SECTION 33 41 13
FOUNDATION DRAINAGE

SPEC WRITER NOTES: Use this section only for NCA projects. Delete text between // _____ // not applicable to project. Edit remaining text to suit project.

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Foundation drainage system, including installation, backfill, and cleanout extensions.

1.2 RELATED REQUIREMENTS

SPEC WRITER NOTE: Update and retain references only when specified elsewhere in this section.

A. Materials testing and inspection during construction: Section 01 45 29, TESTING LABORATORY SERVICES.

B. Safety requirements: Section 00 72 00, GENERAL CONDITIONS, Article, ACCIDENT PREVENTION.

C. Existing utility protection, fire protection services, existing equipment, roads, and pavements: Section 01 00 00, GENERAL REQUIREMENTS.

D. Subsurface Investigation: Section 01 00 00, GENERAL REQUIREMENTS, Article, PHYSICAL DATA.

E. Trenching and Excavation: Section 31 20 00, EARTH MOVING.

1.3 APPLICABLE PUBLICATIONS

A. Comply with references to extent specified in this section.

B. American Association of State Highway and Transportation Officials (AASHTO):

1. M006-13-UL - Fine Aggregate for Hydraulic Cement Concrete.
2. M252-09-UL - Corrugated Polyethylene Drainage Pipe.
3. M288-15-UL - Geotextile Specification for Highway Applications.

C. ASTM International (ASTM):

1. A74-16 - Cast Iron Soil Pipe and Fittings.
2. A746-09 (2014) - Ductile Iron Gravity Sewer Pipe.
3. D448-12 - Sizes of Aggregate for Road and Bridge Construction.

4. D2321-14 - Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.
5. D2729-03 - Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
6. D2737-12 - Polyethylene (PE) Plastic Tubing.
7. D3034-14 - Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
8. D4216-13 - Rigid Poly (Vinyl Chloride) (PVC) and Related PVC and Chlorinated Poly (Vinyl Chloride) (CPVC) Building Products Compounds.
9. F477-14 - Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
10. F758-141 - Smooth-Wall Poly (Vinyl Chloride) (PVC) Plastic Underdrain Systems for Highway, Airport, and Similar Drainage.

1.4 SUBMITTALS

A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Manufacturer's Literature and Data:
   1. Description of each product.
   2. Filter fabric indicating manufacturer recommendation for each application.
   3. Installation instructions.
   4. Warranty.

C. Samples:
   1. Product: // long // square //, each type and color //.
      a. Submit quantity required to show full color // and texture // range.

D. Certificates: Certify // each product complies // products comply // with specifications.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications:
   1. Regularly manufactures specified products.
   2. Manufactured specified products with satisfactory service on five similar installations for minimum five years.
      a. // Project Experience List: Provide contact names and addresses for completed projects. //

1.6 DELIVERY

A. Deliver products in manufacturer's original sealed packaging.

B. Mark packaging, legibly. Indicate manufacturer's name or brand, type, // color, // production run number, and manufacture date.

C. Before installation, return or dispose of products within distorted, damaged, or opened packaging.

1.7 STORAGE AND HANDLING

A. Protect products from damage during handling and construction operations.

1.8 FIELD CONDITIONS

A. Field Measurements: Verify field conditions affecting drainage installation. Show field measurements on Submittal Drawings.

1. Coordinate field measurement and fabrication schedule to avoid delay.

1.9 WARRANTY

SPEC WRITER NOTE: Always retain construction warranty. FAR includes Contractor's one year labor and material warranty.

A. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction."

PART 2 - PRODUCTS

SPEC WRITER NOTES: Make material requirements agree with applicable requirements specified in the referenced Applicable Publications. Update and specify only which applies to the project.

2.1 MATERIALS

A. Pipes: Type and size indicated. Make transitions, adapters, or joint details for dissimilar materials.

B. Underslab Header:

SPEC WRITER NOTES: Choose material type based on design requirements and location and when possible follow geotechnical recommendations.

1. DN 100 to DN 375 (NPS 4 to NPS 15):

a. Pipe and Fittings: Cast-iron, ASTM A74 or ASTM A746.

b. Joints: Hub-and-spigot, gasket type.

2. // DN 100 to DN 250 (NPS 4 to NPS 10) // DN 300 to DN 900 (NPS 12 to NPS 36) //:
   a. Pipe and Fittings: PE, ASTM D2737.
   b. Joints: Coupling type.
3. DN 100 to DN 375 (NPS 4 to NPS 15):
   a. Pipe and Fittings: PVC, ASTM D3034.
   b. Joints: Bell-and-spigot.
   c. Seal Gaskets: ASTM F477, elastomeric.

C. Perforated Drainage Pipe:

SPEC WRITER NOTES: Choose material type based on design requirements.

1. // DN 100 to DN 150 (NPS 4 to NPS 6) // DN 200 to DN 600 (NPS 8 to NPS 24) //:
   a. Pipe and Fittings: PE, ASTM D2737.
   b. Joints: Coupling type.
2. DN 100 (NPS 4):
   a. Pipe and Fittings: PVC, ASTM D2729.
   b. Joints: Bell-and-spigot, loose type.

D. Cleanout Extension: ASTM A74, cast iron pipe or ASTM A746 ductile iron.
1. Gravity Sewer Pipes: Provide neoprene gasket joints and long sweep elbow fittings.

E. Drainage Conduit:
1. Pipe: ASTM D4216 and ASTM D2729, PVC, perforated.
   a. Size: 200 mm (8 inches), high minimum flow rate equal DN 100 (NPS 4) pipe.
2. Fittings and Couplings: PVC.

SPEC WRITER NOTES: Modify the following paragraph based on site characteristics and Geotechnical Engineer's recommendation, when possible.

F. Filter Fabric: Woven pervious filament sheet // polyester // nylon // polypropylene.
1. Equivalent Opening Size (AOS): No finer than US Standard Sieve No. // _____ // and no coarser than US Standard Sieve No. // _____ //.
2. // Percent Open Area: Minimum // _____ // percent and maximum // _____ // percent. //.
3. Physical Characteristics:

a. Physical Strength: Minimum // _____ // pounds per inch when tested according to ASTM D 5034 using grab test method with 1 square inch jaws and 12 inches per minute constant travel rate.

b. Elongation at Failure: Between // 30 // _____ // and // 70 // _____ // percent.

4. // Filaments: Long-chain synthetic polymer; 85 percent by weight of propylene, ethylene, or vinylidene-chloride, with stabilizers or inhibitors added to base plastic //.

5. // Fabric Edges, selvage or finish. // Fabric woven without longitudinal seams, installed as indicated on Drawings //.

G. Drainage Material:

1. Bedding: Crushed stone, 20 mm (3/4 inch) to 25 mm (No. 4), ASTM D448.

2. Pipe Fill 300 mm (1 Foot) Above: Crushed stone, 20 mm (3/4 inch) to 25 mm (No. 4) per ASTM D448.

H. Concrete Sand: AASHTO M006.

PART 3 - EXECUTION

3.1 PREPARATION

A. Examine and verify substrate suitability for product installation in the presence of Contracting Officer's Representative (COR).

B. Correct substrate deficiencies.

1. Fill.

2. Level.

C. Keep trenches dry during drainage system installation.

D. Clean interior of pipe before installation.

3.2 INSTALLATION - FOUNDATION DRAINAGE

A. Install products according to manufacturer's instructions // and approved submittal drawings //.

1. When manufacturer's instructions deviate from specifications, submit proposed resolution for COR consideration.

B. Trenching, Excavation and Backfilling:

1. Perform trenching, excavation and backfilling according to Section 31 20 00 EARTH MOVING. Make 1/8 bends changes in direction of drain lines. Use wye fittings at intersections.

C. Bedding:

1. Place and compact graded bedding at bottom trench, minimum 6 inches deep. Rest section firmly through entire length, with recesses

formed for bell joints. Fully support pipe lower quadrant with bedding, except bell joint recesses.

SPEC WRITER NOTES: Include filter fabric when required by Geotechnical Engineer.

D. // Filter Fabric: Place drainage pipe on filter fabric //.

E. Pipe Laying:

1. Install PE and PVC Pipe according to ASTM D2321 and ASTM F758.
2. Lay drain lines to grades and alignment, with continuous fall in flow direction and as indicated on Drawings.
3. Place bells ends, face upgrade.
4. Lay drain lines and firmly bed in granular material minimum 75 mm (3 inches) below invert to top of pipe true to grades and alignment, and slope uniformly between elevations shown on foundation drainage drawings. Keep trenches dry until pipe is in place and granular material backfill is completed, 300 mm (1 foot) above top of pipe, unless otherwise noted.
5. Lay perforated pipe, perforations down. Lay plain end pipe, closed joints, held in place with two No. 9 spring steel wire clips at joint or standard clay collars.
6. Foundation Subdrainage: Install pipe pitched down in flow direction, minimum slope 0.5 percent, minimum cover 900 mm (3 feet), unless otherwise indicated.
7. Underslab subdrainage: Install piping pitched down in flow direction, minimum slope of 0.5 percent.
8. Install gaskets, seals, sleeves, and couplings according to manufacturer's instructions and as follows:
   a. PE Joint: ASTM D2737 and AASHTO HB17, Division II, Section 26.4.2.4, “Joint Properties”.
   b. PVC Joint: ASTM D3034 with elastomeric seals gaskets, ASTM D2321.
   c. Perforated PVC Joint: ASTM D2729, with loose bell and spigot joints.
9. Install cleanout extensions as indicated on Drawings and as follows:
   a. Pre-placed Crypt Field Underdrain Cleanouts: Install as indicated on Drawings and set not to interfere with mowing operations. Provide concrete anchorage for plastic tops. Check

drain lines before backfilling. Remove obstructions and recheck lines.

3.3 FIELD QUALITY CONTROL

A. Field Inspections:

SPEC WRITER NOTE: Section 01 45 29, TESTING LABORATORY SERVICES includes VA provided testing for large projects and contractor provided testing for small projects. Coordinate testing responsibility.

B. Field Tests: Performed by testing laboratory specified in Section 01 45 29, TESTING LABORATORY SERVICES.

3.4 PROTECTION

A. Protect pipe from and aggregate cover from damage and displacement until backfilling operation begins.

- - - E N D - - -