

## SECTION 02630 - STORM DRAINAGE

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes gravity-flow, nonpressure storm drainage outside the building, with the following components:
  - 1. Special fittings for expansion and deflection.
  - 2. Backwater valves.
  - 3. Cleanouts.
  - 4. Drains.
  - 5. Corrosion-protection piping encasement.
  - 6. **Precast concrete** and **Cast-in-place concrete** manholes.

#### 1.3 DEFINITIONS

- A. ABS: Acrylonitrile-butadiene-styrene plastic.
- B. EPDM: Ethylene-propylene-diene-monomer rubber.
- C. FRP: Fiberglass-reinforced plastic.
- D. LLDPE: Linear low-density, polyethylene plastic.
- E. PE: Polyethylene plastic.
- F. PP: Polypropylene plastic.
- G. PVC: Polyvinyl chloride plastic.
- H. RTRF: Glass-fiber-reinforced, thermosetting-resin fitting.
- I. RTRP: Glass-fiber-reinforced, thermosetting-resin pipe.
- J. TPE: Thermoplastic elastomer.

#### 1.4 PERFORMANCE REQUIREMENTS

- A. Gravity-Flow, Nonpressure, Drainage-Piping Pressure Rating: **30 kPa**. Pipe joints shall be at least silttight, unless otherwise indicated.

#### 1.5 SUBMITTALS

- A. Product Data: For the following:

1. Special pipe fittings.
2. Backwater valves.
3. Drains.
4. Channel drainage systems.

- B. Shop Drawings: For the following:

1. Manholes: Include plans, elevations, sections, details, and frames and covers. **Include design calculations, and concrete design-mix report for cast-in-place manholes.**
2. **Catch Basins and Stormwater Inlets.** Include plans, elevations, sections, details, and frames, covers, and grates.
3. Stormwater Detention Structures: Include plans, elevations, sections, details, frames and covers, design calculations, and concrete design-mix report.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Do not store plastic pipe and fittings in direct sunlight.
- B. Protect pipe, pipe fittings, and seals from dirt and damage.
- C. Handle manholes according to manufacturer's written rigging instructions.
- D. Handle **catch basins and stormwater inlets** according to manufacturer's written rigging instructions.

#### 1.7 PROJECT CONDITIONS

- A. Interruption of Existing Storm Drainage Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:
1. Notify **Owner** no fewer than 10 days in advance of proposed interruption of service.
  2. Do not proceed with interruption of service without **Owner's** written permission.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

### 2.2 PE PIPE AND FITTINGS

- A. Corrugated PE Drainage Pipe and Fittings **DN 250** and Smaller: 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.
  2. Soiltight Couplings: AASHTO M 252M, corrugated, matching tube and fittings.
  3. Corrugated PE Pipe and Fittings **DN 250 to DN 1200**: AASHTO M 294M, Type S, with smooth waterway for coupling joints.
  4. Silttight Couplings: PE sleeve with ASTM D 1056, Type 2, Class A, Grade 2 gasket material that mates with pipe and fittings.
  5. Soiltight Couplings: AASHTO M 294M, corrugated, matching pipe and fittings.
- B. Corrugated PE Pipe and Fittings **DN 1400 and DN 1524**: AASHTO MP7, 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.
  2. Soiltight Couplings: AASHTO MP7, corrugated, matching pipe and fittings.

### 2.3 CONCRETE PIPE AND FITTINGS

- A. Reinforced-Concrete Sewer Pipe and Fittings: **ASTM C 76M**, with **bell-and-spigotends** and **gasketed joints with ASTM C 443 (ASTM C 443M), rubber gaskets**
1. Class III
  2. Class IV

### 2.4 NONPRESSURE-TYPE PIPE 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 443M](#), rubber.
  2. For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
  3. For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.
- C. Unshielded Flexible Couplings: Elastomeric sleeve with corrosion-resistant-metal tension band and tightening mechanism on each end.
1. **Available Manufacturers:**
    - a. Dallas Specialty & Mfg. Co.
    - b. Fernco Inc.
    - c. Logan Clay Products Company (The).
    - d. Mission Rubber Company; a division of MCP Industries, Inc.
    - e. NDS Inc.
    - f. Plastic Oddities, Inc.
- D. Shielded Flexible Couplings: 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.
1. **Available Manufacturers:**
    - a. Cascade Waterworks Mfg.
    - b. Dallas Specialty & Mfg. Co.
    - c. Mission Rubber Company; a division of MCP Industries, Inc.
- E. Ring-Type Flexible Couplings: Elastomeric compression seal with dimensions to fit inside bell of larger pipe and for spigot of smaller pipe to fit inside ring.
1. **Available Manufacturers:**
    - a. Fernco Inc.
    - b. Logan Clay Products Company (The).
    - c. Mission Rubber Company; a division of MCP Industries, Inc.

## 2.5 BACKWATER VALVES

- A. Gray-Iron Backwater Valves: ASME A112.14.1, gray-iron body and bolted cover, with bronze seat.
1. **Available Manufacturers:**
    - a. Josam Company.
    - b. Smith, Jay R. Mfg. Co.
    - c. Wade Div.; Tyler Pipe.
    - d. Watts Industries, Inc.
    - e. Watts Industries, Inc.; Enpoco, Inc. Div.
    - f. Zurn Industries, Inc.; Zurn Specification Drainage Operation.

2. Horizontal Type: With swing check valve and hub-and-spigot ends.
  3. Combination Horizontal and Manual Gate-Valve Type: With swing check valve, integral gate valve, and hub-and-spigot ends.
  4. Terminal Type: With bronze seat, swing check valve, and hub inlet.
- B. PVC Backwater Valves: Horizontal type; with PVC body, PVC removable cover, and PVC swing check valve.
1. **Available** Manufacturers:
    - a. Canplas Inc.
    - b. IPS Corporation.
    - c. NDS Inc.
    - d. Plastic Oddities, Inc.
    - e. Sioux Chief Manufacturing Company, Inc.
    - f. Zurn Industries, Inc.; Zurn Light Commercial Specialty Plumbing Products.

## 2.6 DRAINS

- A. Gray-Iron Area Drains: ASME A112.21.1M, round body with anchor flange and round **secured** grate. Include bottom outlet with inside calk or spigot connection, of sizes indicated.
1. **Available** Manufacturers:
    - a. Josam Company.
    - b. MIFAB Manufacturing, Inc.
    - c. Smith, Jay R. Mfg. Co.
    - d. Wade Div.; Tyler Pipe.
    - e. Watts Industries, Inc.
    - f. Watts Industries, Inc.; Enpoco, Inc. Div.
    - g. Zurn Industries, Inc.; Zurn Specification Drainage Operation.
  2. Top-Loading Classification(s): **Heavy** duty.
- B. Gray-Iron Trench Drains: ASME A112.21.1M, **150-mm-** wide top surface, rectangular body with anchor flange or other anchoring device, and rectangular **secured** grate. Include units of total length indicated and number of bottom outlets with inside calk or spigot connections, of sizes indicated.
1. **Available** Manufacturers:
    - a. Josam Company.
    - b. Smith, Jay R. Mfg. Co.
    - c. Wade Div.; Tyler Pipe.
    - d. Watts Industries, Inc.
    - e. Watts Industries, Inc.; Enpoco, Inc. Div.
    - f. Zurn Industries, Inc.; Zurn Specification Drainage Operation.
  2. Top-Loading Classification(s): **Heavy** duty.

## 2.7 MANHOLES

- A. Standard Precast Concrete Manholes: **ASTM C 478M**, precast, reinforced concrete, of depth indicated, with provision for sealant joints.
1. Diameter: **1200 mm** minimum, unless otherwise indicated.
  2. Ballast: Increase thickness of precast concrete sections or add concrete to base section, as required to prevent flotation.
  3. Base Section: **150-mm** minimum thickness for floor slab and **102-mm** minimum thickness for walls and base riser section, and having separate base slab or base section with integral floor.
  4. Riser Sections: **102-mm** minimum thickness, and lengths to provide depth indicated.
  5. 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. Joint Sealant: **ASTM C443M**, Rubber. .
  7. Resilient Pipe Connectors: **ASTM C 923M**, cast or fitted into manhole walls, for each pipe connection.
  8. Steps: **Individual FRP steps, FRP ladder, or ASTM A 615/A 615M, deformed, 13-mm steel reinforcing rods encased in ASTM D 4101, PP**, wide enough to allow worker to place both feet on 1 step and designed to prevent lateral slippage off of step. Cast or anchor steps into sidewalls at **300- to 400-mm** intervals. Omit steps if total depth from floor of manhole to finished grade is less than **1500 mm**.
  9. Grade Rings: Reinforced-concrete rings, **150- to 225-mm** total thickness, to match diameter of manhole frame and cover.
  10. Manhole Frames and Covers: Ferrous; **610-mm** ID by **175- to 225-mm** riser with **102-mm-** minimum width flange and **660-mm-** diameter cover. Include indented top design with lettering cast into cover, using wording equivalent to "STORM SEWER."
    - a. Material: **ASTM A 48, Class 35 gray** iron, unless otherwise indicated.
    - b. Protective Coating: Foundry-applied, SSPC-Paint 16, coal-tar, epoxy-polyamide paint; **0.26-mm** minimum thickness applied to all surfaces, unless otherwise indicated.
- B. Cast-in-Place Concrete Manholes: Construct of reinforced-concrete bottom, walls, and top; designed according to **ASTM C 890** for A-16 (ASSHTO HS20-44), heavy-traffic, structural loading; of depth, shape, dimensions, and appurtenances indicated.
1. Ballast: Increase thickness of concrete, as required to prevent flotation.
  2. Resilient Pipe Connectors: **ASTM C 923 (ASTM C 923M)**, cast or fitted into manhole walls, for each pipe connection.
  3. Steps: **Individual FRP steps, FRP ladder, or ASTM A 615/A 615M, deformed, 13-mm steel reinforcing rods encased in ASTM D 4101, PP**, wide enough to allow worker to place both feet on 1 step and designed to prevent lateral slippage off of step. Cast or anchor steps into sidewalls at **300- to 400-mm** intervals. Omit steps if total depth from floor of manhole to finished grade is less than **1500 mm**.
  4. Grade Rings: Reinforced-concrete rings, **150- to 225-mm** total thickness, to match diameter of manhole frame and cover.
  5. Manhole Frames and Covers: Ferrous; **610-mm** ID by **175- to 225-mm** riser with **102-mm-** minimum width flange and **660-mm** diameter cover. Include indented top design with lettering cast into cover, using wording equivalent to "STORM SEWER."

- a. Material: [ASTM A 48, Class 35 gray iron, unless otherwise indicated.
- b. Protective Coating: Foundry-applied, SSPC-Paint 16, coal-tar, epoxy-polyamide paint; 0.26-mm minimum thickness applied to all surfaces, unless otherwise indicated.

## 2.8 CONCRETE

A. General: Cast-in-place concrete according to ACI 318/318R, ACI 350R, 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.
4. Water: Potable.

B. Portland Cement Design Mix: 27.6 MPa minimum, with 0.45 maximum water-cementitious materials ratio.

1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.
2. Reinforcement Bars: ASTM A 615/A 615M, 420 MPa, deformed steel.

C. Ballast and Pipe Supports: Portland cement design mix, 20.7 MPa minimum, with 0.58 maximum water-cementitious materials ratio.

1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.
2. Reinforcement Bars: ASTM A 615/A 615M, 420 MPa, deformed steel.

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

1. Large Catch Basins: 610-by-305-mm polymer-concrete body, with outlets in number and sizes indicated. Include gray-iron slotted grate.
  - a. Frame: Include gray-iron or steel frame for grate.
2. Small Catch Basins: 483- to 610-mm by approximately 150-mm polymer-concrete body, with outlets in number and sizes indicated. Include gray-iron slotted grate.
  - a. Frame: Include gray-iron or steel frame for grate.

E. Supports, Anchors, and Setting Devices: Manufacturer's standard, unless otherwise indicated.

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

## 2.9 CATCH BASINS

A. Standard Precast Concrete Catch Basins: ASTM C 478M, precast, reinforced concrete, of depth indicated, with provision for sealant joints.

1. Base Section: 150-mm minimum thickness for floor slab and 102-mm minimum thickness for walls and base riser section, and having separate base slab or base section with integral floor.

2. Riser Sections: 102-mm minimum thickness, 1220-mm diameter, and lengths to provide depth indicated.
  3. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated. Top of cone of size that matches grade rings.
  4. Joint Sealant: ASTM C443M, Rubber.
  5. Grade Rings: Include 2 or 3 reinforced-concrete rings, of (150- to 229-mm total thickness, that match diameter frame and grate.
  6. Steps: **Individual FRP steps, FRP ladder, or ASTM A 615/A 615M, deformed, 13-mm steel reinforcing rods encased in ASTM D 4101, PP**, wide enough to allow worker to place both feet on 1 step and designed to prevent lateral slippage off of step. Cast or anchor steps into sidewalls at 300- to 400-mm intervals. Omit steps if total depth from floor of manhole to finished grade is less than **1500 mm**.
  7. Pipe Connectors: **ASTM C 923M**, resilient, of size required, for each pipe connecting to base section.
- B. Designed Precast Concrete Catch Basins: ASTM C 913, precast, reinforced concrete; designed according to ASTM C 890 for A-16 (ASSHTO HS20-44), heavy-traffic, structural loading; of depth, shape, and dimensions indicated, with provision for sealant joints.
1. Joint Sealants: ASTM C443M, Rubber
  2. Grade Rings: Include 2 or 3 reinforced-concrete rings, of (150- to 229-mm total thickness, that match diameter frame and grate..
  3. Steps: **Individual FRP steps, FRP ladder, or ASTM A 615/A 615M, deformed, 13-mm steel reinforcing rods encased in ASTM D 4101, PP**, wide enough to allow worker to place both feet on 1 step and designed to prevent lateral slippage off of step. Cast or anchor steps into sidewalls at 300- to 400-mm intervals. Omit steps if total depth from floor of manhole to finished grade is less than **1500 mm**.
  4. Pipe Connectors: **ASTM C 923M**, resilient, of size required, for each pipe connecting to base section.
- C. Cast-in-Place Concrete, Catch Basins: Construct of reinforced concrete; designed according to ASTM C 890 for structural loading; of depth, shape, dimensions, and appurtenances indicated.
1. Bottom, Walls, and Top: Reinforced concrete.
  2. Channels and Benches: Concrete.
  3. Steps: **Individual FRP steps, FRP ladder, or ASTM A 615/A 615M, deformed, 13-mm steel reinforcing rods encased in ASTM D 4101, PP**, wide enough to allow worker to place both feet on 1 step and designed to prevent lateral slippage off of step. Cast or anchor steps into sidewalls at 300- to 400-mm intervals. Omit steps if total depth from floor of catch basin to finished grade is less than **1500 mm**).
- D. Frames and Grates: ASTM A 536, Grade 60-40-18, ductile iron designed for A-16, structural loading, or ASTM A48, Class 35B, gray iron castings designed for heavy-duty service. Include 610-mm ID by 178- to 229-mm riser with 102-mm minimum width flange, and 660-mm-diameter flat grate with small square or short-slotted drainage openings.
1. Grate Free Area: Approximately 50 percent, unless otherwise indicated.

## 2.10 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 frames and grates according to utility standards.
- E. Curb Inlets: Vertical curb opening, of materials and dimensions indicated.
- F. Gutter Inlets: Horizontal gutter opening, of materials and dimensions indicated. Include heavy-duty frames and grates.
- G. Combination Inlets: Vertical curb and horizontal gutter openings, of materials and dimensions indicated. Include heavy-duty frames and grates.
- H. Frames and Grates: Dimensions, opening pattern, free area, and other attributes indicated.

## 2.11 STORMWATER DETENTION STRUCTURES

- A. Cast-in-Place Concrete, Stormwater Detention Structures: Construct of reinforced-concrete bottom, walls, and top; designed according to ASTM C 890 for A-16 (ASSHTO HS20-44), heavy-traffic, structural loading; of depth, shape, dimensions, and appurtenances indicated.
  - 1. Ballast: Increase thickness of concrete, as required to prevent flotation.
  - 2. Grade Rings: Include 2 or 3 reinforced-concrete rings, of 150- to 229-mm total thickness, that match diameter frame and cover.
  - 3. Steps: **Individual FRP steps, FRP ladder, or ASTM A 615/A 615M, deformed 13-mm steel reinforcing rods encased in ASTM D 4101, PP**, wide enough to allow worker to place both feet on 1 step and designed to prevent lateral slippage off of step. Cast or anchor steps into sidewalls at 300- to 400-mm intervals. Omit steps if total depth from floor of structure to finished grade is less than **1500 mm**
- B. Manhole Frames and Covers: ASTM A 536, Grade 60-40-18, ductile-iron castings designed for heavy-duty service. Include 610-mm ID by 178- to 229-mm riser with 102-mm minimum width flange, and 660-mm- diameter cover. Include indented top design with lettering "STORM SEWER" cast into cover.

## 2.12 MISCELLANEOUS MATERIALS

- A. Paint: SSPC-Paint 16.

## PART 3 - EXECUTION

### 3.1 EARTHWORK

- A. Excavation, trenching, and backfilling are specified in Division 2 Section "Earthwork."

### 3.2 PIPING APPLICATIONS

- A. Pipe couplings and special pipe fittings with pressure ratings at least equal to piping rating may be used in applications below, unless otherwise indicated.
  - 1. Use nonpressure-type flexible couplings where required to join gravity-flow, nonpressure sewer piping, unless otherwise indicated.
    - a. **Unshielded** flexible couplings for same or minor difference OD pipes.
    - b. Unshielded, increaser/reducer-pattern, flexible couplings for pipes with different OD.
    - c. Ring-type flexible couplings for piping of different sizes where annular space between smaller piping's OD and larger piping's ID permits installation.
  - B. Special Pipe Fittings: Use for pipe expansion and deflection. Pipe couplings and special pipe fittings with pressure ratings at least equal to piping rating may be used in applications below, unless otherwise indicated.
  - C. Gravity-Flow, Nonpressure Sewer Piping: Use the following pipe materials for each size range:
    - 1. **DN 80**: ABS, SDR 35, sewer pipe and fittings; gaskets; and gasketed joints.
    - 2. **DN 80**: Corrugated PE drainage pipe and fittings, **soiltight** couplings, and coupled joints.
    - 3. **DN 200 to DN 300**: **DN 300** reinforced-concrete sewer pipe and fittings, gaskets, and gasketed joints.
    - 4. **DN 375**: Corrugated PE pipe and fittings, **silttight** couplings, and coupled joints.
    - 5. **DN 375**: Reinforced-concrete sewer pipe and fittings, gaskets, and gasketed joints.
    - 6. **DN 450 to DN 900**: Reinforced-concrete sewer pipe and fittings, gaskets, and gasketed joints.

### 3.3 PIPING INSTALLATION

- A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground storm drainage piping. Location and arrangement of piping layout take design considerations into account. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.
- B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.

- C. Install manholes for changes in direction unless fittings are indicated. Use fittings for branch connections unless direct tap into existing sewer is indicated.
- D. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.
- E. Tunneling: Install pipe under streets or other obstructions that cannot be disturbed by tunneling, jacking, or a combination of both.
- F. Install gravity-flow, nonpressure drainage piping according to the following:
  - 1. Install piping pitched down in direction of flow, at minimum slope of 0.5 percent, unless otherwise indicated.
  - 2. Install piping with 1.2m minimum cover.
  - 3. Install piping below frost line.
  - 4. Install PE corrugated sewer piping according to CPPA's "Recommended Installation Practices for Corrugated Polyethylene Pipe and Fittings."
  - 5. Install reinforced-concrete sewer piping according to ASTM C 1479 and ACPA's "Concrete Pipe Installation Manual."

### 3.4 PIPE JOINT CONSTRUCTION

- A. Basic pipe joint construction is specified in Division 2 Section "Piped Utilities - Basic Materials and Methods." Where specific joint construction is not indicated, follow piping manufacturer's written instructions.
- B. Join gravity-flow, nonpressure drainage piping according to the following:
  - 1. J
  - 2. Join corrugated PE piping according to CPPA 100 and the following:
    - a. Use silttight couplings for Type 1, silttight joints.
  - 3. Join reinforced-concrete sewer piping according to ACPA's "Concrete Pipe Installation Manual" for rubber-gasket joints.
  - 4. Join dissimilar pipe materials with nonpressure-type flexible couplings.
- C. Join dissimilar pipe materials with pressure-type couplings.

### 3.5 BACKWATER VALVE INSTALLATION

- A. Install horizontal-type backwater valves in piping where indicated.
- B. Install combination horizontal and manual gate valve type in piping and in manholes where indicated.
- C. Install terminal-type backwater valves on end of piping and in manholes where indicated.

### 3.6 DRAIN INSTALLATION

- A. Install type of drains in locations indicated.
  - 1. Use heavy-duty, top-loading classification drains in **vehicle-traffic service** areas.
- B. Embed drains in **102-mm** minimum depth of concrete around bottom and sides.
- C. Fasten grates to drains if indicated.
- D. Set drain frames and covers with tops flush with pavement surface.
- E. Assemble trench sections with flanged joints.
- F. Embed trench sections in **102-mm** minimum concrete around bottom and sides.

### 3.7 MANHOLE INSTALLATION

- A. General: Install manholes, complete with appurtenances and accessories indicated.
- B. Install precast concrete manhole sections according to ASTM C 891.
- C. Construct cast-in-place manholes as indicated.
- D. Install PE sheeting on earth where cast-in-place-concrete manholes are to be built.
- E. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops 75mm above finished surface elsewhere, unless otherwise indicated.

### 3.8 CATCH BASIN INSTALLATION

- A. Construct catch basins to sizes and shapes indicated.
- B. Set frames and grates to elevations indicated.

### 3.9 CONCRETE PLACEMENT

- A. Place cast-in-place concrete according to ACI 318/318R.

### 3.10 CONNECTIONS

- A. Connect nonpressure, gravity-flow drainage piping in building's storm building drains specified in Division 15 Section "Storm Drainage Piping."
  - 1. Protect existing piping, manholes, and structures to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

### 3.11 FIELD QUALITY CONTROL

- A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 610 mm of backfill is in place, and again at completion of Project.
1. Submit separate reports for each system inspection.
  2. Defects requiring correction include the following:
    - a. Alignment: Less than full diameter of inside of pipe is visible between structures.
    - b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
    - c. Crushed, broken, cracked, or otherwise damaged piping.
    - d. Infiltration: Water leakage into piping.
    - e. Exfiltration: Water leakage from or around piping.
  3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
  4. Reinspect and repeat procedure until results are satisfactory.
- B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.
1. Do not enclose, cover, or put into service before inspection and approval.
  2. Test completed piping systems according to authorities having jurisdiction.
  3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
  4. Submit separate report for each test.
  5. Gravity-Flow Storm Drainage Piping: Test according to requirements of authorities having jurisdiction, UNI-B-6, and the following:
    - a. Exception: Piping with soiltight joints unless required by authorities having jurisdiction.
    - b. Option: Test plastic piping according to ASTM F 1417.
    - c. Option: Test concrete piping according to ASTM C 924 (ASTM C 924M).
- C. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

### 3.12 CLEANING

- A. Clean interior of piping of dirt and superfluous materials.

END OF SECTION 02630