334100 - Storm Drainage

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334100 - Storm Drainage
SECTION 33 4100 - STORM DRAINAGE

1.1 SUMMARY

A. UNH makes every effort to mitigate stormwater discharge to the utility system. Please visit the UNH and NH DES Stormwater sites for additional information.


B. Section Includes:

1. Pipe and fittings.
2. Channel drainage systems.
3. Encasement for piping.
5. Cleanouts.
7. Expansion joints.
8. Catch basins.

C. See Chapter 5, Division 01, Section 017700.1.1.B.1.i Closeout Procedures - Project Record Documents for equipment list requirements for all equipment provided in this section.

1.2 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 74, Service class.

B. Gaskets: ASTM C 564, rubber.

C. Calking Materials: ASTM B 29, pure lead and oakum or hemp fiber.

1.3 HUBLESS CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 888 or CISPI 301.

B. Heavy-Duty, Shielded Couplings:

1. Description: ASTM C 1277 and ASTM C 1540, with stainless-steel shield; stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.
1.4 DUCTILE-IRON, CULVERT PIPE AND FITTINGS

A. Pipe: ASTM A 716, for push-on joints.
B. Standard Fittings: AWWA C110, ductile or gray iron, for push-on joints.
C. Compact Fittings: AWWA C153, for push-on joints.
D. Gaskets: AWWA C111, rubber.

1.5 PE PIPE AND FITTINGS

A. Corrugated PE Drainage Pipe and Fittings NPS 3 to NPS 10 (DN 80 to DN 250): AASHTO M 252M, Type S, with smooth waterway for coupling joints.
   1. Silttight Couplings: PE sleeve with ASTM D 1056, Type 2, Class A, Grade 2 gasket material that mates with tube and fittings.
B. Corrugated PE Pipe and Fittings NPS 12 to NPS 60 (DN 300 to DN 1500): AASHTO M 294M, Type S, with smooth waterway for coupling joints.
   1. Silttight Couplings: PE sleeve with ASTM D 1056, Type 2, Class A, Grade 2 gasket material that mates with pipe and fittings.

1.6 PVC PIPE AND FITTINGS

A. PVC Corrugated Sewer Piping:
   2. Fittings: ASTM F 949, PVC molded or fabricated, socket type.

1.7 CONCRETE PIPE AND FITTINGS

A. Nonreinforced-Concrete Sewer Pipe and Fittings: ASTM C 14 (ASTM C 14M).
B. Reinforced-Concrete Sewer Pipe and Fittings: ASTM C 76 (ASTM C 76M).

1.8 NONPRESSURE TRANSITION COUPLINGS

A. Comply with ASTM C 1173, elastomeric, sleeve-type, reducing or transition coupling, for joining underground nonpressure piping. Include ends of same sizes as piping to be joined, and corrosion-resistant-metal tension band and tightening mechanism on each end.
B. Sleeve Materials:

1. For Concrete Pipes: ASTM C 443 (ASTM C 443M), rubber.
3. For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
4. For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.

C. Unshielded, Flexible Couplings:

1. Description: Elastomeric sleeve with stainless-steel shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.

D. Shielded, Flexible Couplings:

1. Description: ASTM C 1460, elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.

E. Ring-Type, Flexible Couplings:

1. Description: Elastomeric compression seal with dimensions to fit inside bell of larger pipe and for spigot of smaller pipe to fit inside ring.

1.9 EXPANSION JOINTS

A. Ductile-Iron Flexible Expansion Joints:

1. Manufacturers:
   a. EBAA Iron Sales, Inc.
   b. Romac Industries, Inc.
   c. Star Pipe Products.

2. Description: Compound fitting with combination of flanged and mechanical-joint ends complying with AWWA C110 or AWWA C153. Include two gasketed ball-joint sections and one or more gasketed sleeve sections, rated for 250-psig (1725-kPa) minimum working pressure and for offset and expansion indicated.

1.10 CLEANOUTS

A. Cast-Iron Cleanouts:

1. Description: ASME A112.36.2M, round, gray-iron housing with clamping device and round, secured, scoriated, gray-iron cover. Include gray-iron ferrule with inside calk or spigot connection and countersunk, tapered-thread, brass closure plug.

2. Top-Loading Classification(s): Light Duty, Medium Duty, Heavy Duty and Extra-Heavy Duty.
3. Sewer Pipe Fitting and Riser to Cleanout: ASTM A 74, Service class, cast-iron soil pipe and fittings.

B. Plastic Cleanouts:

1. Description: PVC body with PVC threaded plug. Include PVC sewer pipe fitting and riser to cleanout of same material as sewer piping.

1.11 ENCASEMENT FOR PIPING

A. Standard: ASTM A 674 or AWWA C105.

B. Material: Linear low-density polyethylene film of 0.008-inch (0.20-mm) or high-density, cross-laminated polyethylene film of 0.004-inch (0.10-mm) minimum thickness.

C. Form: Sheet or tube.

D. Color: Black or natural.

1.12 MANHOLES

A. Standard Precast Concrete Manholes:

1. Description: ASTM C 478 (ASTM C 478M), precast, reinforced concrete, of depth indicated, with provision for sealant joints.

2. Diameter: 48 inches (1200 mm) minimum unless otherwise indicated.

3. Ballast: Increase thickness of precast concrete sections or add concrete to base section as required to prevent flotation.

4. Base Section: 6-inch (150-mm) minimum thickness for floor slab and 4-inch (102-mm) minimum thickness for walls and base riser section, and separate base slab or base section with integral floor.

5. Riser Sections: 4-inch (102-mm) minimum thickness, and lengths to provide depth indicated.

6. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated, and top of cone of size that matches grade rings.


8. Resilient Pipe Connectors: ASTM C 923 (ASTM C 923M), cast or fitted into manhole walls, for each pipe connection.

9. Steps: Individual FRP steps; FRP ladder; or ASTM A 615/A 615M, deformed, 1/2-inch (13-mm) steel reinforcing rods encased in ASTM D 4101, PP, wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch (300- to 400-mm) intervals. Omit steps if total depth from floor of manhole to finished grade is less than 60 inches (1500 mm).

10. Grade Rings: Reinforced-concrete rings, 6- to 9-inch (150- to 225-mm) total thickness, to match diameter of manhole frame and cover, and height as required to adjust manhole frame and cover to indicated elevation and slope.

B. Manhole Frames and Covers:
1. Description: Ferrous; 24-inch (610-mm) ID by 7- to 9-inch (175- to 225-mm) riser with 4-inch- (102-mm-) minimum width flange and 26-inch- (660-mm-) diameter cover. Include indented top design with lettering cast into cover, using wording equivalent to “STORM SEWER.”

2. Material: ASTM A 536, Grade 60-40-18 ductile or ASTM A 48/A 48M, Class 35 gray iron unless otherwise indicated.

### 1.13 CONCRETE

**A. General:** Cast-in-place concrete according to ACI 318, ACI 350/350R (ACI 350M/350RM), and the following:

1. **Cement:** ASTM C 150, Type II.
2. **Fine Aggregate:** ASTM C 33, sand.
3. **Coarse Aggregate:** ASTM C 33, crushed gravel.

**B. Portland Cement Design Mix:** 4000 psi (27.6 MPa) minimum, with 0.45 maximum water/cementitious materials ratio.

1. **Reinforcing Fabric:** ASTM A 185/A 185M, steel, welded wire fabric, plain.
2. **Reinforcing Bars:** ASTM A 615/A 615M, Grade 60 (420 MPa) deformed steel.

**C. Manhole Channels and Benches:** Factory or field formed from concrete. Portland cement design mix, 4000 psi (27.6 MPa) minimum, with 0.45 maximum water/cementitious materials ratio. Include channels and benches in manholes.

1. **Channels:** Concrete invert, formed to same width as connected piping, with height of vertical sides to three-fourths of pipe diameter. Form curved channels with smooth, uniform radius and slope.
2. **Benches:** Concrete, sloped to drain into channel.

**D. Ballast and Pipe Supports:** Portland cement design mix, 3000 psi (20.7 MPa) minimum, with 0.58 maximum water/cementitious materials ratio.

1. **Reinforcing Fabric:** ASTM A 185/A 185M, steel, welded wire fabric, plain.
2. **Reinforcing Bars:** ASTM A 615/A 615M, Grade 60 (420 MPa) deformed steel.

### 1.14 POLYMER-CONCRETE, CHANNEL DRAINAGE SYSTEMS

**A. General Requirements for Polymer-Concrete, Channel Drainage Systems:** Modular system of precast, polymer-concrete channel sections, grates, and appurtenances; designed so grates fit into channel recesses without rocking or rattling. Include quantity of units required to form total lengths indicated.

**B. Manufacturers:**

1. ABT, Inc.
2. ACO USA.
C. Sloped-Invert, Polymer-Concrete Systems:

1. Grates:
   a. Manufacturer's designation "Heavy or Medium Duty," with slots or perforations that fit recesses in channels.
   b. Material: Fiberglass, Galvanized steel, Gray iron or Stainless steel.

2. Covers: Solid gray iron if indicated. Clearly engraved Storm Water.

3. Locking Mechanism: Manufacturer's standard device for securing grates to channel sections.

D. Narrow-Width, Level-Invert, Polymer-Concrete Systems:

1. Grates:
   a. Slots or perforations that fit recesses in channels.
   b. Material: Fiberglass, Galvanized steel, Gray iron or Stainless steel.

2. Covers: Solid gray iron if indicated.

3. Locking Mechanism: Manufacturer's standard device for securing grates to channel sections.

E. Drainage Specialties: Precast, polymer-concrete units.

1. Large Catch Basins:
   a. 24-by-12-inch (610-by-305-mm) polymer-concrete body, with outlets in quantities and sizes indicated.
   b. Gray-iron slotted grate.
   c. Frame: Include gray-iron or steel frame for grate.

2. Small Catch Basins:
   a. 19- to 24-inch by approximately 6-inch (483- to 610-mm by approximately 150-mm) polymer-concrete body, with outlets in quantities and sizes indicated.
   b. Gray-iron slotted grate.
   c. Frame: Include gray-iron or steel frame for grate.

3. Oil Interceptors:
   a. Polymer-concrete body with interior baffle and four steel support channels and two 1/4-inch- (6.4-mm-) thick, steel-plate covers.
   b. Steel-plate covers.

4. Sediment Interceptors:
a. 27-inch- (686-mm-) square, polymer-concrete body, with outlets in quantities and sizes indicated.
b. 24-inch- (610-mm-) square, gray-iron frame and slotted grate.

F. Supports, Anchors, and Setting Devices: Manufacturer’s standard unless otherwise indicated.

G. Channel-Section Joining and Fastening Materials: As recommended by system manufacturer.

1.15 CATCH BASINS

A. Standard Precast Concrete Catch Basins:

1. Description: ASTM C 478 (ASTM C 478M), precast, reinforced concrete, of depth indicated, with provision for sealant joints.
2. Base Section: 6-inch (150-mm) minimum thickness for floor slab and 4-inch (102-mm) minimum thickness for walls and base riser section, and separate base slab or base section with integral floor.
3. Riser Sections: 4-inch (102-mm) minimum thickness, 48-inch (1200-mm) diameter, and lengths to provide depth indicated.
4. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated. Top of cone of size that matches grade rings.
6. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch (150- to 225-mm) total thickness, that match 24-inch- (610-mm-) diameter frame and grate.
7. Steps: Individual FRP steps; FRP ladder; or ASTM A 615/A 615M, deformed, 1/2-inch (13-mm) steel reinforcing rods encased in ASTM D 4101, PP, wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch (300- to 400-mm) intervals. Omit steps if total depth from floor of catch basin to finished grade is less than 60 inches (1500 mm).
8. Pipe Connectors: ASTM C 923 (ASTM C 923M), resilient, of size required, for each pipe connecting to base section.

B. Frames and Grates: ASTM A 536, Grade 60-40-18, ductile iron designed for A-16, structural loading. Include flat grate with small square or short-slotted drainage openings.

1. Size: 24 by 24 inches (610 by 610 mm) minimum unless otherwise indicated.
2. Grate Free Area: Approximately 50 percent unless otherwise indicated.

C. Frames and Grates: ASTM A 536, Grade 60-40-18, ductile iron designed for A-16, structural loading. Include 24-inch (610-mm) ID by 7- to 9-inch (175- to 225-mm) riser with 4-inch (102-mm) minimum width flange, and 26-inch- (660-mm-) diameter flat grate with small square or short-slotted drainage openings.

1. Grate Free Area: Approximately 50 percent unless otherwise indicated.
1.16 STORMWATER INLETS

A. Curb Inlets: Made with vertical curb opening, of materials and dimensions according to utility standards.

B. Gutter Inlets: Made with horizontal gutter opening, of materials and dimensions according to utility standards. Include heavy-duty frames and grates.

C. Combination Inlets: Made with vertical curb and horizontal gutter openings, of materials and dimensions according to utility standards. Include heavy-duty frames and grates.

D. Frames and Grates: Heavy duty, according to utility standards.

1.17 PIPE OUTLETS

A. Head Walls: Cast-in-place reinforced concrete, with apron and tapered sides.

B. Riprap Basins: Broken, irregularly sized and shaped, graded stone according to NSSGA's "Quarried Stone for Erosion and Sediment Control."

   1. Average Size: NSSGA No. R-3, screen opening 2 inches (51 mm).
   2. Average Size: NSSGA No. R-4, screen opening 3 inches (76 mm).
   3. Average Size: NSSGA No. R-5, screen opening 5 inches (127 mm).


D. Energy Dissipaters: According to NSSGA's "Quarried Stone for Erosion and Sediment Control," No. A-1, 3-ton (2721-kg) average weight armor stone, unless otherwise indicated.

END OF SECTION 33 4100