SECTION 33 46 00

SUBDRAINAGE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Perforated wall pipe and fittings.
   2. Drainage panels.
   3. Geotextile filter fabrics.

1.2 ACTION SUBMITTALS

A. Product Data: Technical data for drainage conduits, including rated capacities; drainage panels, including rated capacities, and geotextile filter fabrics.

PART 2 - PRODUCTS

2.1 PERFORATED WALL PIPES AND FITTINGS

A. Perforated PE Pipe and Fittings:
   1. NPS 6 (DN 150) and Smaller: ASTM F405 or AASHTO M 252, Type CP; corrugated, for coupled joints.
   2. NPS 8 (DN 200) and Larger: ASTM F667; AASHTO M 252, Type CP; or AASHTO M 294, Type CP; corrugated; for coupled joints.
   3. Couplings: Manufacturer's standard, band type.

B. Perforated PVC Sewer Pipe and Fittings: ASTM D2729, bell and spigot ends, for loose joints.

2.2 DRAINAGE PANELS

A. Molded Sheet Drainage Panels: Prefabricated geocomposite, 36 to 60 inches (915 to 1525 mm) wide with drainage core faced with geotextile filter fabric.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. American Wick Drain.
      b. Dorken Systems Inc.
      c. Eljen Corporation.
      d. JDR Enterprises, Inc.
      e. MAPEI Corporation.

f. Mar-flex Waterproofing & Building Products.
g. Midwest Diversified Technologies Incorporated.
h. Sika Greenstreak.
i. TenCate Geosynthetics.
j. Trace-LINQ Inc.

2. Drainage Core: Three dimensional, nonbiodegradable, molded PP.
   a. Minimum Compressive Strength: 10,000 lbf/sq. ft. (479 kPa) when tested according to ASTM D1621.
   b. Minimum In-Plane Flow Rate: 7 gpm/ft. (87 L/min. per m) of unit width at hydraulic gradient of 1.0 and compressive stress of 25 psig (172 kPa) when tested according to ASTM D4716.
3. Filter Fabric: Nonwoven needle punched geotextile, manufactured for subsurface drainage, made from polyolefins or polyesters; with elongation greater than 50 percent; complying with the following properties determined according to AASHTO M 288:
   a. Survivability: Class 1.
   b. Apparent Opening Size: No. 60 (0.25-mm) sieve, maximum.
   c. Permittivity: 0.2 per second, minimum.
4. Filter Fabric: Woven geotextile fabric, manufactured for subsurface drainage, made from polyolefins or polyesters; with elongation less than 50 percent; complying with the following properties determined according to AASHTO M 288:
   a. Survivability: Class 2.
   b. Apparent Opening Size: No. 60 (0.25-mm) sieve, maximum.
   c. Permittivity: 0.2 per second, minimum.
5. Film Backing: Polymeric film bonded to drainage core surface.

2.3 SOIL MATERIALS

A. Soil materials are specified in Division 31 Section for Earth Moving or as indicated on the Civil Documents.

B. Drainage Fill: Evenly graded mixture of natural or crushed gravel or crushed stone and natural sand with 100% passing a 1/2" sieve and 0.5% passing a No. 50 sieve.

2.4 GEOTEXTILE FILTER FABRICS

A. Description: Fabric of PP or polyester fibers or combination of both, with flow rate range from 110 to 330 gpm/sq. ft. (4480 to 13 440 L/min. per sq. m) when tested according to ASTM D4491.

B. Structure Type: Nonwoven, needle-punched continuous filament.
   1. Survivability: AASHTO M 288 Class 2.
   2. Styles: Flat and sock.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces and areas for suitable conditions where subdrainage systems are to be installed.

B. If subdrainage is required for landscaping, locate and mark existing utilities, underground structures, and aboveground obstructions before beginning installation and avoid disruption and damage of services.

C. Verify that drainage panels installed as part of foundation wall waterproofing is properly positioned to drain into subdrainage system.

D. Proceed with installation after correcting unsatisfactory conditions.

3.2 EARTHWORK

A. Excavating, trenching, and backfilling are specified in Division 31 Section for Excavation or as indicated on the Civil Documents..

3.3 FOUNDATION DRAINAGE INSTALLATION

A. Place impervious fill material on subgrade adjacent to bottom of footing after concrete footing forms have been removed. Place and compact impervious fill to dimensions indicated, but not less than 6 inches (150 mm) deep and 12 inches (300 mm) wide.

B. Lay flat style geotextile filter fabric in trench and overlap trench sides.

C. Place supporting layer of drainage course over compacted subgrade and geotextile filter fabric, to compacted depth of not less than 4 inches (100 mm).

D. Encase pipe with sock-style geotextile filter fabric before installing pipe. Connect sock sections with tape.

E. Install drainage piping indicated for foundation subdrainage.

F. Add drainage course to width of at least 6 inches (150 mm) on side away from wall and to top of pipe to perform tests.

G. After satisfactory testing, cover drainage piping to width of at least 6 inches (150 mm) on side away from footing and above top of pipe to within 12 inches (300 mm) of finish grade.

H. Install drainage course and wrap top of drainage course with flat-style geotextile filter fabric.

I. Place layer of flat style geotextile filter fabric over top of drainage course, overlapping edges at least 4 inches (100 mm).

J. Install drainage panels on foundation walls as follows:
   1. Coordinate placement with other drainage materials.
   2. Lay perforated drainage pipe at base of footing. Install as indicated.
   3. Separate 4 inches (100 mm) of fabric at beginning of roll and cut away 4 inches (100 mm) of core. Wrap fabric around end of remaining core.
   4. Attach panels to wall beginning at subdrainage pipe. Place and secure molded-sheet drainage panels, with geotextile facing away from wall.

K. Place backfill material over compacted drainage course. Place material in loose depth layers not exceeding 6 inches (150 mm). Thoroughly compact each layer. Final backfill to finish elevations and slope away from building.

3.4 PIPING INSTALLATION

A. Install piping beginning at low points of system, true to grades, required pitch and alignment indicated, with unbroken continuity of invert. Bed piping with full bearing in drainage fill material. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions and other requirements indicated.
   1. Foundation Subdrainage: Install piping level and with a minimum cover of 36 inches (915 mm) of drainage fill material unless otherwise indicated.
   2. Excavate recesses in trench bottom for bell ends of pipe. Lay pipe with bells facing upslope and with spigot end entered fully into adjacent bell.

B. Use increasers, reducers, and couplings made for different sizes or materials of pipes and fittings being connected. Reduction of pipe size in direction of flow is prohibited.

C. Install thermoplastic piping according to ASTM D2321.

3.5 PIPE JOINT CONSTRUCTION

A. Join perforated PE pipe and fittings with couplings according to ASTM D3212 with loose banded, coupled, or push-on joints.

B. Join perforated PVC sewer pipe and fittings according to ASTM D3212 with loose bell and spigot, push on joints.

C. Special Pipe Couplings: Join piping made of different materials and dimensions with special couplings made for this application. Use couplings that are compatible with and fit materials and dimensions of both pipes.

3.6 BACKWATER VALVE INSTALLATION

A. Comply with requirements for backwater valves specified in Section 33 41 00.

B. Install horizontal backwater valves in header piping downstream from perforated subdrainage piping.

C. Install horizontal backwater valves in piping [**in manholes or pits**] where indicated.

3.7 CLEANOUT INSTALLATION

A. Comply with requirements for cleanouts specified in Section 33 41 00.

B. Cleanouts for Subdrainage:

1. Install cleanouts from piping to grade. Locate cleanouts at beginning of piping run and at changes in direction. Install fittings so cleanouts open in direction of flow in piping.
2. In vehicular traffic areas, use NPS 4 (DN 100) cast iron soil pipe and fittings for piping branch fittings and riser extensions to cleanout. Set cleanout frames and covers in a cast in place concrete anchor, 18 inches by 18 inches by 12 inches (450 mm by 450 mm by 300 mm) deep. Set top of cleanout flush with grade.
3. In nonvehicular traffic areas, use NPS 4 (DN 100) PVC pipe and fittings for piping branch fittings and riser extensions to cleanout. Set cleanout frames and covers in a cast in place concrete anchor, 12 inches by 12 inches by 4 inches (300 mm by 300 mm by 100 mm) deep. Set top of cleanout 1 inch (25 mm) above grade.
4. Comply with requirements for concrete specified in Section 03 30 00.

3.8 CONNECTIONS

A. Comply with requirements for piping specified in Section 33 41 00. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect low elevations of subdrainage system to building's solid wall piping storm drainage system unless otherwise indicated.

C. Where required, connect low elevations of foundation subdrainage to stormwater sump pumps. Comply with requirements for sump pumps.

3.9 IDENTIFICATION

A. Arrange for installation of green warning tapes directly over piping. Comply with requirements for underground warning tapes specified in specified in Section 31 20 00.

1. Install PE warning tape or detectable warning tape over ferrous piping.
2. Install detectable warning tape over nonferrous piping and over edges of underground structures.

3.10 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. After installing drainage course to top of piping, test drain piping with water to ensure free flow before backfilling.
2. Remove obstructions, replace damaged components, and repeat test until results are satisfactory.

B. Drain piping will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.11 CLEANING

A. Clear interior of installed piping and structures of dirt and other superfluous material as work progresses. Maintain swab or drag in piping and pull past each joint as it is completed. Place plugs in ends of uncompleted pipe at end of each day or when work stops.

END OF SECTION