

**SECTION 02720
STORM SEWAGE SYSTEMS**

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and General Provisions of Contract, including General and other Division 1 Specifications Sections, apply to this Section.

1.2 RELATED SECTIONS

- A. Section 02200 - General Earthwork For Athletic and Baseball Fields
- B. Section 03300 - Cast-In-Place Concrete
- C. Section 04100 - Mortar and Grout
- D. Local governing authority and code requirements

1.3 REFERENCE STANDARDS

- A. American Association of State Highway and Transportation Officials (AASHTO) latest edition
 - 1. M36 Zinc Coated (Galvanized) Corrugated Iron or Steel Culverts and Under Drains
 - 2. M190 Bituminous Coated Corrugated Metal Culvert Pipe and Arches
 - 3. M252 Corrugated Polyethylene Drainage Tubing, 3 to 10 Inch Diameter
 - 4. M294 Corrugated Polyethylene Drainage Tubing, 12 to 48 Inch Diameter
 - 5. MP7-97 Corrugated Polyethylene Drainage Tubing, 54 to 60 Inch Diameter
- B. American Society for Testing and Materials (ASTM) latest edition
 - 1. A74 Cast Iron Soil Pipe and Fittings
 - 2. A185 Steel welded Wire Fabric, Plain, for Concrete Reinforcement
 - 3. A615 Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
 - 4. A746 Ductile Iron Gravity Sewer Pipe
 - 5. C 76 Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
 - 6. C150 Portland Cement
 - 7. C206 Finished Hydrated Lime
 - 8. C443 Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets
 - 9. C478 Precast Reinforced Concrete Manhole Sections
 - 10. C564 Rubber Gasket for Cast Iron Soil Pipe and Fittings
 - 11. C969 Infiltration and Exfiltration Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines
 - 12. D 3034 Type PSM Polyvinyl Chloride (PVC) Sewer Pipe and Fittings
 - 13. D3212 Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
 - 14. D3350 Polyethylene Plastic Pipe and Fitting Materials
 - 15. F477 Elastomeric Seals (Gaskets) for Joining Plastic Pipe

1.3 SUMMARY

- A. Extent of storm sewage system work is indicated on drawings and schedules, and by requirements of this section. Included is the supplying, installation, construction, alteration, reconstruction, conversion or resetting of Catch Basins, Storm Manholes, Drop Inlets, Storm water recharge piping, Storm Sewer Piping, Underdrains, Culvert Ends, and all appurtenances and adapters for drainage structures at the locations and to the lines and grades shown on the Contract Drawings ordered by the Engineer and as specified herein.

Limit of piping covered under these specifications shall be offsite and on site as indicated on the Contract Drawings or ordered by the Engineer.

- B. Refer to Division-2 Section, "General Earthwork" for excavation and backfill required for storm sewage system; not work of this section.
- C. Refer to Division-3 Sections for concrete work required for storm sewage systems; not work of this section.
- D. Refer to Division-4 Sections for masonry work required for storm sewage systems; not work of this section.
- E. Refer to Contract Drawings for Site Contractor's scope of work for building storm drainage and storm water roof leader construction.

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's technical product data on pipe materials, pipe fittings, and accessories. Provide shop drawings for precast inlets, catch basins, storm manholes and yard drains for approval by Engineer prior to construction.

1.5 QUALITY ASSURANCE

- A. The manufacturing plant for precast materials, the quality of materials, the process of manufacture and the finished precast unit or pipe shall be subject to inspection and approval by the Engineer.

1.6 DEFINITIONS

For the work under this section, the following definitions shall apply:

- A. "Install" as called for on the Contract Drawings shall mean the work required to construct a new manhole or catch basin in conformance with the Contract Drawings.
- B. "Replace" as called for on the Contract Drawings shall mean the work required to remove an existing catch basin or manhole and its appurtenances and construct a new catch basin or manhole in conformance with the Contract Drawings.
- C. "Reconstruct" as called for on the Contract Drawings shall mean that work required on existing manholes or catch basins in order to make required connections and/or disconnections of pipes being installed and/or abandoned under other sections of work.

- D. "Convert" shall mean the work required in changing an existing unit to a unit of another type.
- E. "Reset" shall mean the minor adjustment of frames, grates, and covers of existing units to the proposed grade not involving major reconstruction of the unit. (Examples of resetting are: adding several courses of brick/block to bring a frame to required grade; removing some masonry courses for lowering a frame without reconstruction below the required elevation of the bottom of the frame; providing that the frame will be properly seated).

1.7 REQUIREMENTS

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of storm sewage system's products of types, materials, and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

1.8 PROJECT RECORD DOCUMENTS

- A. Accurately record actual locations of pipe runs, connections, catch basins, cleanouts, and invert elevations.
- B. Identify and describe unexpected variations to subsoil conditions and location of uncharted utilities.

1.9 PROJECT CONDITIONS

Coordinate work with termination of storm sewer connection outside building including connection to municipal storm sewer system.

PART 2 PRODUCTS

2.1. PIPES AND FITTINGS, MANHOLES, BASINS AND ACCESSORIES

General: Provide pipes of one of the following materials, of size weight/class indicated. Provide pipe fittings and accessories of same material and weight/class as pipes as applicable with joining method as indicated.

- A. Pipe - All sewer pipe shall be of sizes and classes as shown on the Contract Drawings.
- B. Reinforced Concrete Pipe - (RCP): shall conform to the requirements of ASTM C-76; all RCP shall be Class IV or of the class and wall indicated on the Contract Drawings, installed with O-ring gaskets at joints. Gaskets shall comply with ASTM C443, C361 and shall be installed in strict accordance with pipe manufacturer's recommendations.

Each length of pipe shall be provided with bell-and-spigot or tongue-and-groove ends formed in the concrete wall which shall enclose the gasket on all surfaces when the joint is in final position. Tongue or spigot ends of pipe shall be a grooved type to hold O-ring compression gasket in place.

RCP elbows, tees, wyes, and/or increasers/reducers shall be plant manufactured units conforming to all the requirements for RCP. Joints shall be as on the main sewer pipe.

The increasers/reducers shall be eccentric about the horizontal axis and symmetrical about the vertical axis of the pipe, with uniform and gradual varying dimensions to/from the larger diameter pipe from/to the smaller diameter pipe.

- C. Spiral Rib Metal Pipe Type 1R - Only permitted when specifically indicated on Construction Drawings and shall be aluminized type 2 spiral ribbed steel, 16 gauge sizes twelve inches(12") through twenty four (24") and 16 gauge sizes thirty inches (30") through thirty six (36") inches in diameter. Joints shall be standard 16 gauge one piece corrugated connecting bands. Conduits larger than 36 inches shall be 14 gauge aluminized type 2 steel with 3 inch by 1 inch or 5 inch by 1-inch corrugations. Where perforations are indicated on the Contract Drawings, they shall be patterned for 30, 3/8" diameter holes occurring per square foot of pipe surface. Joints shall be continuous corrugation bands with bar and strap connector of same material as joined conduit sections. Fittings shall be fabricated to conform to connecting pipe. Aluminized type 2 spiral ribbed steel pipe may be used in lieu of RCP at locations approved by Engineer. Acceptable manufacturer: CONTECH, INC. "ULTRA FLO or ULTRA FLO II", or approved equal.
- D. Polyvinyl Chloride Pipe - (PVC): shall be where indicated on the Contract Drawings and conform to ASTM D 3034 for SDR 35. Hydrostatic design stress rating shall be 730 psi based on 1,460-psi material per ASTM D2837. Pipe lengths shall not exceed 20 feet, be bell and spigot type with integral rubber ring gasket conforming to ASTM C361. Markings for pipe and fittings shall indicate the manufacturer's name, nominal size, material designation, type, and ASTM designation in accordance with ASTM D3034. Fittings shall be molded of same material as pipe. Joints for PVC shall conform to ASTM D 3212 using restrained gasket conforming to ASTM F477. Elbows for schedule 40 pipe shall conform to ASTM D2466 or D2467. Pipe for underdrains shall conform to ASTM D2729.
- E. High Density Polyethylene Pipe (HDPE) Smooth interior (Solid or Perforated): Only permitted when specifically indicated on Construction Drawings and shall conform with AASHTO Designation M 294 Type S. The pipe shall have annular corrugations. The self-locking integral bell portion shall be permanently affixed to the pipe and shall be polyethylene. The locking mechanism shall engage at 4 equally spaced locations around the pipe circumference. It shall be manufactured from high density polyethylene (HDPE) meeting the requirements of ASTM D3350 cell class 324420C; or the requirements of ASTM D1248: Type III, Category 4 Grade P33, Class C. Acceptable manufacturers: Advanced Drainage Systems, Inc. "ADS N-12", HANCOR, INC. "Hi-Q", or approved equal.
- F. Flexible Service Tees and Flexible Watertight Connections shall consist of neoprene rubber by Fernco or approved equal.
- G. Concrete shall conform to the requirements of Division 3 of these Specifications.
- H.. Grout Bonding Agent where called for shall be Sikadur Hi-Mod by Sika Chemical Corporation or Floroks Plas-Text by the Charger Corporation or equal.
- I. Grout - where non-shrink grout is called for, it shall conform to ASTM C827 allowing 3 percent expansion and have a compressive strength of 4,500 psi or shall consist of one part cement and one part sand with sufficient water to provide suitable workability. The grout shall contain "Embeco", by Master Builders Co., "Florok" by the Charger Corp., or approved equal.

- J. Bedding Material shall be of the type as indicated on the Contract Drawings and conform to requirements of Section 02200 for foundation stone, borrow and backfill requirements as specified.
- K. Manholes: Materials for construction of manholes shall be those shown (if indicated) on the Contract Drawings and shall conform to the requirements of these Specifications.

Reinforced concrete riser sections for manholes shall conform to the applicable provisions of ASTM Designation C478 for strength requirements and shall be as manufactured for manhole with neoprene coated steel or aluminum manhole steps. Precast manhole sections shall be joined with resilient rubber gaskets in conformance with the provisions of ASTM Specifications C361.

Cast-in-place concrete for bases, tables, inverts, and encasements shall be Class A, 3000-psi concrete and conform to the requirements of Division 3 Concrete of these Specifications.

Joints shall be mortared with non-shrink mortar. The exterior surfaces of all concrete manholes shall be coated with a bitumastic coating.

The bitumastic coating shall conform to the following requirements:

Weight per gallon, pounds - 11-13 weighting cup

Ash, % by weight, 36-41% ignition

Flash point, °F, minimum 95° ASTM D-56

Openings shall be provided in the precast reinforced concrete riser sections to receive entering and existing pipes, and these openings may be made at the place of manufacture or they shall be cut in the field.

Frames and covers shall be indicated on the Contract Drawings. Metal for manhole frames and covers shall be cast iron and metal for steps shall be forged aluminum conforming to the dimensions shown on the Contract Drawings. The lower surface of the cover and the corresponding upper surface of the frame shall be machine finished to provide a smooth support without tendency for the cover to rock or rattle. Cast iron shall conform to the requirements of AASHTO M105, Class 25. Forged aluminum shall conform to the provisions of ASTM B209. Unless otherwise specified, all frames, grates, and covers shall be painted with one shop coat of red lead paint and all areas so painted shall be given a field coat of RC-2 asphalt or SS-1 emulsion immediately before installation.

- L. Catch Basins/Yard Drains: Materials for construction of catch basins, and yard drains shall be as those shown on the Contract Drawings and shall conform to the requirements of CONNDOT Form 814A Article M.08.02 unless indicated otherwise on the Contract Drawings.

Precast catch basins and drop inlets shall conform to the requirements of ASTM C478 as modified by the plans or the following specifications for drainage structures.

Precast units for drainage structures shall conform to the details for each type as shown on the plans and the following requirements.

All material used for concrete shall conform to the requirements of Division 3 and shall develop a minimum compressive strength of 5,000 pounds per square inch in 28 days. Reinforcement shall conform to the requirements of ASTM A-615 for Grade 60.

The units shall be cast in substantial permanent steel forms so constructed that no overall dimension of a casting shall vary more than one-quarter inch over or under the specified dimension, and so that the frame for the inlet grate is in the desired position in the completed unit.

The manufacturing plant, the quality of materials, the process of manufacture and the finished precast unit shall be subject to inspection and approval by the Engineer.

Suitable provision shall be made in precasting the units for convenient handling of the completed casting, and additional reinforcement steel shall be provided to allow for such handling in the casting yard and during transportation and placing. Each completed unit shall be identified with the serial number and date of the concrete pour from which it was cast, either by casting this information into an exposed face of the unit or by suitable stencil. Forms shall not be removed until 24 hours after placing of concrete. The precast units shall be cured in accordance with AASHTO M 170, except that liquid membrane-forming compounds for curing concrete shall not be used in curing the precast tops of catch basins or drop inlets. Upon completion of the curing, all surfaces of the top units of catch basins and drop inlets shall be given an application of protective compound material, conforming to CONNDOT form 814A Article M.03.01-11, at the rate of 0.04 gallons per square yard.

- M. SNOUT® Oil & Debris Stops (Where Shown on the Contract Drawings) shall consist of a plastic composite hooded outlet that attaches to the wall of a storm water catch basin over the outlet pipe in such a manner as to prevent the exit of floating debris and oil.

Manufacturer

Best Management Products, Inc.
53 Mt. Archer Road
Lyme, CT 06371
Phone: (800)504-8008 or (860)434-0277
Fax: (410)687-6757
E-mail: tjm@bmpinc.com
Web Site: <http://www.bmpinc.com>

The SNOUT Oil and Debris Stop components shall consist of:

1. Standard size composite hoods
2. Gasketed, screw down, water tight, clean-out access port
3. Stainless steel mounting hardware
4. PVC Schedule 40 fittings and pipe for anti-siphon device
5. Pressure sensitive oil resistant foam rubber gasket

All catch basin structures that which are indicated on the Contract Drawings shall be outfitted with the SNOUT Oil and Debris Stop on the exit pipe as indicated on the Contract Drawing Details. The size and position shall be determined by pipe style and sump depth per manufacturer's recommendations. The anti-siphon device shall extend above the flood level of the structure where practical (a length of vent pipe is included in the installation kit.) The hood shall be securely attached to the catch basin wall with 6-

3/8" diameter stainless steel bolts and sealed to the structure with marine silicone adhesive or gasket material supplied in the installation kit.

- N. Metal for Drainage Structures: Metal for catch basin, drop inlet and manhole frames, extensions, covers and gratings and yard drain grates shall be cast iron, cast steel, structural steel or malleable iron conforming to the requirements of the plans. Covers and gratings shall bear uniformly on their supports.

Cast iron manhole and catch basin frames and covers shall be qualified for HS 20 loading conforming to ASTM A48 and State of Connecticut requirements. Catch basin frames and covers conforming to ASTM A27 for cast steel, ASTM A36 for structural steel and State of Connecticut Department of Transportation, Standard Specifications for Roads, Bridges and Incidental Construction, Form 814A. Frames and grates to be galvanized in accordance with ASTM A123.

Extensions shall be designed so that the existing manhole cover or catch basin grate, when set in place, will have substantially the same bearing, fit and load carrying capacity as in the existing frame. The extension shall be designed to fit into the original frame, resting specifically on the flange and rim area.

The extension shall accept the existing cover or grate so that the cover or grate is seated firmly without movement.

Ladder rungs for manholes shall conform to ASTM C478 and ASTM A48 for cast iron. Plastic coated rungs shall be equal to M.A. Industries copolymer polypropylene plastic over 1/2" diameter grade 60 bar or approved equal. Aluminum rungs shall conform to the Contract Drawings.

Cast steel shall conform to the requirements of ASTM A 27, Grade optional, and shall be thoroughly annealed.

Structural Steel shall conform to the requirements of ASTM A 36, or A 283, Grade B or better, as to quality and details of fabrication, except that in the chemical composition of the steel, the two-tenths of one percent of copper may be omitted.

Malleable iron shall conform to the requirements of the specifications of ASTM A 47, Grade 32510.

The materials and method of manufacture for drop inlets shall conform to the requirements as stated on the plans or as ordered.

- O. Brick and Masonry: Brick for catch basins, manholes or drop inlets shall conform to the requirements of ASTM Specification C32 Grade MA for tables and inverts. The depth shall be 2 1/4 inches, the width 3 5/8 inches and the length 8 inches, and the maximum water absorption by 5-hour boiling shall not exceed the following limits:

Average of 5 bricks	15 percent
Individual brick	18 percent

Concrete building brick for catch basins, manholes or drop inlets shall conform to the requirements of ASTM C 62 Grade SW S II.

Precast concrete grade rings for setting of manhole frames shall conform to the provisions of ASTM C478.

Masonry concrete units for catch basins, manholes or drop inlets shall conform to the requirements of ASTM C 139.

Mortar shall conform to ASTM C387 for Type M.

- P. Filter Fabric shall be spunbound, woven filaments of polypropylene or polyethylene and conform to the minimum requirements of these specifications. Materials incidental to and necessary for the installation of Filter Fabric, such as, but not limited to sewing thread, staples, pins, etc., shall conform to the requirements of the manufacturer of the Filter Fabric.

Weight	6.0 oz./yd ²	ASTM D1910
Tensile Strength	120 lbs.	ASTM D4632
Elongation at break	50%	ASTM D4632
Trapezoidal Tear Strength	50 lbs	ASTM D4555
Puncture Strength	70 lbs	ASTM D4833
Mullen Burst	240	ASTM 3786
Apparent Opening	70	ASTM D4751
Permittivity	1.8 sec ⁻¹	ASTM 4491

Filter Fabric to be as manufactured by TC Mirafi, N-Series, 140N or approved equal.

- Q. Cleanouts shall be ductile iron (ANSI A21.51) or Polyvinyl chloride pipe (ASTM D3034) risers, with sealed plug at grade for cleaning. Frame and cover to be cast iron.

Size of riser shall be same as downstream pipe up to 8" maximum.

- R. Underdrains: shall be perforated, PVC or Flexible corrugated High Density Polyethylene (HDPE) pipe as specified herein of the size indicated on the construction drawings.

- S. Catch basin hoods shall be Campbell Foundry Company cast iron type or approved equal.

PART 3 EXECUTION

3.1 INSTALLATION OF PIPE AND FITTINGS

- A. The Contractor shall install piping and appurtenances in accordance with governing authorities having jurisdiction except where more stringent requirements are indicated.

- 1. Concrete Pipe: Install in accordance with applicable provisions of ACPA "Concrete Pipe Installation Manual".

2. Plastic Pipe: Install in accordance with manufacturer's installation recommendations, and in accordance with ASTM D 2321.
3. High Density Polyethylene (HDPE): shall be installed in accordance with standard practice for corrugated polyethylene pipe and as recommended by the pipe manufacturer. The Engineer or other qualified individual shall inspect all components upon delivery. Damaged, defective, or improper products may not be accepted.
4. Aluminized Steel Type 2 corrugated Pipe (ASP) shall be installed in accordance with the plans and installation specification ASTM A796 & A798. The manufacturer's representative is required to be on site to ensure proper handling and installation of pipe.

All prefabricated fittings, bulkheads and stubs shall be welded watertight. Any field connection to main distribution pipe shall be welded watertight.

The manufacturer of the pipe shall provide certification of compliance with AASHTO M36 and M274 specifications.

5. Cleaning Piping: Clear interior of piping of dirt and other superfluous material as work progresses. Maintain swab or drag in line and pull past each joint as it is completed.

In large accessible piping, brushes and brooms may be used for cleaning.

Place plugs in ends of uncompleted conduit at end of day or whenever work stops.

Flush lines between manholes if required to remove collected debris.

6. Joint Adapters: Make joints between different types of pipe with standard manufactured adapters and fittings intended for that purpose.
7. Pipe laying - All sewers shall be laid true to line and grade with bells or grooves upgrate. The sections of the pipe shall be so laid and fitted together that, when complete, the sewer will have a smooth and uniform invert. The pipe shall be kept thoroughly clean so that jointing compounds will adhere. Each pipe shall be inspected for defects before being lowered into the trench.

All excavations, trenching supports and backfilling shall conform to applicable sections of Division 2.

The Contractor shall provide all necessary pumps, dams, drains, ditches, flumes, well points and other means for excluding and removing water from trenches and other parts of the work. Water shall not be allowed to rise around joints until they have set.

Remove existing piping and drainage structures so indicated on the Contract Drawings to be Removed.

Precautions shall be taken during freezing weather to protect the masonry from damage by frost.

If, pipe laying can not start at the downgrade end and progress upgrade, due to restrictions imposed by land acquisition and/or other construction activities, then construction may be done in sections as approved by the Engineer.

Make connections to existing piping and underground structures, so that finished work will conform as nearly as practicable to requirements specified for new work.

Use commercially manufactured wyes for branch connections. Field cutting into piping will be permitted unless indicated or directed by the Engineer.

For branch connections from side into existing 24" or larger piping or to underground structures, cut opening into unit sufficiently large to allow 3" of concrete to be packed around entering connection. Cut ends of connection passing through pipe or structure wall to conform to shape of and be flush with inside wall, unless otherwise indicated. For RCP connections to CMP, ASP detention piping install RCP to project 12" into detention piping. On outside of pipe or structure wall, encase entering connection in 6" of concrete for minimum length of 12" to provide additional support or collar from connection to undisturbed ground.

- a. Provide concrete which will attain minimum 28-day compressive strength of 3000 psi, unless otherwise indicated.
- b. Use epoxy-bonding compound as interface between new and existing concrete and piping materials.

Take care while making tap connections to prevent concrete or debris from entering existing piping or structure. Remove debris, concrete, or other extraneous material which may accumulate.

Where the pipe connects with the outside faces of manhole walls or the outside faces of the walls of other structures and approved flexible connections are not used there shall be a short section of pipe (usually 2 feet) placed at the connection to the structure. In order to accomplish this, without cutting pipe and destroying water tight integrity by having other than the normal type joints, minor modifications in manhole locations may be made with the approval of the Engineer.

The Contractor shall furnish materials, tools and men to assist the Owner's Representative and to handle survey equipment, levels, grade poles, plumb poles, plumb bobs, straight edges, laser equipment, and other equipment used for transferring grades, setting strings on profiles or grade slats or aligning pipe. While inspectors may at times check alignment, the Contractor's crew shall not be dependent upon the Owner's Representative for the performance of such work. All labor, tools and facilities needed to set or transfer line and grade, to measure pipe beds, pipe grade and line, etc. shall be furnished by the Contractor.

Not more than 100 feet of trench shall be opened in advance of pipe laying unless permitted by the Engineer. The excavation of trenches shall be fully completed a sufficient distance in advance of laying of the sewer, and the

exposed end of all pipes shall be fully protected with a board or other approved stopper to prevent earth or other substances from entering the pipe.

Any storm sewer pipe delivered to the job site in a damaged condition shall be removed from the job site immediately. Except for RCP, other sewer pipe bruised or damaged after delivery to the job site may be repaired and used as specified when permitted by the Engineer.

Any fitting showing a crack and any fitting or pipe which has received a severe blow that may have caused an incipient fracture, even though no such fracture can be seen, shall be marked as rejected and removed at once from the site.

In any pipe except as specified otherwise, showing a distinct crack and in which it is believed there is no incipient fracture beyond the limits of the visible crack, the cracked portion, if so approved, may be cut off by and at the expense of the Contractor before the pipe is laid so that the pipe used may be perfectly sound. The cut shall be made in the sound barrel at a point at least 12 inches from the visible limits of the crack.

Except as otherwise approved, all cutting of sewer pipe shall be done with an approved power-driven cutter or pipe-cutter. Hammer and chisel shall not be used to cut pipe. All cut ends shall be examined for possible cracks caused by cutting. The use of an oxyacetylene torch for flame cutting shall be done in a neat and workmanlike manner without damage to the pipe or its lining and so as to leave a smooth end at right angles to the pipe.

8. Pipe Jointing - Approved joint materials shall be handled and installed in accordance with the recommendation of the manufacturer. All joints shall be wiped smooth inside the pipe.
 - a. RCP Joints shall be made in accordance with the recommendation of the manufacturer. Prior to laying the pipe the spigot of the pipe shall be lubricated with an approved vegetable soap mixture, which will not harm the rubber. The gasket shall then be placed on the spigot end and adjusted to equalize the tension within the gasket around its circumference. After the pipes are aligned in the trench, ready to be jointed, all joint surfaces shall be cleaned and immediately before jointing the pipes together, the bell shall be completely covered with the same vegetable soap mixture. The pipe shall then be carefully pushed home into place without damage to pipe, gasket, bells or bitumastic coatings of the pipe. Any interior coatings damaged during installation shall be given two field coats of bitumastic. Any lifting holes shall be filled with non-shrink grout.
 - b. PVC shall be installed in accordance with the manufacturer's recommendations. Particular care should be taken to keep fine materials from interfering with proper joint assembly. Matching surfaces of a joint shall be wiped clean. The surfaces shall then be coated with a lubricating material prescribed by the manufacturer to overcome the frictional resistance encountered when shoving the pipe home. Pipe that is not marked with a depth mark shall be marked before assembly to assure that the spigot end is inserted to the full depth of the joint.

9. Foundation for Storm Sewers - The pipe shall be laid on a foundation and backfilled as shown on the Contract Drawings. Where the soil in subgrade is found to be soft, loose, freshly-filled earth, unstable or unsuitable as a base for the proposed sewer or appurtenances, the Engineer may, at his discretion, order it excavated to such additional depth and width as he may deem proper and replace with gravel fill, borrow, concrete, structural geogrid, geotextile or similar materials as he may direct.

Pipe foundation for each length of pipe shall be as noted on the Contract Drawings and conform to bedding details. The foundation stone where required shall conform to the requirements of Section 02200. The top of the stone shall be brought carefully to the proper grade, well tamped or compacted as directed and shaped for the barrel of the pipe and the pipe laid thereon.

Concrete cradles and encasements where called for on the Contract Drawings shall be of Class A concrete. The concrete shall conform to the requirements of Division 3. The cradle or encasement shall be as detailed on the Contract Drawings.

Where pipe is to be encased in concrete or laid in a concrete cradle the pipe will be laid on wooden cross sills of adequate size and area to support the pipe to grade and line after excavating to required subgrade. Wooden wedges or shims and tie downs will be used to secure pipe in place and to proper lines and grades.

10. Caps and/or Plugs - All pipes (e.g. manhole pipe stubs, service laterals, service chimneys, sewers to be abandoned, etc.) shall be either plugged with manufactured units or masonry bulkheads as specified hereinafter. All plugs and masonry bulkheads must be installed so that any future removal will not damage the bell of the pipe.

Close open ends of abandoned underground utilities which are indicated to remain in place. Provide sufficiently strong closures to withstand hydrostatic or earth pressure which may result after ends of abandoned utilities have been closed.

Close open ends of concrete masonry utilities with not less than 8" thick masonry bulkheads.

Close open ends of piping with threaded metal caps, plastic plugs, or other acceptable methods suitable for size and type of material being closed. Wood plugs are not acceptable.

11. Connection to Existing Manhole if indicated on the Contract Drawings shall be conducted utilizing a core drill on concrete manholes or by minimal removal of brick and mortar on brick manholes. The lateral shall be cut flush at the inside manhole face and excess opening at manhole wall shall be fully packed and sealed in a workmanlike manner with non shrink grout as approved by the Engineer.

12. Pipe Bedding: Where foundation stone is used for a foundation or to replace unsuitable materials, it shall be deposited in layers not over 8 inches thick and each layer shall be thoroughly compacted before the addition of other layers.

The Engineer will specify the foundation stone gradation to be utilized based on field conditions. The surface shall be carefully brought to grade and compacted as shown on the Contract Drawings and as directed by the Engineer.

Where foundation stone is used for pipe bedding it shall be placed and compacted in conformance with the respective item for the pipe being bedded or as directed by the Engineer.

13. Manholes: Place precast concrete sections as indicated. Where manholes occur in pavements, set tops of frames and covers flush with finish surface. Elsewhere, set tops 3" above finish surface, unless otherwise indicated.

The coating shall cover evenly the entire exterior of the riser, the groove and exterior of the tongue.

Pipe to manhole connections shall be made with a mortared connection.

The top of uppermost precast manhole sections shall be set at a grade that will allow a minimum of two courses and a maximum of seven courses of brick or precast concrete grade rings and mortar before setting the cast iron frame and cover. Mortar for brick masonry shall be made of Portland cement; to two parts of sand, worked to the proper consistency.

The Contractor shall furnish and faithfully use suitable slings, hooks, cable, or such other means as he may elect, for the proper and safe handling of precast manhole sections and bases. No cracked, damaged or defective sections will be allowed in the work. Each precast manhole section must be inspected and approved by the Engineer immediately prior to final placement. Any sections not approved for use in this work shall be removed from the site and satisfactorily disposed.

Manhole tables shall be constructed of brick, or concrete as ordered by the Engineer. Inverts shall have the exact shape of the sewers which are connected. Any change in elevation, size or direction shall be gradual and even. Manhole frames and covers shall be as indicated on the Contract Drawings.

All plugs in manholes shall be sealed with brick and non-shrink mortar.

No water shall be allowed to rise in excavations for manholes until mortar has set sufficiently. Upon completion, all debris shall be removed from each manhole.

The entire work of constructing manholes must be carried on in a manner to insure watertight work.

Any leak in manholes shall be caulked and completely repaired, or the entire work shall be removed and rebuilt.

Where proposed manholes are indicated on the Contract Drawings to be constructed over existing storm sewers, the existing storm sewer pipe shall be left undisturbed and the flow maintained through it until the manhole has been completed and accepted. Unless otherwise specified, required, ordered, or shown on the Contract Drawings, the Contractor shall carefully excavate around and properly support the existing pipe. The base section of the manhole shall be cast-in-place and shall have a ring-formed joint cast or formed in the base

section which shall be compatible with the corresponding precast manhole riser sections.

On completion and acceptance of the manhole, the top portion of the existing pipe shall be carefully removed and the water table formed to the limits and in accordance with the details shown on the Contract Drawings or as directed by the Engineer. Reinforced concrete pipe shall have the reinforcement cut off and mortared over with a minimum of one-half inch of mortar.

Manholes of precast reinforced concrete riser sections and bases shall be furnished with neoprene coated steel steps. All joints shall be grooved type with rubber gasket and shall be installed as specified.

Approved joint materials shall be handled and installed in accordance with the recommendation of the manufacturer. All joints shall be wiped smooth inside the pipe.

Joints shall be made in accordance with the recommendation of the manufacturer. Prior to installing the riser, the spigot of the riser shall be cleaned of all foreign matter. The gasket shall then be placed on the spigot end and adjusted to equalize the tension within the gasket around its circumference.

The riser shall then be carefully pushed home into place without damage to riser, gasket, bells or bitumastic coating of the riser.

14. Catch Basins/Yard Drains: The work under this section shall conform to the requirements of State of Connecticut Department of Transportation Form 814A and the details shown on the Contract Drawings or as directed by the Engineer. Castings shall be set to grade on no less than two courses of brick with the exception of Yard Drains where the metal frame and grate shall be attached directly to the precast concrete as shown on the Contract Drawings.

The surfaces of the tops of all catch basins and drop inlets shall be given a coat of protective compound material immediately upon completion of the concrete curing period at the rate of 0.04 gallons per square yard.

All masonry units shall be laid in full mortar beds.

Metal fittings for catch basins, manholes or drop inlets shall be set in full mortar beds or otherwise secured as shown on the plans.

Inlet and outlet pipes shall extend through the walls for a sufficient distance beyond the outside surface to allow for satisfactory connections, and the concrete or masonry shall be constructed around them neatly to prevent leakage along their outer surfaces. The pipe shall be cut flush with the inside face of the wall, or as shown on the plans.

Pervious material shall be used for backfilling the upper portion of the excavation made for catch basins and drop inlets down to the elevation of the invert of the outlet pipe but in no case to a depth greater than 3 feet below the top of the structure. Drainage openings shall be formed in the four walls of the structure at or immediately above the bottom of the pervious backfill. Depending on the masonry used in the walls, such openings shall be formed by the insertion of 2-inch pipes, omission of a header brick or by leaving two open vertical joints in the masonry.

Frames and strainers or covers which are to be reset shall be removed from their present beds, the walls or sides shall be rebuilt to conform to the requirements of the new construction and the frames and gratings or covers reset. If the frames, grating or covers are broken or so damaged as to be unfit for further use, they shall be replaced with new, sound material conforming to the above requirements for the material involved.

Unless otherwise specified, all ungalvanized steel frames, grates, and covers shall be painted with one shop coat of red lead paint and all areas so painted shall be given a field coat of RC-2 Asphalt or SS-1 Emulsion immediately before installation. All iron frames, grates and covers shall not be painted, unless otherwise specified.

15. Underdrains: For underdrains pipe shall conform to ASTM D2729 for perforated PVC pipe and ASTM D3034 for solid piping, except if indicated otherwise on the Contract Drawings. Holes shall be 3/8-inch diameter 3 hole style nine holes per linear foot.

When the bottom of the trench is unstable or in rock, the trench shall be excavated 6" deeper and an additional 6" layer of foundation stone, crushed stone, gravel fill or aggregate similar to that used to fill the trench shall be placed and compacted in the trench which ever is indicated on the Contract Drawings.

The perforations are to be at the bottom of the pipe except if otherwise indicated on the Contract Drawings, the aggregate for filling the trench shall then be placed to a depth of 3" and tamped true to grade. The pipe shall be placed and firmly bedded on the aggregate. This aggregate shall be placed whether the pipe is encased with Filter Fabric or not.

When the pipe used has a bell, the pipe shall be installed with the bell end upgrade with the spigot end entered fully into the adjacent bell.

When plastic, or polyethylene pipe is used, the pipe shall be carefully butted together and held by bands or other approved means so as to prevent any displacement of the joint.

After the pipe has been installed as described above, the aggregate shall be placed carefully around and over the pipe to a height of 12" above the top of the pipe or as indicated on Contract Drawings for under drains. The remainder of the trench shall be filled with aggregate and tamped in layers as shown on the plans.

When the pipe is used with the holes in an upward position, and in all cases where sand is used instead of the aggregate described herein, a protective 3" minimum layer of 3/8" aggregate shall be placed over the pipe and around all of the holes. Filter fabric may be substituted for the 3" layer of aggregate. When filter fabric is used, the entire length of each drainpipe shall be wrapped with the fabric and the seams lapped and welded or bonded. Where the seams of the filter fabric are not welded or bonded, they shall be lapped to a minimum width equal to the diameter of the pipe for 6" pipe and larger and a minimum of 6" for smaller pipe.

In all cases where subbase material or gravel is to be placed over the underdrain a layer of at least 6" of subbase material or gravel shall be placed over the underdrain immediately after its completion.

Where shown on the plans or directed by the Engineer, the Contractor shall connect, underdrains or outlets to existing or proposed drainage systems or structures, and provide cleanout riser pipes and caps.

This work shall be performed in a workmanlike manner satisfactory to the Engineer by installation of tees or wye branches or by providing a hole in the mainline underdrain.

Where the upgrade end of the, underdrain does not enter a structure, it shall be capped or plugged as directed.

18. Hooded Catch Basin and Chamber Outlets shall be installed in accordance with the manufacturer's instructions.

19. Inspection: Upon completion of installation and backfilling, all pipe and structures shall be inspected by the Engineer. This inspection shall be undertaken as the work progresses, and shall be a pre-requisite for acceptance of all work.

An inspection of the interior of the completed pipe by direct visual inspection shall be made for pipe installed. Any facilities, materials, lights, equipment or labor necessary for such inspection shall be provided by the Contractor.

Any foreign material found in the interior of the pipe, any dirt, debris or other objects shall be removed by the Contractor. Visible defects such as broken pipe sections, improperly installed gaskets, projecting connections, cracks, visible leaks, irregular inverts or other defects shall be noted, corrected and the pipe re-inspected.

3.3 SNOUT® OIL AND DEBRIS STOP

- A. Select the SNOUT Oil and Debris Stop of size and configuration to fit application.
- B. Center the SNOUT directly over the exit pipe so that the entire pipe is covered and so that the lower edge of the hood is at least ½ the pipe diameter below the lowest point of the pipe.
- C. Drill equally spaced 7/16" holes through the SNOUT flange. (Number of holes vary depending on size of SNOUT.)
- D. Mark and drill catch basin and install the tamp-in lead anchors.
 - 1. Drill a ¾" hole into the base material to the required depth.
 - 2. Below the hole clean of dust and other material.
 - 3. Insert the anchor into the hole (Lead shield out).
 - 4. Position the setting tool in the anchor. (The outer rim of the tool should seat the lead shield rim.)
 - 5. Using the tool, set the anchor by driving the lead sleeve over the cone using several sharp hammer blows. (Be sure the anchor is at the required elevation depth.)
 - 6. Attach the vent pipe adapter in the predrilled hole in the top of the SNOUT using the 2 flat O-ring gaskets and PVC lock-nut supplied in kit. Install with the female slip adapter up and a washer on each side of the SNOUT shell. Tighten lock-nut hand tight.

7. Attach the SNOOT to the catch basin wall with 3/8" diameter stainless steel bolts. Do not over tighten – 10 to 15 foot pounds should be sufficient.
8. Cut the anti-siphon vent stack to length and attach to hood with PVC cement.
9. Attach 90 degree fitting to vent stack with PVC cement. Insure that fitting opening is accessible for maintenance and inspection.

END OF SECTION 02720