

**NATURAL RESOURCES CONSERVATION SERVICE
CONSTRUCTION SPECIFICATIONS**

SUBSURFACE DRAIN

1. Scope

The work shall consist of all construction operations and furnishing all materials for the installation of the subsurface drain as required and outlined on the construction plans.

2. Location

The location of the subsurface drain and all related appurtenant structures shall be as shown on the construction plans or as staked in the field.

3. Materials

Materials shown on the drawings or otherwise specified to be used in the installation of the inlet, main conduit, outlet, and appurtenant items shall meet the requirements stated herein.

- Smooth-wall polyvinyl chloride (PVC) pipe shall be free from defects and be labeled to indicate the type and grade of pipe. The pipe shall meet the requirements of American Society for Testing and Materials (ASTM) D2241, D3034, or F679 or American Water Works Association (AWWA) C900 or C905 as shown on the drawings or indicated in the “Construction Details” section. Joints at fittings and pipe sections shall be gasketed and watertight.
- Dual-wall corrugated pipe may be PVC or polyethylene (PE) meeting the requirements of ASTMs F949, F2306, or F2648 as shown on the drawings or indicated in the “Construction Details” section. It shall be free from defects and be labeled to indicate the type and grade of pipe. Joints at fittings and pipe sections shall be gasketed and watertight.
- Corrugated iron or steel pipe shall meet the requirements of ASTM A760, be galvanized or aluminized, be at least 16 gauge in thickness, and have helical or annular corrugations as shown on the drawings or indicated in the “Construction Details” section. Connections shall be gasketed flanges or gasketed connecting bands (either 1- or 2-piece) that are standard with the manufacturer.
- Corrugated aluminum pipe shall be at least 16 gauge in thickness and meet the requirements in ASTM B745. Aluminum pipe shall not be used in soils having a pH greater than 9 or less than 4. Connections shall be gasketed flanges or gasketed connecting bands (either 1- or 2-piece) that are standard with the manufacturer.
- Single-wall corrugated plastic pipe shall be PE and meet the requirements in ASTM F405 or F667 or American Association of State Highway Transportation Officials (AASHTO) M252 or M294. The joints at each fitting shall be double-wrapped with PE tape at least 6 mils thick and 2 inches wide.
- Appurtenant items such as water level control structures or junction boxes shall meet the requirements shown on the drawings or as indicated in the “Construction Details” section.

Perforations in smooth-wall conduits shall be either circular or slots. Circular perforations will only be used when an envelope is used in the design. Circular perforations shall be rows of holes ¼ inch in diameter on 2-inch centers, and the rows shall be parallel to the axis of the pipe. Rows shall be arranged in 2 equal groups at equal distance from the bottom on each side of the vertical centerline of the pipe. The lowest rows shall be separated by an arc of not less than 60 degrees and not more than 125 degrees. The upper rows shall be separated by an arc not to exceed 166 degrees.

Slot perforations shall be symmetrically located in rows on each side of the centerline of the pipe. Slots will not be wider than $\frac{1}{8}$ inch and spaced not to exceed 11 times the perforation width. Slot perforations in corrugated plastic conduits shall be located in the middle of the valley so there is a shoulder on each side of the slot. Perforations shall be free of cuttings or frayed edges on both the inside and outside of the pipe. The water inlet area shall be at least 0.44 square inch per foot of conduit.

4. Installation

Inspecting and handling materials. Material for subsurface drains shall be carefully inspected before the drains are installed. Plastic pipe and tubing shall be protected from hazard causing deformation or warping. Plastic pipe and tubing with physical imperfections shall not be installed. A damaged section shall be removed and a suitable joint made connecting the replaced and retained sections. All material shall be satisfactory for its intended use and shall meet applicable specifications and requirements.

Placement. All subsurface drain conduits shall be laid to the lines and grades shown on the drawings and covered with approved soil, envelope, or filter material to a depth of not less than 3 inches. No reversals in grade of the conduit shall be permitted. Equipment shall not cross the conduit until it has been covered by a minimum of 2 feet of soil, envelope, or filter material. The maximum cover over the conduit shall be as shown on the drawings or specified in the "Construction Details" section.

Plastic pipe conduits with diameters 8 inches or less shall be bedded on a sand-gravel filter or placed in a V-shaped groove in the bottom of the trench for support and alignment. The groove shall provide an angle of support of 90 degrees or more. Plastic pipe larger than 8 inches shall have the same requirements except the groove shall be a semicircle or trapezoid shape to fit the conduit with a support angle of at least 120 degrees.

If the conduit is to be laid in a rock trench or if rock is exposed at the bottom of the trench, the rock shall be removed below grade so that the trench can be backfilled, compacted, and bedded. When completed, the conduit shall not be less than 6 inches from rock.

Earth backfill material shall be placed in the trench in a manner to ensure that the conduit does not become displaced and so that the filter and bedding material, after backfilling, meet the requirements of the plans and specifications.

If sand-gravel filter material is used, it shall be a mixture of sand and gravel within the gradation required by the base material in the trench. The trench shall be overexcavated 3 inches and backfilled to grade with filter material. After the conduit is placed on the filter material, additional filter material shall be placed over the conduit to fill the trench to a depth of 3 inches over the conduit. Friable soil may be used as the backfill over the subsurface drain if specified. An envelope of larger gravel will be required if the conduit has circular perforations. The envelope should extend at least 3 inches beyond the circumference of the conduit in all directions. Filter material should be placed between the trench sidewalls and the envelope.

Laying corrugated plastic conduit. Conduit with physical imperfections shall not be installed. Care shall be taken to prevent excessive impact or pull on the conduit during installation. The allowable stretch shall not exceed 5 percent of the normal length. When the temperature exceeds 90 degrees Fahrenheit, the conduit shall be allowed to cool in the trench to the soil temperature before backfilling.

Site cleanup. Any scraps or excess material brought to the work site shall be removed. Excess excavated soil and scalped material shall be spread over the work area to fill ruts from machine travel and to blend the surface with the surrounding field. The finished surface shall be smooth enough for travel by farm-type equipment.

5. Measurement

The quantity of installed drainage conduit and filter or envelope material will be determined from measured ground surfaces. Measurement will be to the nearest foot for the conduit. Computations for the filter or envelope material shall be to the nearest cubic yard.

6. Construction Details