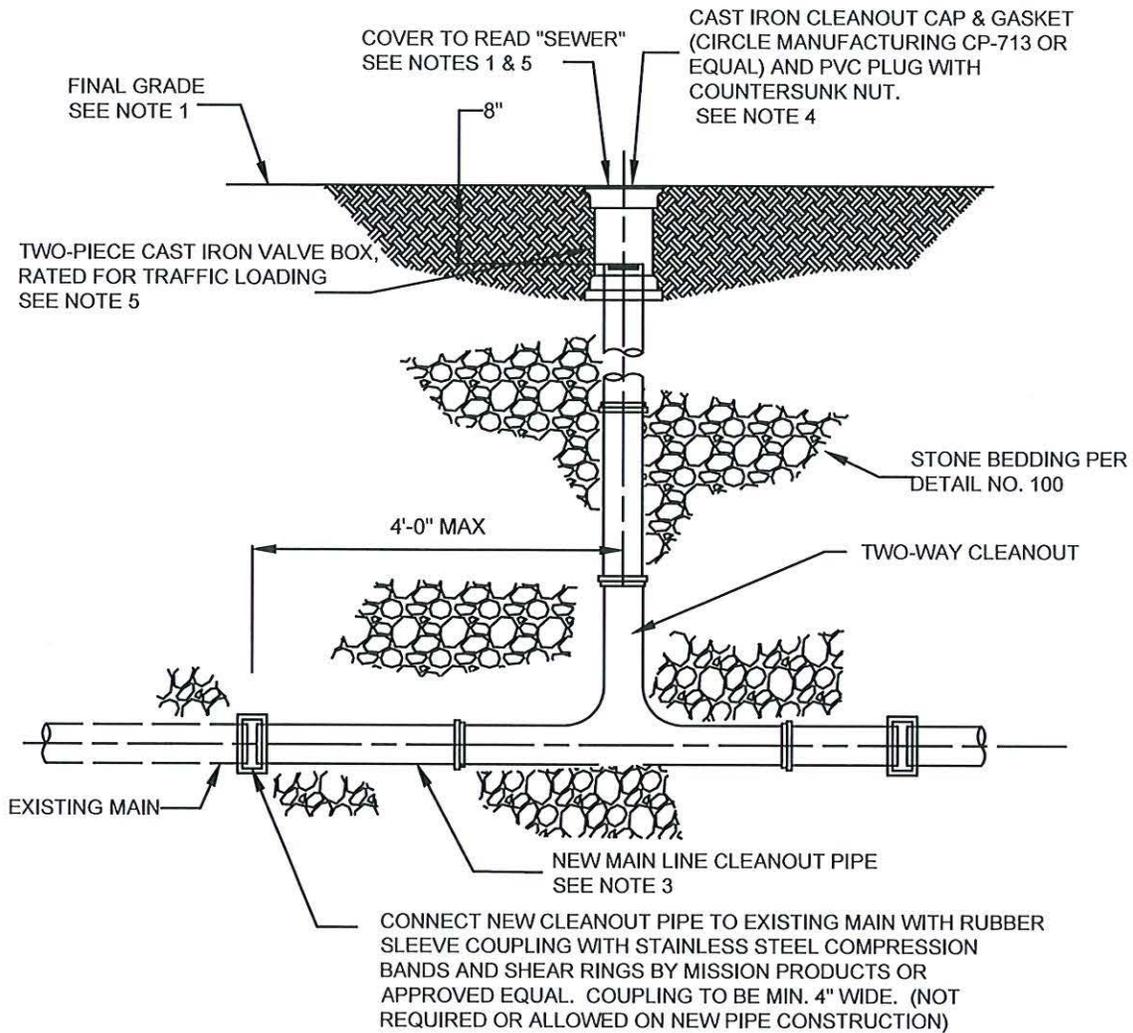
1. CLEANOUT COVER TO BE FLUSH WITH THE FINAL GRADE.
2. LOCATION OF CLEANOUT TO BE FIELD APPROVED BY TOWN/ENGINEER. MAIN CLEANOUTS SHALL BE INSTALLED AS SHOWN IN THE CONTRACT DOCUMENTS OR AS REQUIRED BY TOWN/ENGINEER.
3. CLEANOUT PIPE AND FITTINGS SHALL BE THE SAME PIPE MATERIAL UNLESS APPROVED OTHERWISE BY TOWN/ENGINEER.
4. ALTERNATE CLEANOUT CAPS MUST BE APPROVED BY TOWN/ENGINEER.
5. VALVE BOXES SHALL BE GRAY IRON CONFORMING TO ASTM A48 CLASS 35 AND SHALL BE FULLY BITUMINOUS SEAL COATED, MIN. LENGTH OF TOP SECTION TO BE 16 INCHES.
6. FOR GRASSED AREAS, INSTALL A CAST IRON CLEANOUT, CAP AND GASKET.
7. MAIN LINE CLEANOUT SHALL BE THE SAME SIZE AS THE SEWER MAIN EXCEPT AS OTHERWISE NOTED.

Town of Thurmont
Public Works Department
Frederick County, MD

Revisions	
Date	Notes



MAIN LINE CLEANOUT DETAIL-TYPE I		
Approved By:	Date	DETAIL NO. 119



NOTES:

1. CLEANOUT COVER TO BE FLUSH WITH THE FINAL GRADE.
2. LOCATION OF CLEANOUT TO BE FIELD APPROVED BY TOWN/ENGINEER. MAIN CLEANOUTS SHALL BE INSTALLED AS SHOWN IN THE CONTRACT DOCUMENTS OR AS REQUIRED BY TOWN/ENGINEER.
3. CLEANOUT PIPE AND FITTINGS SHALL BE THE SAME PIPE MATERIAL UNLESS APPROVED OTHERWISE BY TOWN/ENGINEER.
4. ALTERNATE CLEANOUT CAPS MUST BE APPROVED BY TOWN/ENGINEER.
5. VALVE BOXES SHALL BE GRAY IRON CONFORMING TO ASTM A48 CLASS 35 AND SHALL BE FULLY BITUMINOUS SEAL COATED, MIN. LENGTH OF TOP SECTION TO BE 16 INCHES.
6. FOR GRASSED AREAS, INSTALL A CAST IRON CLEANOUT, CAP AND GASKET.
7. MAIN LINE CLEANOUT SHALL BE THE SAME SIZE AS THE SEWER MAIN EXCEPT AS OTHERWISE NOTED.

Town of Thurmont Public Works Department Frederick County, MD	Revisions			MAIN LINE CLEANOUT DETAIL		
	Date	Notes		Approved By:	Date	DETAIL NO. 119A
	9/12/23	REMOVED TYPE 1 FROM TITLE				

The Insignia™ End Seal Kit contains the following materials:

1. Insignia™ Hydrophilic End Seal (Fig. 1)
2. Metal Retaining Ring with Adhesive Tape (Fig. 2)



Fig. 1

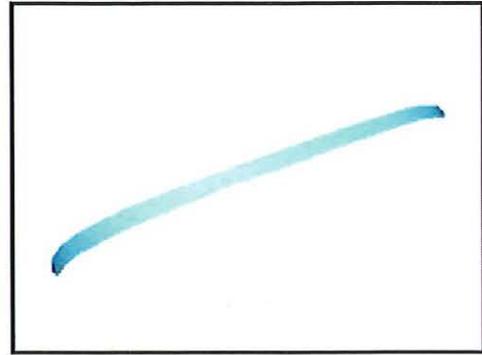


Fig. 2

For the Installation of an Insignia™ End Seal, the procedure below must be followed:

1. The interior pipe surface is prepared by thoroughly cleaning it using a high pressure water jet.
2. The blue backing of the adhesive tape on the Insignia™ End Seal Retaining Ring is peeled off.
3. The Metal Retaining Ring is carefully placed around the interior of the End Seal such that the adhesive side of the clip adheres to the inside of the seal (Fig. 3 & 4).



Fig. 3



Fig. 4

4. The Insignia™ End Seal is then inserted into the pipe such that the Metal Retaining Ring is on the leading edge of the seal (Fig. 5). **NOTE:** It is very important that the Insignia™ End Seal be installed in such a way that the Metal Retaining Ring is positioned on the end of the seal through which the CIPP will be inverted (Fig. 6).



Fig. 5



Fig. 6

5. Once the CIPP Liner has been inverted through the pipe, the Insignia™ End Seal get embedded between the lining and the host pipe.

Town of Thurmont Public Works Department Frederick County, MD	Revisions			Insignia End Seal from LMK Technologies Installation for CIPP Pipe Seal at Manhole		
	Date	Notes		Approved By:	Date	DETAIL NO. 120

INLET: GASKETED BELL-SDR 35 PVC

Base Casting is ASTM A-48 Class 30 Cast Iron
(Various Contours available to fit 6.275" - 30.000" O.D. Mains)

PVC Adapter is an ASTM D3034, SDR35---35 Gasketed Bell

Adapter is cemented permanently in place with two-part urethane adhesive

Base of Saddle is dip-coated in a Waterbased Bituminous Coating

Strap is 24 ga. x 2.5" wide Type 304 Stainless Steel

Strap Pins are .75" dia. Type 303 Stainless Steel

T-Bolts are .375" - 16 Type 304 Stainless Steel

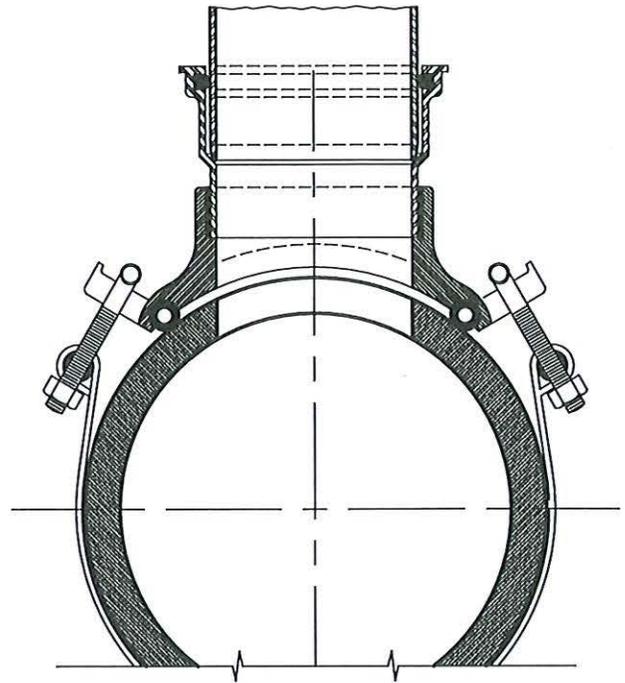
Nuts and Washers are Type 18-8 Stainless Steel

O-Ring is ASTM C-361-77 Tubular Polyisoprene

4" Inlet requires a 4" dia. Tap in the Sewer Main

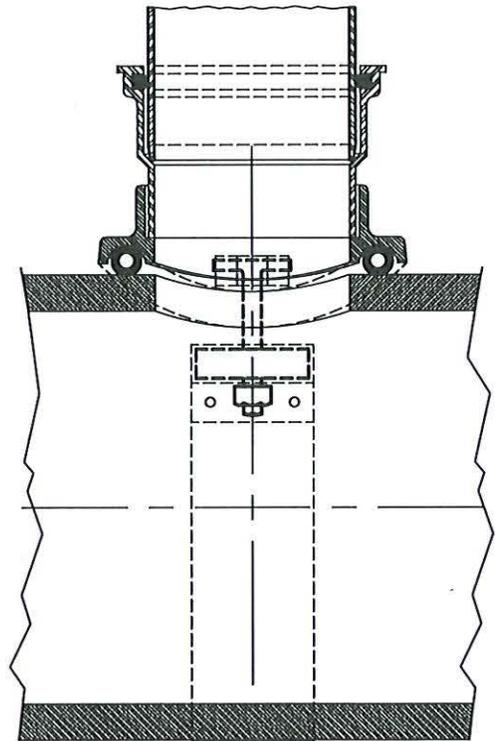
6" Inlet requires a 6" dia. Tap in the Sewer Main
(Sewer Main must be at least 8" dia.)

Note: This Dwg. supercedes Dwg. No. R-3408-D2



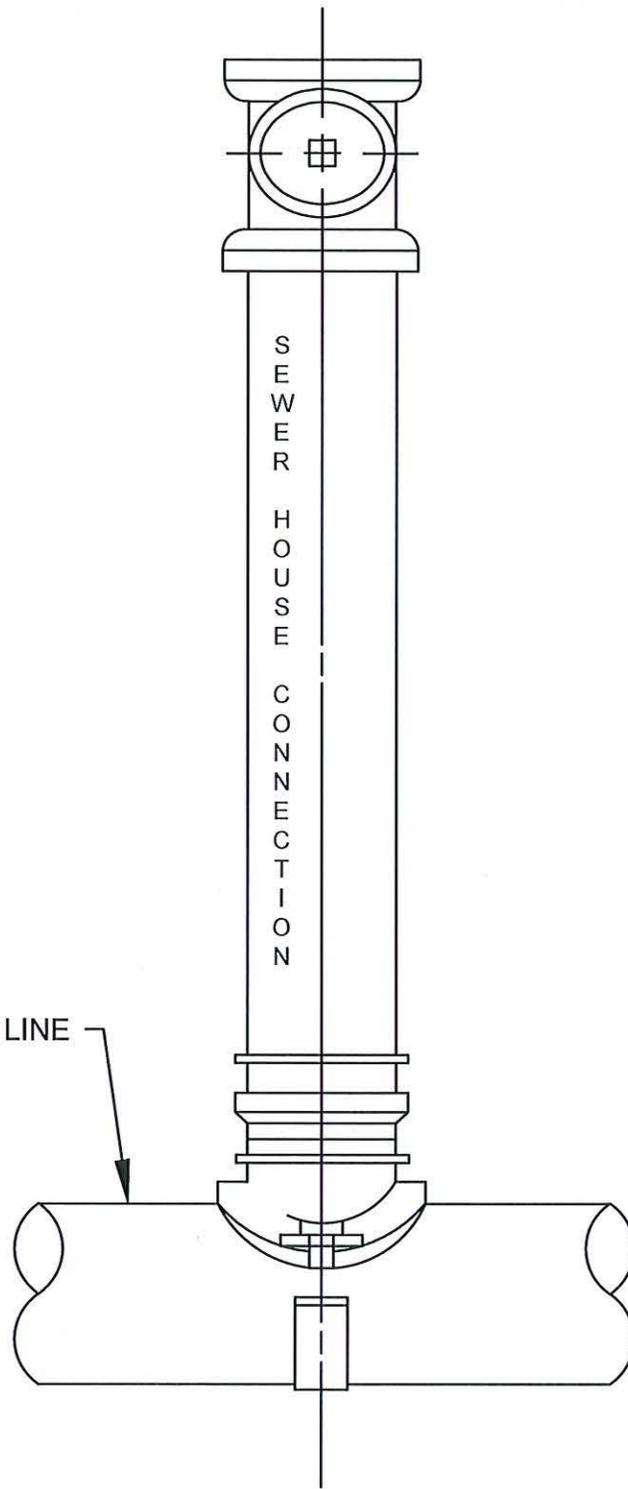
NOTES:

1. Tapping saddle to be Geneco Sealtite Type U or F as specified.
2. Hole for sewer connection to be machine tapped only.
3. Angle of tap to be determined in the field.
4. Host pipe to be completely removed and cleaned before installation.
5. Before backfill, encase liner and saddle in grout.
6. After installation and backfill, LMK Stubby CIP connection is to be done.



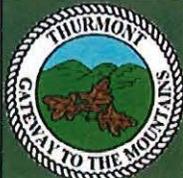
Town of Thurmont Public Works Department Frederick County, MD	Revisions			SERVICE LATERAL CONNECTION TO CIP LINED SEWERS		
	Date	Notes		Approved By:	Date	DETAIL NO.
						121

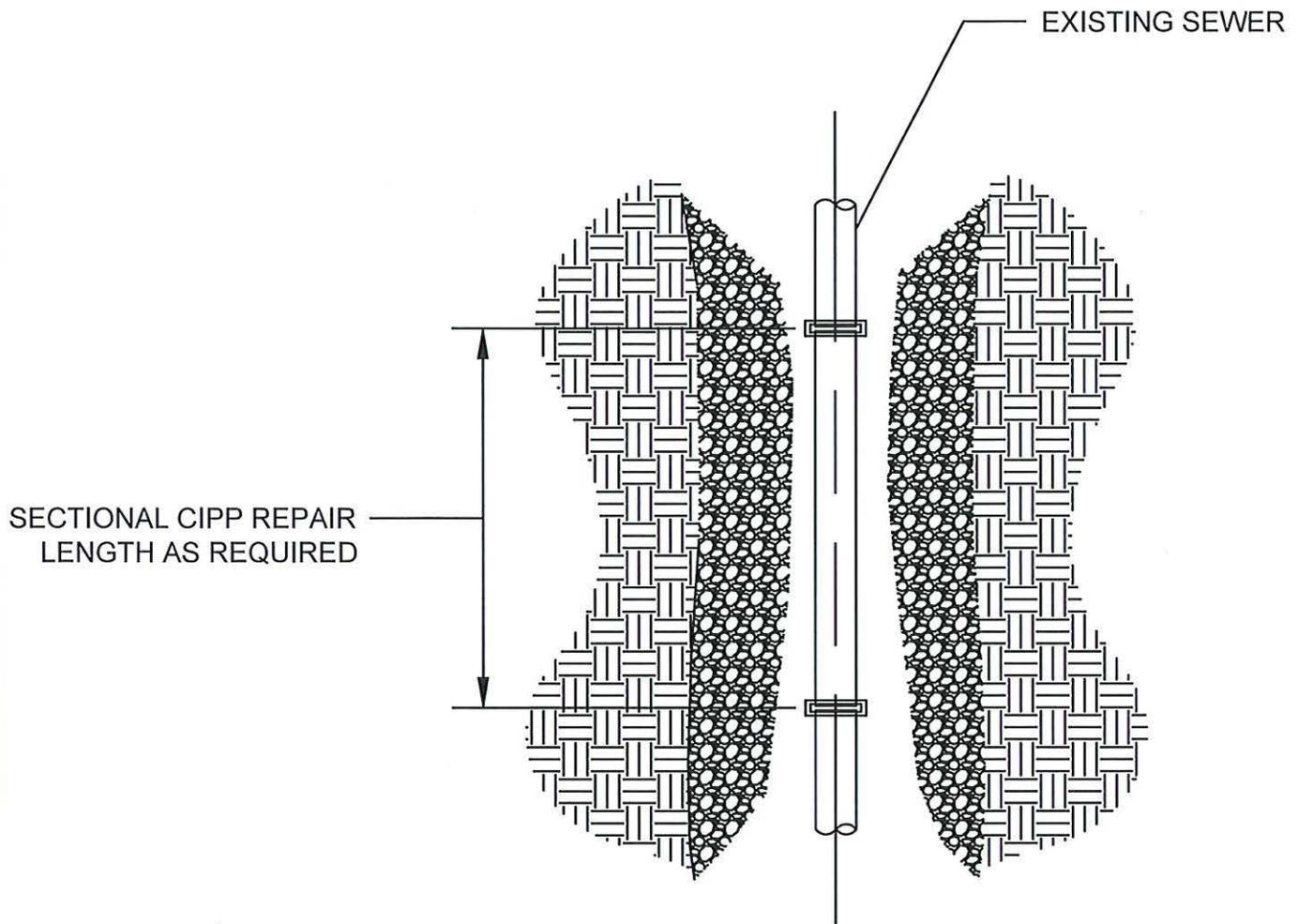
EXISTING MAIN LINE



NOTES:

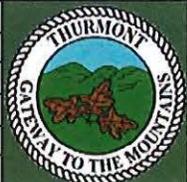
1. SDR 35 PVC PIPE TO BE USED UNLESS SPECIFIED OTHERWISE.
2. NEW SDR 35 PVC PIPE TO EXTEND TO 4' BEYOND PROPERTY LINE OR RIGHT-OF-WAY.
3. NEW TWO-WAY CLEANOUT TO BE PLACED 4' BEHIND PROPERTY LINE OR RIGHT-OF-WAY PER DETAILS 112, 113, 113A, AND 113B.

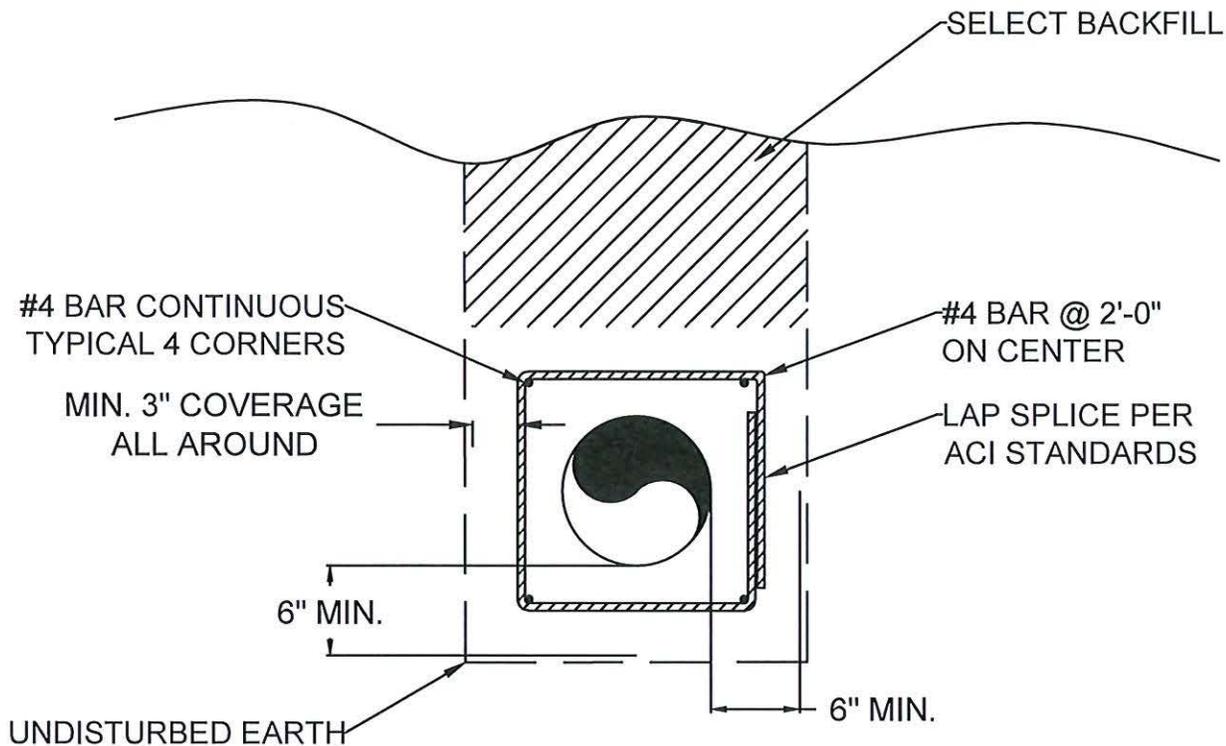
Town of Thurmont Public Works Department Frederick County, MD	Revisions			SERVICE LATERAL CONNECTION TO EXISTING CIP LINED SEWER		
	Date	Notes		Approved By:	Date	DETAIL NO.
	9/12/23	ADDED 113A AND 113B TO NOTE 3				122



NOTES:

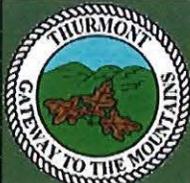
1. REPAIR CIP LINER TO EXTEND MINIMUM 2' PAST DAMAGED PIPE EACH DIRECTION.
2. REPAIR TO BE PERFORMED BY CERTIFIED LINING COMPANY.
3. FOR ALL PIPE CONNECTIONS, EXCEPT DIP, USE RUBBER SLEEVE COUPLING WITH STAINLESS STEEL COMPRESSION BANDS AND SHEAR RINGS BY MISSION PRODUCTS OR APPROVED EQUAL. COUPLING TO BE ONE PIECE CONSTRUCTION EVEN WHERE THERE IS A CHANGE IN PIPE SIZE. NO BUSHING ARE TO BE USED. FOR DIP PIPE, HYMAXX COUPLINGS ARE TO BE USED FOR PIPE CONNECTIONS.

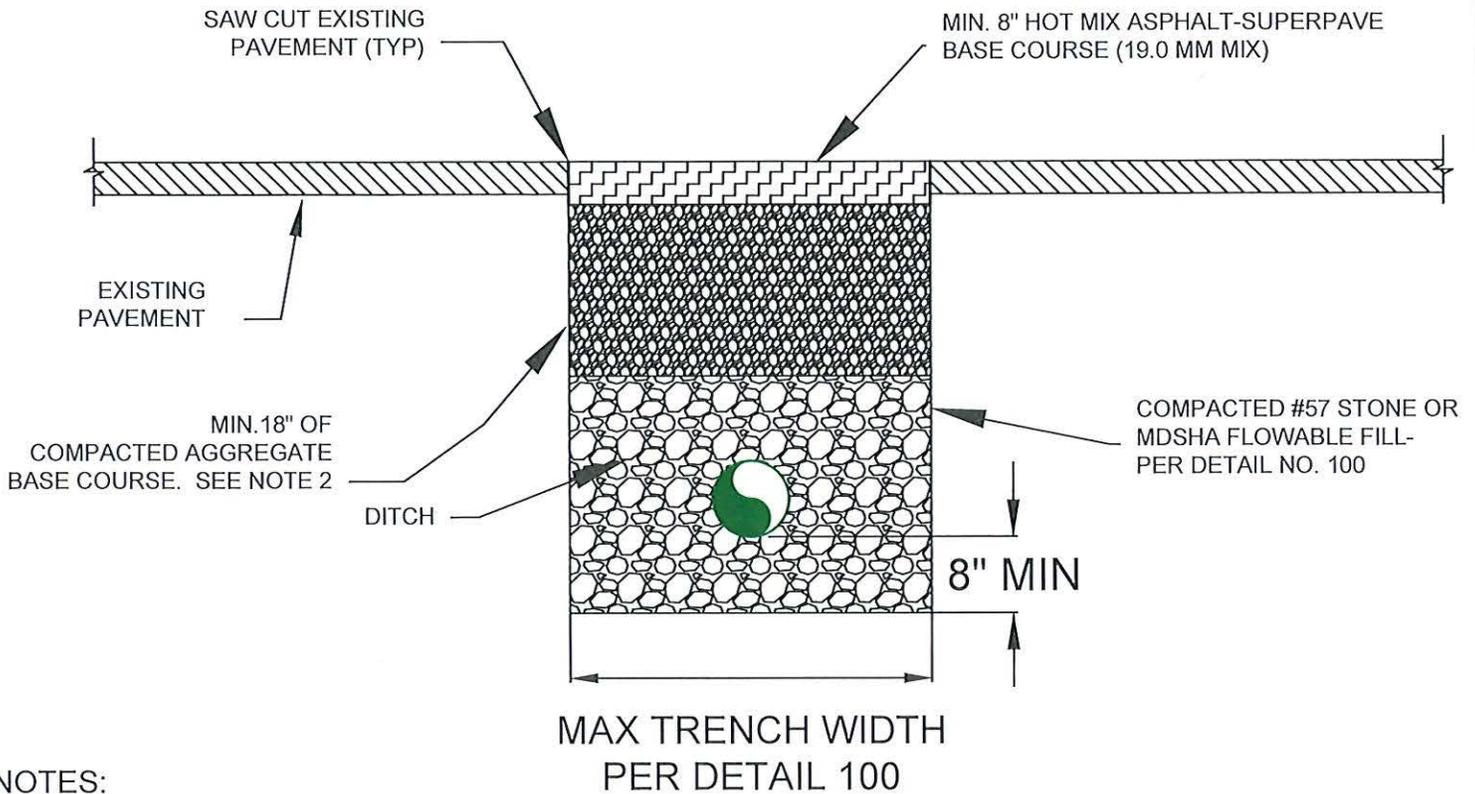
Town of Thurmont Public Works Department Frederick County, MD	Revisions			SEWER MAIN REPAIR ON CIPP LINED PIPE		
	Date	Notes		Approved By:	Date	DETAIL NO. 123
	9/12/23	REVISED NOTE 3				



NOTES:

1. CONTRACTOR IS RESPONSIBLE TO PROTECT AND SUPPORT EXISTING PIPE FOR THE DURATION OF THE WORK.
2. ALL REINFORCING STEEL SHALL BE GRADE 60 EPOXY COATED STEEL, UNLESS NOTED OTHERWISE.
3. TIE-WIRE TO BE USED TO CONNECT CONTINUOUS BAR TO HOOP BAR. ALSO CONNECT LAP SPLICE IN HOOP BAR WITH TIE-WIRE.

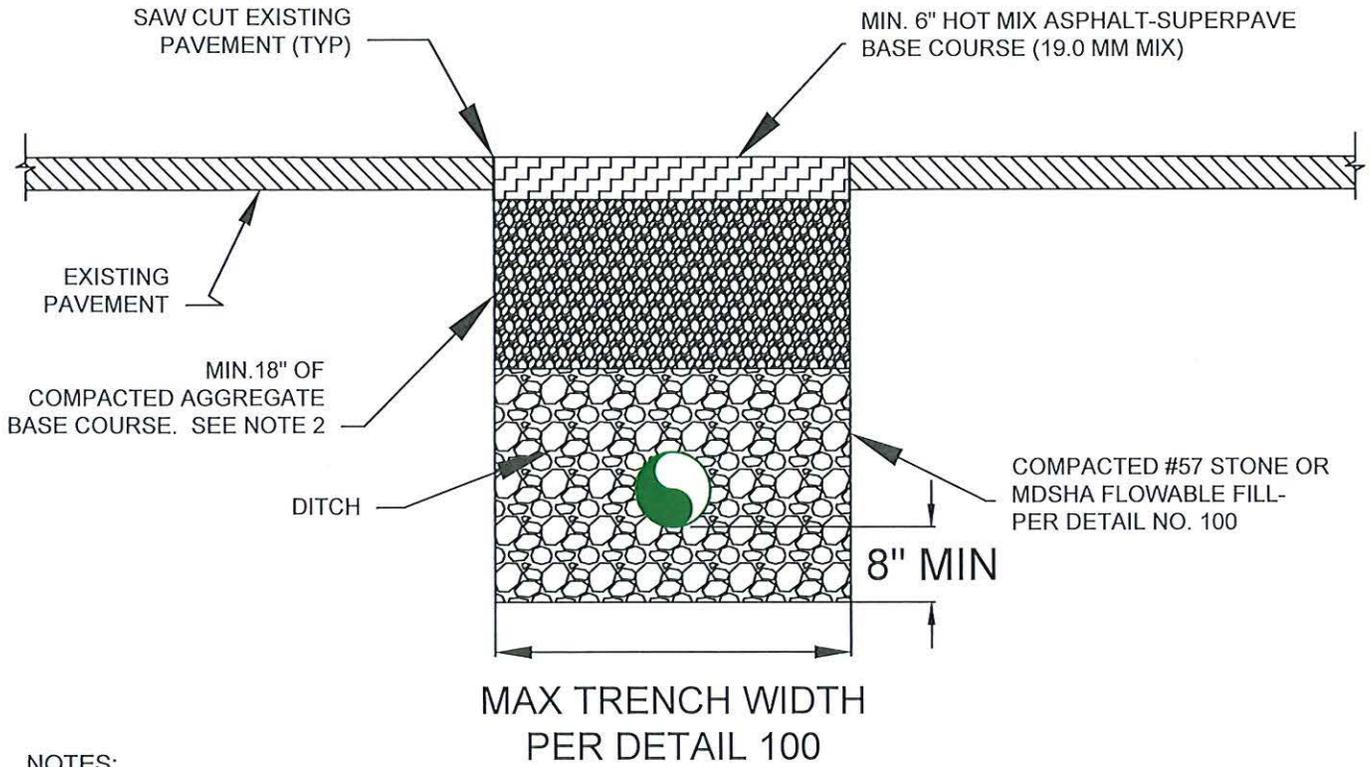
Town of Thurmont Public Works Department Frederick County, MD	Revisions			CONCRETE ENCASEMENT		
	Date	Notes		Approved By:	Date	DETAIL NO. 124
	9/12/23	RENAMED FROM DETAIL 140 TO DETAIL 124				



NOTES:

1. ALL PAVEMENT MATERIALS AND INSTALLATION SHALL BE IN ACCORDANCE WITH MDSA STANDARD SPECIFICATIONS.
2. PLACE AGGREGATE BASE COURSE IN MAX. 8" LIFTS AND COMPACT TO 95% MAXIMUM DRY DENSITY PER AASHTO T180.
3. FINAL PAVEMENT PATCH MATERIALS AND COURSE THICKNESS SHALL BE EQUAL TO EXISTING PAVING SECTION, OR AT LEAST A MINIMUM TOTAL OF 8" OF HOT MIX ASPHALT MATERIAL INSTALLED IN MAXIMUM LIFT THICKNESS OF 3.0 INCHES (8 INCH HMA BASE COURSE MUST BE PLACED IN THREE LIFTS).
4. ROLL ASPHALT SMOOTH, UNIFORM AND LEVEL WITH EXISTING PAVEMENT.
5. PRIOR TO PLACING NEW ASPHALT, APPLY TACK COAT ON THE SURFACES WHERE THE ASPHALT WILL BE PLACED INCLUDING ON THE EXISTING ASPHALT AND AT ALL SAWCUT JOINTS.
6. CONTRACTOR SHALL INSTALL HOT MIX BASE COURSE AT THE END OF EACH WORK DAY TO CREATE A PATCH THAT IS LEVEL & SMOOTH WITH EXISTING PAVEMENT. WHEN WORK IN THAT SECTION IS COMPLETE, CONTRACTOR SHALL MILL AND OVERLAY AS DIRECTED-SEE DETAIL 134.
7. THE OWNER RESERVES THE RIGHT TO TEST ANY OR ALL COMPACTED FILL OR HMA PRIOR TO APPROVAL FOR PAYMENT. CONTRACTOR SHALL COOPERATE FULLY WITH TESTING LABORATORY PERSONNEL.

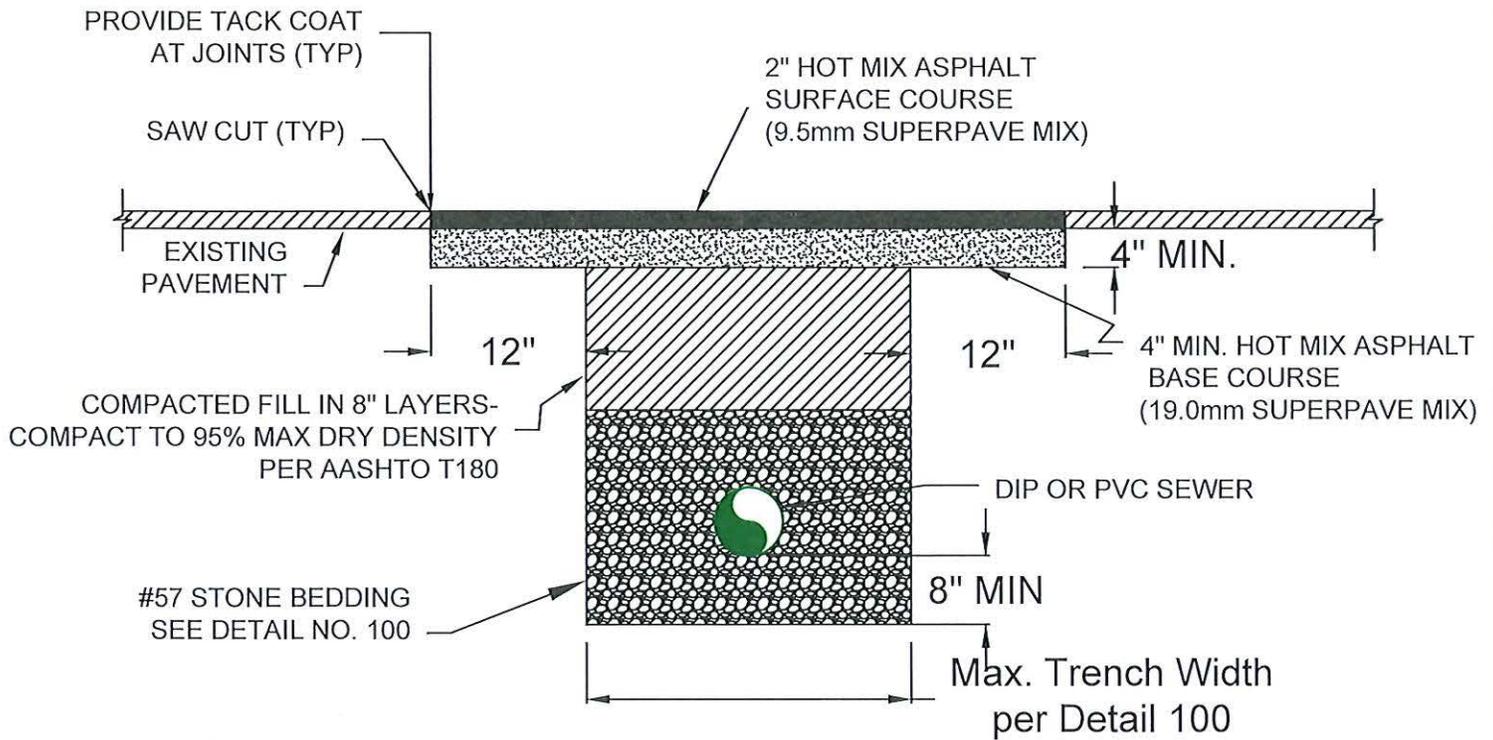
Town of Thurmont Public Works Department Frederick County, MD	Revisions			ASPHALT PAVEMENT PATCH 8" HMA BASE COURSE		
	Date	Notes		Approved By:	Date	DETAIL NO.
						131



NOTES:

1. ALL PAVEMENT MATERIALS AND INSTALLATION SHALL BE IN ACCORDANCE WITH MDSHA STANDARD SPECIFICATIONS.
2. PLACE AGGREGATE BASE COURSE IN MAX. 8" LIFTS AND COMPACT TO 95% MAXIMUM DRY DENSITY PER AASHTO T180.
3. FINAL PAVEMENT PATCH MATERIALS AND COURSE THICKNESS SHALL BE EQUAL TO EXISTING PAVING SECTION, OR AT LEAST A MINIMUM TOTAL OF 8" OF HOT MIX ASPHALT MATERIAL INSTALLED IN MAXIMUM LIFT THICKNESS OF 3.0 INCHES (6 INCH HMA BASE COURSE MUST BE PLACED IN TWO LIFTS).
4. ROLL ASPHALT SMOOTH, UNIFORM AND LEVEL WITH EXISTING PAVEMENT.
5. PRIOR TO PLACING NEW ASPHALT, APPLY TACK COAT ON THE SURFACES WHERE THE ASPHALT WILL BE PLACED INCLUDING ON THE EXISTING ASPHALT AND AT ALL SAWCUT JOINTS.
6. CONTRACTOR SHALL INSTALL HOT MIX BASE COURSE AT THE END OF EACH WORK DAY TO CREATE A PATCH THAT IS LEVEL & SMOOTH WITH EXISTING PAVEMENT. WHEN WORK IN THAT SECTION IS COMPLETE, CONTRACTOR SHALL MILL AND OVERLAY AS DIRECTED-SEE DETAIL 134.
7. THE OWNER RESERVES THE RIGHT TO TEST ANY OR ALL COMPACTED FILL OR HMA PRIOR TO APPROVAL FOR PAYMENT. CONTRACTOR SHALL COOPERATE FULLY WITH TESTING LABORATORY PERSONNEL.

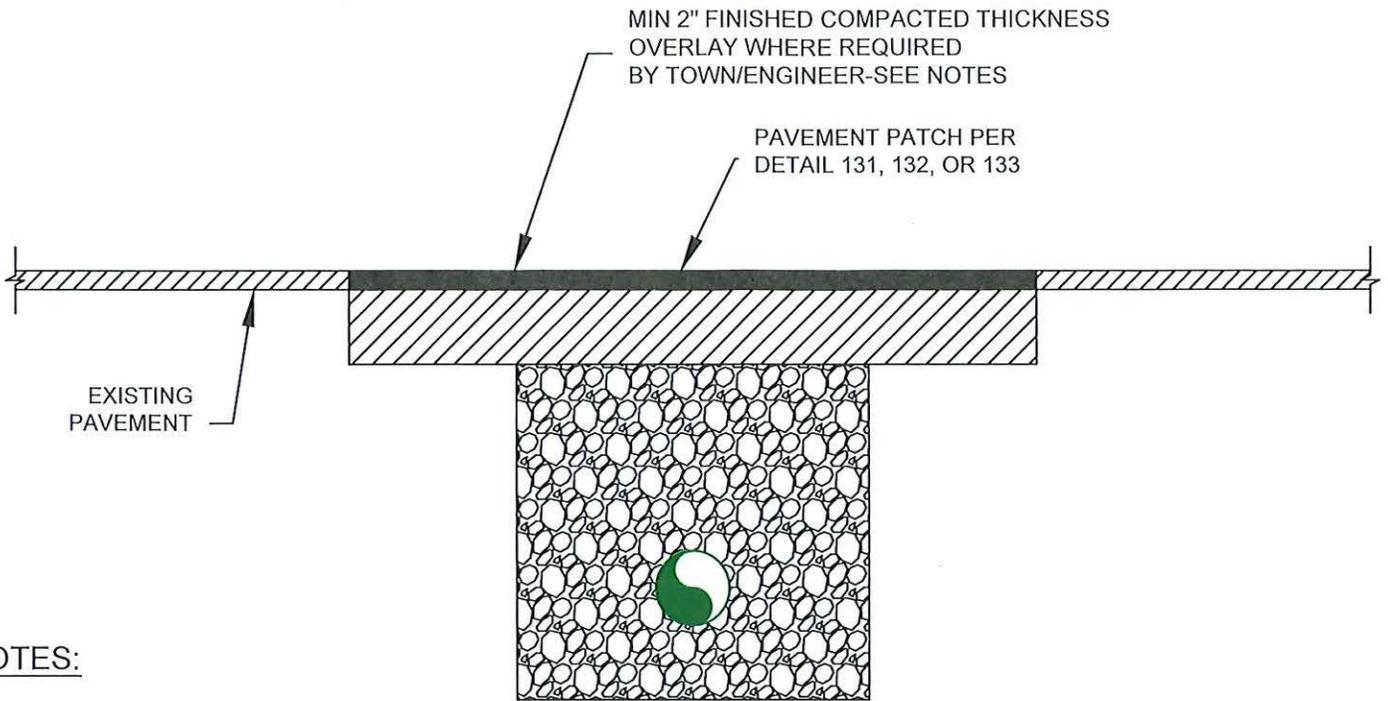
Town of Thurmont Public Works Department Frederick County, MD	Revisions			ASPHALT PAVEMENT PATCH 6" HMA BASE COURSE		
	Date	Notes		Approved By:	Date	DETAIL NO.
						132



NOTES:

1. ALL PAVEMENT MATERIALS AND INSTALLATION SHALL BE IN ACCORDANCE WITH MDSHA STANDARD SPECIFICATIONS. REFER TO THE SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.
2. ROLL ASPHALT PATCH SMOOTH, UNIFORM AND LEVEL WITH EXISTING PAVEMENT.
3. INSTALL ASPHALT OVERLAY WHERE REQUIRED BY TOWN/ENGINEER PER DETAIL 134.
4. TOWN/ENGINEER RESERVES THE RIGHT TO TEST ANY OR ALL COMPACTED FILL OR HMA PRIOR TO APPROVAL FOR PAYMENT. CONTRACTOR SHALL COOPERATE FULLY WITH TESTING LABORATORY PERSONNEL.

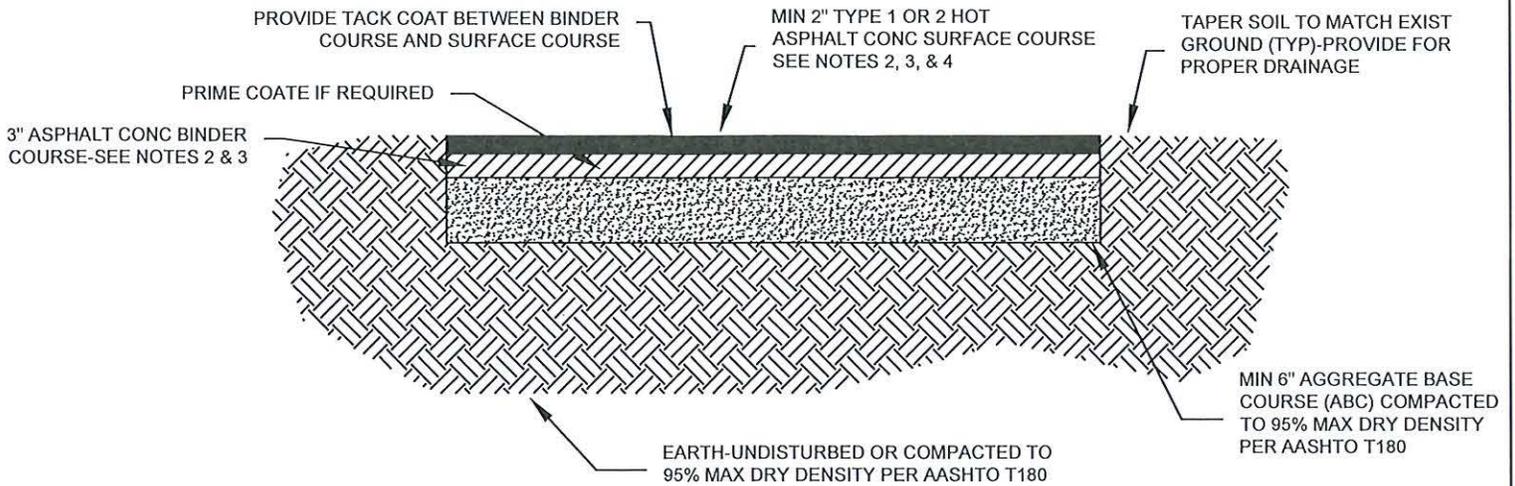
Town of Thurmont Public Works Department Frederick County, MD	Revisions			ASPHALT PAVEMENT PATCH 4" BASE & 2" SURFACE		
	Date	Notes		Approved By:	Date	DETAIL NO.
						133



NOTES:

1. ALL PAVEMENT MATERIALS AND INSTALLATION SHALL BE IN ACCORDANCE WITH MDSHA STANDARD SPECIFICATIONS. THIS DETAIL SHALL BE MODIFIED AS REQUIRED BY MDSHA.
2. THE LENGTH AND WIDTH OF THE OVERLAY MUST BE APPROVED BY THE ENGINEER PRIOR TO COMMENCEMENT OF THE WORK. NO PAYMENT WILL BE MADE FOR MILLING OR ASPHALT OVERLAY QUANTITIES INSTALLED WITHOUT PRIOR APPROVAL.
3. MILL PATCHED ASPHALT SURFACE DOWN 2" SO THAT PLACEMENT OF THE NEW 2" OVERLAY WILL CREATE A SMOOTH, RIDGE FREE SURFACE.
4. OVERLAY TO BE INSTALLED WITH A PAVING MACHINE.
5. PRIOR TO PLACING NEW ASPHALT, REMOVE ALL LOOSE DEBRIS AND DUST FROM SURFACE USING COMPRESSED AIR, THEN APPLY A BONDING AGENT ON THE SURFACES WHERE THE ASPHALT WILL BE PLACED.
6. OVERLAY REQUIREMENTS SPECIFIED IN THIS DETAIL CAN ALSO APPLY TO OVERLAYS INSTALLED WHERE NO SEWER WORK (NO SEWER TRENCH) HAS OCCURRED.
7. THE OWNER RESERVES THE RIGHT TO TEST ANY OR ALL COMPACTED FILL OR HMA PRIOR TO APPROVAL FOR PAYMENT. CONTRACTOR SHALL COOPERATE FULLY WITH TESTING LABORATORY PERSONNEL.
8. 2" OVERLAY SHALL BE HMA SUPERPAVE, 9.5mm MIX OR AS DIRECTED BY MD SHA.

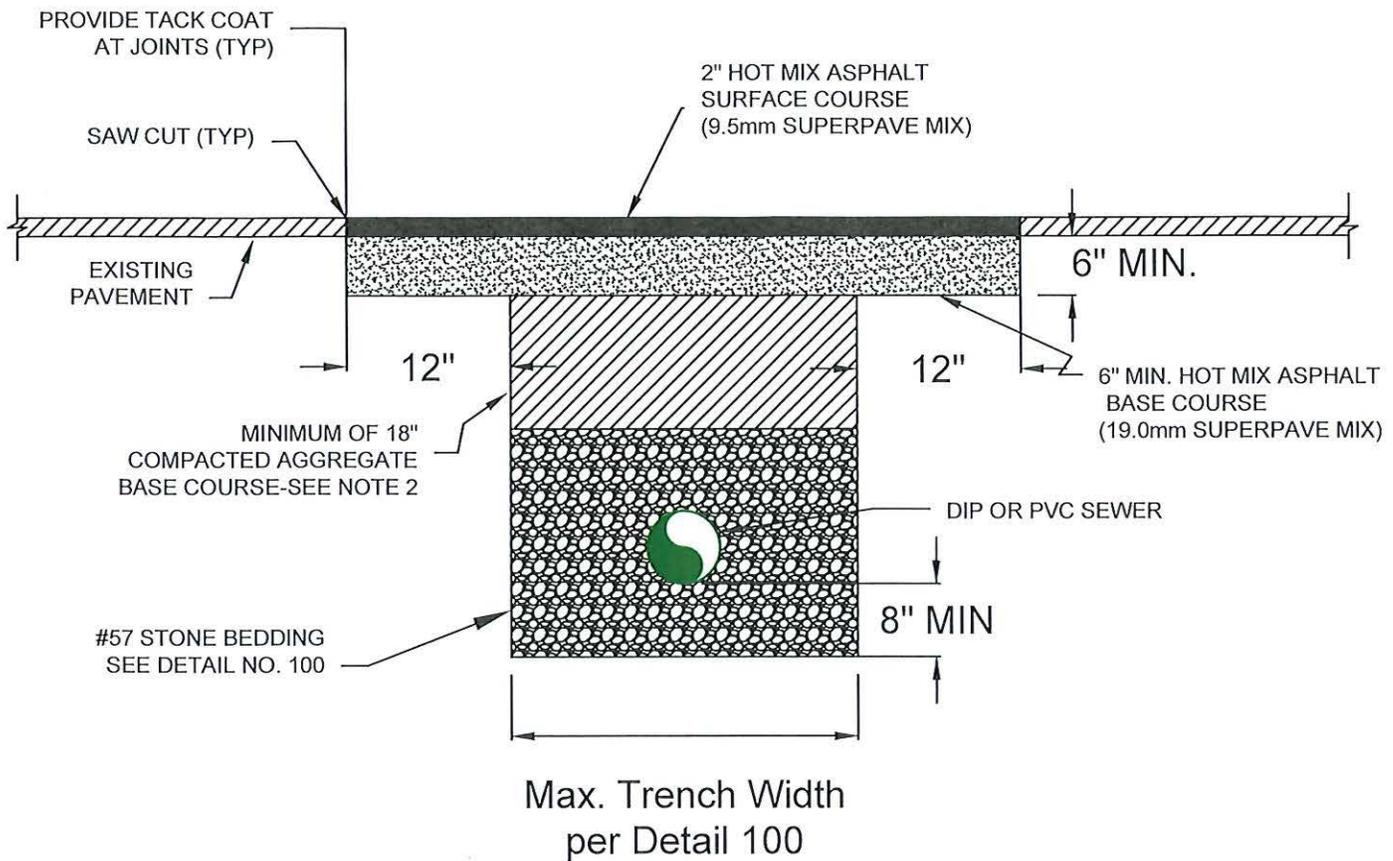
Town of Thurmont Public Works Department Frederick County, MD	Revisions			ASPHALT OVERLAY		
	Date	Notes		Approved By:	Date	DETAIL NO.
						134



NOTES:

1. REFER TO THIS DETAIL WHEN REPLACING PAVED PARKING LOTS AND PRIVATE ROADS.
2. ALL PAVEMENT MATERIALS AND INSTALLATION SHALL BE IN ACCORDANCE WITH MDSHA STANDARD SPECIFICATIONS. REFER TO THE SPECIFICATIONS FOR ADDITIONAL REQUIRMENTS.
3. PAVEMENT TO BE INSTALLED TO MATCH PRE-CONSTRUCTION ELEVATIONS, SLOPES AND CONFIGURATIONS. DRAINAGE PATTERN TO BE MAINTAINED. RE-STRIPE PARKING SPACES AND INSTALL SPEED BUMPS PER PRE-CONSTRUCTION LOCATIONS AS APPLICABLE.
4. PAVEMENT THICKNESS TO BE INCREASED TO MATCH EXISTING PAVEMENT THICKNESS AS APPLICABLE. MIN THICKNESS TO BE 1 1/2".
5. TOWN/ENGINEER MAY REQUIRE THAT COMPACTION TESTS BE PERFORMED TO CONFIRM PROPER COMPACTION PRIOR TO PLACING ABC STONE AND PAVEMENT.

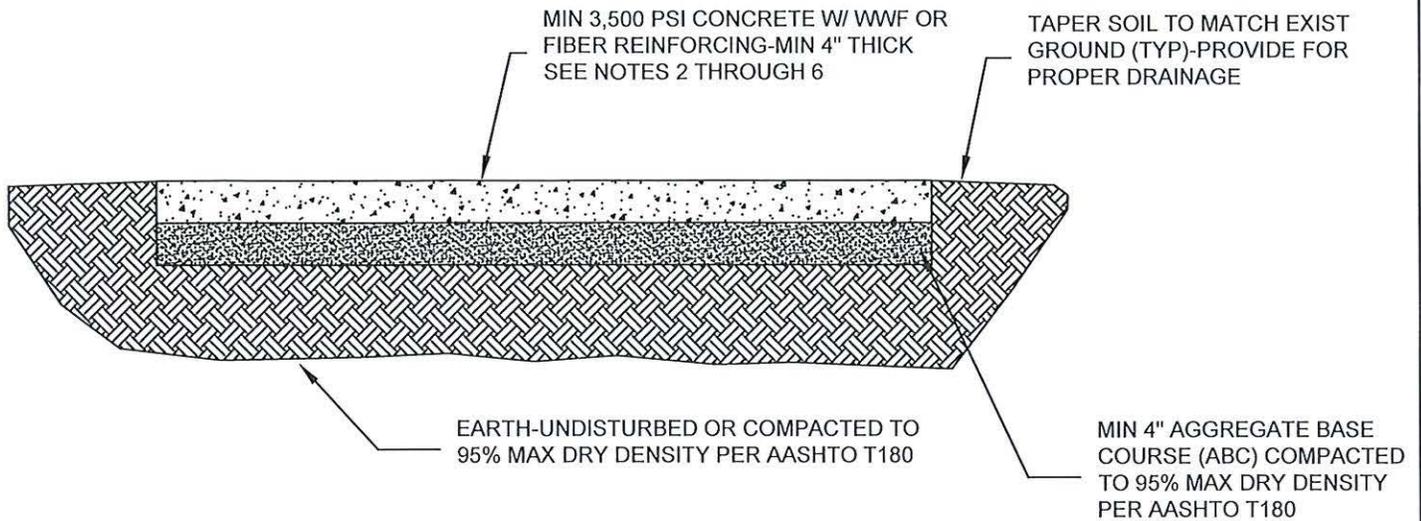
Town of Thurmont Public Works Department Frederick County, MD	Revisions			ASPHALT RESTORATION FOR PARKING LOTS AND PRIVATE ROADS		
	Date	Notes		Approved By:	Date	DETAIL NO.
						135



NOTES:

1. ALL PAVEMENT MATERIALS AND INSTALLATION SHALL BE IN ACCORDANCE WITH MDSHA STANDARD SPECIFICATIONS. REFER TO THE SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.
2. PLACE AGGREGATE BASE COURSE IN MAX 8" LIFTS AND COMPACT TO 95% MAXIMUM DRY DENSITY PER AASHTO T180.
3. ROLL ASPHALT PATCH SMOOTH, UNIFORM AND LEVEL WITH EXISTING PAVEMENT.
4. INSTALL ASPHALT OVERLAY WHERE REQUIRED BY TOWN/ENGINEER PER DETAIL 134.
5. TOWN/ENGINEER RESERVES THE RIGHT TO TEST ANY OR ALL COMPACTED FILL OR HMA PRIOR TO APPROVAL FOR PAYMENT. CONTRACTOR SHALL COOPERATE FULLY WITH TESTING LABORATORY PERSONNEL.

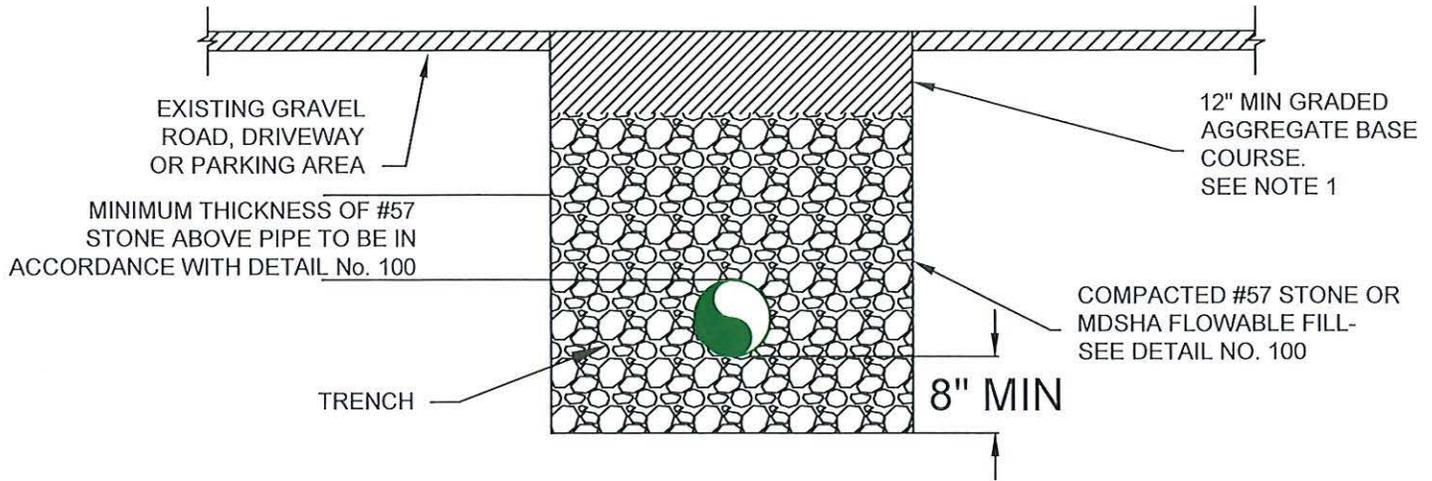
Town of Thurmont Public Works Department Frederick County, MD	Revisions			ASPHALT PAVEMENT PATCH 6" BASE & 2" SURFACE	
	Date	Notes		Approved By:	Date



NOTES:

1. REFER TO THIS DETAIL WHEN REPLACING CONCRETE DRIVEWAYS, PARKING LOTS, AND SIDEWALKS.
2. REFER TO THE SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.
3. CONCRETE TO BE INSTALLED TO MATCH PRE-CONSTRUCTION ELEVATIONS, SLOPES AND CONFIGURATIONS. DRAINAGE PATTERN TO BE MAINTAINED. INSTALL DRAINAGE PIPES AND CULVERTS PER PRE-CONSTRUCTION CONDITIONS AS APPLICABLE.
4. CONCRETE THICKNESS TO BE INCREASED TO MATCH EXISTING PAVEMENT THICKNESS AS APPLICABLE. MIN THICKNESS TO BE 4".
5. REMOVE EXISTING CONCRETE FROM EXPANSION JOINT TO EXPANSION JOINT AND REPLACE COMPLETELY UNLESS APPROVED OTHERWISE. PROVIDE NEW EXPANSION JOINTS PER NOTE 6. PROVIDE CONTROL JOINTS WHERE DIRECTED BY THE ENGINEER.
6. PROVIDE 1/2" EXPANSION JOINT WITH BITUMINOUS IMPREGNATED BACKER BOARD AND 1" DEEP POLYURETHANE JOINT SEALANT ON TOP AND SIDES AT 8' MAX SPACING UNLESS APPROVED OTHERWISE.
7. IN SOME INSTANCES, THE CONCRETE THICKNESS FOR DRIVEWAYS AND PARKING LOTS MAY BE INCREASED TO 6" OR 8" TO SUPPORT TRAFFIC LOADINGS. ALSO, THE BASE COURSE WILL BE INCREASED TO 6" AS DIRECTED BY THE ENGINEER.

Town of Thurmont Public Works Department Frederick County, MD	Revisions			CONCRETE DRIVEWAYS, PARKING LOTS AND SIDEWALKS		
	Date	Notes		Approved By:	Date	DETAIL NO.
						137



NOTES:

1. AGGREGATE BASE COURSE SHALL BE COMPACTED TO 95% MAX DRY DENSITY PER AASHTO T180.

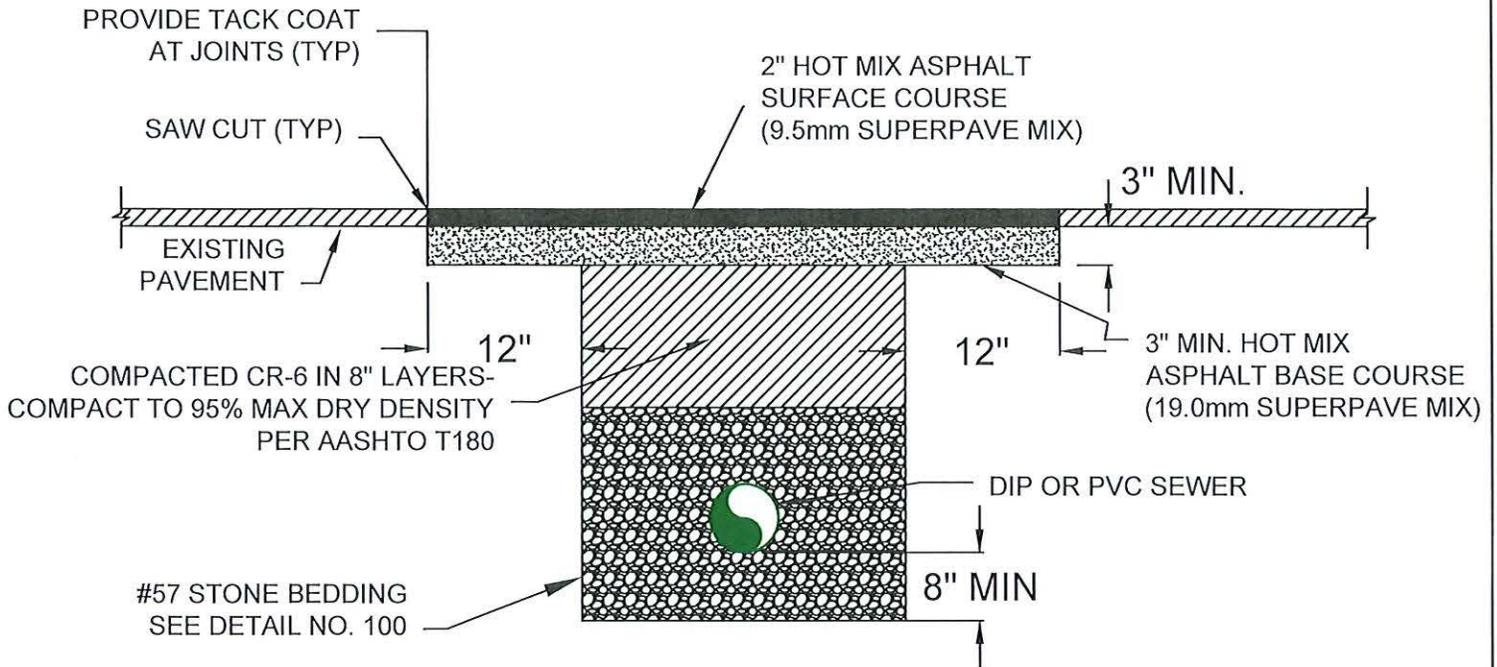
Town of Thurmont
 Public Works Department
 Frederick County, MD

Revisions	
Date	Notes



STONE/GRAVEL ROAD, DRIVEWAY, OR
 PARKING AREA RESTORATION

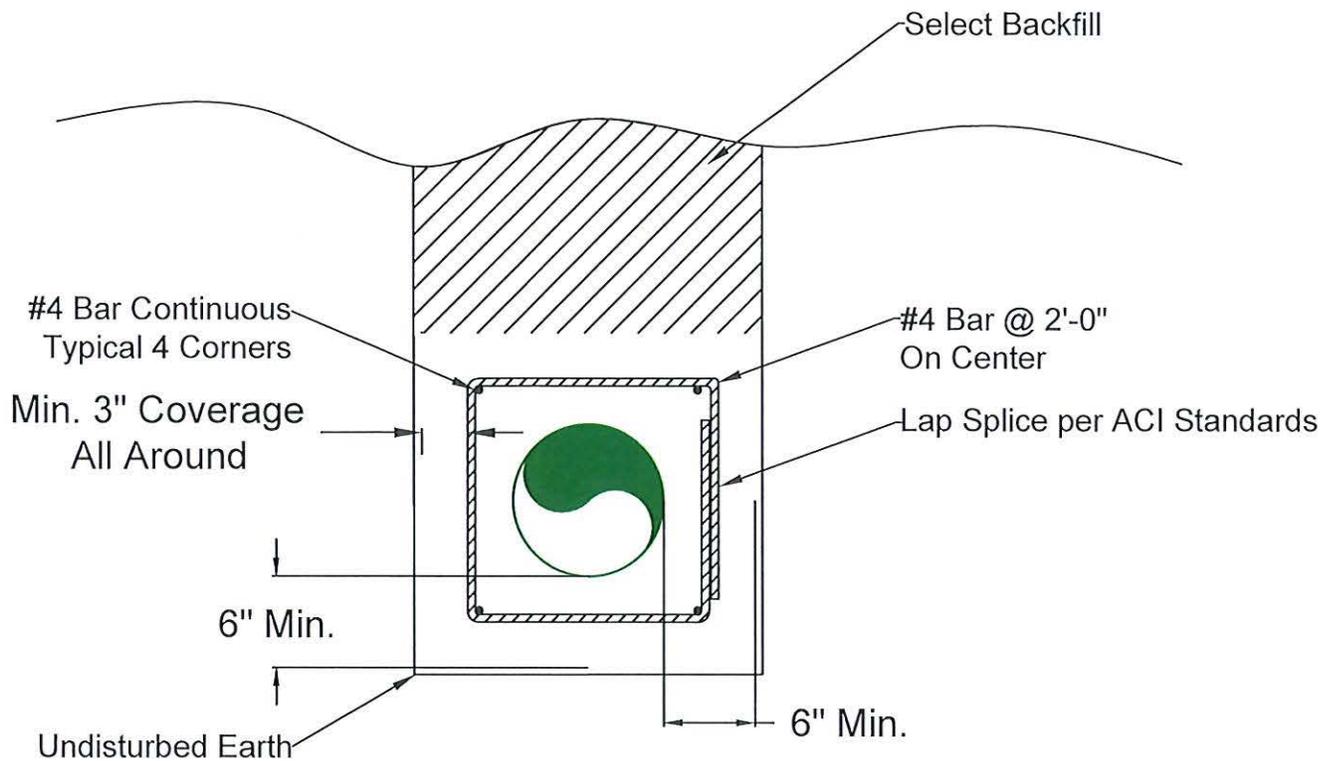
Approved By:	Date	DETAIL NO. 138



NOTES:

1. ALL PAVEMENT MATERIALS AND INSTALLATION SHALL BE IN ACCORDANCE WITH MDSHA STANDARD SPECIFICATIONS. REFER TO THE SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.
2. ROLL ASPHALT PATCH SMOOTH, UNIFORM AND LEVEL WITH EXISTING PAVEMENT.
3. PRIOR TO PLACING NEW ASPHALT, APPLY A BONDING AGENT ON ALL SURFACES WHERE THE ASPHALT WILL BE PLACED, INCLUDING EXISTING ASPHALT AND AT ALL SAWCUT JOINTS.
4. TOWN/ENGINEER RESERVES THE RIGHT TO TEST ANY OR ALL COMPACTED FILL OR HMA PRIOR TO APPROVAL FOR PAYMENT. CONTRACTOR SHALL PROVIDE ADEQUATE NOTICE OF ANY PAVING ACTIVITIES AND COOPERATE FULLY WITH TESTING LABORATORY PERSONNEL.

Town of Thurmont Public Works Department Frederick County, MD	Revisions			ASPHALT PAVEMENT PATCH 3" BASE & 2" SURFACE		
	Date	Notes		Approved By:	Date	DETAIL NO.
						139



NOTES:

1. CONTRACTOR IS RESPONSIBLE TO PROTECT AND SUPPORT EXISTING PIPE FOR THE DURATION OF THE WORK.
2. ALL REINFORCING STEEL SHALL BE GRADE 60 EPOXY COATED STEEL, UNLESS NOTED OTHERWISE.
3. TIE-WIRE TO BE USED TO CONNECT CONTINUOUS BAR TO HOOP BAR. ALSO CONNECT LAP SPLICE IN HOOP BAR WITH TIE-WIRE.

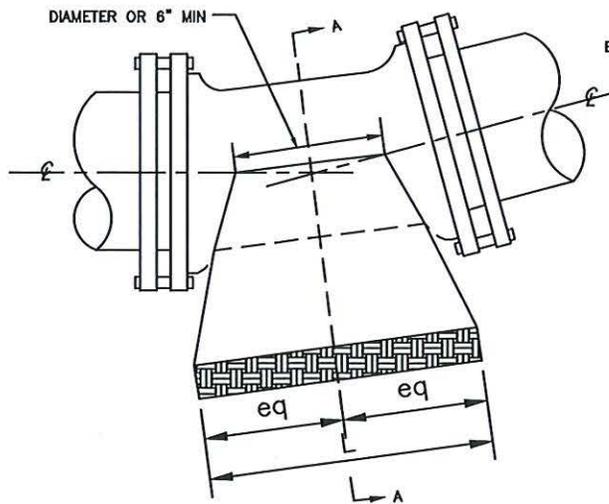
Town of Thurmont Public Works Department Frederick County, MD	Revisions			CONCRETE ENCASEMENT		
	Date	Notes		Approved By:	Date	DETAIL NO.
						140

Mechanical Joint Pipe						
Nominal Pipe Size	Max. Deflection				Minimum Radius-Feet	
	18 Ft Length		20 Ft Length		18 Ft Length	20 Ft Length
	Inches	Degrees	Inches	Degrees		
4	31	8.17	35	8.30	125	140
6	27	7.13	30	7.13	145	160
8	20	5.29	22	5.24	195	220
10	20	5.29	22	5.24	195	220
12	20	5.29	22	5.24	195	220
16	13.5	3.57	15	3.58	285	320
18	11	2.92	12	2.86	340	380
20	11	2.92	12	2.86	340	380
24	9	2.39	10	2.39	450	500
36	9	2.39	10	2.39	450	500
42	7.5	1.99	8	1.91	510	570
48	7.5	1.99	8	1.91	510	570

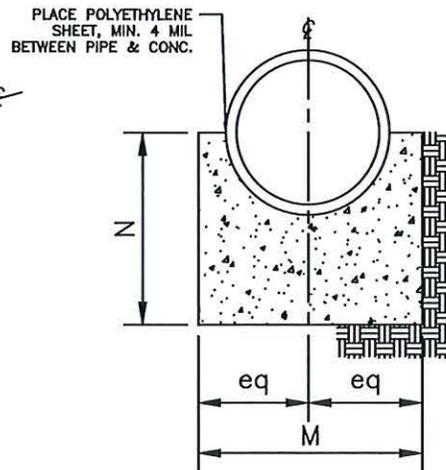
Push-on Joint Pipe						
Nominal Pipe Size	Max. Deflection				Minimum Radius-Feet	
	18 Ft Length		20 Ft Length		18 Ft Length	20 Ft Length
	Inches	Degrees	Inches	Degrees		
4	19	5.03	21	5.00	205	230
6	19	5.03	21	5.00	205	230
8	19	5.03	21	5.00	205	230
10	19	5.03	21	5.00	205	230
12	19	5.03	21	5.00	205	230
16	11	2.92	12	2.86	340	380
18	11	2.92	12	2.86	340	380
20	11	2.92	12	2.86	340	380
24	11	2.92	12	2.86	340	380
36	11	2.92	12	2.86	340	380
42	7.5	1.99	8	1.91	510	570
48	7.5	1.99	8	1.91	510	570

The Above Charts Are In Accordance With AWWA C600.

Town of Thurmont Department of Public Works	Revisions		Curvature of Water Mains	Detail No.
	Date	Note		201.1
			March 2020	



ELEVATION OR PLAN



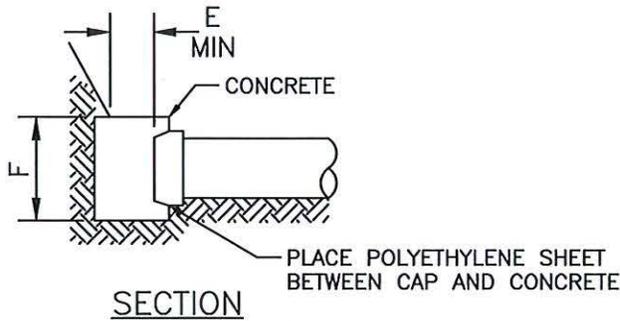
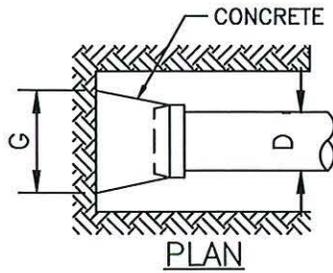
SECTION A-A

BUTTRESS DIMENSIONS											
BEND		SIZE									
		3"	4"	6"	8"	10"	12"	16"	20"	24"	30"
11 1/4°	L	6"	0'-6"	6"	8"	8"	8"	1'-1"	1'-5"	1'-10"	2'-8"
	M	1'-0"	1'-0"	1'-2"	1'-4"	1'-6"	2'-0"	2'-4"	2'-8"	3'-0"	3'-4"
	N	8"	8"	8"	8"	8"	8"	9"	10"	12"	12"
22 1/2°	L	6"	8"	10"	11"	1'-3"	1'-4"	2'-1"	2'-9"	3'-7"	5'-3"
	M	1'-0"	1'-0"	1'-2"	1'-4"	1'-6"	2'-0"	2'-4"	2'-8"	3'-0"	3'-2"
	N	8"	8"	8"	8"	9"	9"	12"	1'-2"	1'-4"	1'-6"
45°	L	10"	1'-0"	1'-2"	1'-9"	2'-5"	2'-9"	4'-0"	5'-6"	6'-0"	8'-2"
	M	1'-0"	1'-0"	1'-2"	1'-4"	1'-6"	2'-0"	2'-4"	2'-8"	3'-6"	4'-0"
	N	8"	8"	8"	8"	12"	1'-2"	1'-5"	2'-0"	2'-6"	3'-0"
90°	L	1'-0"	1'-4"	2'-0"	2'-8"	3'-4"	3'-8"	5'-6"	6'-8"	8'-0"	9'-8"
	M	9"	10"	12"	1'-4"	1'-9"	2'-3"	2'-8"	3'-6"	4'-0"	4'-7"
	N	1'-8"	1'-8"	1'-8"	1'-8"	1'-8"	1'-9"	2'-0"	2'-3"	2'-9"	3'-5"

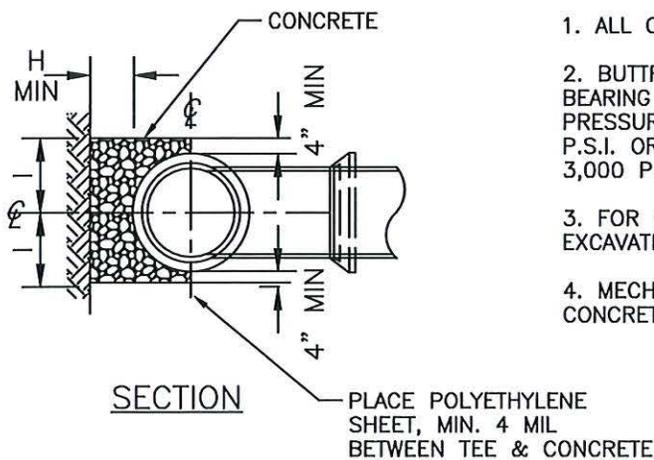
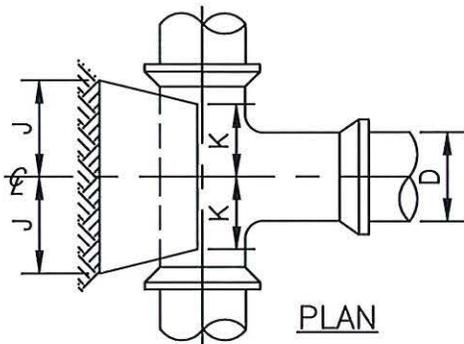
NOTES:

1. ALL CONCRETE TO BE MD. S.H.A. MIX NO.1.
2. ALL BEARING SURFACES SHALL BE PLACED AGAINST UNDISTURBED GROUND WITH A MIN. SOIL BEARING PRESSURE OF 3,000 LBS. PER S.F. & STATIC WATER PRESSURE OF 150 P.S.I. WHERE PRESSURE EXCEEDS 150 P.S.I. OR WHERE SOIL BEARING PRESSURE IS LESS THAN 3,000 P.S.F., SPECIAL BUTTRESS DESIGN IS REQUIRED.
3. THESE BUTTRESSES SHALL BE USED FOR HORIZONTAL AND LOWER VERTICAL BENDS.
4. MECHANICAL JOINT RESTRAINT MAY BE USED IN LIEU OF CONCRETE BUTTRESSES, WITH APPROVAL.

Town of Thurmont Public Works Department Frederick County, MD	Revisions			Buttresses for Use at Horizontal and Lower Vertical Bends		
	Date	Notes		Approved By:	Date	DETAIL NO.
					March 2020	202.1



BUTTRESS FOR CAPS										
D	3"	4"	6"	8"	10"	12"	16"	20"	24"	30"
E	7"	7"	6"	8"	8"	10"	12"	1'-4"	1'-8"	2'-0"
F	14"	14"	12"	1'-4"	1'-9"	2'-0"	2'-8"	3'-3"	4'-0"	4'-9"
G	12"	12"	1'-5"	1'-11"	2'-5"	2'-10"	3'-9"	4'-9"	5'-8"	7'-6"



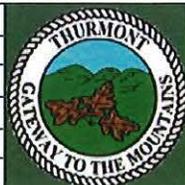
BUTTRESS FOR TEES										
D	3"	4"	6"	8"	10"	12"	16"	20"	24"	30"
H	7"	7"	8"	9"	10"	12"	1'-4"	1'-8"	2'-2"	2'-8"
I	7"	7"	10"	1'-1"	1'-4"	1'-7"	2'-2"	2'-8"	3'-2"	3'-8"
J	6"	6"	6"	8"	1'-1"	1'-1"	1'-5"	1'-9"	2'-1"	2'-6"
K	4"	4"	6"	7"	8"	9"	10"	1'-2"	1'-4"	1'-6"

NOTES:

1. ALL CONCRETE SHALL BE MIX NO.1
2. BUTTRESS DIMENSIONS SHOWN ARE BASED UPON SOIL BEARING PRESSURE OF 3,000 P.S.F. & STATIC WATER PRESSURE OF 150 P.S.I. WHERE PRESSURE EXCEEDS 150 P.S.I. OR WHERE SOIL BEARING PRESSURE IS LESS THAN 3,000 P.S.F. SPECIAL BUTTRESS DESIGN IS REQUIRED.
3. FOR CAPS ON MAINS WHERE ROCK HAS BEEN EXCAVATED AHEAD OF PIPE LAYING, USE DETAIL NO. 204.1.
4. MECHANICAL JOINT RESTRAINT MAY BE USED IN LIEU OF CONCRETE BUTTRESSES, WITH APPROVAL.

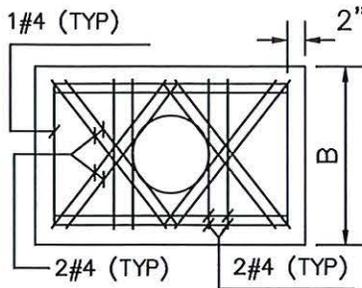
Town of Thurmont
Public Works
Department
Frederick County, MD

Revisions	
Date	Notes



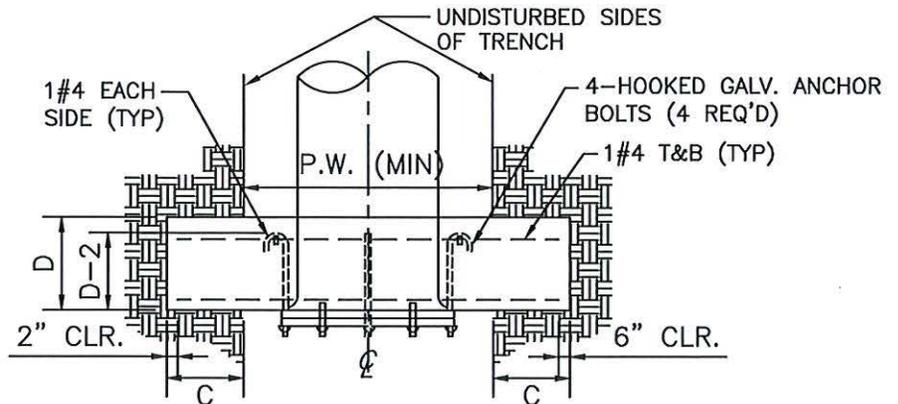
Buttresses for Caps and Tees on Water Mains

Approved By:	Date	DETAIL NO.
	March 2020	203.1



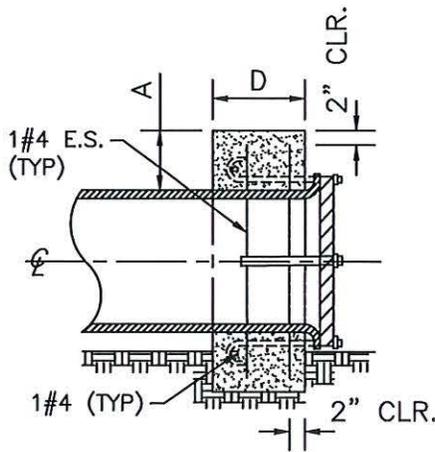
**FRONT ELEVATION
FOR 3" & 4" PIPES**

MINIMUM CLEARANCE SHALL BE 1" FROM PIPE TO REINFORCING STEEL

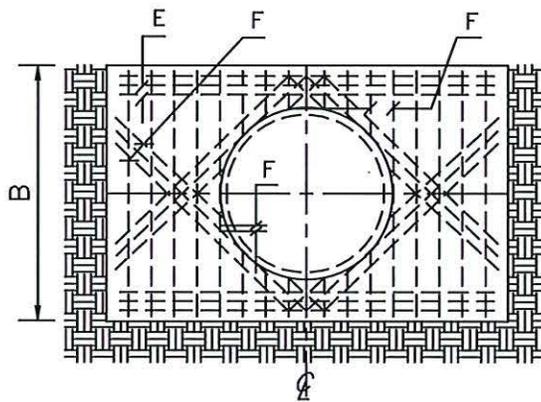


PLAN FOR ALL PIPES

COMPLETE TRENCH IN FRONT OF PLUG SHALL BE BACKFILLED AND COMPACTED PER THE GENERAL COND, AND STD, SPECS, PRIOR TO TESTING.



SECTION

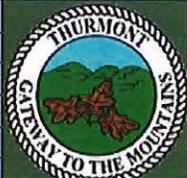


FRONT ELEVATION FOR 6" TO 12" PIPES

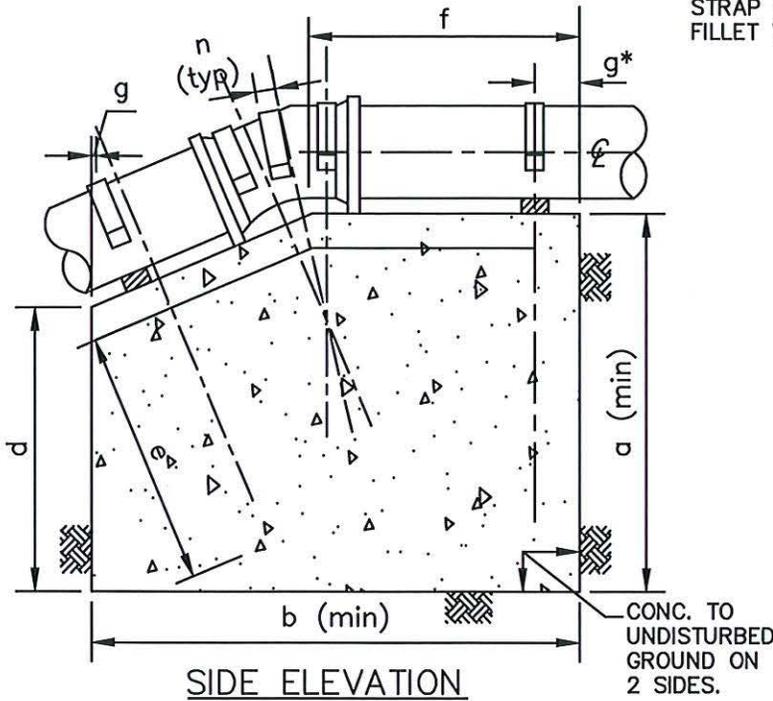
NOTES:

1. CONCRETE SHALL BE MSHA MIX NO. 1.
2. REINFORCING STEEL TO BE A.S.T.M. A-615 GRADE 40 AND/OR GRADE 60.
3. GALVANIZED ANCHOR BOLTS TO HAVE A MINIMUM F_y = 36,000 PSI.
4. IF TRENCH WIDTH EXCEEDS P.W. BY MORE THAN 25% ANCHOR WALL DESIGN MUST BE VERIFIED FOR STRUCTURAL ADEQUACY.
5. PIPE TEST PRESSURE = 150 P.S.I. HYDROSTATIC.
6. MECHANICAL JOINT RESTRAINT MAY BE USED IN LIEU OF CONCRETE ANCHORS WITH APPROVAL.

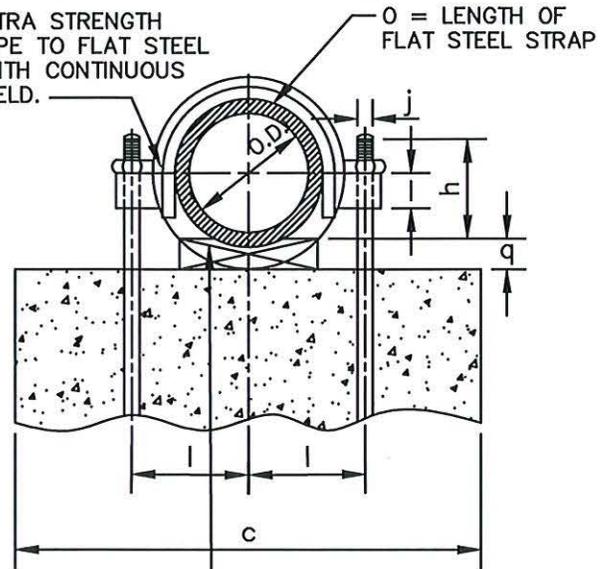
ANCHOR DIMENSIONS				STEEL-SIZE & SPACING			
PIPE SIZE	A	B	C	D	E	F	G
0'-3"	4"	1'-0"	6"	12"	—	—	—
0'-4"	4"	1'-0"	9"	12"	—	—	—
0'-6"	6"	1'-6"	1'-0"	12"	2-#4	2-#4	#4@3"
0'-8"	1'-0"	2'-9"	1'-0"	1'-6"	2-#4	2-#4	#4@3"
0'-10"	1'-0"	3'-3"	1'-3"	1'-6"	3-#4	2-#4	#4@3"
1'-0"	1'-0"	3'-9"	1'-6"	1'-6"	4-#4	2-#4	#4@3"

Town of Thurmont Public Works Department Frederick County, MD	Revisions			Anchors For Plugs		
	Date	Notes		Approved By:	Date	DETAIL NO. 204.1
					March 2020	

*OMIT STRAP AT ENDS OF BLOCK, WHERE 'g' HAS NO TABULATED DIMENSION.

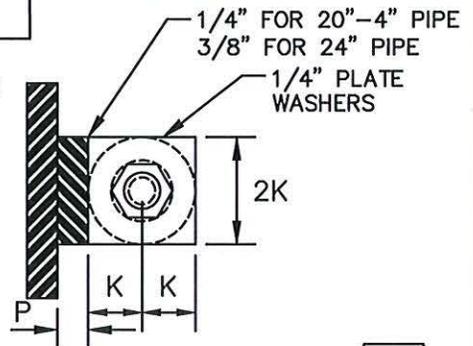


WELD EXTRA STRENGTH STEEL PIPE TO FLAT STEEL STRAP WITH CONTINUOUS FILLET WELD.



CROSS SECTION

PRESSURE TREATED WOOD BLOCK FOR USE BELOW GRADE OD X 4" X q



STRAP ATTACHMENT

NOTES:

1. CONCRETE SHALL BE MSHA MIX NO. 1.
 2. ANCHOR BOLTS SHALL HAVE 3" THREADED LENGTH & STD. 90° HOOK FACING CENTER OF BLOCK, AND SHALL BE TIED TO REBAR WITH EQUAL DIAMETER.
 3. ALL EXPOSED STEEL TO BE PAINTED WITH 2 COATS OF BITUMINOUS PAINT CONFORMING TO MIL-P-23236P, CLASS 2.
 4. BELL TO REST ON SCREEDED UPPER SURFACES OF BLOCK.
 5. TEST PRESSURE 15 PSI HYDROSTATIC.
- * THIS METHOD IS ALTERNATIVE TO USE MEGA-LUGS.

DIMENSIONS FOR VERTICAL BEND ANCHORAGES - IN INCHES

BEND	1/32 - 11-1/4'								1/16 - 22-1/2'								1/8 - 45'							
	4	6	8	10	12	16	20	24	4	6	8	10	12	16	20	24	4	6	8	10	12	16	20	24
A	12	16	18	22	26	34	36	42	15	20	26	36	36	42	48	56	18	27	45	48	60	66	72	76
B	12	18	20	26	34	44	50	54	18	22	33	44	50	72	80	90	21	39	51	63	75	84	99	111
C	15	18	28	30	30	34	42	50	18	30	30	30	36	39	48	54	30	30	30	36	36	51	60	72
D	11	14-1/4	16	19-1/2	22-3/4	30	31-1/2	37	11-1/2	16	18-3/4	27-1/4	28-1/2	31-1/4	33-1/2	39	9	13	25	28	31	37	37	40
E	8	12	14	18	22	28	30	36	11	16	22	30	30	36	42	50	14	23	39	42	54	60	66	70
F	6-1/2	9-1/2	10	14	18	24	27	29	6-1/2	22	33	44	50	72	80	90	21	39	51	63	75	84	99	111
G	---	---	---	---	---	6	6	6	---	---	---	---	6	6	6	6	---	---	---	---	6	6	6	6
H	6-1/2	7-1/2	8-1/2	9-1/2	10-3/4	13	15-1/8	18	6-1/2	7-1/2	8-1/2	9-1/2	10-3/4	15	15-1/2	18	6-1/2	7-1/2	8-1/2	9-1/2	10-3/4	13-1/4	15-1/2	18
I	3-1/2	4-9/16	5-11/16	6-3/4	7-3/4	9-3/4	12-1/8	14-1/4	3-1/2	4-9/16	5-11/16	6-3/4	7-3/4	9-3/4	12-1/4	14-1/4	3-1/2	4-5/16	5-11/16	6-3/4	7-7/8	10-1/16	12-1/4	14-5/16
J	3/4	3/4	3/4	3/4	3/4	3/4	7/8	1	3/4	3/4	3/4	3/4	3/4	3/4	7/8	1	3/4	3/4	3/4	3/4	3/4	1-1/4	1-1/4	1-1/4
K	3/4	3/4	3/4	3/4	3/4	3/4	7/8	15/16	3/4	3/4	3/4	3/4	3/4	3/4	7/8	15/16	3/4	3/4	3/4	3/4	3/4	15/16	15/16	1-1/8
L	1	1	1	1	1-1/4	2	3	4	1	1	1-1/4	2	1-1/2	2-1/4	3-1/2	5	1	1-1/2	2-1/2	2	2-1/2	4-1/4	4-1/4	6
M	1	1	1	1	1	1	1-1/4	1-1/2	1	1	1	1	1	1	1-1/4	1-1/2	1	1	1	1	1	1-1/4	1-1/2	1-1/2
N	1-1/4	1-1/4	1-1/4	1-1/4	1-1/4	2	2	2-1/2	1-1/4	1-1/4	1-1/4	1-1/4	2	2	2	2-1/2	1-1/4	1-1/4	2	2	2	2-1/2	2-1/2	2-1/2
O	12-1/4	15-3/4	19	22-1/4	26-1/8	33-3/4	42-1/8	51-1/8	12-1/4	15-1/2	19-1/2	24	28-1/2	34	43	53	12-1/4	16-1/8	22	24	29	36	46	55
P	1/4	1/4	1/4	1/4	1/4	1/4	3/8	3/8	1/4	1/4	1/4	1/4	1/4	1/4	3/8	3/8	1/4	1/4	1/4	1/4	3/8	3/8	1/2	1/2
Q	1	1	1	1-1/8	1-1/8	1-5/8	1-5/8	1-5/8	1	1	1	1-1/8	1-1/8	1-5/8	1-5/8	1-5/8	1	1	1	1-1/8	1-1/8	1-5/8	1-5/8	1-5/8

Town of Thurmont
Public Works Department
Frederick County, MD

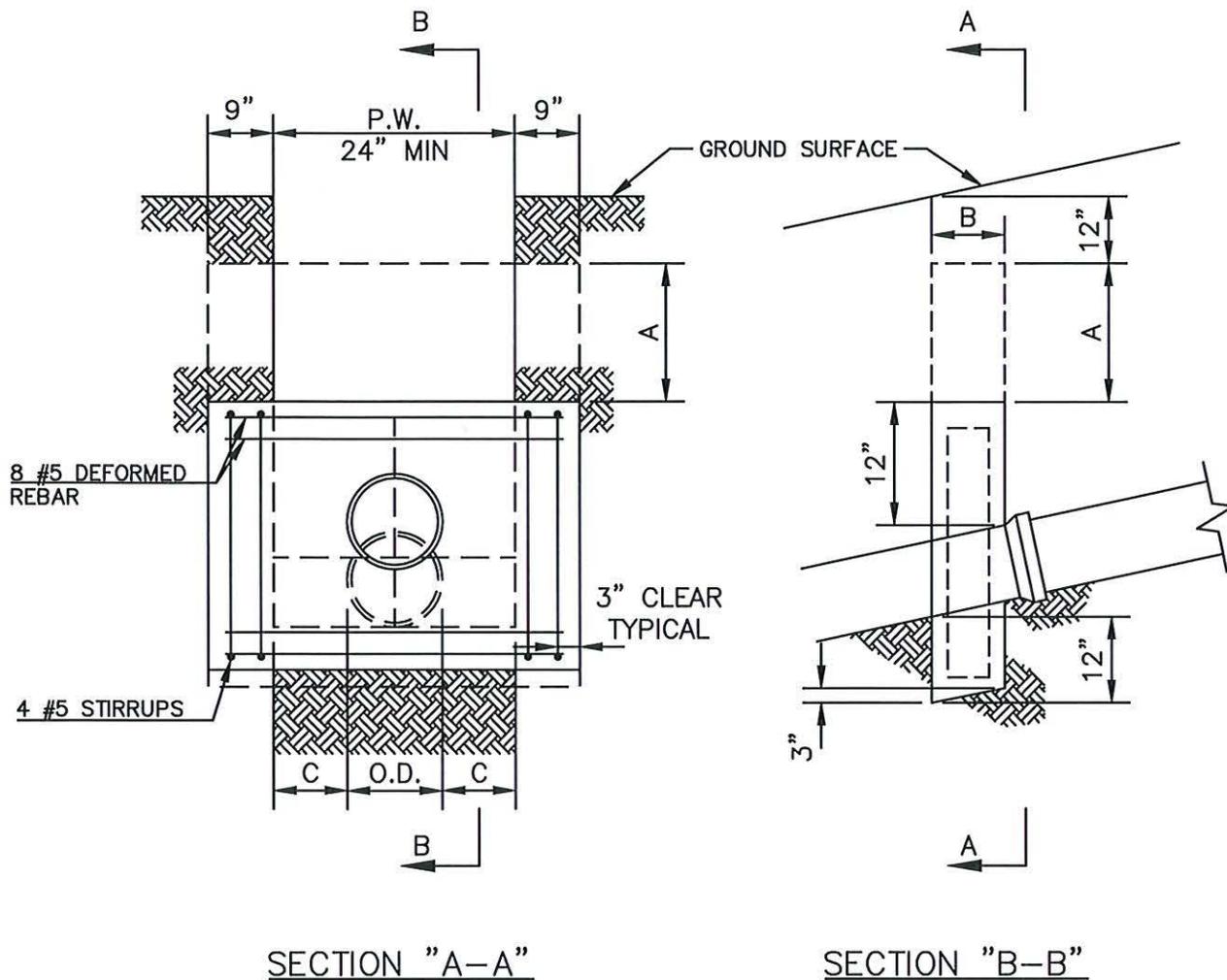
Revisions	
Date	Notes



ANCHORS FOR 11-1/4', 22-1/2' AND 45' UPPER VERTICAL BENDS

Approved By: _____ Date: _____

DETAIL NO. 205.1

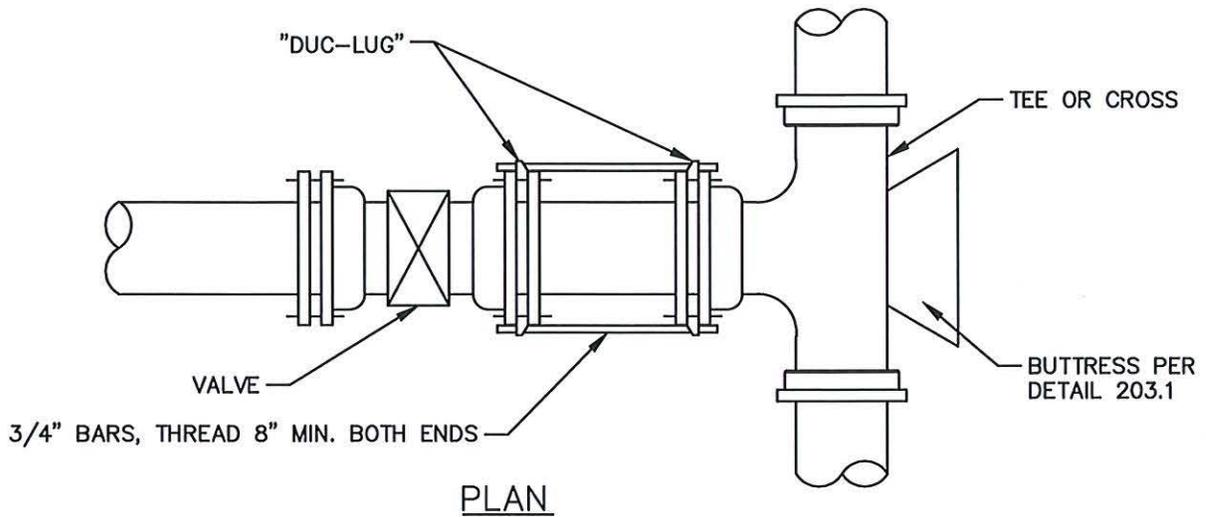


- A = EXTENSION OF ANCHOR TO 12" BELOW GROUND, WHEN NECESSARY TO PREVENT WASHOUT OF BACKFILL BY SURFACE WATER.
 B = 12" FOR PIPES 10" OR LESS, 18" FOR PIPES 10" TO 18" NOMINAL DIAMETER
 P.W. - O.D. + 2E.

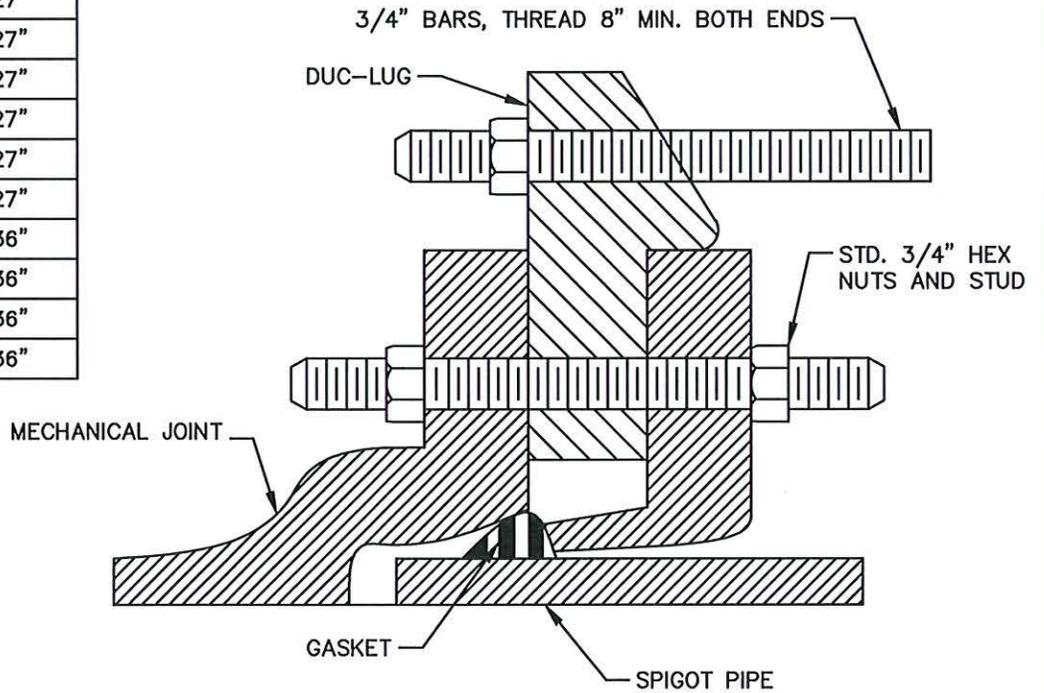
NOTES:

1. PROVIDE NO ANCHORS ON GRADES LESS THAN 20% UNLESS NOTED ON THE PLANS.
2. PROVIDE ANCHORS 36 FEET CENTER TO CENTER ON GRADES BETWEEN 20% & 30%.
3. PROVIDE ANCHORS 24 FEET CENTER TO CENTER ON GRADES BETWEEN 34% & 50%.
4. ON GRADES OVER 50% THE METHOD OF ANCHORING PIPE IS TO BE DETERMINED VIA GEOTECHNICAL STUDY.
5. PROVIDE ANCHORS 16 FEET CENTER TO CENTER ON GRADES BETWEEN 50% & 70%.
6. ALL ANCHORS TO BE MSHA MIX NO. 1 CONCRETE, PLACED DOWNGRADE OF BELL, AS SHOWN BEFORE.
7. PLACE ANCHORS IN MULTIPLE LENGTHS, 18' OR 20', IF ANCHORS IS TO BE IMMEDIATELY DOWNGRADE OF BELL.

Town of Thurmont Public Works Department Frederick County, MD	Revisions			CONCRETE ANCHORS FOR PIPE INSTALLED ON GRADES 20% OR MORE		
	Date	Notes		Approved By:	Date	DETAIL NO.



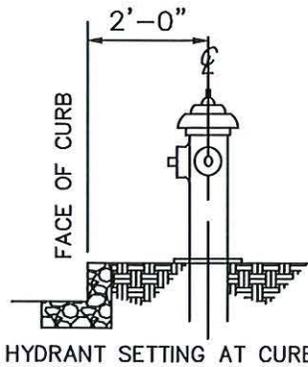
VALVE SIZE	NO. OF 3/4" DIA BARS REQUIRED	MAX SPIGOT LENGTH
3"	2	27"
4"	2	27"
6"	2	27"
8"	2	27"
10"	4	27"
12"	6	27"
16"	8	36"
20"	12	36"
24"	16	36"
30"	20	36"



NOTES:

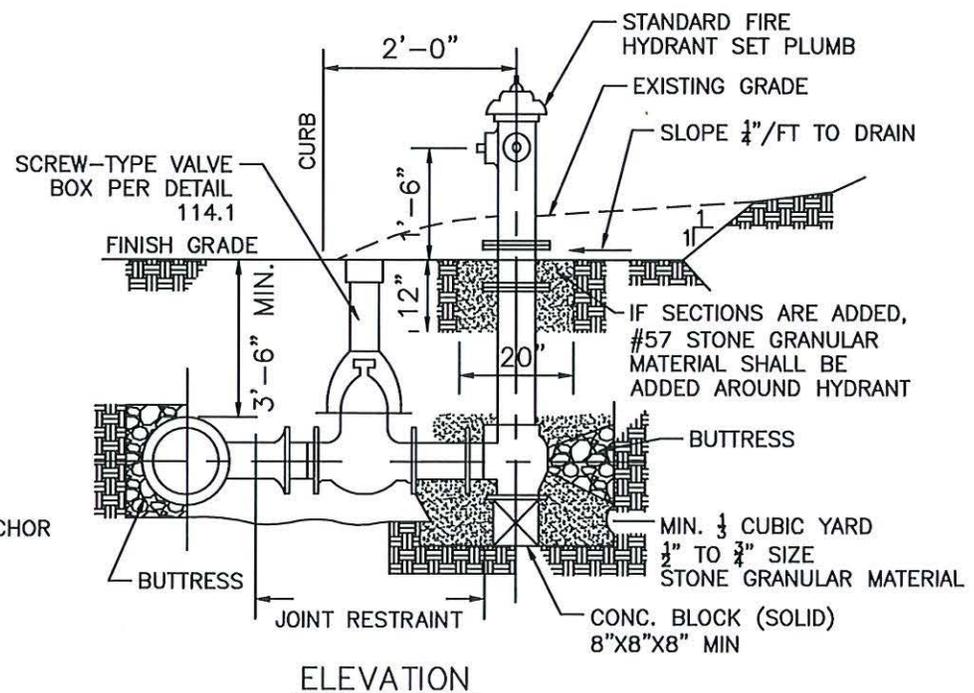
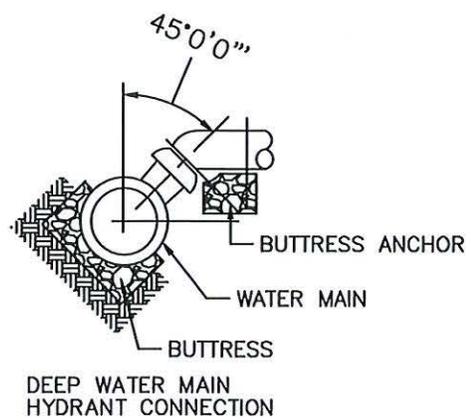
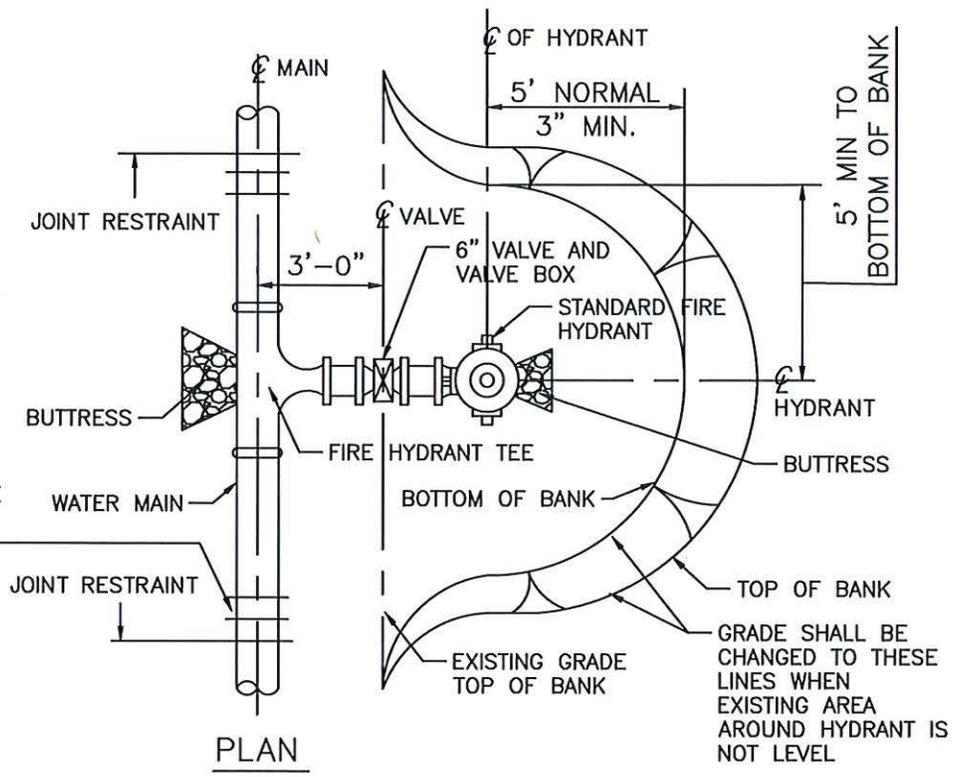
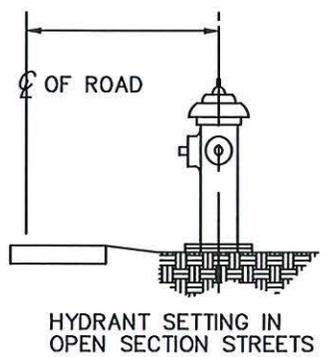
1. MECHANICAL JOINT FITTINGS ONLY SHALL BE USED.
2. ALL STEEL SHALL BE COATED WITH TWO COATES OF BITUMINOUS PAINT, CONFORMING TO MIL-P-23236P, CLASS 2.
3. IF TAPPING SLEEVE & VALVE ARE USED, OMIT STRAPPING AND SPIGOT PIPE.
4. TIE BOLTS BY "STAR" ARE AN APPROVED EQUAL TO "DUC-LUGS".
5. "DUC-LUGS" ONLY TO BE USED WHEN "MEGA-LUG" RESTRAINT IS NOT POSSIBLE.
* USED AS ALTERNATIVE TO MEGA-LUG RESTRAINTS.

Town of Thurmont Public Works Department Frederick County, MD	Revisions			METHOD OF STRAPPING VALVE TO TEE WITH "DUC-LUGS"		
	Date	Notes		Approved By:		Date
						DETAIL NO. 207.1



NOTE:
JOINT RESTRAINT SYSTEM THIS
DETAIL. EXTENT OF JOINT
RESTRAINT ON WATER MAIN TO BE
DETERMINED BY CALCULATIONS
FROM MANUFACTURER.

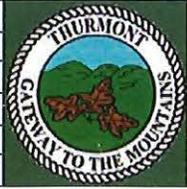
- 18' FOR 20' ROAD
- 20' FOR 22' ROAD
- 21' FOR 24' ROAD



*WHEN THE SIDEWALK ABUTS THE CURB, LOCATE THE HYDRANT 2'-0" BEHIND THE SIDEWALK.

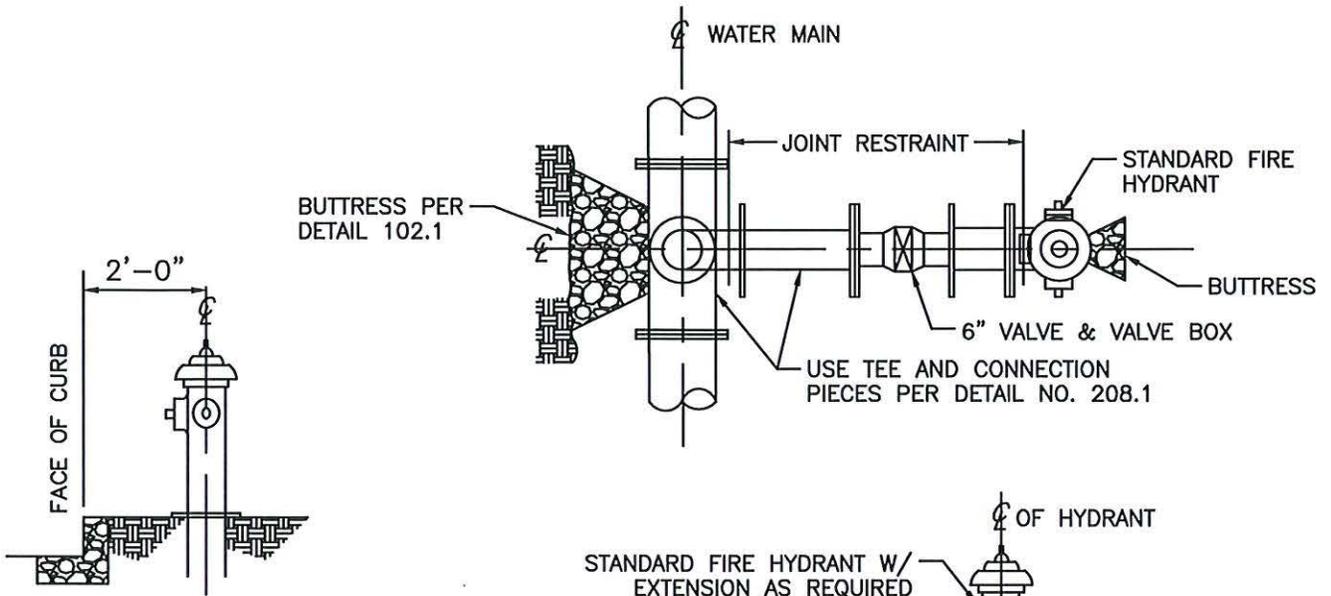
Town of Thurmont
Public Works
Department
Frederick County, MD

Revisions	
Date	Notes



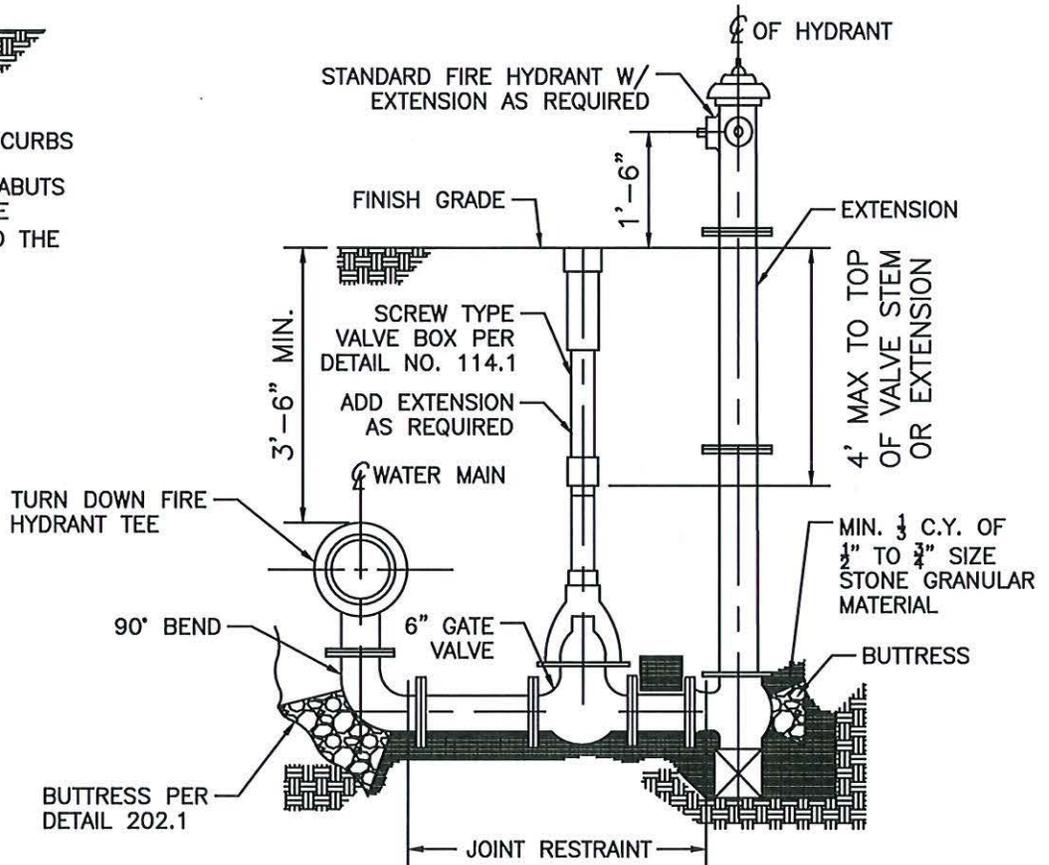
Fire Hydrant Setting and Grading

Approved By:	Date	DETAIL NO.
	March 2020	208.1



HYDRANT SETTING AT CURBS

*WHEN THE SIDEWALK ABUTS THE CURB, LOCATE THE HYDRANT 2'-0" BEHIND THE SIDEWALK.

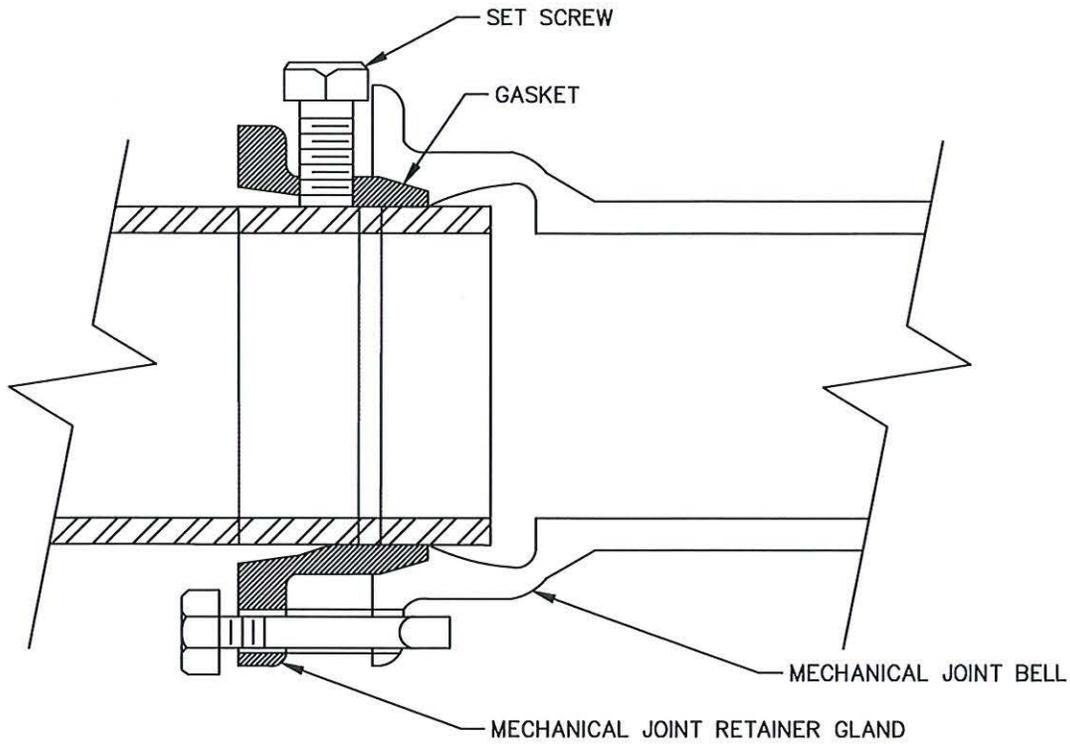


NOTE:
JOINT RESTRAINT SYSTEM THIS DETAIL. EXTENT OF JOINT RESTRAINT ON WATER MAIN TO BE DETERMINED BY CALCULATIONS FROM MANUFACTURER.

ALTERNATE METHOD PER DETAIL NO. 208.1 REQUIRES RODDING.

NOTE:
1. WHEN HYDRANT HEIGHT WOULD EXCEED 8'-0" THEN 45° VERTICAL BENDS MAY BE USED IN PLACE OF THE 90° BENDS TO MITIGATE NECESSARY CUT AND HYDRANT HEIGHT.

Town of Thurmont Public Works Department Frederick County, MD	Revisions			Low Point Dewatering Fire Hydrant		
	Date	Notes		Approved By:	Date	DETAIL NO.
					March 2020	208.2

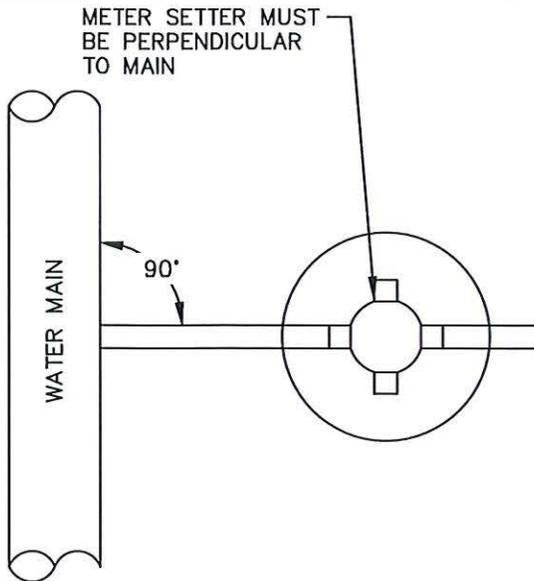


NOMINAL SIZE IN INCHES	NO. OF SET SCREWS	PRESSURE RATING IN PSI
3	4	300
4	4	300
6	6	300
8	9	300
10	16	300
12	16	300
16	24	300
20	28	300
24	32	300
30	40	300

NOTES:

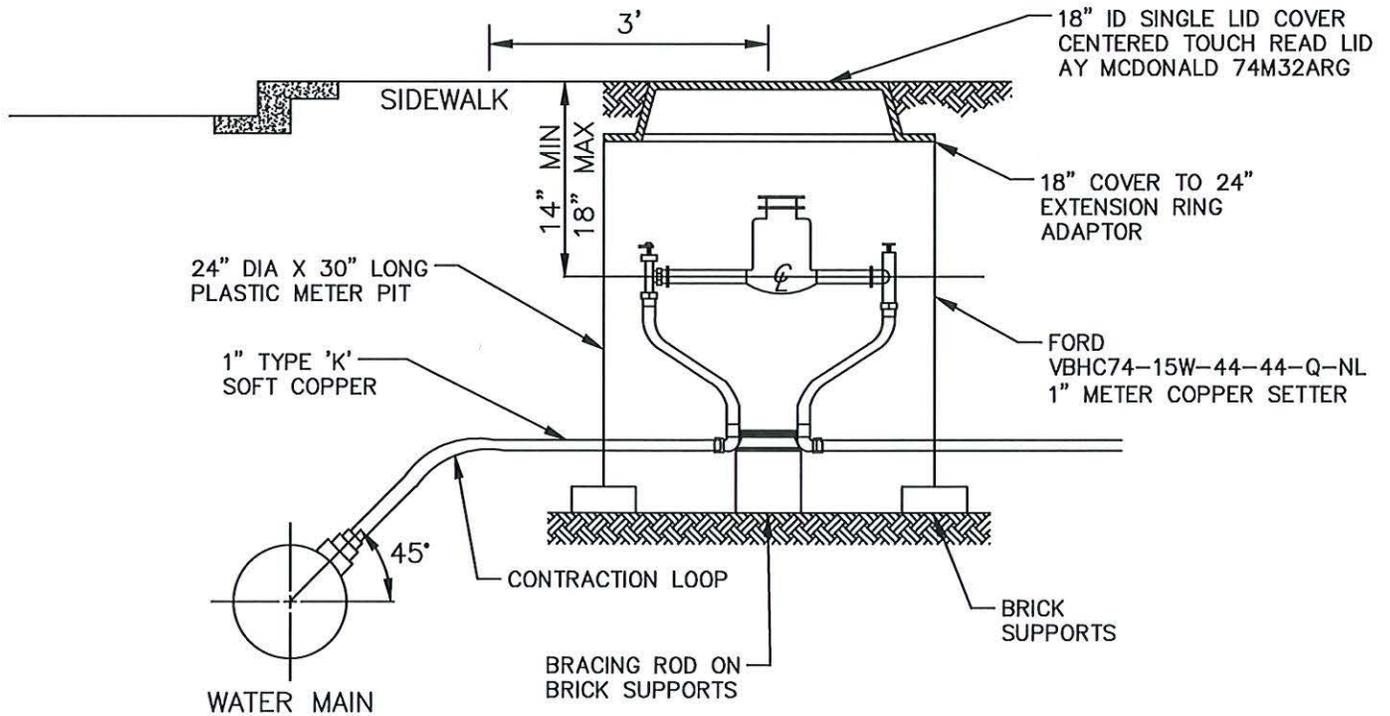
1. MECHANICAL JOINT PIPE & FITTINGS ONLY.
2. ALL SET SCREWS ARE 5/8" WITH HARDENED CUPPED ENDS AND 5/8" SQUARE HEADS.
3. SIZES 16" THROUGH 30" ARE FOR INSTALLATION ON DUCTILE IRON PIPE.
4. TIGHTEN SET SCREWS EVENLY TO 80 FOOT-POUNDS ON 3"-12" GLANDS AND 65 FOOT-POUNDS ON 16"-30" GLANDS.

Town of Thurmont Public Works Department Frederick County, MD	Revisions			MECHANICAL JOINT RETAINER GLAND		
	Date	Notes		Approved By:	Date	DETAIL NO. 209.1



NOTES:

1. SERVICE LINE TO BE TYPE K COPPER BURIED 36" MIN. 42" MAX. WITH NO SPLICES FROM CORPORATION STOP IN MAIN TO METER SETTER AND EXTEND 2" BEYOND METER VAULT ON OUTLET SIDE OF METER SETTER. BRASS COMPRESSION TYPE FITTINGS ONLY.
2. COPPER METER SETTER TO BE FOR VQHC-74-15W-44-44-Q-NL UNLESS OTHERWISE APPROVED BY THE TOWN OF THURMONT.
3. METER VAULTS TO BE LOCATED AT FRONT PROPERTY LINES, 2" OFF SIDE PROPERTY LINES AND OUT OF DRIVEWAYS. EXACT LOCATION OF METER VAULT TO BE APPROVED BY THE TOWN OF THURMONT.
4. METER VAULTS TO BE 24" DIA. X 30" LENGTH HEAVY WALL PLASTIC, SIGMA RAVEN RMP 2430W OR COMPARABLE WITH A 24" TILE X 18" COVER STEEL EXTENSION RING ADAPTOR. VAULT COVER TO BE STEEL 18" ID WITH STEEL CENTERED TOUCH READ LID AY MCDONALD 74M32ARG OR COMPARABLE. IF PRE-APPROVED, DRIVEWAY METER VAULTS TO BE PRE-CAST CONCRETE WITH ROADWAY BEARING COVERS AND LIDS. TOP OF METER VAULT LID TO BE EVEN WITH FINISHED GRADE.
5. IF INSTALLATION OF SERVICE LINE IS CONSTRUCTED BY PUNCHING UNDER AN EXISTING SIDEWALK OR CURB AND GUTTER, A PVC SLEEVE OF APPROPRIATE SIZE MUST BE INSTALLED. PUNCHED HOLE MAY NOT EXCEED WITHIN 1/4" DIAMETER OF SLEEVE.
6. NO METER VAULT HEIGHT EXTENSIONS OF COPPER METER SETTER RISERS TO BE INSTALLED WITHOUT PRIOR APPROVAL FROM THE TOWN OF THURMONT.



Town of Thurmont Public Works Department Frederick County, MD	Revisions			1" SERVICE INSTALLATION		
	Date	Notes		Approved By:	Date	DETAIL NO. 210

WATERPROOF ALL JOINTS BETWEEN TOP, BOTTOM AND GRADE RINGS WITH RUBBER GASKET OR EQUAL

(1) 1-1/2" METER USE FORD CUSTOM SETTER "VBHH76-15B-44-66-G" OR EQUAL.
2" METER USE FORD CUSTOM SETTER "VBHH77-15B-44-77-G" OR EQUAL.

1" IRON PIPE, PLACED THRU TEE AND SUPPORTED ON BRICK, EACH SIDE OF METER

12" DIA. X 4" DEEP SUMP CAST IN BASE

1-1/2" OR 2" TYPE K COPPER

FRAME AND COVER TO BE BOLTED TO MH TOP SLAB

PLAN

BRING TO GRADE

GRADE

FLAT PRECAST TOP SLAB PER DETAIL NO. 201.3

24" MAX

12" TYP

3'-6" MINIMUM

STANDARD 4' DIA. 5' DEEP PRECAST MANHOLE BASE AND RISER

48" MINIMUM

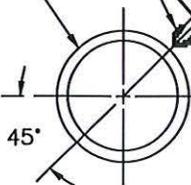
SEE (1) ABOVE

RUBBER GASKET AROUND PIPE TYP.

1'

WATER MAIN

CORP.



MIN. 6" OF #57 STONE GRANULAR MATERIAL

CONNECT W/PLUG OR CONNECT TO BUILDING

SECTION A-A

Town of Thurmont
Public Works
Department
Frederick County, MD

Revisions	
Date	Notes

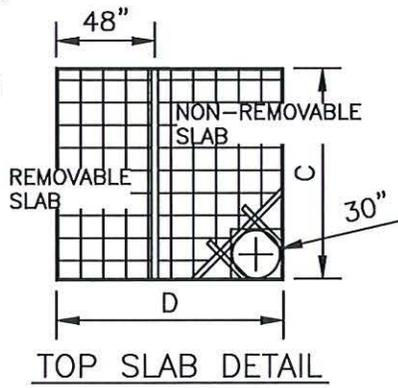
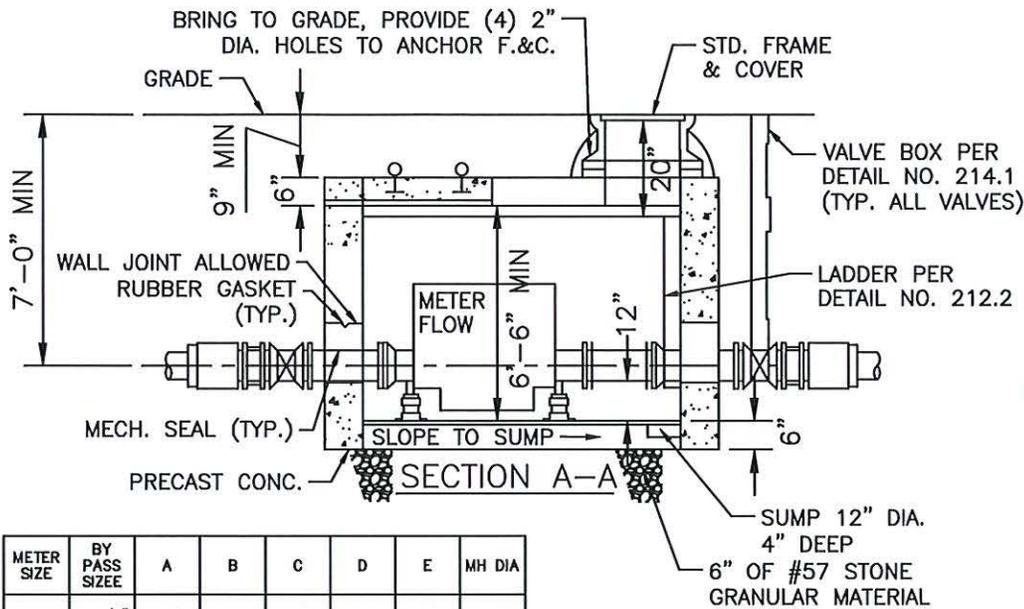
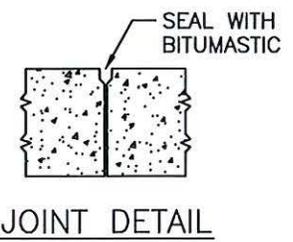
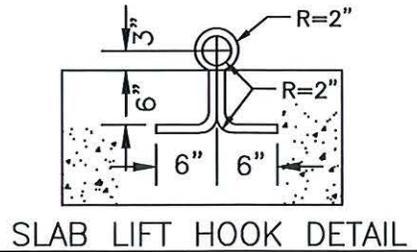
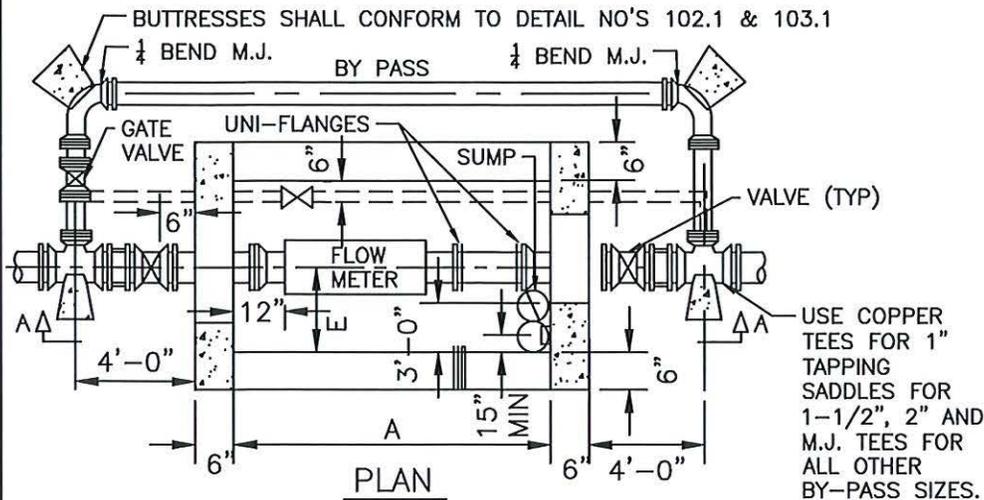


1-1/2" & 2" Water Meter Installation

Approved By:

Date

DETAIL NO.
211.1

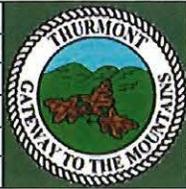


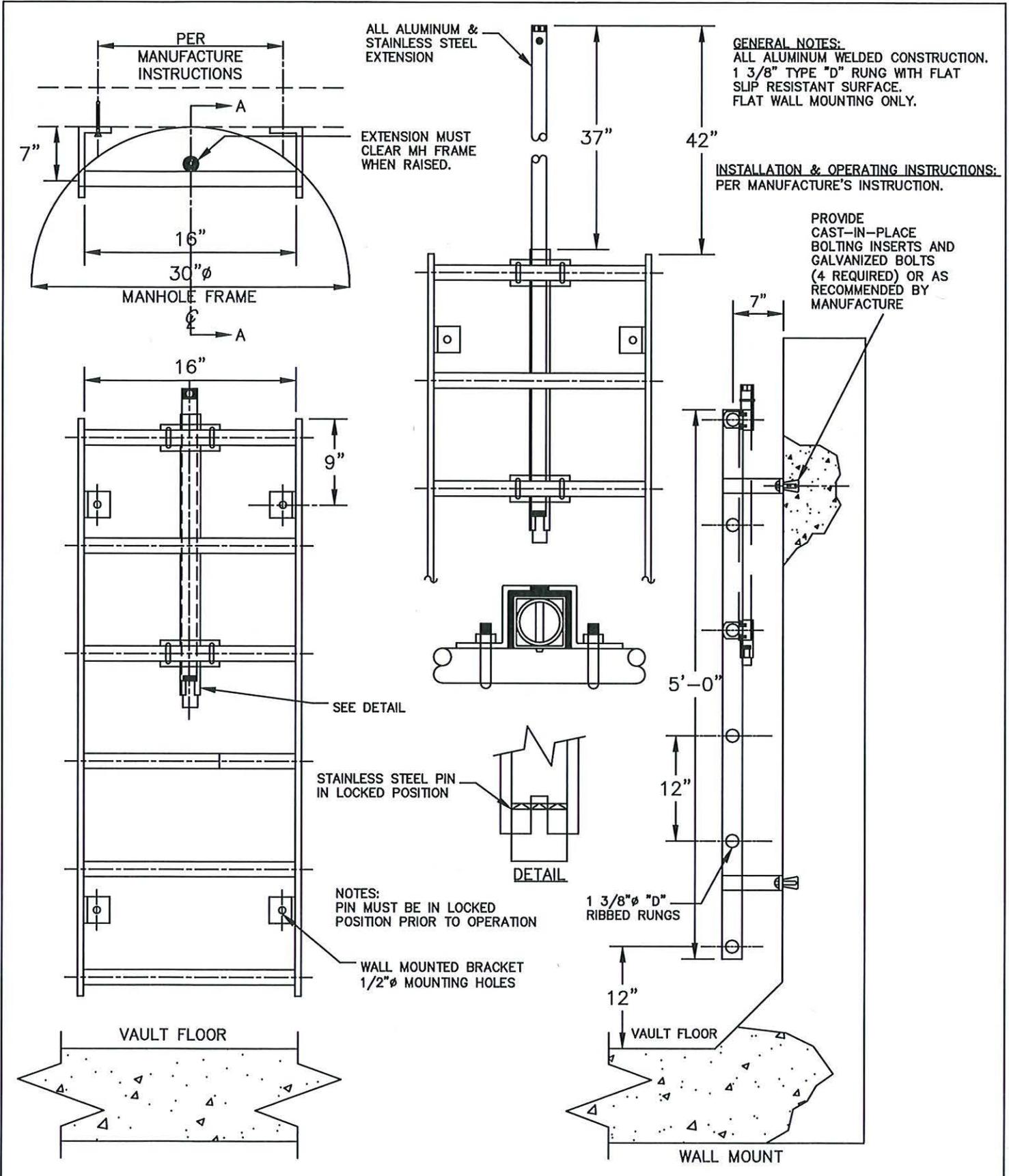
METER SIZE	BY PASS SIZE	A	B	C	D	E	MH DIA
3"	1-1/2"	72"	72"	84"	84"	46"	30"
4"	2"	72"	72"	84"	84"	47"	30"
6"	3"	84"	72"	84"	96"	51"	30"
8"	4"	96"	96"	108"	108"	57"	30"
10"	6"	108"	96"	108"	120"	66"	30"

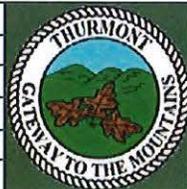
VAULTS TO BE PRECAST CONC.

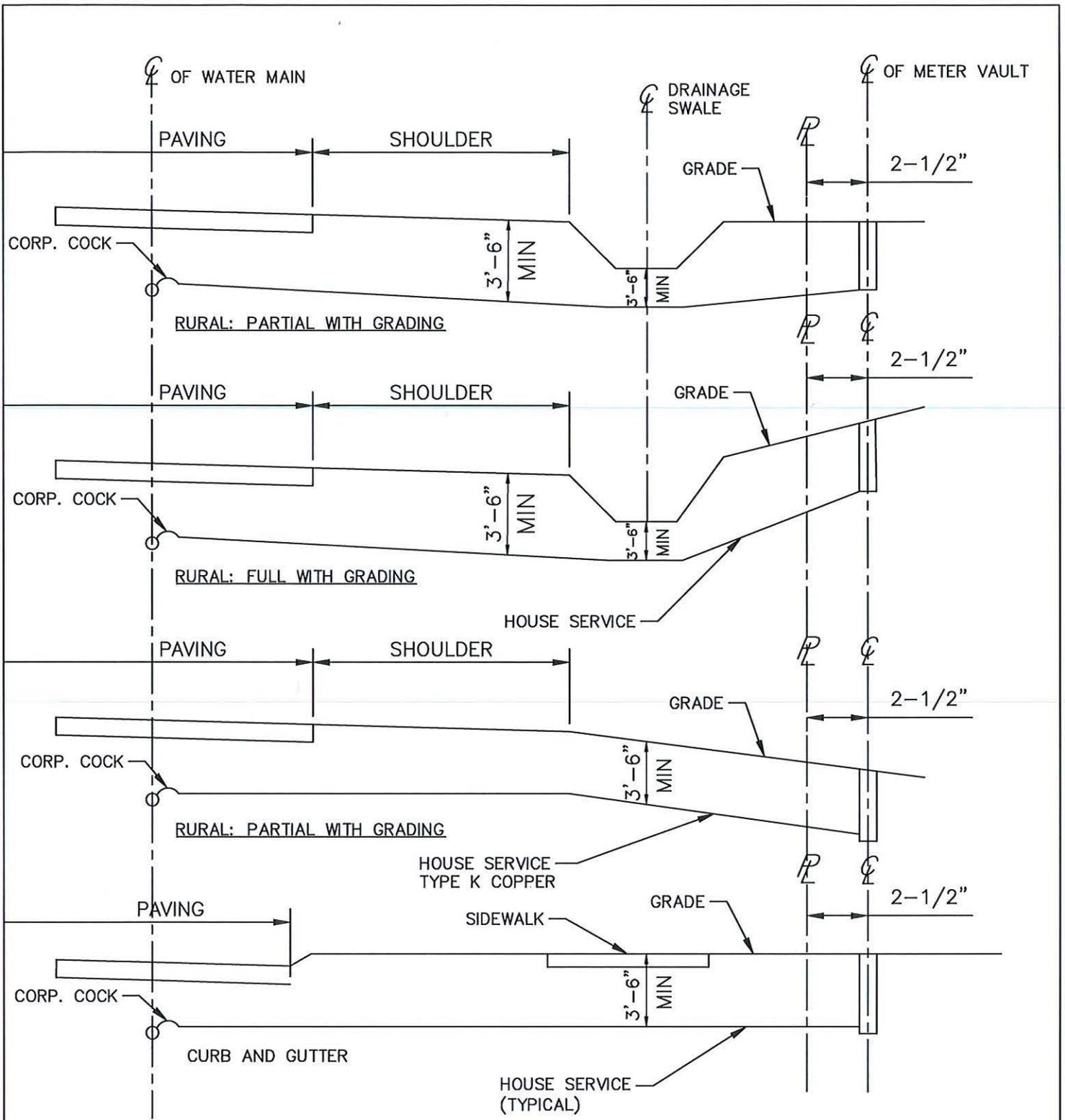
PROVIDE TOP SLAB WITH REMOVABLE SECTION AS PER DETAIL.

- NOTES:**
1. REINFORCING STEEL TO BE DESIGNED FOR MIN. H-20 LOADING.
 2. PROVIDE A MIN. OF EIGHT DIAMETERS OF STRAIGHT PIPE AT INLET END OF INSTALLATION.
 3. 1", 1-1/2", 2" BY-PASS LINES TO BE COPPER TYPE "K" AND PLACED INSIDE VAULT, ALL OTHERS OUTSIDE VAULT.
 4. FOR THE 2' METER USE COPPER TUBING, 2"x1" COPPER TEE, COPPER TO IRON THREAD ADAPTORS, BRASS VALVES, BRASS PIPE NIPPLES, AND CONNECT TO METER W/ CLASS 125 FLANGES.
 5. ALL JOINTS SHALL HAVE A FLEXIBLE GASKET, BE PARGED WITH NON-SHRINK GROUT AND WATERPROOFED WITH A BITUMINOUS COATING, CONFORMING TO MIL-P-23236 P CLASS 2.
 6. PROVIDE MH FRAME AND COVER WITH 30" DIA.
 7. STANDON ADJUSTABLE PIPE SUPPORT MODEL 5-89 AS MFG. BY MATERIAL RESOURCES, OR EQUAL.
 8. ALL VAULT DIMENSIONS ARE MINIMUM.
 9. DRAWINGS ARE NOT TO SCALE.
 10. MECHANICAL JOINT RESTRAINT MAY BE USED TO NEGATE NEED FOR CONCRETE THRUST BLOCKS. FINAL DETERMINATION SHALL BE MADE BY DEPARTMENT OF ENGINEERING AND PLANNING.

Town of Thurmont Public Works Department Frederick County, MD	Revisions			3",4",6",8" AND 10" Compound and Detector Meter Installation		
	Date	Notes		Approved By:	Date	DETAIL NO.
					March 2020	212.1

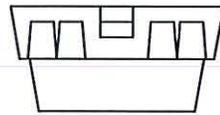
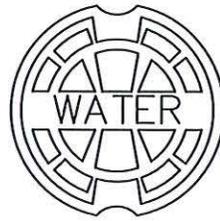
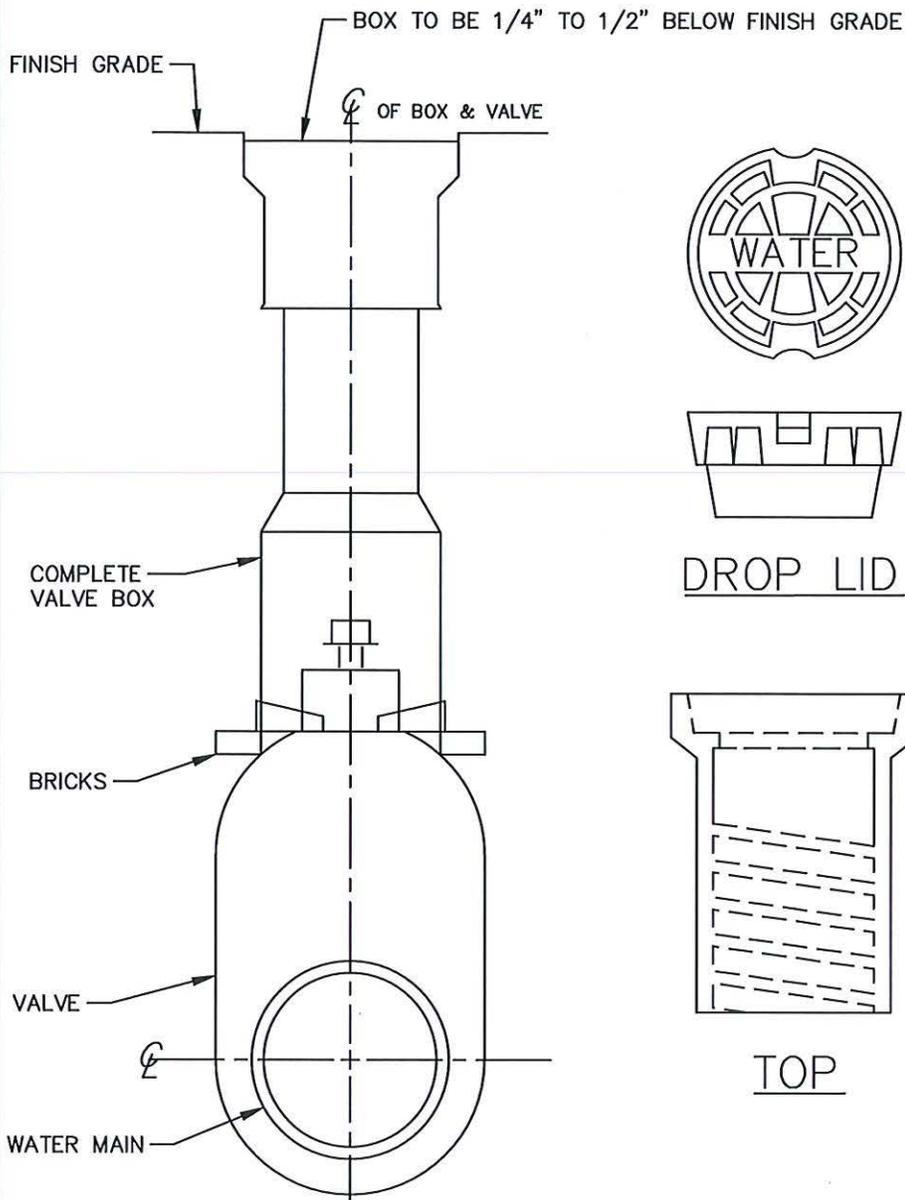


Town of Thurmont Public Works Department Frederick County, MD	Revisions			METER VAULT LADDER WITH SUPPORT EXTENSION		
	Date	Notes		Approved By:	Date	DETAIL NO. 212.2

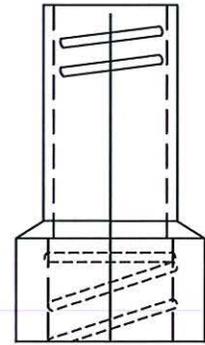


1. HOUSE SERVICE SHALL BE TYPE K COPPER PIPE.
2. METER VAULT SHALL BE PROVIDED WITH A PLUG OR CAP UNLESS HOUSE IS CONNECTED IMMEDIATELY.
3. 1 1/2" & 2" LINES REQUIRE TAPPED TEE AT MAIN LINE.

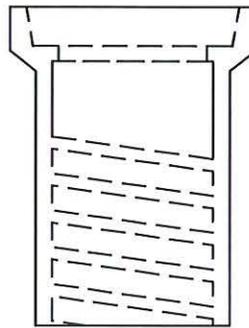
Town of Thurmont Public Works Department Frederick County, MD	Revisions			3/4", 1", 1-1/2", & 2" WATER HOUSE CONNECTIONS		
	Date	Notes		Approved By:	Date	DETAIL NO. 213.1



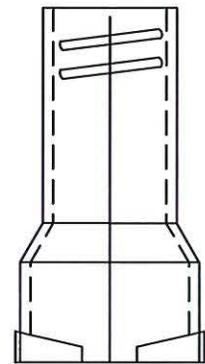
DROP LID



EXTENSION



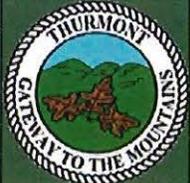
TOP

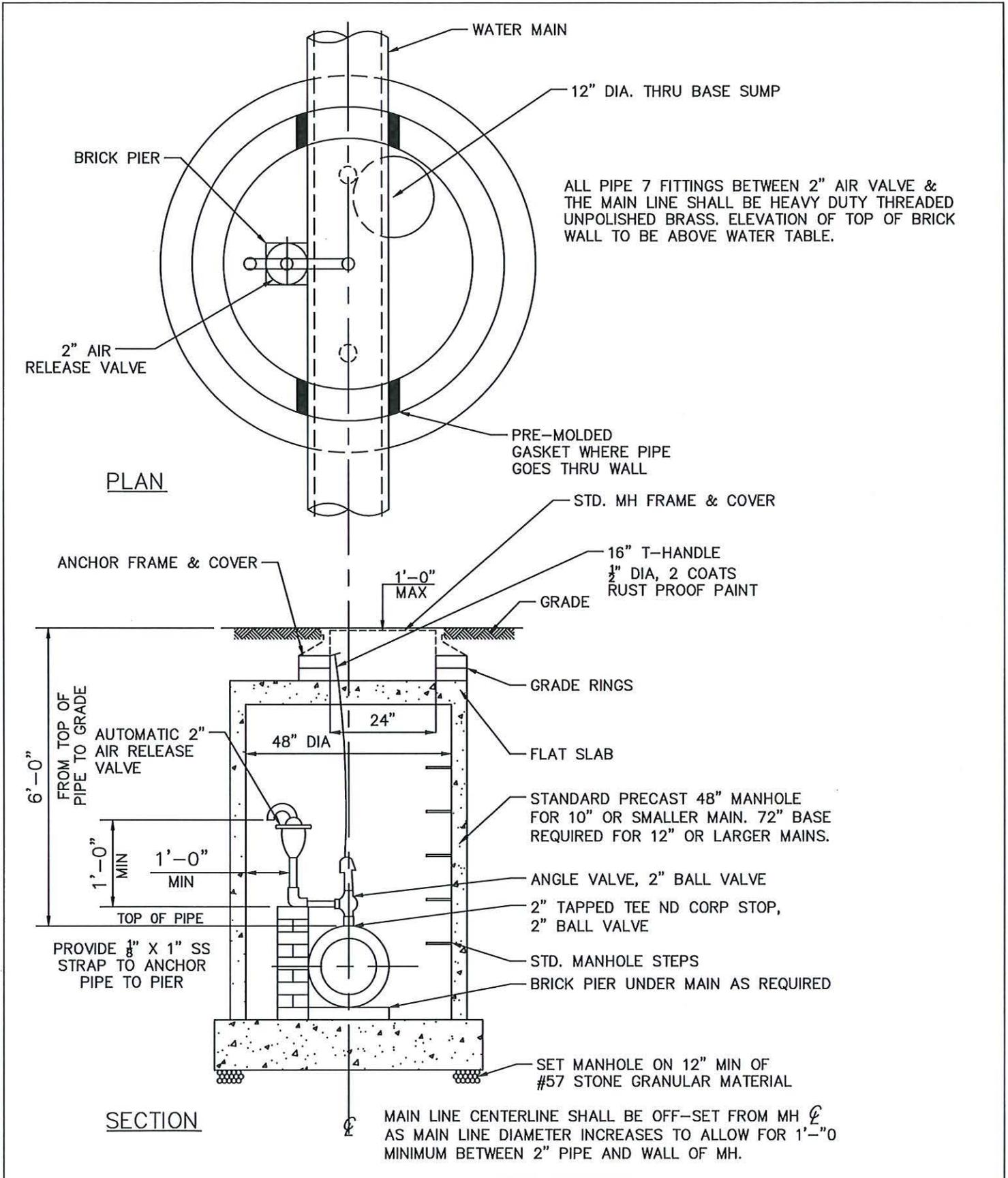


BOTTOM

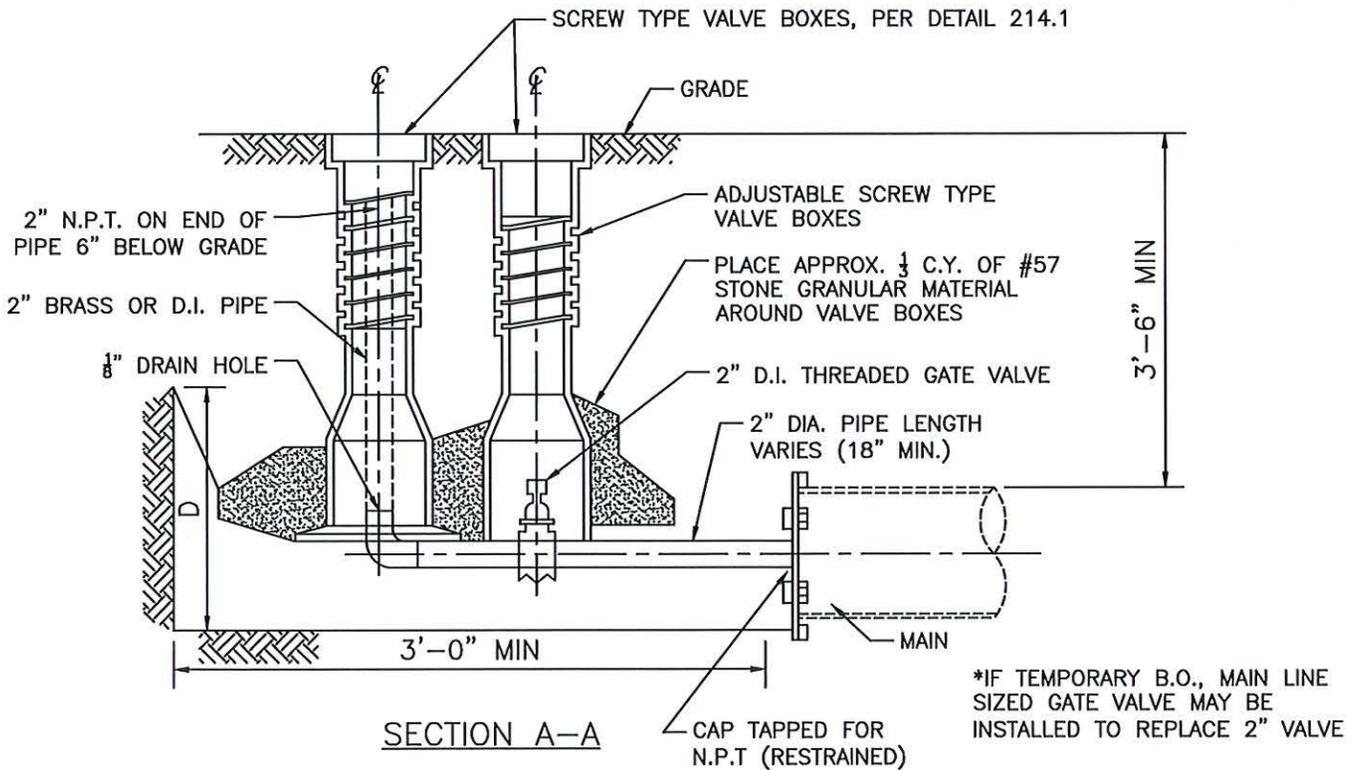
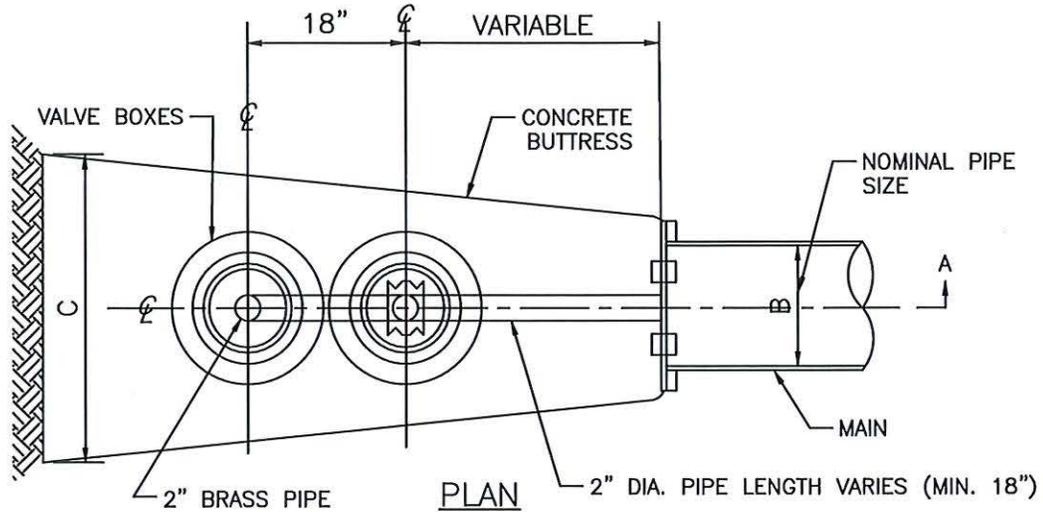
Notes:

1. VALVE BOX BASES SHALL BE SIZED AND INSTALLED SO THAT VALVE BOX CAN NOT TRANSFER LOADS TO VALVES. PLACE BASE ON BRICKS.
2. VALVE BOX SHALL BE ADJUSTED TO FINISHED GRADE TO ALLOW FUTURE 6" ADJUSTMENT UP OR DOWN.
3. VALVE BOXES SHALL BE CAST IRON, SCREW TYPE WITH 5-1/4" SHAFT BY TYLER PIPE, GENERAL ENGINEERING OR EQUAL.

Town of Thurmont Public Works Department Frederick County, MD	Revisions			VALVE BOXES FOR WATER MAINS		
	Date	Notes		Approved By:	Date	DETAIL NO. 214.1



Town of Thurmont Public Works Department Frederick County, MD	Revisions			2" Air Release Valve In MH for 24" & Smaller Water Mains	
	Date	Notes		Approved By:	Date

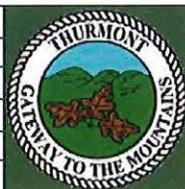


TO UNDISTURBED GROUND (LIMIT OF MEASUREMENT FOR PAYMENT).
 CONCRETE SHALL BE MIXED NO.1.

BUTTRESS DIMENSIONS IN INCHES						
B	4	6	8	10	12	16
C	17	17	23	29	34	45
D	10	12	16	20	24	32

Town of Thurmont
 Public Works
 Department
 Frederick County, MD

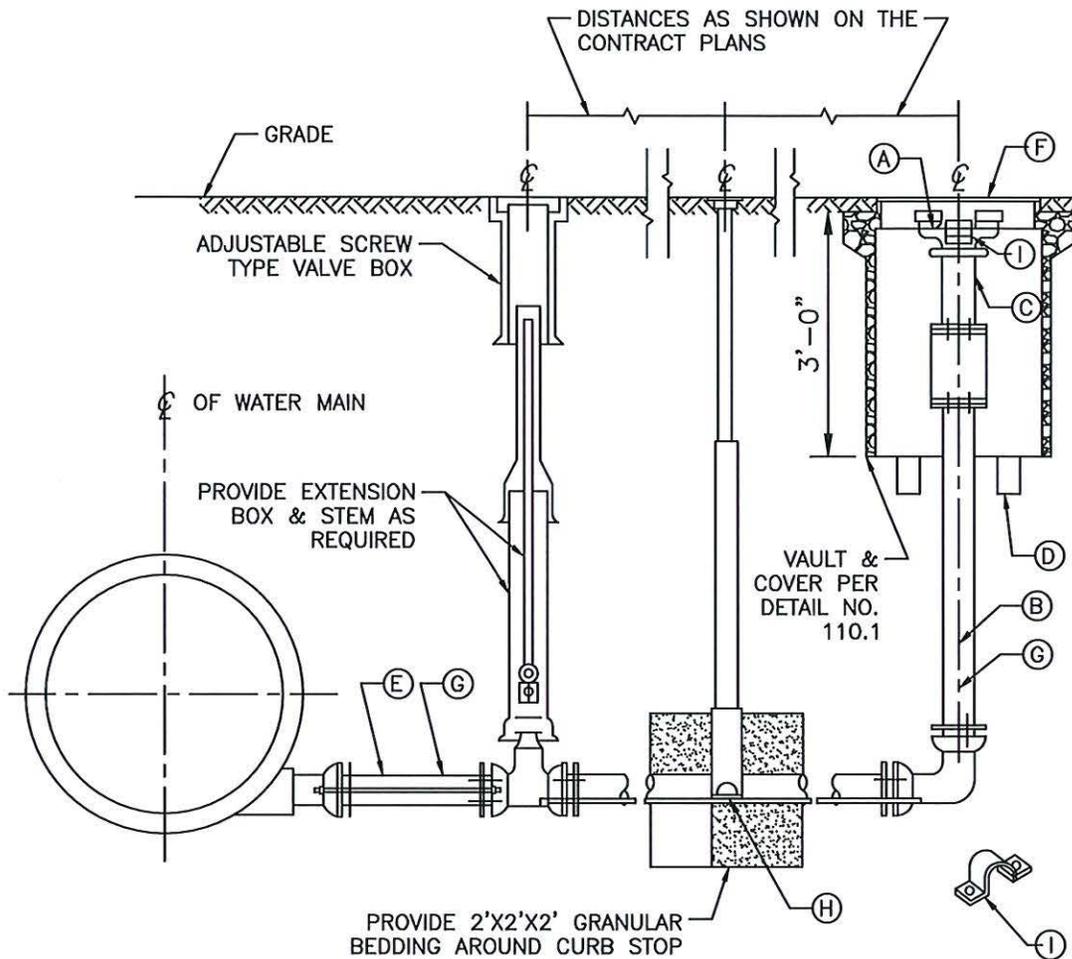
Revisions	
Date	Notes



Cap and Blow-Off at End of Main
 Modified

Approved By: _____ Date: March 2020

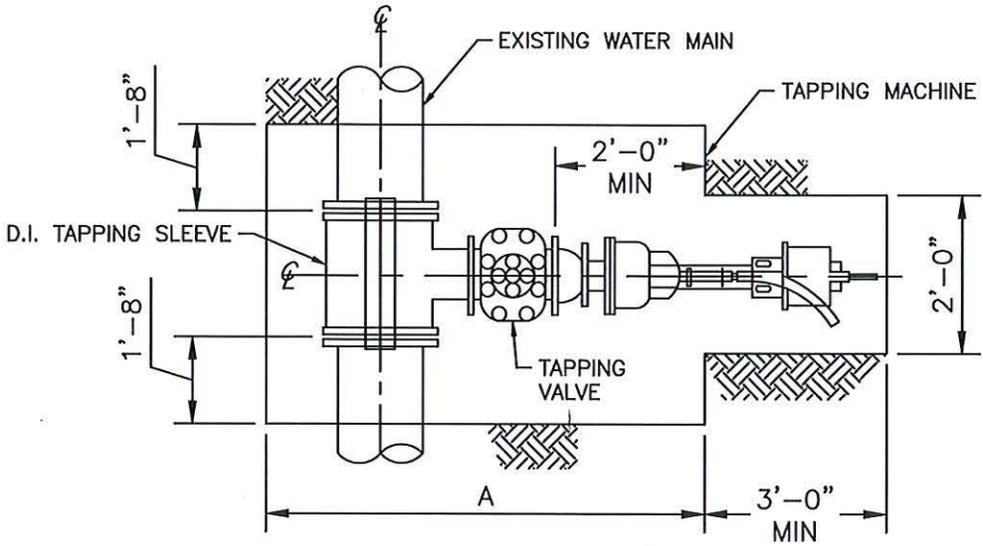
DETAIL NO. 216.1



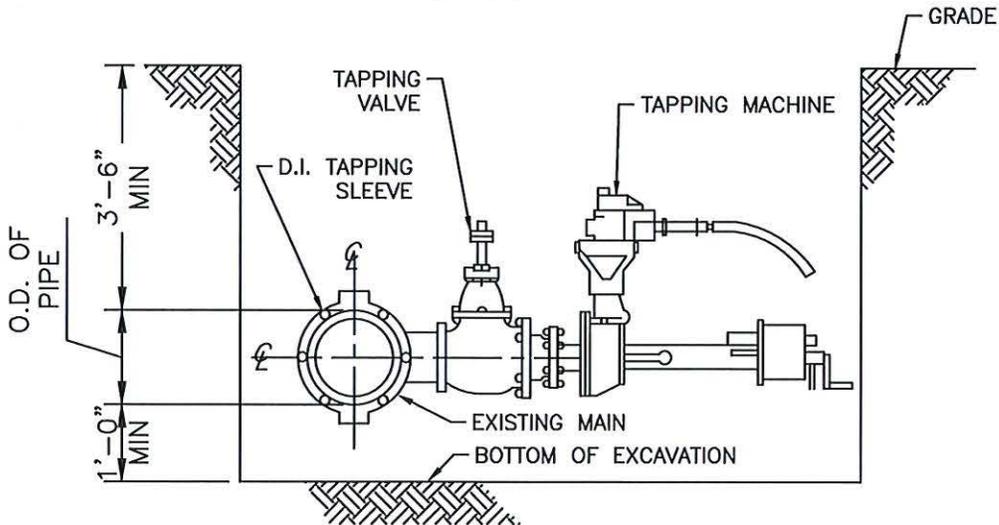
- (A) 2-1/2" X 2-1/2" X 4" STRAIGHT BODY SLAMESE CONNECTION—INSTALL WITHOUT DAPPERS.
- (B) STRAP SLAMESE CONNECTION TO BELL OF BEND WITH TWO 3/4" DIA. STAINLESS STEEL BARS AND STRAP I.
- (C) 1'-3" LONG - 4" STAINLESS STEEL PIPE, 4-1/2" O.D. SCHEDULE 40 WITH ONE END PLAIN AND ONE END THREADED TO MATCH THREAD ON SLAMESE CONNECTION.
- (D) 2-PRESSURE TREATED (RATED FOR GROUND CONTACT) OAK 2X6'S SPIKED TOGETHER SHALL EXTEND A MIN. OF 18" ON EACH SIDE BEYOND THE LIMITS OF THE TRENCH TO FIRM BEARING.
- (E) STRAP VALVE AND 90° BEND TO MAIN LINE USING 3/4" STAINLESS STEEL BARS OR RETAINER GLANDS PER DETAIL NO. 207.1.
- (F) SLAMESE CONNECTION HOUSING TO BE LOCATED OUTSIDE OF PRESENT OR PROPOSED TRAFFIC BEARING AREA.
- (G) PAINT ALL EXPOSED STEEL SURFACES WITH 2 COATS OF BITUMINOUS PAINT PER MIL-P-23236P, CL.2.
- (H) 3/4" CORP, COCK, SHORT COPPER NIPPLE AND CURB STOP WITH CURB BOX AND CUT-OFF STEM TO GROUND SURFACE AS REQUIRED TO DRAIN PIPE.
- (I) 2-1/2" WIDE X 1/4" THICK STAINLESS STEEL STRAP BENT TO CONFORM TO THE SLAMESE CONNECTION.

Town of Thurmont Public Works Department Frederick County, MD	Revisions			BLOWOFF FOR 30" OR 36" WATER MAINS			
	Date	Notes		Approved By:	Date	DETAIL NO.	
						MARCH 2020	216.2

MAIN DIA.	4"	6"	8"	10"	12"	14"	16"	18"	20"
A (MIN)	4'-10"	5'-3"	5'-6"	5'-9"	6'-0"	6'-2"	6'-9"	7'-3"	7'-6"



PLAN



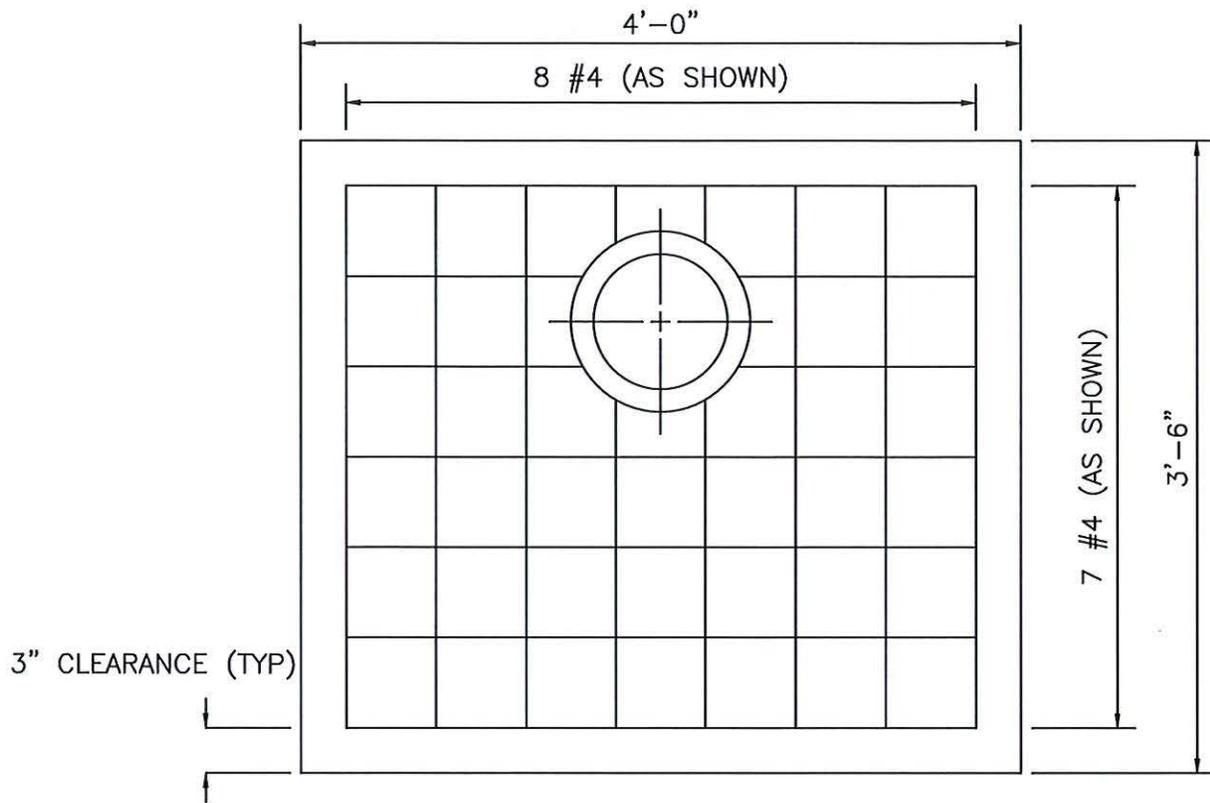
AFTER TAPPING, BUTTRESS PER DETAIL NO.203.1

ELEVATION

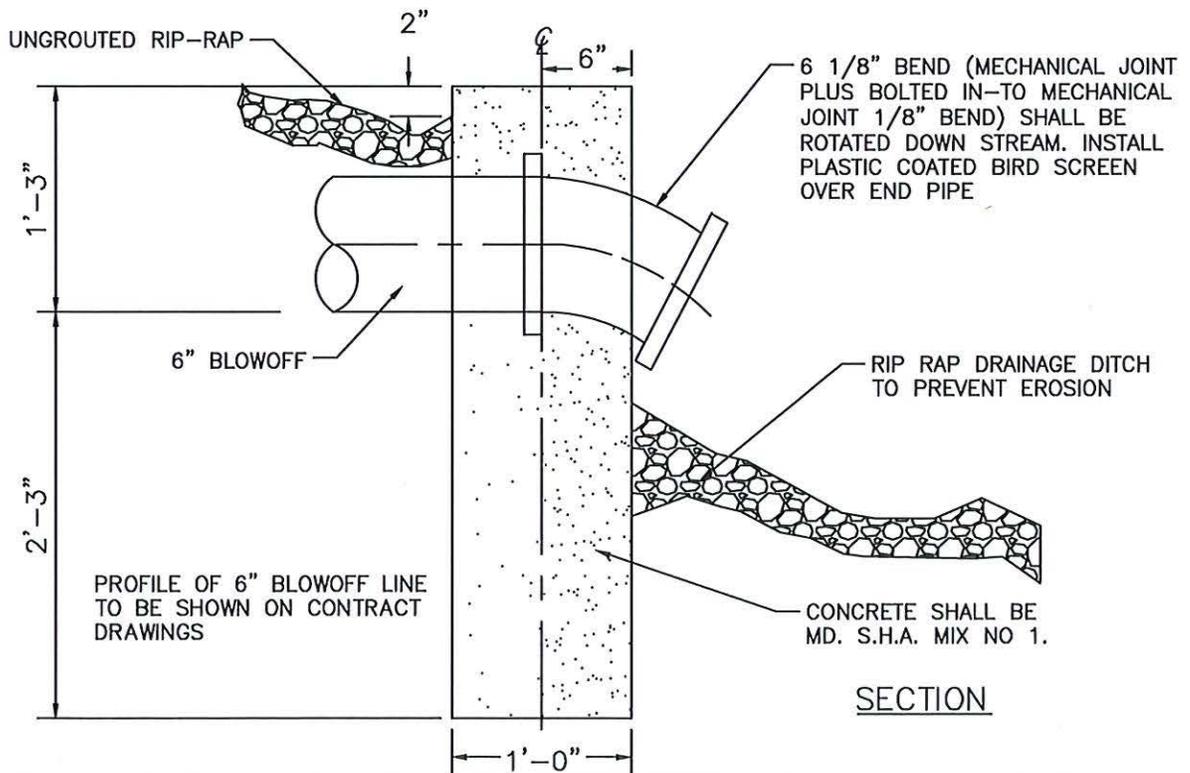
NOT TO SCALE

NOTE: NO STAINLESS STEEL

Town of Thurmont Public Works Department Frederick County, MD	Revisions			Tapping Sleeve and Valve Installation		
	Date	Notes		Approved By:	Date	DETAIL NO.
					MARCH 2020	217.1

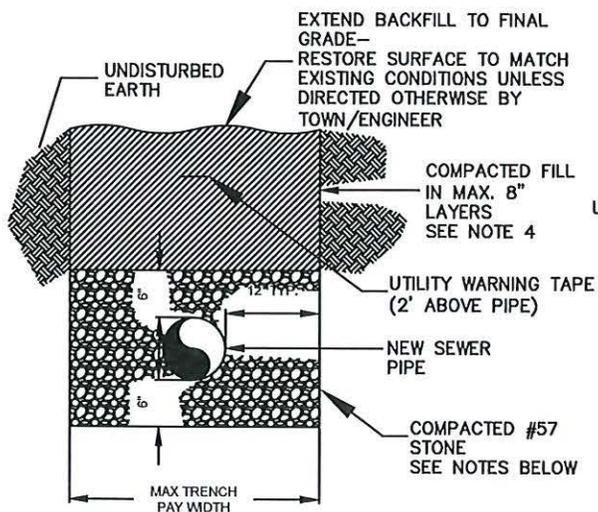


ELEVATION

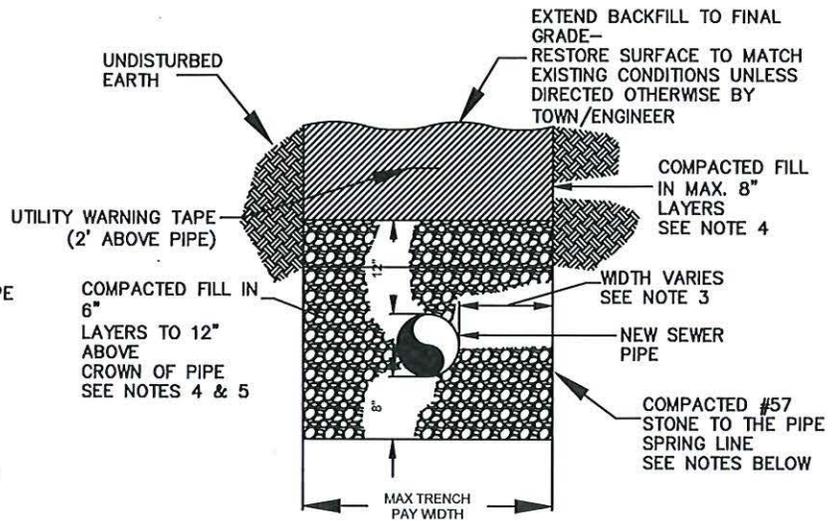


SECTION

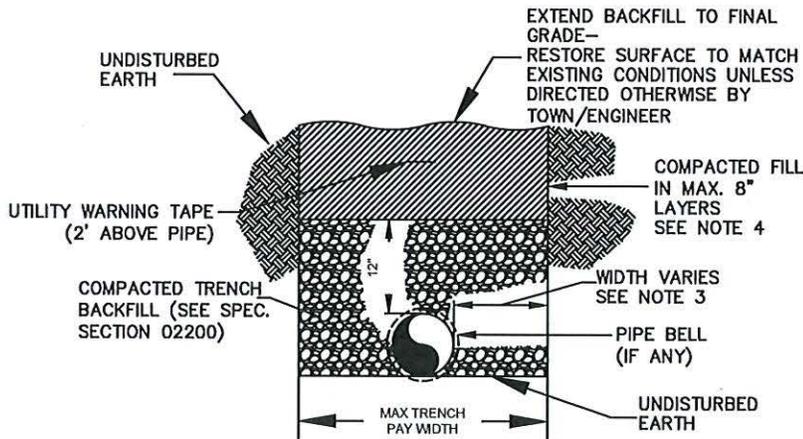
Town of Thurmont Public Works Department Frederick County, MD	Revisions			Endwall For 6" Blowoff		
	Date	Notes		Approved By:	Date	DETAIL NO.



**FOR SERVICE LATERALS
(4" & 6" PIPE, ANY PIPE MATERIALS)**



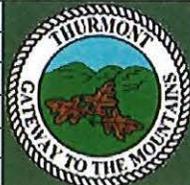
**FOR 8" AND LARGER
SEWER PIPE**

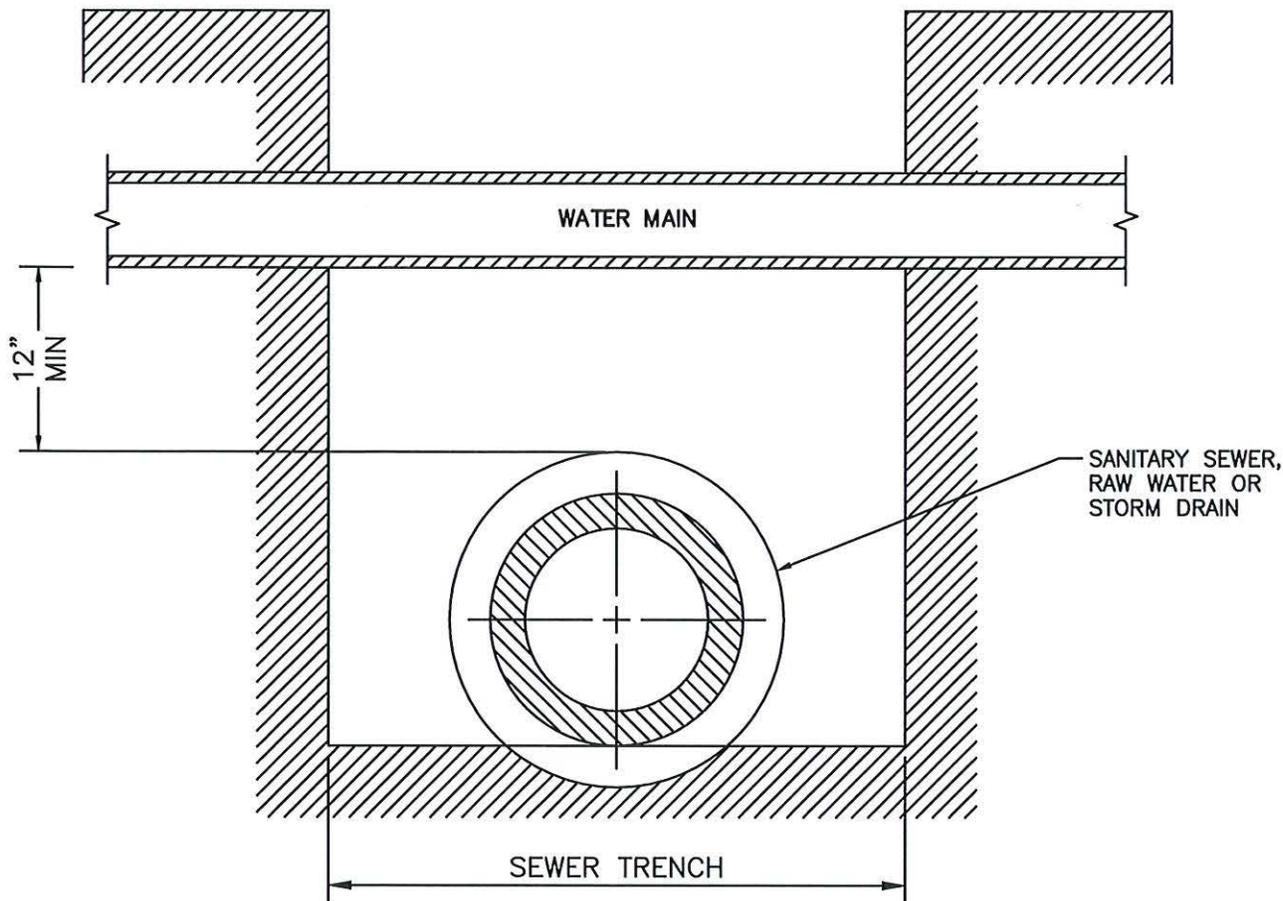


**FOR D.I.P.
WATER MAIN**

NOTES:

1. PIPE BEDDING DETAIL APPLIES TO ALL NEW WATER & SEWER PIPES INSTALLED.
2. THE CONTRACTOR SHALL USE A TRENCH BOX OR SHEETING AND SHORING IN ACCORDANCE WITH OSHA REGULATIONS WHILE INSTALLING NEW SEWERS. THE CONTRACTOR WILL NOT BE ALLOWED TO SLOPE TRENCH WALLS.
3. TRENCH WIDTH SHALL BE LIMITED TO AND THE CONTRACTOR SHALL ONLY BE PAID FOR THE FOLLOWING UNLESS OTHERWISE APPROVED PRIOR TO THE START OF WORK IN WRITING BY TOWN/ENGINEER:
 - 4" AND 6" PIPE - 12" EACH SIDE
 - 8" TO 15" PIPE - 15" EACH SIDE
 - 16" TO 30" PIPE - 18" EACH SIDE
4. IN GRASSED AREAS, COMMON FILL MAY BE USED AS BACKFILL. IN MD SHA, COUNTY AND TOWN PAVED ROADS, CR-6 SHALL BE IMPORTED AND USED AS BACKFILL. TRENCHES THAT LEAVE ANY ROADWAY SHALL BE BACKFILLED WITH CR-6 TO 12" BEYOND ANY ASPHALT/CONCRETE WORK. REMOVE ALL EXCAVATED MATERIAL AND DISPOSE OFFSITE.
5. COMPACTION OF STONE AND COMMON FILL TO 12" ABOVE PIPE TO BE WITH "JUMPING JACK" HAND MECHANICAL TAMPS ONLY.
6. MAINTAIN GROUND WATER LEVEL AT LEAST 1 FOOT BELOW TRENCH BOTTOM OF THE STONE BEDDING AT ALL TIMES.
7. IN ROCK, REDUCE STONE BEDDING UNDER PIPE AND STRUCTURES TO 6 INCHES.

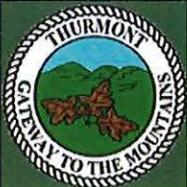
Town of Thurmont Public Works Department Frederick County, MD	Revisions			Typical Trench for Sewer or Water Lines		
	Date	Notes		Approved By:	Date	DETAIL NO.
					March 2020	219.1



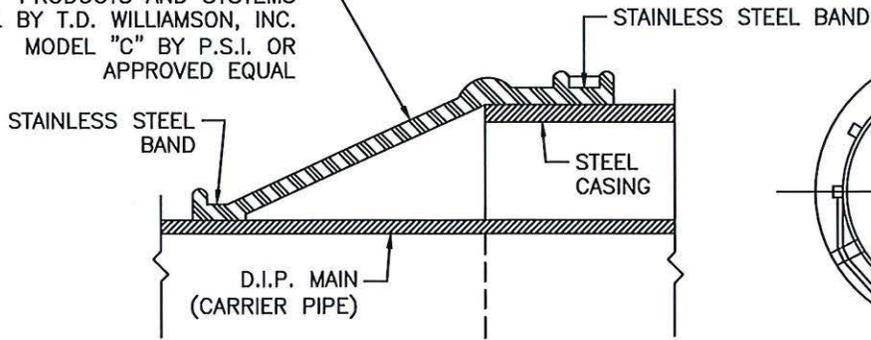
SECTION

NOTES:

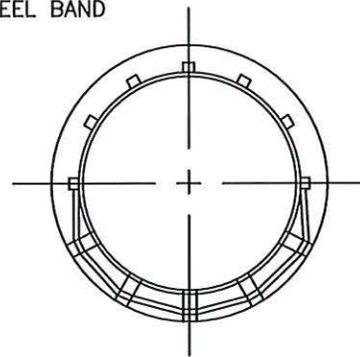
1. IF CLEARANCE IS LESS THAN 12 INCHES – ENCASE THE LOWER OF THE TWO PIPE LINES IN CONCRETE 10 FEET MINIMUM EACH SIDE OF CROSSING. CONCRETE SHALL EXTEND TO THE FACE OF THE BELLS AT BOTH ENDS OF THE ENCASEMENT
2. IF JOINT ON EXPOSED EXISTING WATER MAIN IS WITHIN THE LIMITS OF NEWLY CONSTRUCTED SEWER TRENCH, A BELL CLAMP JOINT SHALL BE PROVIDED ON THE MAIN WATER JOINT
3. IF WATER MAIN IS BELOW SANITARY SEWER LINE, ENCASEMENT IS REQUIRED AS PER NOTE NO. 1 ABOVE, REGARDLESS OF CLEARANCE. AN ALTERNATIVE TO THE ABOVE ENCASEMENT IS THE USE OF 20 FOOT LENGTHS OF PIPE SO THAT NO JOINT IS WITHIN 10 FEET OF CROSSING.

Town of Thurmont Public Works Department Frederick County, MD	Revisions			Water and Sewer Line Crossing		
	Date	Notes		Approved By:	Date	DETAIL NO.

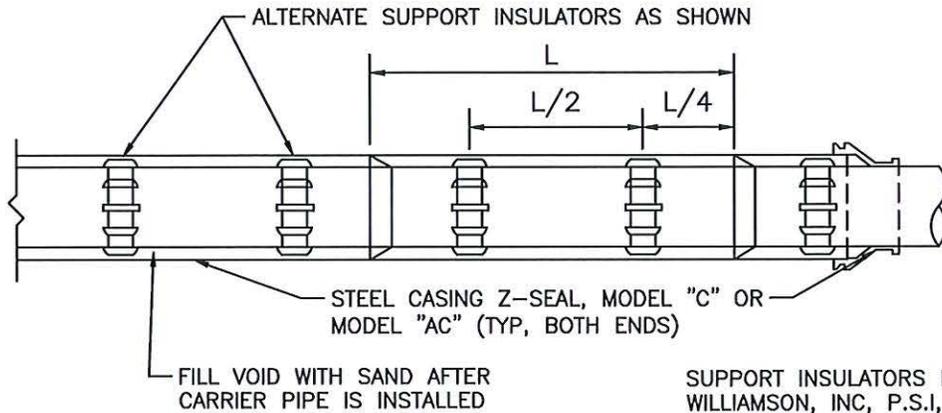
MODEL "AC" BY ADVANCED PRODUCTS AND SYSTEMS
Z-SEAL BY T.D. WILLIAMSON, INC.
MODEL "C" BY P.S.I. OR APPROVED EQUAL



END SEAL INSTALLATION



SECTION A-A



SUPPORT INSULATORS BY T.D. WILLIAMSON, INC, P.S.I, OR ADVANCED PRODUCTS (TWO PIPES PER SECTION)

LOCATION OF INSULATORS

NOMINAL DIAMETERS IN INCHES

MAIN DIAMTER D.I.P.	MIN. STEEL CASING DIAMETER	
	PUSH JOINT D.I.P.	MECH. JOINT D.I.P.
3	10	12
4	10	12
6	12	16
8	16	18
10	18	20
12	20	24
14	24	24
16	30	30
18	30	30
20	30	36
24	36	36

CASING SHALL CONFORM TO AWWA C200. MIN. WALL THICKNESS SHALL BE 3/8".

DUCTILE IRON CARRIER PIPE SHALL BE COATED IN ACCORDANCE WITH AWWA C-104.

ALL CARRIER PIPE JOINTS SHALL BE RESTRAINED WITHIN CASING.

Town of Thurmont
Public Works
Department
Frederick County, MD

Revisions	
Date	Notes

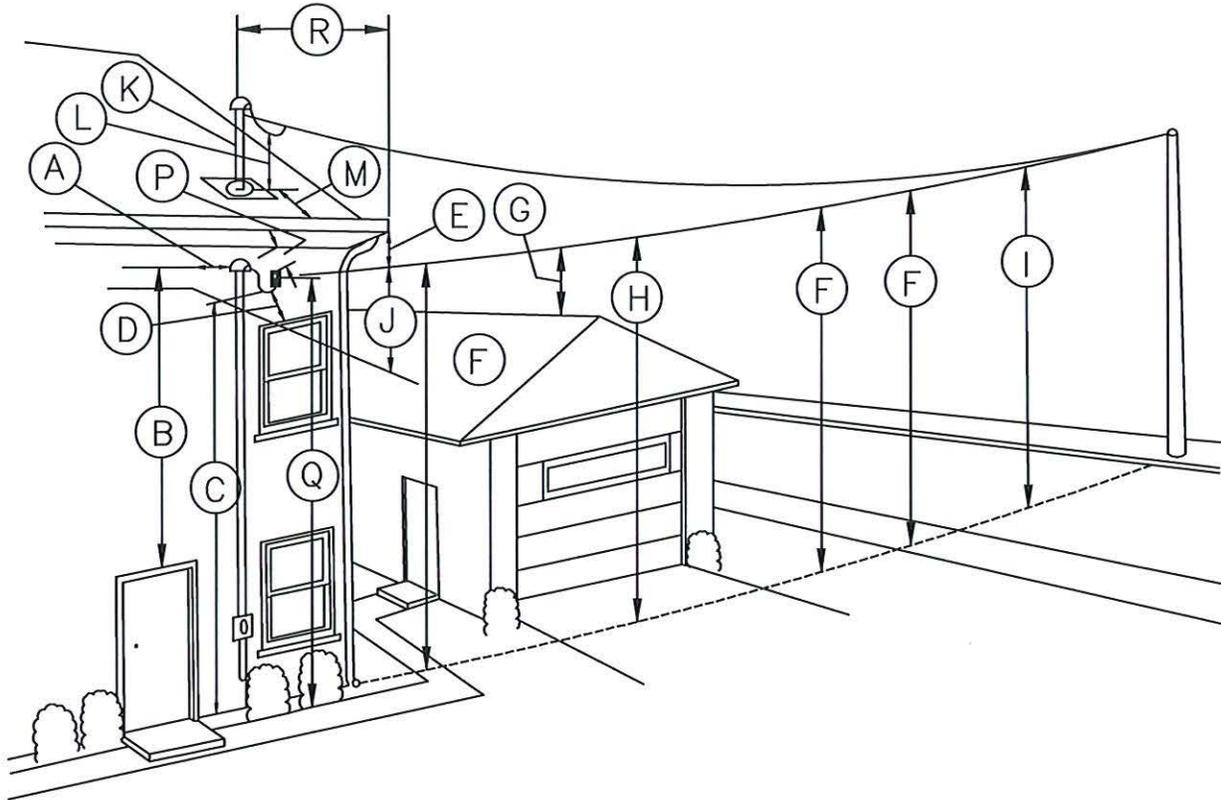


Casing for D.I.P. Main under Highways and Railroads

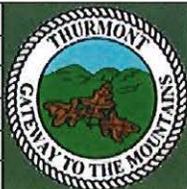
Approved By: _____ Date: MARCH 2020

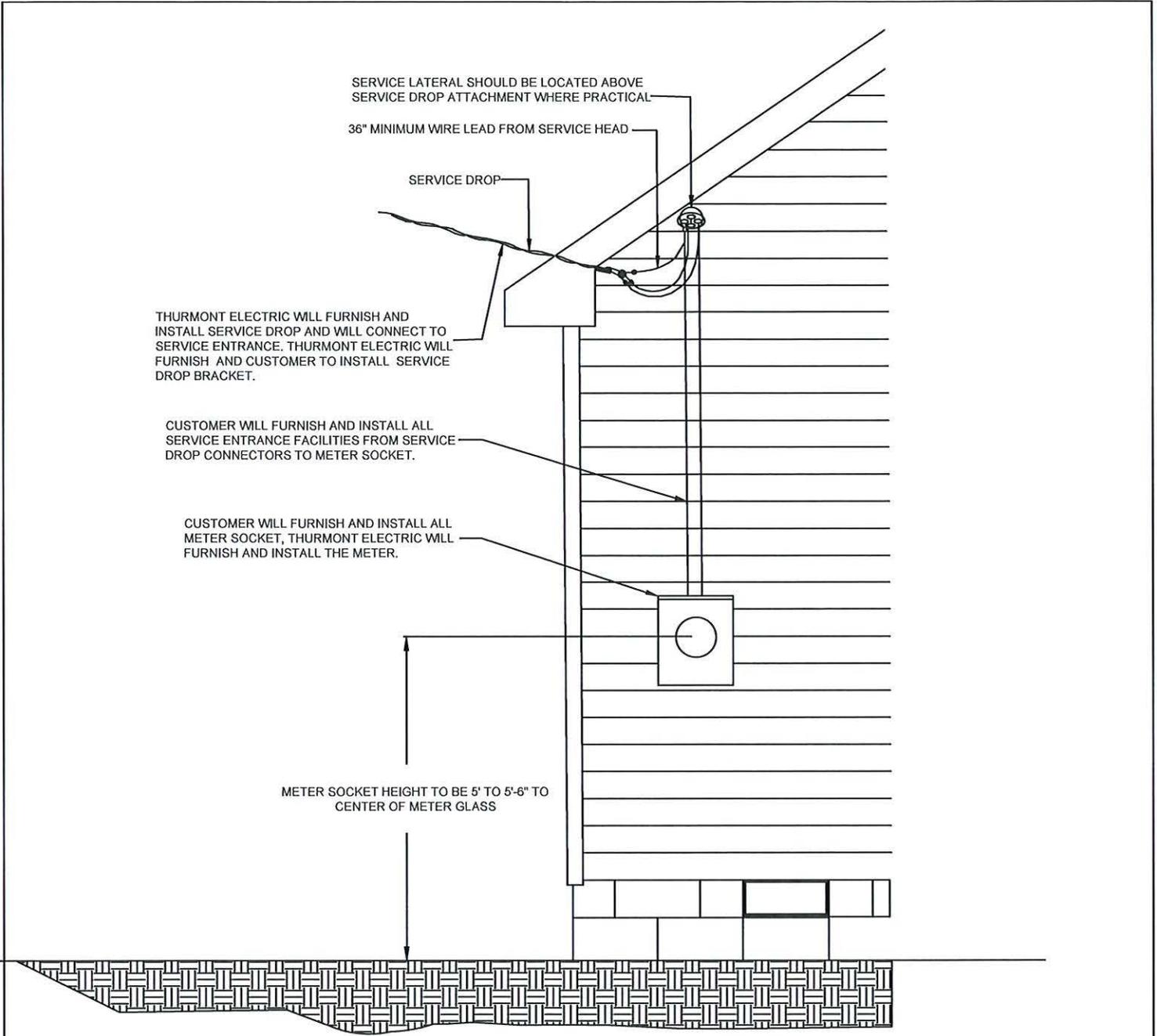
DETAIL NO. 223.1

FIGURE 1
SERVICE DROP CLEARANCE MINIMUMS
FOR SERVICES UNDER 600V



A	TELEPHONE SERVICE AT POINT OF ATTACHMENT	12"
B	DOORS, PORCHES, FIRE ESCAPES AND SIMILAR LOCATIONS	3'
C	LOWEST POINT OF DRIP LOOP: MULTIPLEX OPEN WIRE TO 300V TO GROUND	10'
D	WINDOWS: BESIDE AND BELOW ABOVE WINDOW	12' 3' 4'
E	GUTTERS AND DOWNSPOUTS	3'
F	SIDEWALKS AND FINISHED GRADE: MULTIPLEX OPEN WIRE TO 300V TO GROUND	12' 12.5'
G	REFER TO SECTION 4.3 FOR CONDUCTORS NOT ATTACHED TO BUT CROSS OVER BUILDINGS	--
H	RESIDENTIAL DRIVEWAYS	16'
I	PUBLIC STREETS, ALLEY, PUBLIC PARKING LOT AND AREAS SUBJECT TO TRUCK TRAFFIC	18'
J	TELEPHONE SERVICE DROP AT CROSSING	2'
K	OPTIONAL METHOD BY USE OF MOST. CONDUIT COUPLING MUST BE LOCATED NEAR METER SOCKET. ONLY POWER SERVICE DROP CONDUCTORS SHALL BE ATTACHED TO MAST.	18"
L	OVERHANGING ROOF: IF SERVICE OVERHANG (R) 6' OR LESS AND "M" IS 4' OR LESS	3'
M	DISTANCE FROM SERVICE MAST TO EDGE OF ROOF (SEE DIMENSION "L")	
P	POINT OF ATTACHMENT SHALL NOT BE HIGHER THAN THE WEATHERHEAD	
Q	SERVICE DROP ATTACHMENT	12'
R	SERVICE OVERHANG OF ROOF (SEE DIMENSIONS "L")	--

Town of Thurmont Public Works Department Frederick County, MD	Revisions			SERVICE DROP CLEARANCE MINIMUMS FOR SERVICES UNDER 600V		
	Date	Notes		Approved By:	Date	FIGURE 1



THURMONT ELECTRIC WILL FURNISH AND INSTALL SERVICE DROP AND WILL CONNECT TO SERVICE ENTRANCE. THURMONT ELECTRIC WILL FURNISH AND CUSTOMER TO INSTALL SERVICE DROP BRACKET.

CUSTOMER WILL FURNISH AND INSTALL ALL SERVICE ENTRANCE FACILITIES FROM SERVICE DROP CONNECTORS TO METER SOCKET.

CUSTOMER WILL FURNISH AND INSTALL ALL METER SOCKET, THURMONT ELECTRIC WILL FURNISH AND INSTALL THE METER.

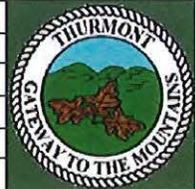
METER SOCKET HEIGHT TO BE 5' TO 5'-6" TO CENTER OF METER GLASS

NOTES:

1. CUSTOMERS MUST CONSULT WITH THURMONT ELECTRIC FOR POINT OF ATTACHMENT OF THE SERVICE DROP AND METER LOCATION.
2. ALL CUSTOMERS WORK MUST BE COMPLETED AND REQUIRED INSPECTIONS BE OBTAINED BEFORE THURMONT ELECTRIC WILL PROVIDE SERVICE.
3. SERVICE DROP POINT OF ATTACHMENT MUST BE OF SUFFICIENT HEIGHT TO MEET THE FOLLOWING MINIMUM SERVICE DROP CLEARANCES.
 - a. TWELVE FEET (12') FROM MULTIPLEX SERVICE ABOVE SIDEWALKS AND FINISHED GRADES.
 - b. TWELVE FEET (12') FOR OPEN WIRE SERVICES ABOVE SIDEWALKS AND FINISHED GRADES.
 - c. FIFTEEN FEET (15') OVER RESIDENTIAL DRIVEWAYS.
 - d. EIGHTEEN FEET (18') OVER PUBLIC STREETS, ALLEYS, ROADS, PARKING LOTS, AND DRIVEWAYS ON OTHER THAN RESIDENTIAL PROPERTY.
 - e. TWO FEET (2') CLEARANCE FROM TELEPHONE AND CATV WIRES AT MID-SPAN CROSSINGS,
4. INHIBITOR COMPOUND SHALL BE USED ON ALL ALUMINUM WIRE TERMINATIONS.

Town of Thurmont
Public Works Department
Frederick County, MD

Revisions	
Date	Notes



TYPICAL 320 AMP OR LESS OVERHEAD SERVICE INSTALLATION

Approved By:	Date	FIGURE 2

36" MINIMUM WIRE LEAD FROM SERVICE HEAD
 SERVICE DROP
 * -18" MOUNTING HEIGHT (WHERE CODE WITH PERMIT)
 48" MAX WITHOUT GUYING OR BRACING

THURMONT ELECTRIC WILL FURNISH AND INSTALL SERVICE DROP AND WILL CONNECT TO SERVICE ENTRANCE. THURMONT ELECTRIC WILL FURNISH AND CUSTOMER TO INSTALL SERVICE DROP BRACKET.

CUSTOMER WILL FURNISH AND INSTALL ALL SERVICE ENTRANCE FACILITIES FROM SERVICE DROP CONNECTORS TO METER SOCKET.

2 1/2" MINIMUM GALVANIZED RIGID CONDUIT

CUSTOMER WILL FURNISH AND INSTALL ALL METER SOCKETS, THURMONT ELECTRIC WILL FURNISH AND INSTALL THE METER.

METER SOCKET HEIGHT TO BE 5' TO 5'-6" TO CENTER OF METER GLASS

NOTES:

1. CUSTOMERS MUST CONSULT WITH THURMONT ELECTRIC FOR POINT OF ATTACHMENT OF THE SERVICE DROP AND METER LOCATION.
2. ALL CUSTOMERS WORK MUST BE COMPLETED AND REQUIRED INSPECTIONS BE OBTAINED BEFORE THURMONT ELECTRIC WILL PROVIDE SERVICE.
3. SERVICE DROP POINT OF ATTACHMENT MUST BE OF SUFFICIENT HEIGHT TO MEET THE FOLLOWING MINIMUM SERVICE DROP CLEARANCES.
 - a. TWELVE FEET (12') FROM MULTIPLEX SERVICE ABOVE SIDEWALKS AND FINISHED GRADES.
 - b. TWELVE FEET (12') FOR OPEN WIRE SERVICES ABOVE SIDEWALKS AND FINISHED GRADES.
 - c. FIFTEEN FEET (15') OVER RESIDENTIAL DRIVEWAYS.
 - d. EIGHTEEN FEET (18') OVER PUBLIC STREETS, ALLEYS, ROADS, PARKING LOTS, AND DRIVEWAYS ON OTHER THAN RESIDENTIAL PROPERTY.
 - e. TWO FEET (2') CLEARANCE FROM TELEPHONE AND CATV WIRES AT MID-SPAN CROSSINGS,
4. INHIBITOR COMPOUND SHALL BE USED ON ALL ALUMINUM WIRE TERMINATIONS.

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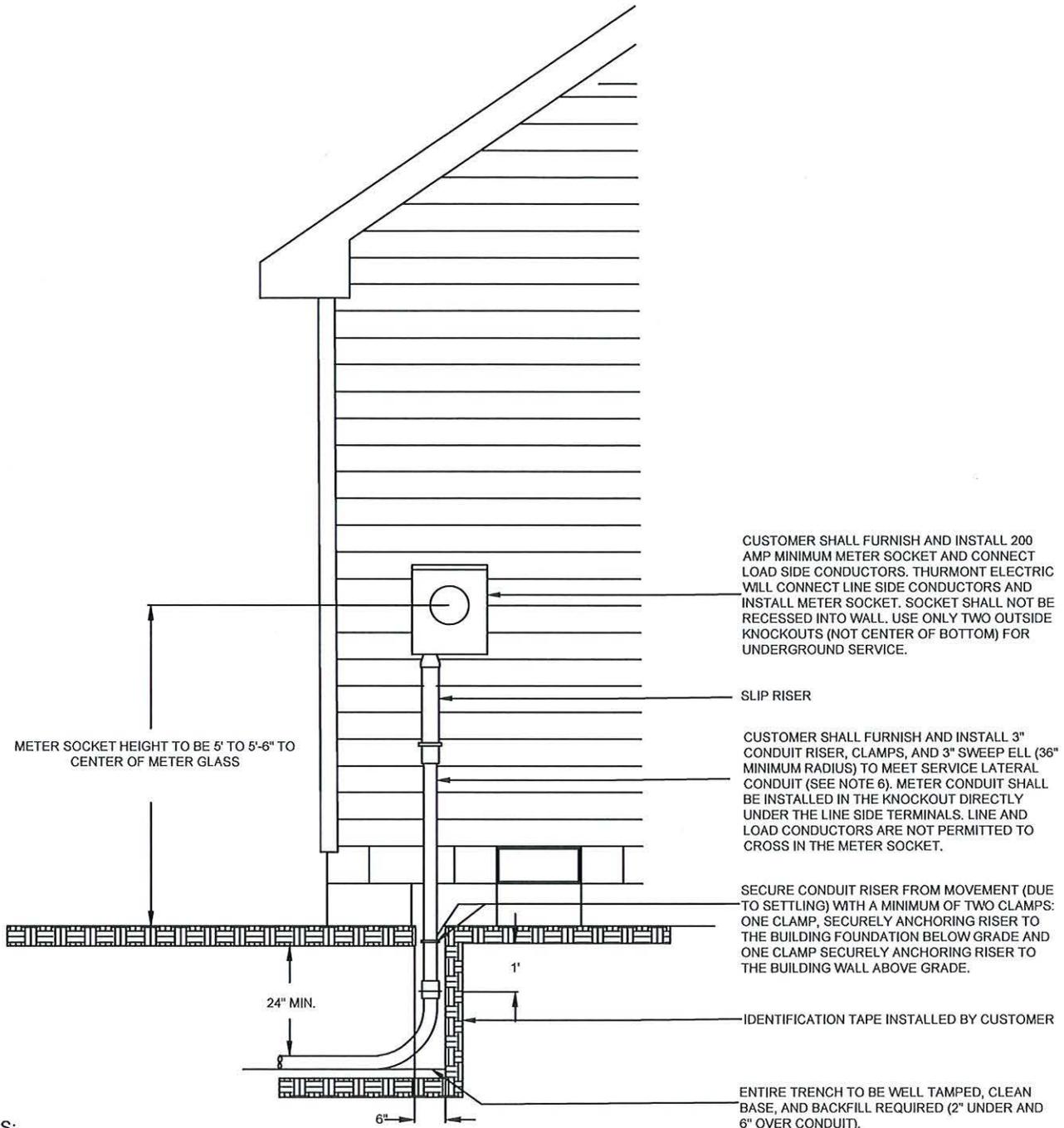
Revisions	
Date	Notes



TYPICAL 320 AMP OR LESS OVERHEAD SERVICE INSTALLATION

Approved By: _____ Date: _____

FIGURE 3



NOTES:

1. CUSTOMERS SHALL CONTACT THURMONT ELECTRIC FOR METER LOCATION. CUSTOMER TO TRENCH AND BACKFILL, FURNISH AND INSTALL CONDUIT WITH 1/4" NYLON PULL ROPE FOR THURMONT ELECTRIC SERVICE LATERAL CONDUCTORS. TRENCH TO BE EXCAVATED IN LOCATION INDICATED BY THURMONT ELECTRIC AND GRADED TO WITHIN 6" OF FINAL GRADE BEFORE SERVICE CONNECTION WILL BE MADE.
2. ALL CUSTOMER WORK MUST BE COMPLETED AND REQUIRED INSPECTIONS BE OBTAINED BEFORE THURMONT ELECTRIC WILL PROVIDE SERVICE.
3. INHIBITOR COMPOUND SHALL BE USED ON ALL ALUMINUM WIRE TERMINATIONS.
4. CONDUIT RISER AND SWEEP ELL SHALL BE 3" SCHEDULE 40 PVC. SERVICE LATERAL CONDUIT SHALL BE 3" SCHEDULE 40 PVC. ALL CONDUITS SHALL BE ELECTRICAL GRADE. CLAMPS SHALL BE SECURELY ANCHORED TO FRAMING TIMBER OR MASONRY.
5. CONDUIT RISER SHALL HAVE WEEP HOLES AT GROUND LINE WHEN REQUIRED.
6. CUSTOMER SHALL PROVIDE 3" SCHEDULE 80 PVC ELL (36" MINIMUM RADIUS) AT TERMINAL POLE OR 3" SCHEDULE 40 PVC SWEEP ELL (36" MINIMUM RADIUS) INTO PAD MOUNTED TRANSFORMER OR HAND-HOLE. SEE FIGURES 16, 29, AND 30 FOR INSTALLATION DETAILS.

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TYPICAL 320 AMP OR LESS UNDERGROUND SERVICE INSTALLATION

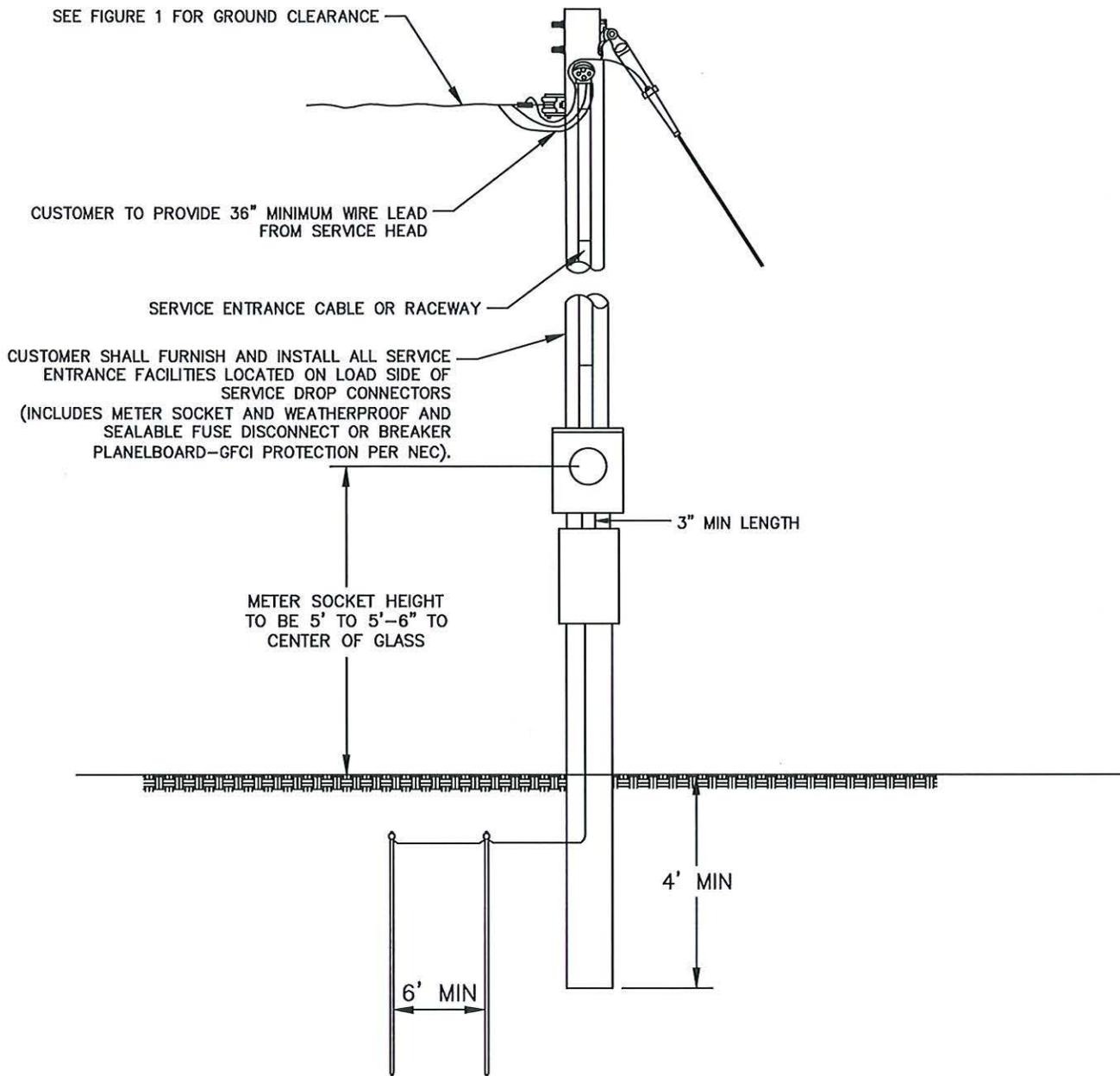
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FIGURE 4

FIGURE 5

TEMPORARY OVERHEAD SERVICE SUPPORT



NOTES:

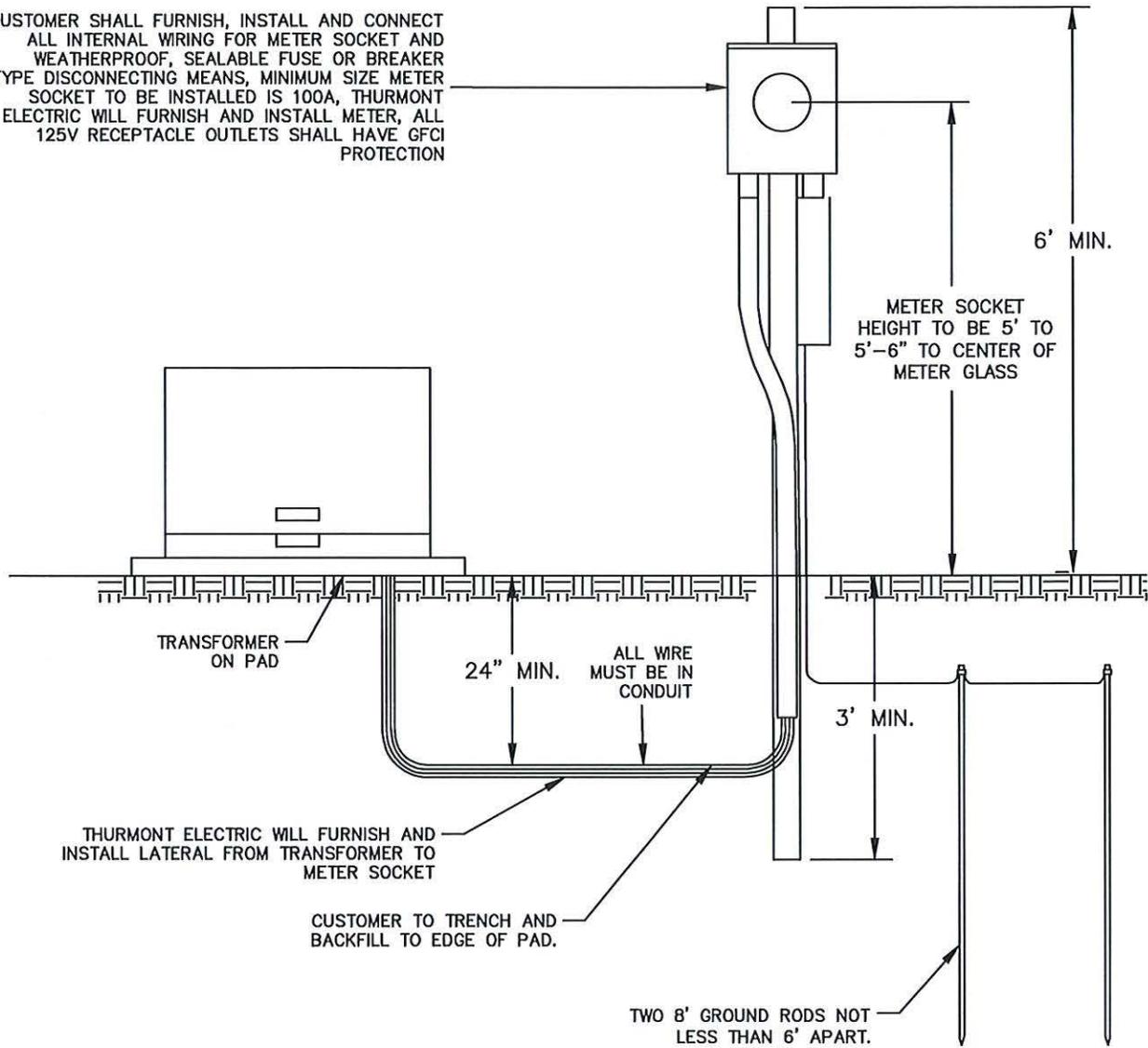
1. CUSTOMER SHALL CONSULT WITH THURMONT ELECTRIC FOR LOCATION OF TEMPORARY SERVICE POLE, SUCH POLE SHALL BE LOCATED NOT LESS THAN 10' OR MORE THAN 75' FROM THURMONT ELECTRIC TRANSFORMER OR SECONDARY, UNLESS OTHERWISE APPROVED BY THURMONT ELECTRIC.
2. CUSTOMER MAY BE REQUIRED TO FURNISH AND INSTALL PROPER GUYING OR INSTALL A PUSH BRACE. IF REQUIRED, CUSTOMER SHALL PAY APPLICABLE CHARGES.
3. ALL CUSTOMERS WORK SHALL BE COMPLETED AND INSPECTIONS OBTAINED BEFORE THURMONT ELECTRIC WILL PROVIDE SERVICE.
4. SERVICE POLE SHALL BE PROVIDED AND INSTALLED BY THE CUSTOMER. MUST BE 20' MINIMUM LENGTH TYPICAL POLE OR 20' TREATED 6"X6" TIMBER INSTALLED A MINIMUM OF 4' IN THE GROUND AND WELL TAMPED.
5. INHIBITOR COMPOUND SHALL BE USED ON ALL ALUMINUM WIRE TERMINATIONS.
6. SERVICE POLE INSTALLATION SUBJECT TO THURMONT ELECTRIC APPROVAL BEFORE CONNECTION.

Town of Thurmont Public Works Department Frederick County, MD	Revisions			TEMPORARY OVERHEAD SERVICE SUPPORT		
	Date	Notes		Approved By:		Date
			FIGURE 5			

FIGURE 6

TEMPORARY UNDERGROUND SERVICE SUPPORT AT TRANSFORMER

CUSTOMER SHALL FURNISH, INSTALL AND CONNECT ALL INTERNAL WIRING FOR METER SOCKET AND WEATHERPROOF, SEALABLE FUSE OR BREAKER TYPE DISCONNECTING MEANS, MINIMUM SIZE METER SOCKET TO BE INSTALLED IS 100A, THURMONT ELECTRIC WILL FURNISH AND INSTALL METER, ALL 125V RECEPTACLE OUTLETS SHALL HAVE GFCI PROTECTION

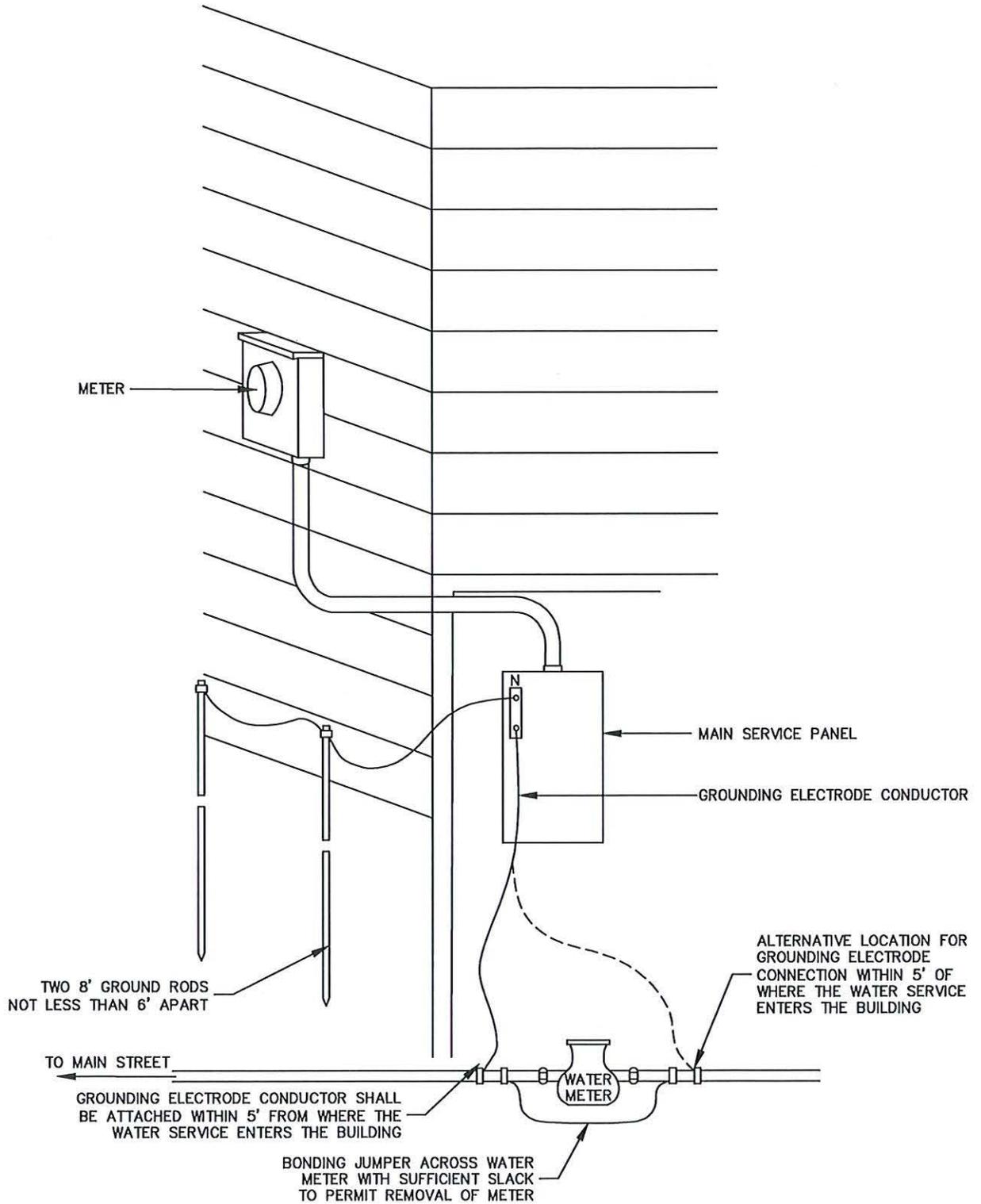


NOTES:

1. CUSTOMER SHALL CONSULT WITH THURMONT ELECTRIC FOR LOCATION OF TEMPORARY SERVICE POLE, SUCH POLE SHALL BE LOCATED WITHIN 5' FROM THURMONT ELECTRIC TRANSFORMER OR SECONDARY AND WITHIN 3' OF PERMANENT METER LOCATION, UNLESS OTHERWISE APPROVED BY THURMONT ELECTRIC.
2. CUSTOMER SHALL FURNISH AND INSTALL 4'X4'X8' PRESSURE TREATED POST OR OTHER THURMONT ELECTRIC APPROVED SUPPORT DEVICE.
3. ALL CUSTOMERS WORK SHALL BE COMPLETED AND INSPECTIONS OBTAINED BEFORE THURMONT ELECTRIC WILL PROVIDE SERVICE.
4. CUSTOMER SHALL TRENCH AND BACKFILL FOR THURMONT ELECTRIC SERVICE LATERAL CONDUCTORS. TRENCH TO BE EXCAVATE IN LOCATION INDICATED BY THURMONT ELECTRIC.
5. INHIBITOR COMPOUND SHALL BE USED ON ALL ALUMINUM WIRE TERMINATIONS.
6. SERVICE POLE INSTALLATION SUBJECT TO THURMONT ELECTRIC APPROVAL BEFORE CONNECTION.

Town of Thurmont Public Works Department Frederick County, MD	Revisions			TEMPORARY UNDERGROUND SERVICE SUPPORT AT TRANSFORMER		
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FIGURE 6						

FIGURE 7
TYPICAL GROUNDING DETAILS



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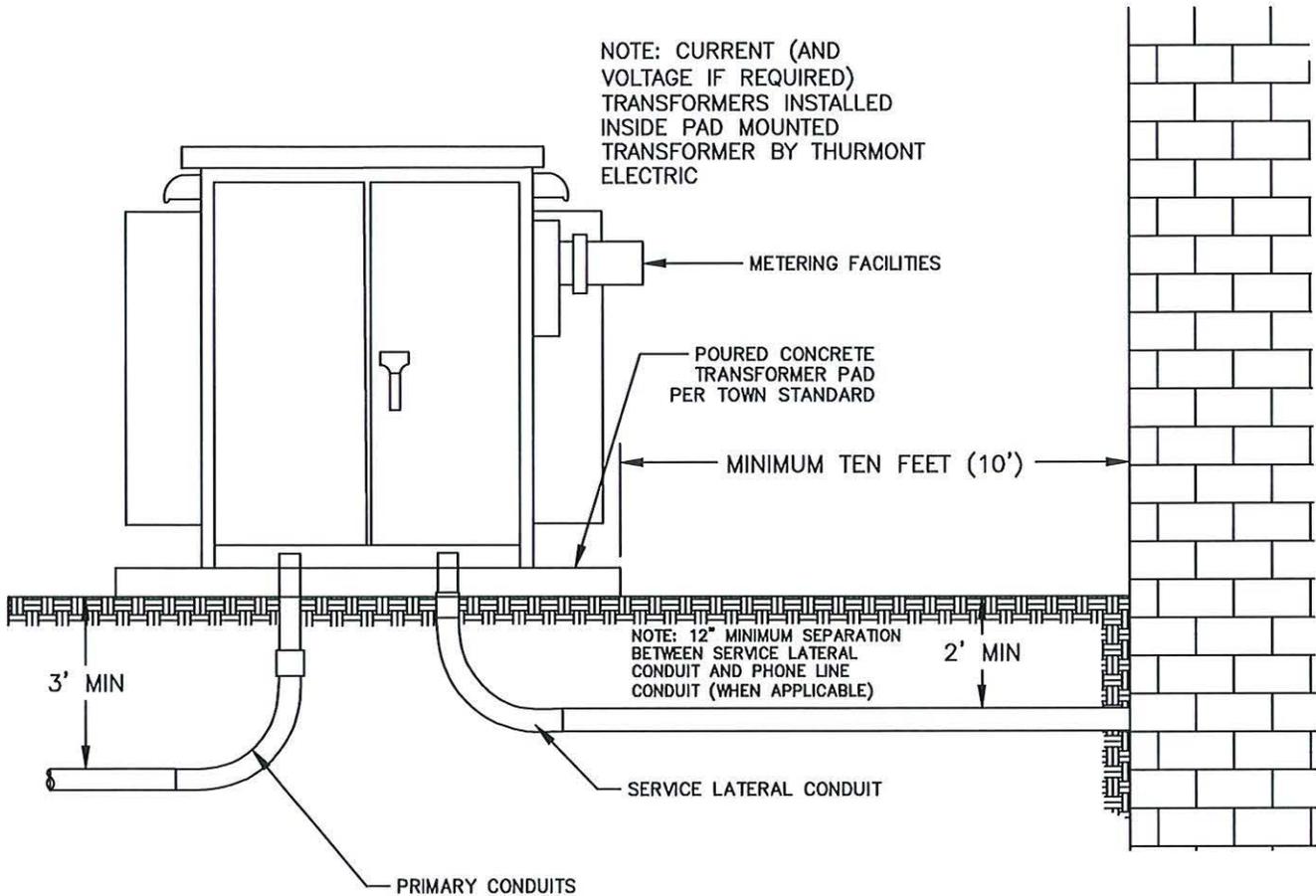
TYPICAL GROUNDING DETAILS

Approved By: _____ Date: _____

FIGURE 7

FIGURE 9

TYPICAL TRANSFORMER-RATED METERING INSTALLATION AT PAD-MOUNTED TRANSFORMER (3-PHASE, 4-WIRE SERVICE)
CONTACT THURMONT ELECTRIC FOR DETAILS BEFORE INSTALLATION



- NOTES:**
1. FOR METERING LOCATED AT PAD MOUNTED TRANSFORMER, SERVICE LATERAL SHALL BE FURNISHED, INSTALLED, OWNED, AND MAINTAINED BY THE CUSTOMER. WHEN APPLICABLE, IN ADDITION TO SERVICE LATERAL CONDUITS, CUSTOMER SHALL FURNISH AND INSTALL 1 1/4" CONDUIT WITH 1/4" NYLON PULL ROPE FROM SECONDARY COMPARTMENT OF PAD MOUNTED TRANSFORMER TO LOCATION AT CUSTOMERS BUILDING WHERE TELEPHONE LINE SERVICE CAN BE MADE AVAILABLE AT THE TELEPHONE DEMARCATION POINT.
 2. TRENCHING AND BACKFILLING SHALL BE DONE BY THE CUSTOMER.
 3. SERVICE LATERAL INSTALLED IN CONDUIT SHALL BE INSTALLED AS A-B-C-N IN EACH CONDUIT.
 4. CONDUIT SHALL HAVE WEEP HOLES AT GROUND LINE WHEN REQUIRED.
 5. THURMONT ELECTRIC WILL PROVIDE ALL CONNECTORS AND MAKE ALL CONNECTIONS TO THE TRANSFORMER.
 6. CUSTOMER SHALL PROVIDE THURMONT ELECTRIC ADEQUATE ADVANCED NOTICE AS TO THE NUMBER AND SIZE OF CONDUCTORS THAT WILL BE INSTALLED.
 7. BARRIERS MAY BE REQUIRED BY THURMONT ELECTRIC FOR PROTECTION OF TRANSFORMER. SEE FIGURE 12.

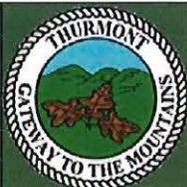
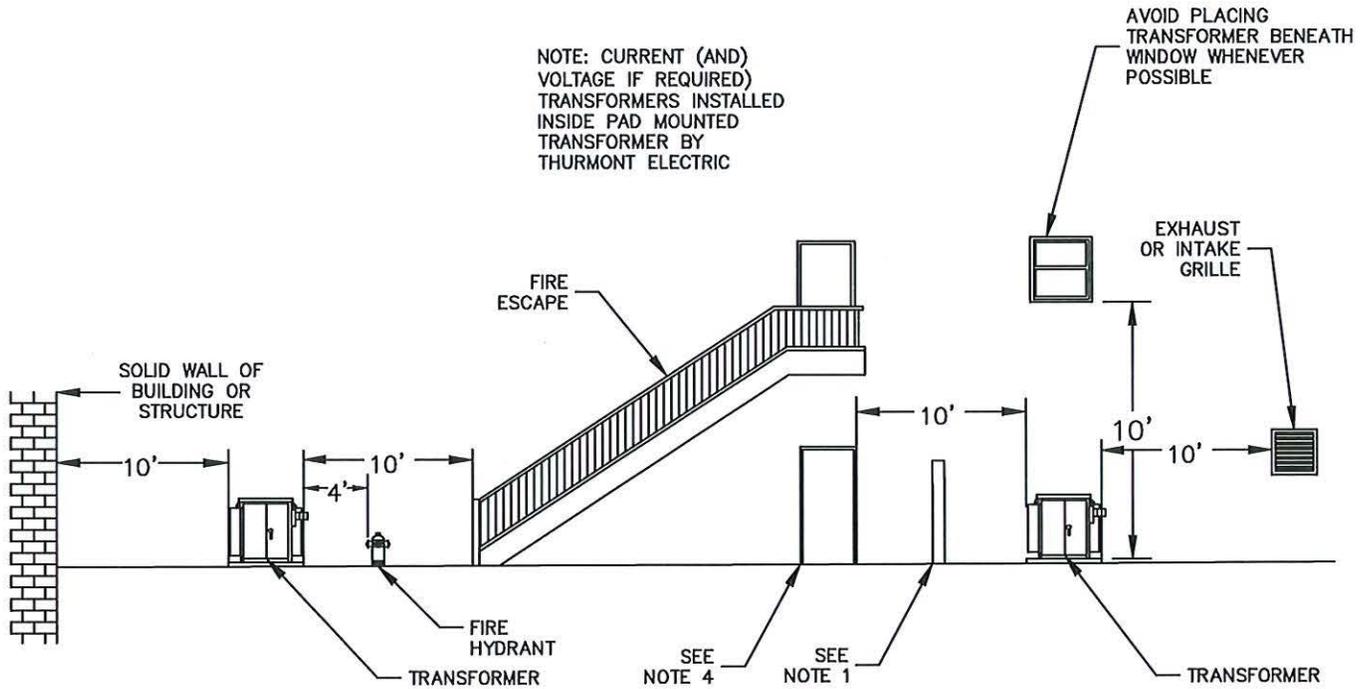
Town of Thurmont Public Works Department Frederick County, MD	Revisions			TYPICAL TRANSFORMER-RATED METERING INSTALLATION AT PAD-MOUNTED TRANSFORMER (3-PHASE, 4-WIRE SERVICE)		
	Date	Notes		Approved By:	Date	FIGURE 9

FIGURE 10
CLEARANCE REQUIREMENTS FROM BUILDINGS
FOR PAD MOUNTED TRANSFORMER



- NOTES:**
1. IN CASES WHERE REQUIRED DISTANCES CANNOT BE OBTAINED, FIRE RESISTANT BARRIER OF 6' MINIMUM HEIGHT SHALL BE CONSTRUCTED.
 2. CERTAIN CONDITIONS MAY REQUIRE CURBING TO CONFINE OIL IN CASE OF TANK RUPTURE.
 3. NO PORTION OF BUILDING OR BUILDING STRUCTURE SHALL OVERHANG ANY PART OF PAD MOUNTED TRANSFORMER.
 4. A 10' CLEARANCE TO TRANSFORMER SHOULD BE INCREASED TO 25' IN CASES OF A FIREPROOF DOOR FOR EXITS FROM PUBLIC ASSEMBLY, SUCH AS AUDITORIUM, AND ETC. UNLESS THERE IS A BARRIER.

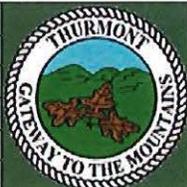
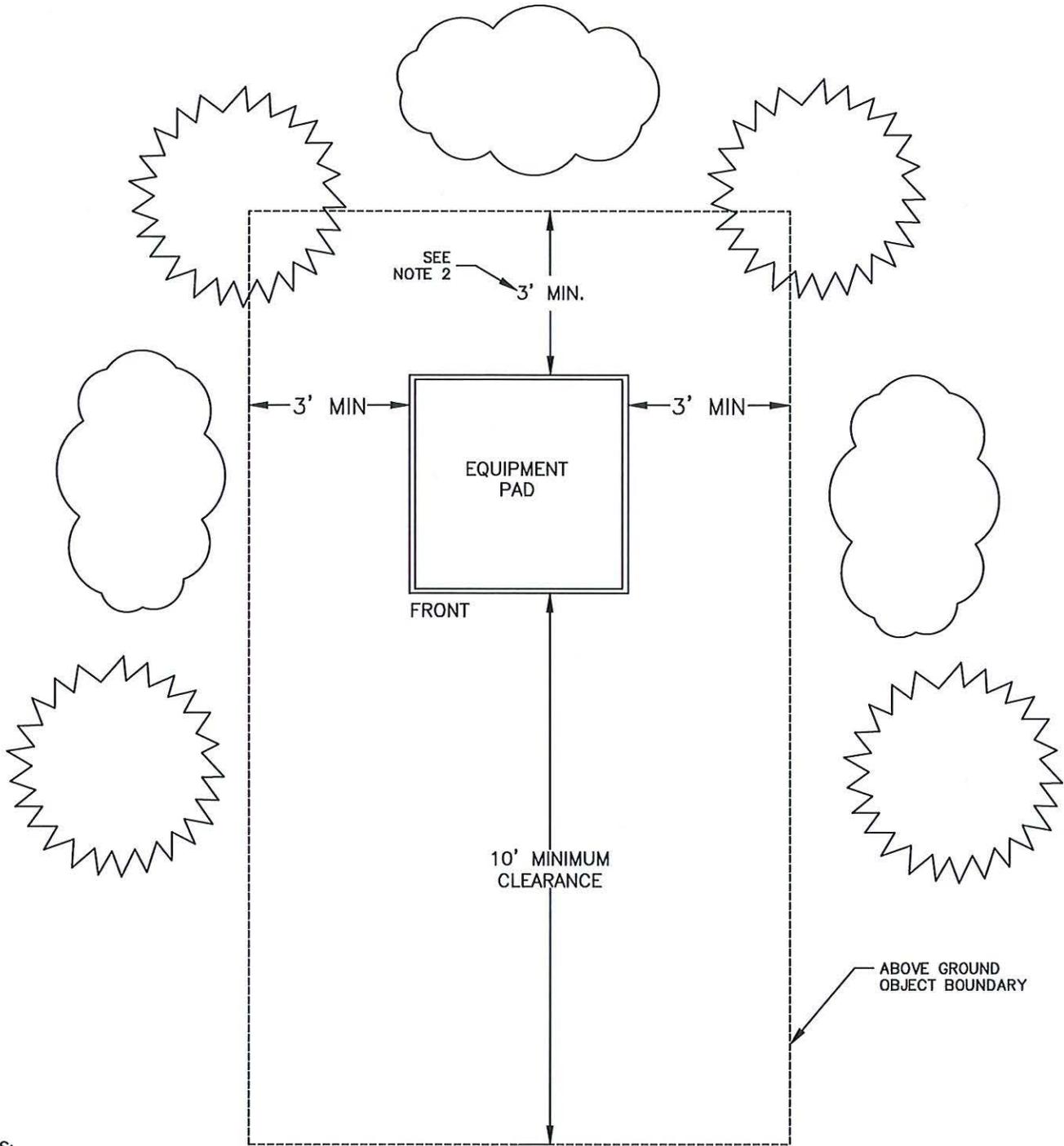
Town of Thurmont Public Works Department Frederick County, MD	Revisions			CLEARANCE REQUIREMENTS FROM BUILDINGS FOR PAD MOUNTED TRANSFORMER		
	Date	Notes		Approved By:	Date	FIGURE 10

FIGURE 11
CLEARANCE OF PAD-MOUNTED EQUIPMENT FROM
SHRUBS, PLANTS, AND OTHER OBSTRUCTIONS



NOTES:

1. THREE FEET (3') MINIMUM CLEARANCE SHALL BE MAINTAINED WHEN PLANTS REACH MATURITY. ALLOW ADEQUATE SPACE FOR FUTURE GROWTH, AND DO NOT PLANT SHRUBS OR SET POSTS DIRECTLY OVER CABLES.
2. IF PAD-MOUNTED EQUIPMENT IS SWITCHGEAR OR OTHER SIMILAR DEVICE WHICH REQUIRE FRONT AND REAR ACCESS, THIS DISTANCE SHALL BE INCREASED TO TEN FEET (10').
3. WARNING - PAD MOUNTED TRANSFORMER AND PAD MOUNTED EQUIPMENT HAVE UNDERGROUND ELECTRIC CABLES ENTERING AND EXITING THEM BELOW GRADE. CALL MISS UTILITY (1-800-257-7777) BEFORE COMMENCING WITH ANY DIGGING OPERATIONS SO THAT UNDERGROUND CABLES CAN BE LOCATED.

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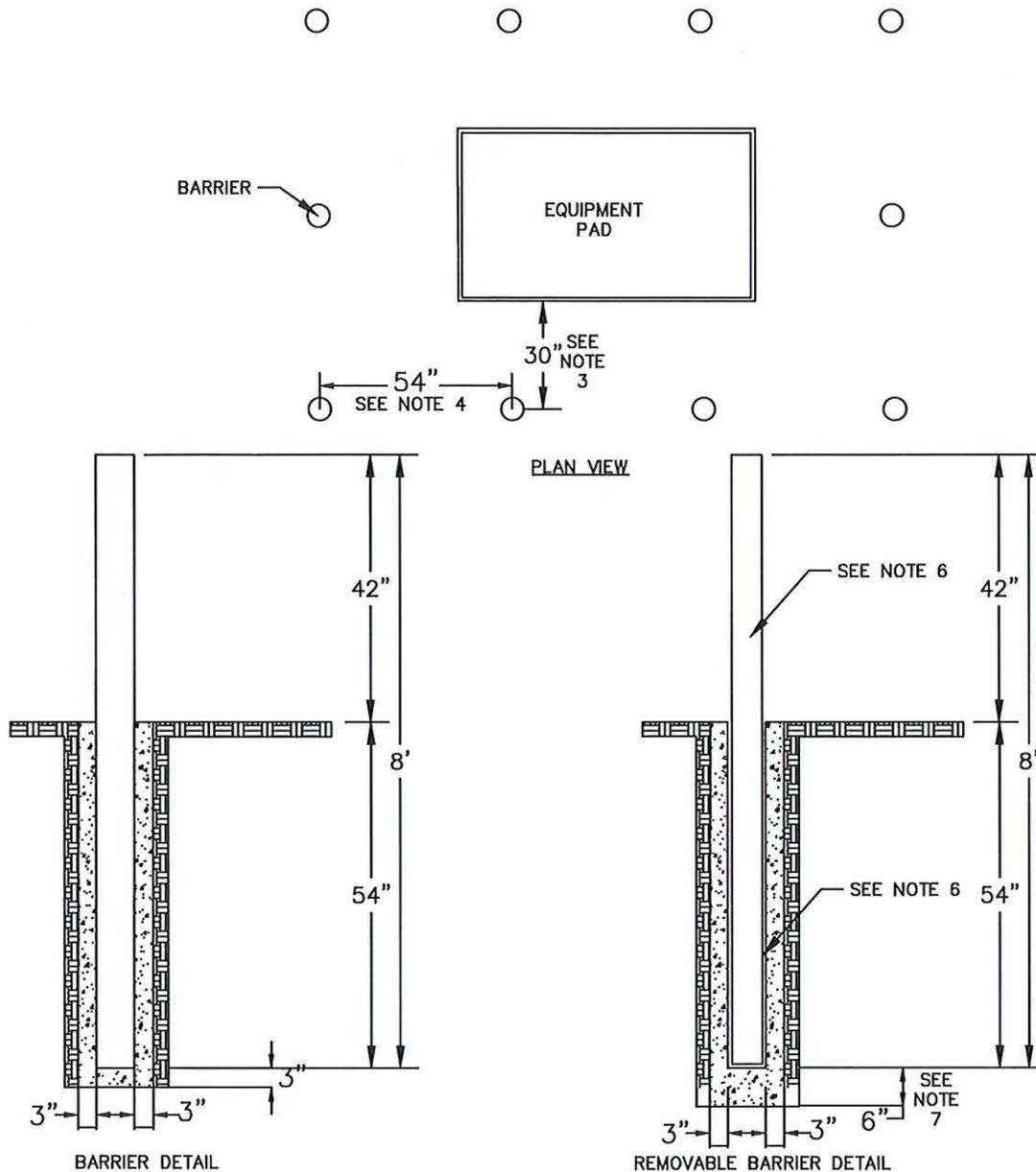
CLEARANCES OF PAD-MOUNTED EQUIPMENT FROM SHRUBS, PLANTS, AND OTHER OBSTRUCTIONS

Approved By: _____ Date: _____

FIGURE 11

FIGURE 12 VEHICULAR BARRIER FOR PAD-MOUNTED EQUIPMENT

CONTACT THURMONT ELECTRIC FOR DETAILS BEFORE INSTALLATION



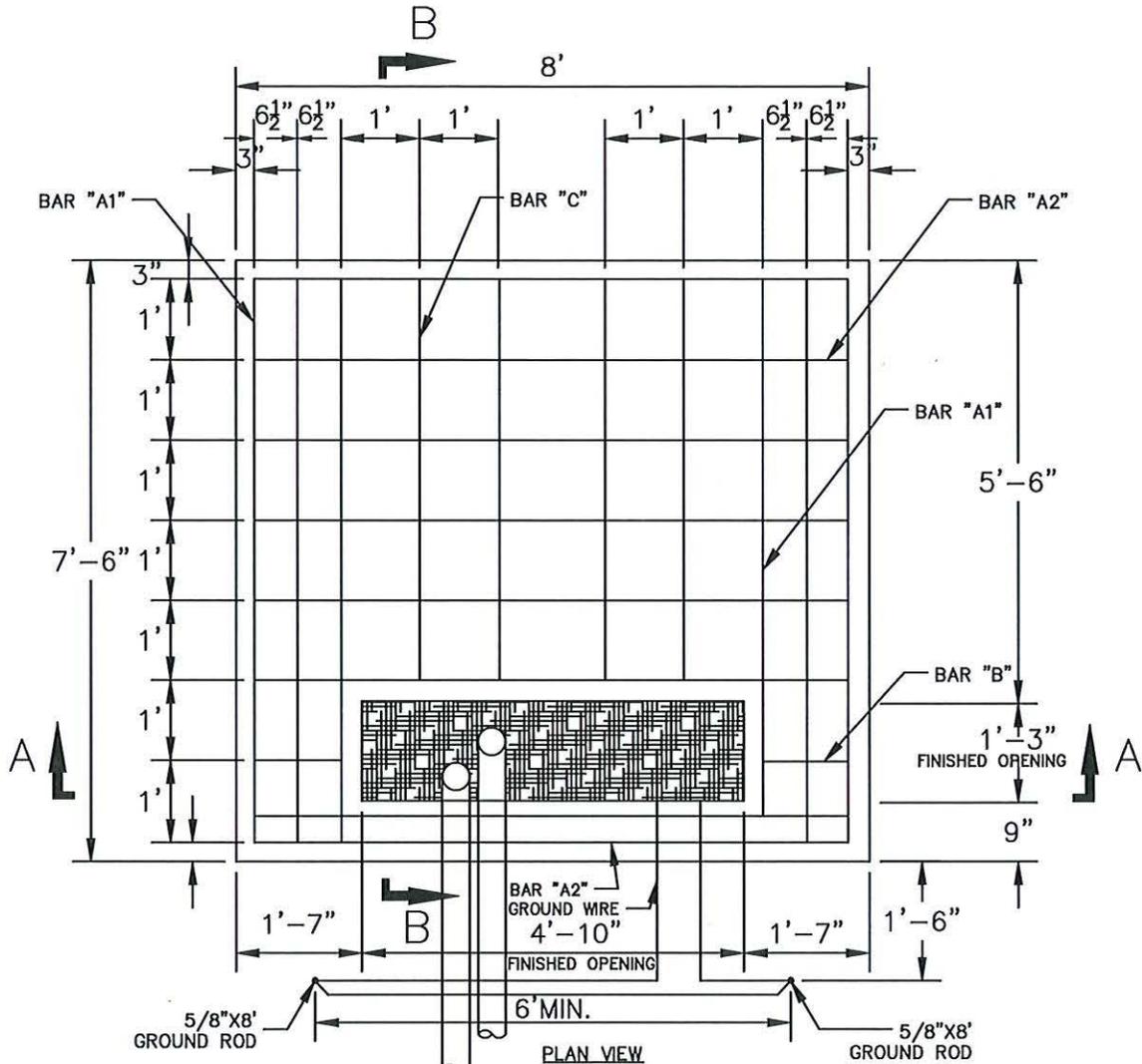
NOTES:

1. USE BARRIER TO PROTECT EQUIPMENT FROM POSSIBLE DAMAGE FROM VEHICLES AND OTHER MOTORIZED EQUIPMENT.
2. USE 6" RIGID GALVANIZED STEEL CONDUIT, CUT TO 8', AND FILL WITH CONCRETE. ENCASE IN 3" OF CONCRETE AS SHOWN.
3. THIS DISTANCE MAY BE REDUCED TO 24" PROVIDED CLEARANCES ARE MAINTAINED FOR SUCH AS TRANSFORMER RADIATORS AND EQUIPMENT DOOR OPENINGS.
4. PROVIDE CLEARANCE FOR REMOVAL OR REPLACEMENT OF EQUIPMENT, WHEN OVERHEAD OBSTACLES PREVENT REMOVAL OF EQUIPMENT, ONE BARRIER SHALL BE REMOVABLE.
5. WHEN NECESSARY, HEIGHT OF BARRIER ABOVE GROUND MAY BE INCREASED TO PREVENT LARGE VEHICLES FROM STRIKING PAD MOUNTED EQUIPMENT.
6. FOR REMOVABLE VEHICLE BARRIERS, USE 6" PVC SCHEDULE 40 CONDUIT, CUT TO 54" AND ENCASE IN CONCRETE. INSERT 8' OF 5" GALVANIZED STEEL CONDUIT, WITH CAP, INTO PVC CONDUIT.
7. USE 6" OF COMPACTED STONE OR GRAVEL FOR SUMP.

Town of Thurmont Public Works Department Frederick County, MD	Revisions			VEHICULAR BARRIER FOR PAD-MOUNTED EQUIPMENT		
	Date	Notes		Approved By:		Date
				FIGURE 12		

FIGURE 13 CONCRETE PAD FOUNDATION 3Ø PAD MOUNTED TRANSFORMER

CONTACT THURMONT ELECTRIC FOR DETAILS BEFORE INSTALLATION



- NOTES:**
1. IF SECONDARY DUCTS FILL UP SECONDARY CONDUIT WINDOW, IT IS ACCEPTABLE TO PLACE BOTH GROUND RODS IN THE PRIMARY CONDUITS WINDOW.
 2. INSPECTION BY THE TOWN OF THURMONT ELECTRIC DEPARTMENT SHALL BE REQUIRED PRIOR TO POURING CONCRETE FOR THE TRANSFORMER PAD. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO CONTACT THE ELECTRIC DEPARTMENT A MINIMUM OF 24 HRS IN ADVANCE OF THE SCHEDULED POUR.
 3. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE PLACEMENT OF THE PRIMARY CONDUIT, METERING CONDUIT AND GROUND ROD(S) INSTALLATION. CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATING ALL CONDUIT REQUIREMENTS WITH THE TOWN OF THURMONT ELECTRIC DEPARTMENT REGARDLESS OF WHETHER THE REQUIRED CONDUIT IS SHOWN ON THIS PLAN. CONTRACTOR SHALL BE RESPONSIBLE FOR PLACEMENT OF SECONDARY CONDUIT. IF REQUIRED BY THE TOWN OF THURMONT, THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROCUREMENT AND PLACEMENT OF PROTECTIVE BOLLARDS. BOLLARDS SHALL BE MINIMUM 6" DIAMETER, FILLED WITH CONCRETE. BOLLARDS SHALL BE PLACED IN CONCRETE, MINIMUM 36" BELOW GRADE AND MINIMUM 48" ABOVE FINISH GRADE.
 4. CONCRETE FOR PAD SHALL HAVE A MINIMUM 28 DAYS COMPRESSIVE STRENGTH OF 3000 PSI AND CONTAIN 3-6% ENTRAINED AIR BY VOLUME, SLUMP SHALL NOT EXCEED 5".
 5. SECONDARY CONDUIT(S) SHALL BE SIZED IN ACCORDANCE WITH THE NEC FOR THE INTENDED CONDUCTORS AND SHALL EXTEND 2" ABOVE THE SURFACE OF THE STONE AS INDICATED. SECONDARY SIDE OF PAD SHALL BE THE RIGHT SIDE OF THE OPENING, FACING THE FRONT (DOOR SIDE) OF THE ENCLOSURE.
 6. TRANSFORMER PAD SHALL BE POURED WITHIN 1/8" OF LEVEL. PAD SHALL CONTAIN #4 REBAR PLACED AS SHOWN. BARS SHALL BE PLACED NO CLOSER THAN 3" TO EARTH.
 7. PAD SHALL BE POURED ON COMPACTED AND NON-ORGANIC MATERIAL.
 8. NO WORK WILL BEGIN UNTIL THE PAD AREA IS WITHIN 6" OF FINAL GRADE.
 9. SECONDARY CONDUITS MUST BE CONTAINED WITHIN DIMENSION INDICATED.

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CONCRETE PAD FOUNDATION
3Ø PAD MOUNTED TRANSFORMER

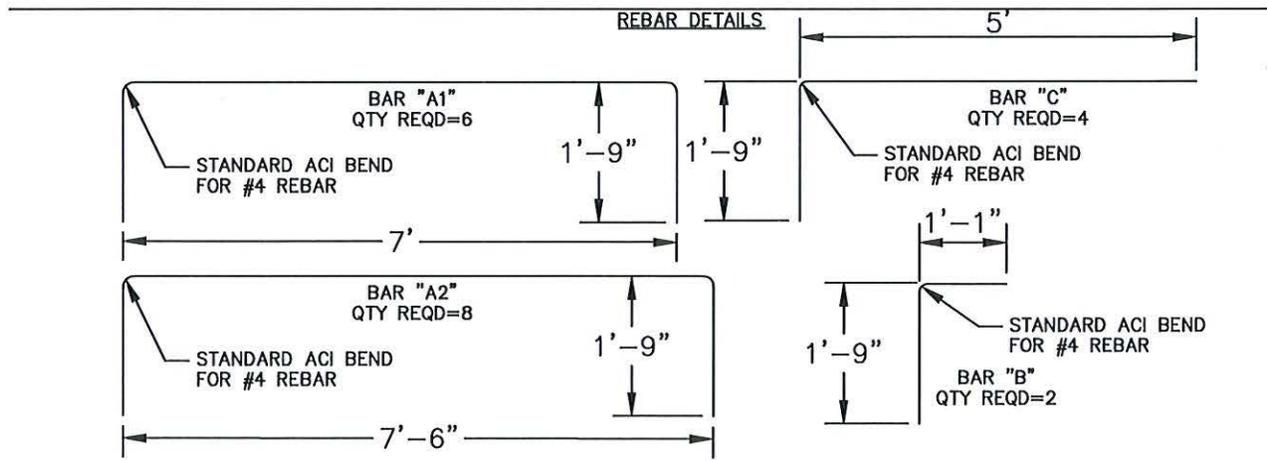
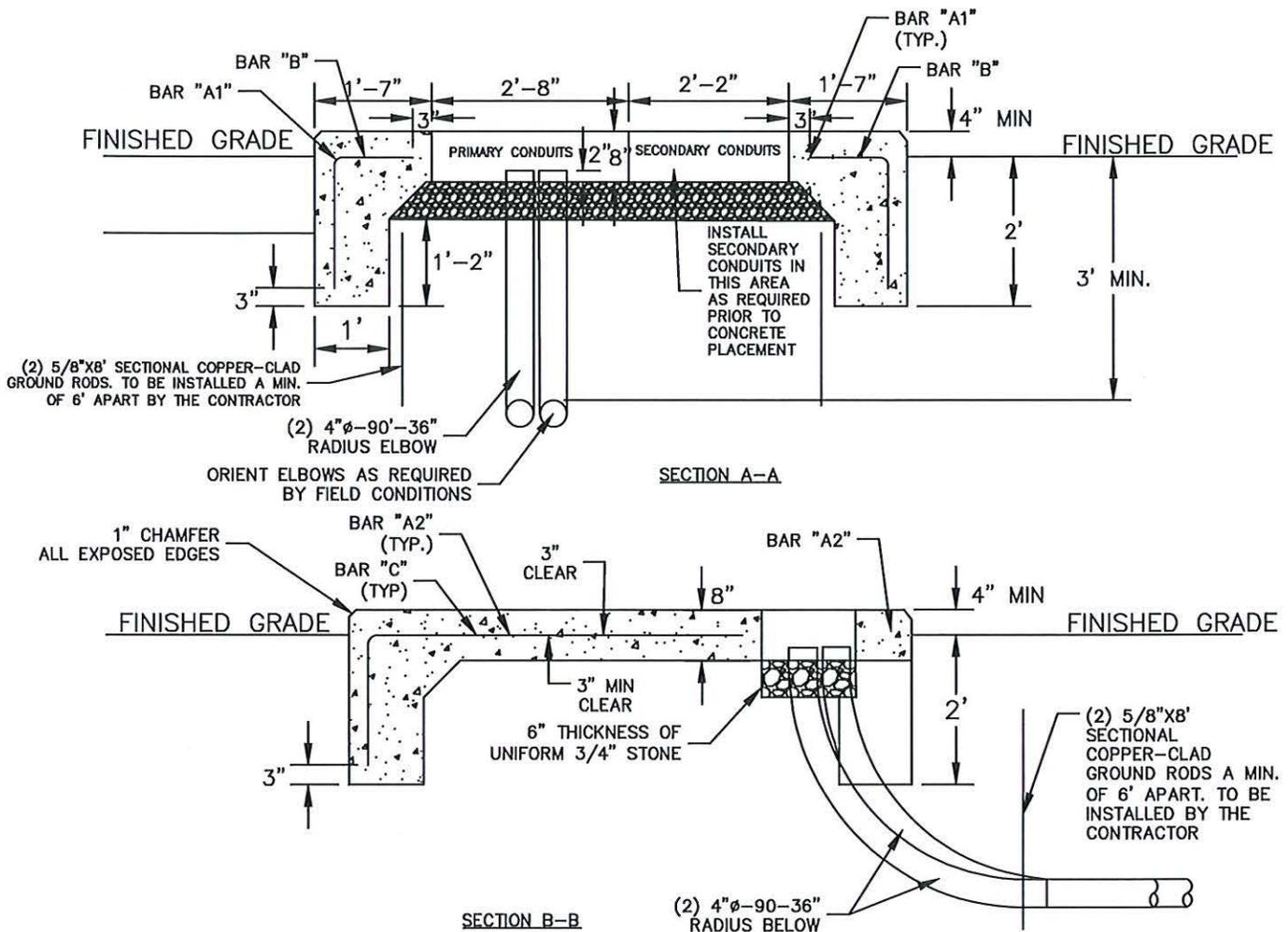
Approved By:

Date

FIGURE 13

FIGURE 13 (CON'T)
CONCRETE PAD FOUNDATION
3Ø PAD MOUNTED TRANSFORMER

CONTACT THURMONT ELECTRIC FOR DETAILS BEFORE INSTALLATION



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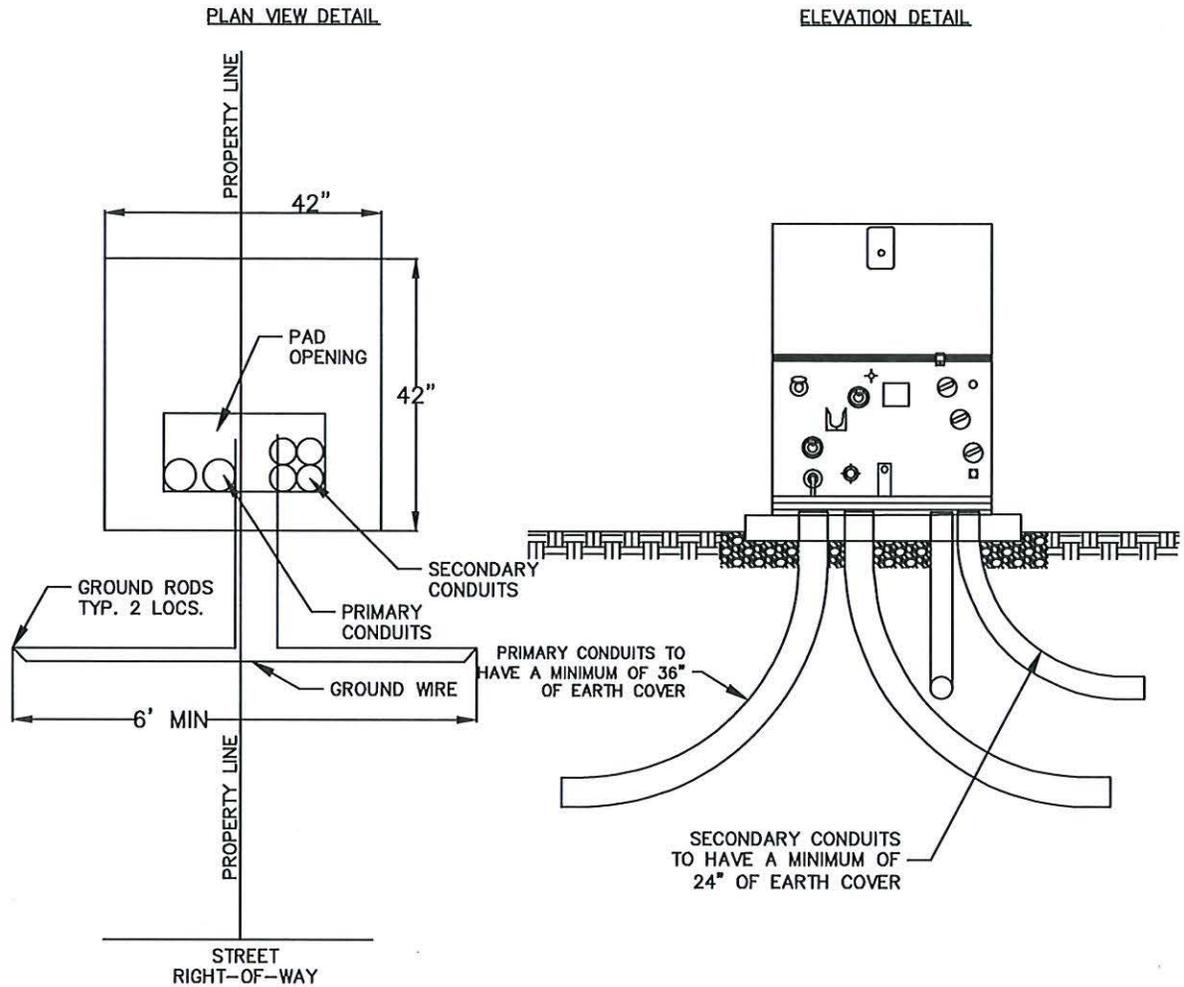
CONCRETE PAD FOUNDATION
3Ø PAD MOUNTED TRANSFORMER

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FIGURE 13
CONT.

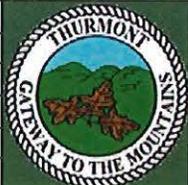
FIGURE 14
PAD FOUNDATION
PAD-MOUNTED TRANSFORMER
25 TO 167 KVA SINGLE PHASE
12.47 KV HIGH SIDE

CONTACT THURMONT ELECTRIC FOR DETAILS BEFORE INSTALLATION

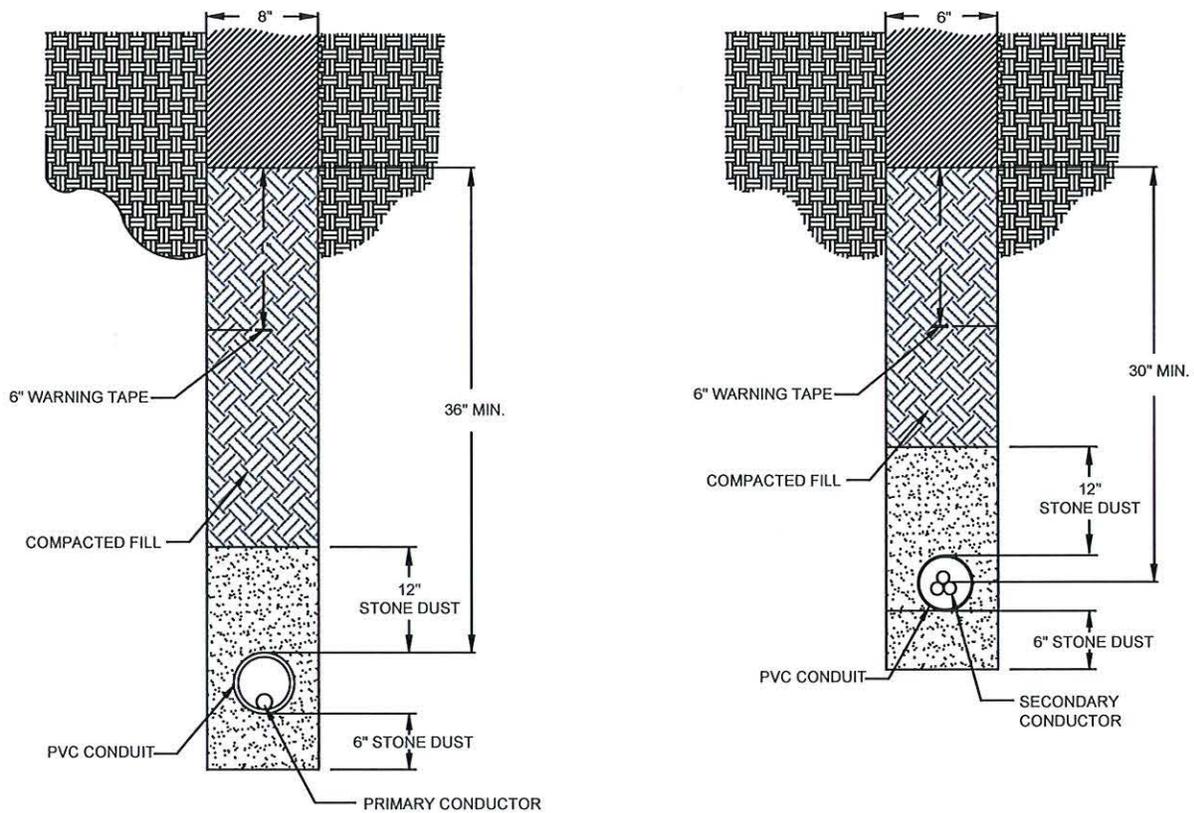


NOTES:

1. PRIMARY CONDUITS ARE LOCATED ON THE LEFT SIDE OF THE PAD OPENING.
2. SECONDARY CONDUITS ARE LOCATED ON THE RIGHT SIDE OF THE PAD OPENING.
3. ELEVATION VIEW IS FROM THE STREET SIDE OF THE TRANSFORMER.
4. CUSTOMER IS RESPONSIBLE FOR SITE PREPARATION AND THE GRADE MUST BE WITHIN 6" OF FINAL GRADE BEFORE INSTALLATION WILL COMMENCE.

Town of Thurmont Public Works Department Frederick County, MD	Revisions			PAD FOUNDATION PAD-MOUNTED TRANSFORMER 25 TO 167 KVA SINGLE PHASE 12.47 KV HIGH SIDE		
	Date	Notes		Approved By:		Date
				FIGURE 14		

TRENCH DETAILS FOR PRIMARY AND SECONDARY CONDUCTOR INSTALLATIONS



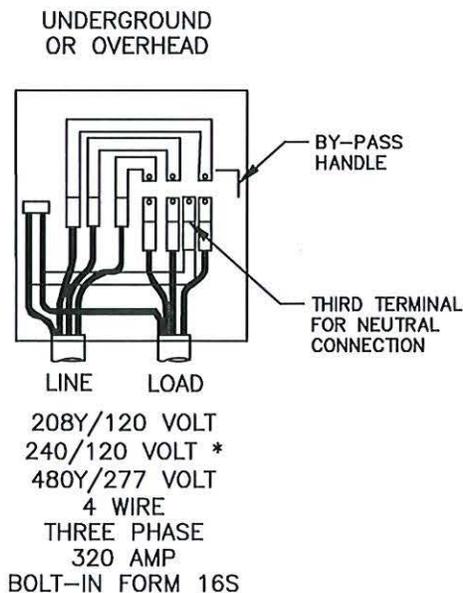
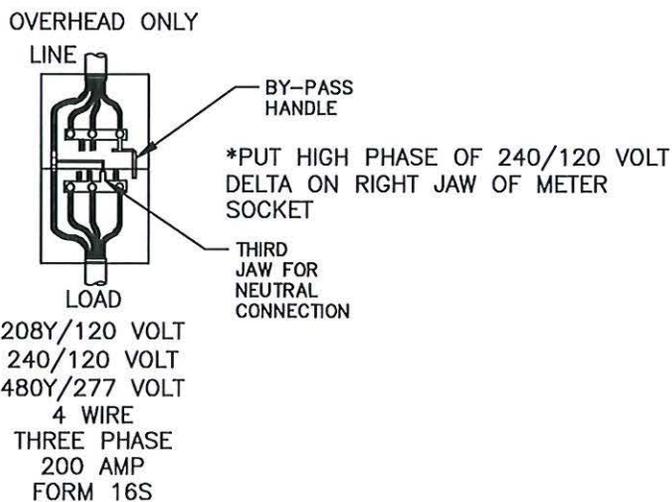
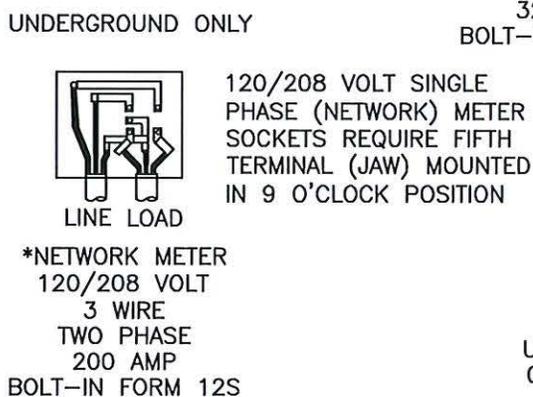
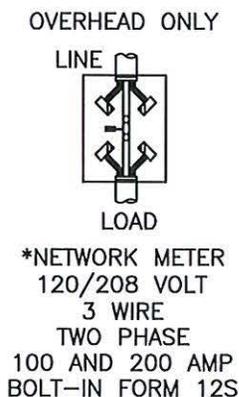
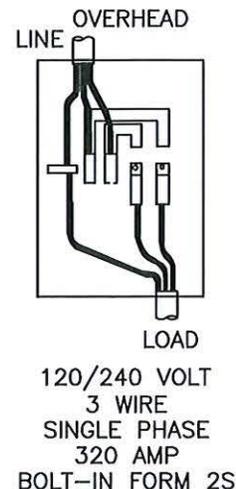
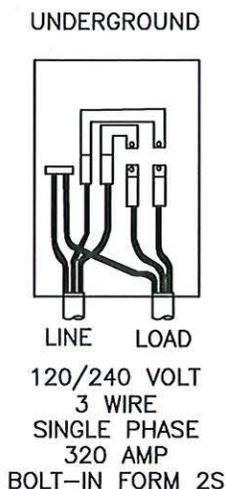
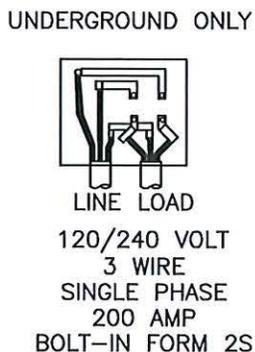
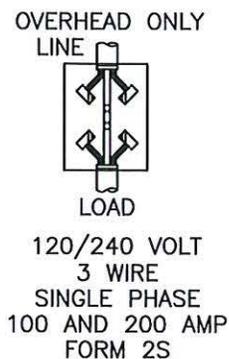
NOTES:

1. NO INSTALLATION SHALL BEGIN UNTIL THE ALTERED GRADE IS WITHIN SIX (6") INCHES OF FINAL GRADE.
2. BOTTOM OF EXCAVATION TO BE LEVEL WHERE PRACTICAL.
3. EXCAVATION TO BE FREE OF LARGE ROCKS OR OTHER UNWANTED DEBRIS.
4. BACKFILL SHALL INCLUDE A TWO (2") INCH BED TO BE PLACED PRIOR TO CONDUIT AND/OR CONDUCTOR INSTALLATION AND A SUBSEQUENT SIX (6") INCH BLANKET OF CLEAN BACKFILL MATERIAL. MINIMAL COMPACTION OF THE BLANKET LAYER IS REQUESTED TO MINIMIZE DAMAGE TO THE CONDUIT AND/OR CONDUCTORS.
5. PLACE SIX (6") INCH WIDE WARNING TAPE TWELVE (12") INCHES BELOW FINISHED GRADE THAT READS "CAUTION, ELECTRIC LINE BURIED BELOW".
6. BACKFILL SHALL BE PLACED IN EIGHT (8") INCH LIFTS, THOROUGHLY COMPACTIONED AFTER EACH LIFT IS PLACED AND PRIOR TO INSTALLING THE NEXT SUCCESSIVE LIFT.

Town of Thurmont Public Works Department Frederick County, MD	Revisions			TRENCH DETAILS FOR PRIMARY AND SECONDARY CONDUCTOR INSTALLATIONS		
	Date	Notes		Approved By:		Date
				FIGURE 15		

FIGURE 17

SELF CONTAINED
METER SOCKET CONNECTIONS



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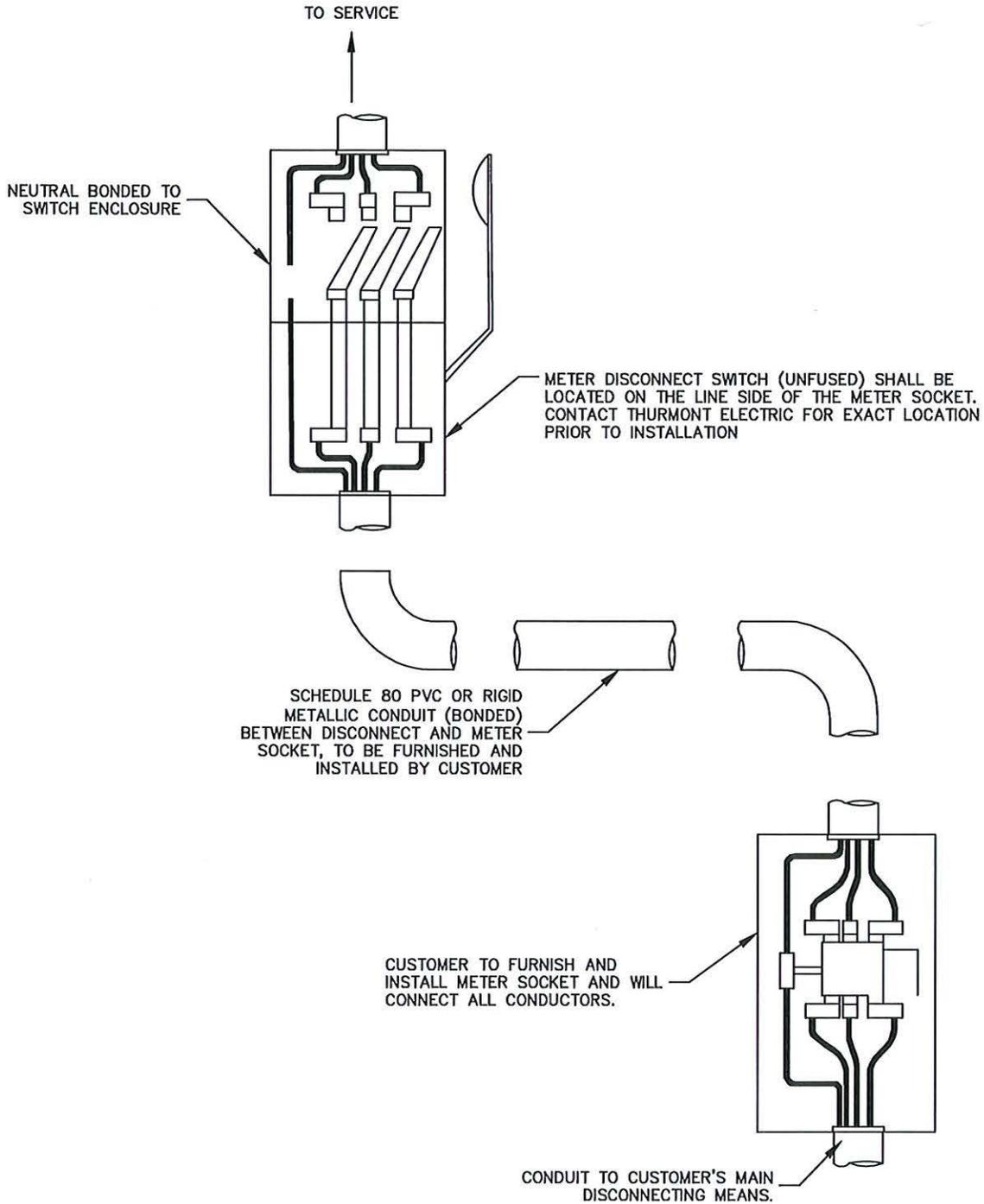
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SELF CONTAINED METER SOCKET CONNECTIONS		
Approved By:	Date	FIGURE 17

FIGURE 18
SELF CONTAINED METER INSTALLATION
480Y/277 VOLT, 3 PHASE, 4-WIRE

CONTACT THURMONT ELECTRIC FOR DETAILS BEFORE INSTALLATION



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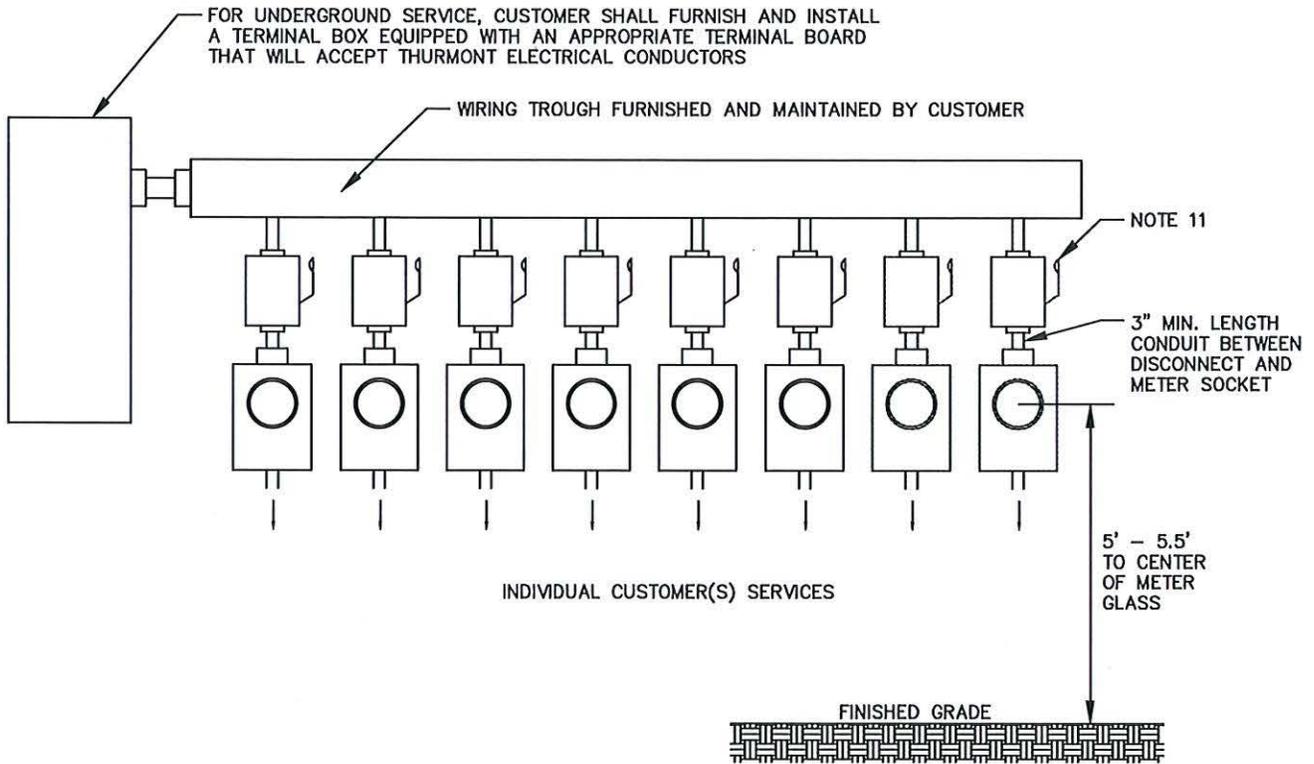


SELF CONTAINED METER INSTALLATION
 480Y/277 VOLT, 3 PHASE, 4-WIRE

Approved By:	Date	FIGURE 18

FIGURE 19 MULTIPLE METER INSTALLATIONS 480Y/277 VOLT

CONTACT THURMONT ELECTRIC FOR INSTALLATION DETAILS PRIOR TO INSTALLATION

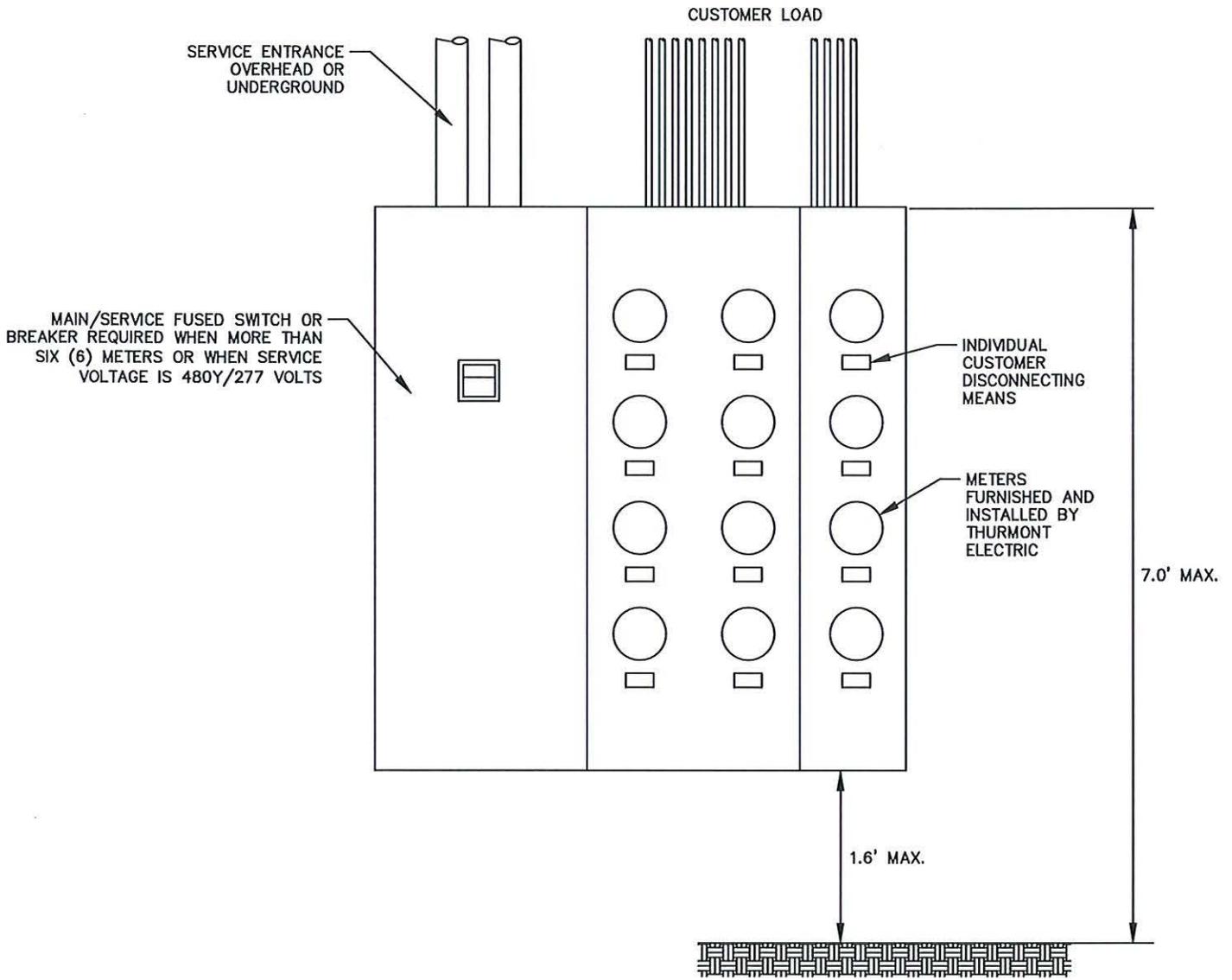


NOTES:

1. CUSTOMER SHALL CONSULT WITH THURMONT ELECTRIC FOR POINT OF ATTACHMENT OF SERVICE DROP, METERING LOCATION, AND PROPOSED SERVICE ENTRANCE FACILITIES PRIOR TO PROCEEDING WITH INSTALLATION.
2. ALL CUSTOMERS WORK SHALL BE COMPLETED AND INSPECTIONS OBTAINED BEFORE THURMONT ELECTRIC WILL PROVIDE SERVICE.
3. CUSTOMERS SHALL BE RESPONSIBLE FOR PROVIDING, INSTALLING, AND CONNECTING ALL SERVICE ENTRANCE WIRING FROM TERMINAL BOX TO METER SOCKETS AND ALSO FOR ENSURING THAT TERMINAL BOX HAS PROPER NUMBER, SIZE, AND TYPE OF TERMINALS TO ACCEPT THURMONT ELECTRIC SERVICE.
4. CUSTOMER SHALL FURNISH AND INSTALL ALL METER SOCKETS AND CONNECT ALL CONDUCTORS IN METER SOCKET. CUSTOMER SHALL PERMANENTLY AND CLEARLY LABEL EACH METER SOCKET TO SHOW AREA/ADDRESS SERVED.
5. THURMONT ELECTRIC SWILL SUPPLY AND INSTALL METERS.
6. METERED CONDUCTORS SHALL NOT BE INSTALLED IN WIRING TROUGHS.
7. CUSTOMER MAY INSTALL METER STACK OR METER TROUGH SUBJECT TO THURMONT ELECTRIC APPROVAL.
8. WHEN SERVICE ENTRANCE CONSISTS OF MORE THAN ONE SET OF CONDUCTORS, INDIVIDUAL LOADS SHALL BE CONNECTED TO BE BALANCED AMONG ALL SETS OF CONDUCTORS.
9. WIRING TROUGHS, MAIN SERVICE DISCONNECT, AND TERMINAL BOX SHALL BE SEALABLE AND SHALL ALSO BE WEATHERPROOF WHEN INSTALLED OUTDOORS.
10. INHIBITOR COMPOUND SHALL BE USED ON ALL ALUMINUM WIRE TERMINATIONS.
11. METER DISCONNECT SWITCH (UNFUSED) SHALL BE LOCATED ON THE LINE SIDE OF EACH METER SOCKET.

Town of Thurmont Public Works Department Frederick County, MD	Revisions			MULTIPLE METER INSTALLATIONS 480Y/277 VOLT		
	Date	Notes		Approved By:		Date
FIGURE 19						

FIGURE 20
MULTIPLE METER INSTALLATIONS 480Y/277 VOLT



NOTES:

1. CUSTOMER SHALL CONSULT WITH THURMONT ELECTRIC FOR POINT OF ATTACHMENT OF SERVICE DROP, METERING LOCATION, AND PROPOSED SERVICE ENTRANCE FACILITIES PRIOR TO PROCEEDING WITH INSTALLATION.
2. ALL CUSTOMERS WORK SHALL BE COMPLETED AND INSPECTIONS OBTAINED BEFORE THURMONT ELECTRIC WILL PROVIDE SERVICE.
3. CUSTOMERS SHALL FURNISH, INSTALL, AND CONNECT SEALABLE MULTIPLE METERING EQUIPMENT FOR OVERHEAD SERVICE. CUSTOMER SHALL FURNISH AND CONNECT SERVICE ENTRANCE CONDUCTORS. FOR UNDERGROUND SERVICE, THURMONT ELECTRIC WILL EXTEND ITS UNDERGROUND CONDUCTORS TO MAIN LUGS IN CUSTOMER METER STACK AND MAKE CONNECTIONS.

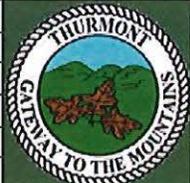
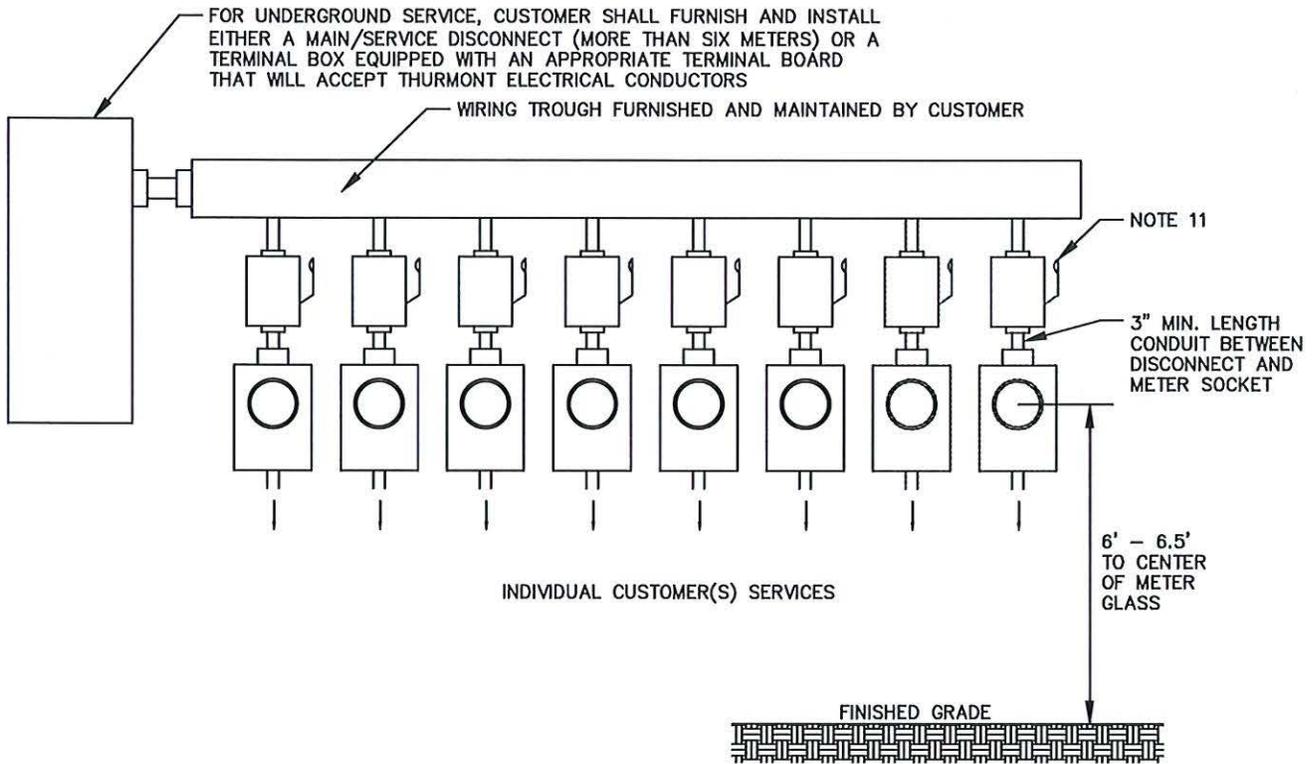
Town of Thurmont Public Works Department Frederick County, MD	Revisions			MULTIPLE METER INSTALLATIONS 480Y/277 VOLT		
	Date	Notes		Approved By:		Date
FIGURE 20						

FIGURE 21 MULTIPLE METER INSTALLATIONS 240 VOLT OR LESS

CONTACT THURMONT ELECTRIC FOR INSTALLATION DETAILS PRIOR TO INSTALLATION



NOTES:

1. CUSTOMER SHALL CONSULT WITH THURMONT ELECTRIC FOR POINT OF ATTACHMENT OF SERVICE DROP, METERING LOCATION, AND PROPOSED SERVICE ENTRANCE FACILITIES PRIOR TO PROCEEDING WITH INSTALLATION.
2. ALL CUSTOMERS WORK SHALL BE COMPLETED AND INSPECTIONS OBTAINED BEFORE THURMONT ELECTRIC WILL PROVIDE SERVICE.
3. CUSTOMERS SHALL BE RESPONSIBLE FOR PROVIDING, INSTALLING, AND CONNECTING ALL SERVICE ENTRANCE WIRING FROM TERMINAL BOX TO METER SOCKETS AND ALSO FOR ENSURING THAT TERMINAL BOX HAS PROPER NUMBER, SIZE, AND TYPE OF TERMINALS TO ACCEPT THURMONT ELECTRIC SERVICE.
4. CUSTOMER SHALL FURNISH AND INSTALL ALL METER SOCKETS AND CONNECT ALL CONDUCTORS IN METER SOCKET. CUSTOMER SHALL PERMANENTLY AND CLEARLY LABEL EACH METER SOCKET TO SHOW AREA/ADDRESS SERVED.
5. THURMONT ELECTRIC SWILL SUPPLY AND INSTALL METERS.
6. METERED CONDUCTORS SHALL NOT BE INSTALLED IN WIRING TROUGHS.
7. CUSTOMER MAY INSTALL METER STACK OR METER TROUGH SUBJECT TO THURMONT ELECTRIC APPROVAL.
8. WHEN SERVICE ENTRANCE CONSISTS OF MORE THAN ONE SET OF CONDUCTORS, INDIVIDUAL LOADS SHALL BE CONNECTED TO BE BALANCED AMONG ALL SETS OF CONDUCTORS.
9. WIRING TROUGHS, MAIN SERVICE DISCONNECT, AND TERMINAL BOX SHALL BE SEALABLE AND SHALL ALSO BE WEATHERPROOF WHEN INSTALLED OUTDOORS.
10. INHIBITOR COMPOUND SHALL BE USED ON ALL ALUMINUM WIRE TERMINATIONS.

Town of Thurmont Public Works Department Frederick County, MD	Revisions			MULTIPLE METER INSTALLATIONS 240 VOLT OR LESS		
	Date	Notes				
			Approved By:	Date	FIGURE 21	