

SECTION 02630 – DRAINAGE STRUCTURES

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK: Provide manholes and precast concrete items as shown on the Drawings. This section includes:

1. Precast Manholes
2. Catch Basins
3. Inverts
4. Risers
5. Frames, Covers, and Grates
6. Area Drain Basins

1.02 RELATED WORK specified elsewhere includes:

1. Existing Subsurface Conditions Section 02010
2. Handling Contaminated Soils: Section 02110
3. Earthwork: Section 02300
4. Erosion and Sedimentation Control: Section 02370
5. Sewers and Drains: Section 02600
6. Stormwater Treatment System: Section 02631.

1.03 QUALITY ASSURANCE:

- A. General: Provide complete manhole and precast concrete structures capable of supporting AASHTO H20 loading. All precast concrete shall comply with ASTM C913 "Standard Specification for Precast Concrete Water and Wastewater Structures."
- B. Precast Manhole and Catch Basin Components: Comply with ASTM C478.
- C. Antifloatation Slab Design Certificate: The CONTRACTOR may provide the precast structures requiring antifloatation slabs as one complete unit. If provided as a monolithic unit, submit a certificate of design signed by a Professional Engineer registered in the State in which the Work is being performed, certifying that the structure including the slab has been designed to withstand all forces including soil, traffic and hydrostatic in accordance with all applicable laws, regulations, rules and codes.

1.04 SUBMITTALS:

- A. Shop Drawings: Submit for precast manholes and all precast concrete items. Show components to be used, elevations of top of precast sections, base and pipe inverts, location of pipe penetrations, steps, for each manhole. Verify finish grade elevation at each proposed manhole location in the field.
- B. Product Data: Submit manufacturers' product data and installation instructions for frames, covers, grates, precast items, manhole sleeves, joint sealants, and frost barrier.

PART 2 - PRODUCTS

2.01 MANHOLES:

- A. Base Sections: Precast monolithic construction with steps.
- B. Barrel Sections: Precast with steps.
- C. Top Sections: Precast eccentric cone with steps. Alternative flat slab may be used if conditions warrant.
- D. Steps: Polypropylene reinforced with steel rod. Meet OSHA requirements, minimum width 16-inches. Cast into concrete.
- E. Pipe to Structure Connections: Connections shall be watertight, expandable pipe sleeve with adjustable expansion ring equal to Press-Boot by Press-Seal Gasket Corp., Fort Wayne, Indiana.
- F. Joints Between Precast Sections: Watertight, shiplap-type seal with two rings of one-inch diameter butyl rubber sealant.

2.02 CATCH BASINS:

- A. Base Sections: Precast monolithic construction.
- B. Barrel Sections: Precast monolithic construction.
- C. Top Sections: Precast eccentric cone. Alternative flat slab may be used if conditions warrant.
- D. Pipe to Structure Connections: Connections shall be watertight, expandable pipe sleeve with adjustable expansion ring equal to Press-Boot by Press-Seal Gasket Corp., Fort Wayne, Indiana.
- E. Joints Between Precast Sections: Watertight, shiplap-type seal with two rings of one-inch diameter butyl rubber sealant.

2.03 INVERTS:

- A. 180 Degree Straight Through Manholes: One piece molded fiberglass invert with integral pipe connections that are factory precast integral with the manhole base, "Fiberliner 2000 Invert System" as manufactured by Fiberliner 2000 New England, Inc, Tel. (508) 349-7401; or approved equal.
- B. Non Straight Through Manholes: One-piece plastic composite invert, "Reliner" as manufactured by Reliner – Duran, Inc. Tel. (860) 434-0277; or approved equal. Provide concrete backfill with brick table.
 - 1. Concrete: 3000 psi.
 - 2. Sewer Brick: ASTM C32, Grade SS, hard brick.
 - 3. Mortar: Type M, ASTM C270. Use Type II portland cement, Type S lime. Proportions for Mortar: 1 part portland cement, 1/4 part hydrated lime, 3 to 3 3/4 parts sand.

2.04 RISERS:

- A. General: Precast concrete grade rings, sewer brick risers, or equal

2.05 FRAMES, COVERS, AND GRATES:

- A. Material: Cast iron, ASTM A48 Class 30.
- B. Manhole Frames and Covers: For manholes 6-feet or more in vertical height, use minimum 24-inch diameter opening. Weight of 350 pounds, labeled with either "DRAIN" or "SEWER" in 3-inch high raised letters on cover for drainage manholes. Standard frames and covers shall be Model E245S by Etheridge Foundry, or approved equal.
- C. Catch Basin Frames and Grates: Catch basin frames and grates shall be standard City of Portland catch basin frame and grate Model E245G by Etheridge Foundry, or approved equal. For curbside catchbasins with inlet stones, frames shall be Etheridge DR5A.

2.06 Area Drain Basins:

- A. Area Drain Basin: Area Drain Basins shall be factory fabricated from PVC pipe stock, utilizing a thermo-molding process to reform the pipe stock to the specified configuration. The Area Drain Basin shall be H-25 rated. The drainage pipe connection stubs shall be manufactured from PVC pipe stock and formed to provide a watertight connection with the specified pipe system. This joint tightness shall conform to ASTM 03212 for joints for drain and sewer plastic pipe using flexible elastomeric seals. The pipe bell spigot shall be joined to the main body of the drain basin or catch basin. The pipe stock used to manufacture the main body and pipe stubs of the surface drainage inlets shall meet the mechanical property requirements for fabricated fittings as described by ASTM 03034. Standard for Sewer PVC Pipe and Fittings; ASTM F1336. Standard for PVC Gasketed Sewer Fittings. The diameter of the Area Drain Basin shall be as specified in the Drawings.
- B. Area Drain Frame and Grates: The grates furnished for all Area Drain Basins shall be ductile iron grates for sizes 8",10",12", 15", 18",24" and 30" (12" and 15" frames are cast iron) shall be made specifically for each basin so as to provide a round bottom flange that closely matches the diameter of the surface drainage inlet. Grates for drain basins shall be capable of supporting H-25 wheel loading for heavy-duty traffic or H-10 loading for pedestrian traffic. 12" and 15" grates will be hinged to the frame using pins. Metal used in the manufacture of the castings shall conform to ASTM A536 grade 70-50-05 for ductile iron and ASTM A-48-83 class 308 for 12" and is" cast iron frames. Grates shall be provided painted black.
- C. Installation: The specified PVC surface drainage inlet shall be installed using conventional flexible pipe backfill materials and procedures. The backfill material shall be crushed stone. The surface drainage inlets shall be bedded and back-filled uniformly. The drain basin body will be cut at the time of the final grade so as to maintain a one piece, leak proof structure. No brick, stone or concrete block will be used to set the grate to the final grade height. For H-25 Load rated installations, an 8" to 10" thick concrete ring will be poured under the grate and frame as recommended by details provided from the manufacturer.

2.07 MISCELLANEOUS:

- A. Frost Barrier: U.V. resistant, high grade polyethylene, minimum thickness eight (8) mils.
- B. Joint Sealants:

1. Butyl Rubber Sealant: One (1) inch diameter strips manufactured by Kent Seal, or approved equal.
 2. Butyl Rubber Caulking: Conform to AASHTO M-198, Type B.
- C. Sewer Manhole Inverts: Provide inverts as specified or as shown. Configuration to be as required by connecting pipes and as shown on Drawings.

PART 3 - EXECUTION:

3.01 INSTALLATION OF MANHOLES/CATCH BASINS:

- A. Placement: Place precast bases and structures on compacted bedding material so bottom of structure is plumb and pipe inverts are at proper elevations. Place manhole barrel and top sections in the appropriate height combinations. Plug all lifting holes inside and out with non-shrink grout. Construct manhole inverts in accordance with specifications.
- B. Joints: Follow manufacturer's instructions for sealing joints between precast sections. Provide two rings of 1 inch diameter butyl rubber sealant. Point joints inside and out with butyl caulk.
- C. Frame and Covers:
 1. Set to final grade as shown on the Drawings and as specified. Provide adequate temporary covers to prevent accidental entry until final placement of frame and cover is made.
 2. Use two rings of 1 inch diameter butyl rubber sealant between frame and rubber riser. Provide downward force to frame so as to compress the joint, provide a watertight seal, and prevent future settlement. Point compressed joint with butyl rubber caulk sealant.
 3. Set manhole frames and covers to final grade only after pavement base course has been applied, or after final grading of gravel roads.
- D. Inverts: As specified.
- E. Steps: Replace any steps that are out of plumb and proper horizontal placement.
- F. Frost Barriers: Wrap each manhole to the maximum excavation depth or not less than 4 ½ feet below grade, with a minimum of three layers of 8 mils each of the polyethylene.
 1. Clean manhole exterior of all dirt and remove any protrusions.
 2. Apply a 6-inch wide vertical strip of bituminous waterproofing adhesive from the top of manhole to the greatest excavation depth, but not in excess of 6 feet.
 3. Start poly wrap at adhesive strip and proceed around manhole continuously, overlapping adhesive strip a minimum of 24 inches on the final layer.
 4. Tuck and pleat poly at top in a continuous manner, minimizing size of folds. Extend poly past top of manhole frame and temporarily tuck remainder inside frame, until final backfill and paving.

5. Paved areas: Cut poly flush with manhole rim after pavement is in place.
6. Unpaved areas: Pull loose ends of poly together, remove excess air and tie off end with galvanized wire. Bury with manhole below grade.

3.02 LEAKAGE TESTING – MANHOLES/CATCH BASINS:

A. General: Tests must be observed by the ENGINEER. Manholes must be complete, including backfill, for final test acceptance except for shelf and invert brickwork. Plug all pipes and other openings in the manhole walls prior to test.

B. Exfiltration Test:

1. Plug pipes into and out of MH and secure plugs.
2. Lower groundwater table (GWT) to below MH. Maintain GWT at this level throughout test. Provide means of determining GWT level at any time throughout test.
3. Fill MH with water to top of cone.
4. Allow a period of time for absorption (determined by CONTRACTOR).
5. Refill to top of cone.
6. Determine volume of leakage in an 8 hour (min) test period and calculate rate.
7. Acceptable leakage rate: Not more than 1 gallon per vertical foot per 24 hours.
8. ENGINEER reserves the right to require an infiltration test if he is not satisfied with the exfiltration test.

C. Vacuum Test:

1. Manholes may be vacuum tested in lieu of the exfiltration test. The vacuum tests must be performed prior to backfilling the manhole, filling joints, and constructing the manhole inverts and benches. All pipe connections shall be made prior to the test.
2. Plug pipe openings and securely brace the plugs and pipe.
3. Set the tester onto the top section of the manhole and inflate the compression band to effect a seal between the structure and the vacuum base.
4. Connect the vacuum pump to the outlet port, open the valve, start the motor and draw a vacuum of 10-inch mercury.
5. Close the valve and monitor the vacuum gauge.
6. The test shall pass if the vacuum holds at 10-inch mercury or drops no lower than 9 inches within the following times:

Depth of Manhole (feet)	Time (min.)
0 - 10	3.0
10 - 15	3.5
15 - 20	4.0
20 - 25	4.5
>25	5.0

7. If the vacuum drops in excess of the prescribed rate, the CONTRACTOR shall locate the leak, make proper repairs, and retest the manhole.

8. If the unit fails the test after repair, the unit shall be water exfiltration tested.

3.03 REPAIRS:

- A. Determine causes of all leaks and repair them. Perform earthwork required if manhole has been backfilled.
- B. Perform repairs using methods and materials approved by the ENGINEER. Remove and replace or reconstruct manhole if necessary. Remove and replace defective sections if required by ENGINEER.

End of Section