

**NATURAL RESOURCES CONSERVATION SERVICE  
CONSTRUCTION SPECIFICATION**

**IA-620A UNDERGROUND OUTLET  
Waubonsie Creek Watershed  
Directional Drilled Conduits**

**1. SCOPE**

This work shall consist of furnishing and installing the materials associated with directional drilled conduit for draining water and sediment control basins in accordance with the approved design and plans.

**2. MATERIALS**

Materials for directional drilled conduits shall meet the requirements as shown in the plans and specifications. They shall be field inspected for any deficiencies such as thin spots or cracking prior to installation.

**Conduit**

The following reference specifications pertain to products currently acceptable for use as directional drilled conduits:

Polyethylene (PE) Pipe ..... ASTM D 3035

Polyethylene Plastic Pipe and Fittings ..... ASTM D 3350

Polyethylene pipe meeting ASTM D3035 requirements shall have a PE4710 designation with a dimension ratio DR = 13.5 or less.

The conduit shall be one continuous piece of pipe. Any joints of the main conduit shall be of a heat fusion joining system. Pipe joints and fittings shall be connected by thermal butt fusion, saddle fusion, or socket fusion in accordance with manufacturer recommended procedures. At the point of fusion, the outside diameter and minimum wall thickness of the fitting shall match the outside diameter and minimum wall thickness of the pipe. Butt fused joints of the pipe shall have a double bead rolled over to the pipe surface on both sides of the pipe and be uniform in size completely around the pipe. The projection beads shall not be greater than 3/16 inch. The tensile strength at yield of the butt-fusion joints shall not be less than the pipe.

**Inlet**

The inlet shall be fabricated and installed as shown on the plans. Inlets must be of durable material, structurally sound, and resistant to damage by rodents or other animals. Inlets shall be of rigid material, which does not require supplemental support to remain in a vertical position. Materials which meet these requirements include the following:

1. Corrugated metal pipe, galvanized or aluminum, 16 gauge minimum,
2. Smooth steel pipe, with 3/16 inch minimum wall thickness,
3. Smooth plastic pipe, polyvinyl chloride (PVC), with an SDR of 43 or less,
4. High-density polyethylene pipe (PE). Round pipe shall have an SDR of 43 or less. Square intakes shall have minimum wall thickness as shown in the following table:

<u>Nominal Size</u>	<u>Minimum Thickness</u>
6 inch	0.16 inch
8 inch	0.21 inch
10 inch	0.26 inch
12 inch	0.31 inch

All plastic and polyethylene inlets shall include ultra-violet stabilizer to protect from solar degradation.

Perforations in the inlet shall be smooth and free of burrs. Unless otherwise specified, the above ground portion of the inlet shall have holes evenly spaced around the perimeter of the inlet in accordance with the following table:

<u>Inlet Size</u>	<u>Minimum Number of 1" Diameter Holes per Foot of Inlet</u>
4 inch	20
5 inch	24
6 inch	30
8 inch	40
10 inch	50
12 inch	60

If slots or round holes other than 1 inch in diameter are provided, the total cross sectional area of the openings per foot shall be equivalent to that provided by 1 inch diameter round holes meeting the above criteria.

The below ground portion of the inlet may be perforated with holes 5/16 of an inch in diameter or less to provide drainage around the inlet.

Appurtenances (i.e. tees and elbows) for polyvinyl chloride (PVC) inlets shall be schedule 40 or heavier.

An offset pipe is required between the surface inlet and the directional drilled conduit. The minimum length of offset shall be 8 feet.

In lieu of an offset pipe, a soil-bentonite cutoff collar can be installed. The bottom of the cutoff shall be a minimum of four feet below the low point in the basin. It shall be a minimum of 3 feet by 3 feet by 12 inches thick and centered around the pipe at the inlet. The following criteria shall apply:

- Bentonite shall be a sodium bentonite with a free swell of at least 22 milliliters as measured by ASTM Standard Test Method D5890, unless laboratory tests using other bentonite types are used for design.
- Bentonite shall be mixed with soil prior to placing in the 12 inch wide cutoff trench. For silts with a Unified Soil Classification of ML or CL-ML, 6 pounds of bentonite shall be mixed with each cubic foot of soil material. For silty sands with a Unified Soil Classification of SM, SC-SM, or SP-SM, 8 pounds of bentonite shall be mixed with each cubic foot of soil material.
- The soil-bentonite mixture shall be placed in the cutoff trench and hand tamped. Impact type compaction equipment may be used; however, plate type or vibratory plate tampers are not allowed. The final thickness of each layer shall be 6 inches or less after compaction.

Additional subsurface drainage tubing or tile may be used in conjunction with the surface inlet to improve access and farmability around the inlet. These underground extensions (when used) shall have a minimum length of 10 feet.

## **Outlet**

The outlet shall be equipped with a hinged animal guard.

### **3. TRENCH EXCAVATION**

Trench excavation at the intake shall be sufficient to provide required cover after other construction is completed.

The trench bottom shall be smooth and free of exposed rock. If rock is encountered in the trench bottom, over-excavate the trench and place at least 6 inches of compacted earth or sand bedding in the trench to bring it up to the conduit grade. In stable soils, the bottom of the trench shall be shaped to form a semicircular, trapezoidal, or 90-degree "V" groove in its center. The groove shall be shaped to fit the size of conduit. The 90-degree "V" groove shall not be used on conduits greater than 6 inches in diameter.

Unless otherwise shown on the drawings, trench width at the top of the conduit should be the minimum required to permit installation and provide bedding conditions suitable to support the load on the conduit, but with not less than 3 inches of clearance on each side. Maximum trench width shall be the conduit diameter plus 12 inches measured at the top of the conduit, unless approved bedding is installed.

### **4. INSTALLATION**

The underground outlet system shall be installed to the line and grade shown in the plans or as staked in the field. Earthwork and directional boring shall be done as close together as practicable. Earthwork shall not commence unless the earthwork and directional drilling can be completed before the next expected rain event.

The conduit shall be pulled from the downstream end in the upstream direction. The borehole diameter shall not be greater than 2 inches larger than the outside diameter of the conduit.

The outlet of the conduit shall be placed on or near the bottom of the gully in a stable or near stable reach. Adequate conduit shall be laid to provide a flexible outlet in the event the channel bottom continues to degrade.

All appurtenant structures, including trash and animal guards, shall be installed promptly and provisions shall be made for protecting them during installation.

### **5. TRENCH BACKFILL**

Intakes and offset pipes shall be bedded and backfilled. Friable soil material shall be placed in 4 inch layers and hand tamped to a depth of 2 feet above the conduit. The sides of the remaining trench shall be sloped no steeper than 3 horizontal to 1 vertical and backfill placed in 9 inch layers and machine compacted.

### **6. FINISH**

Work areas shall be smoothed and left in a workmanlike manner. Vegetation or other protective cover shall be established as specified.

## 7. SPECIAL SPECIFICATIONS