

## SECTION 430 BRIDGE END BACKFILL

### 430.1 DESCRIPTION

This work consists of backfilling bridge abutments and sills with select granular or mechanically stabilized earth (MSE) bridge end backfill.

### 430.2 MATERIALS

**A. Select Granular Backfill:** Shall conform to Section 850.

**B. Granular Backfill Material for MSE Backfill:** The granular backfill material shall consist of crushed rock, manufactured sands, or combinations thereof. Granular backfill material shall meet the following gradation requirements:

<u>Sieve Designation</u>	<u>Percentage Passing</u>
2 inch (50 mm)	100
No. 4 (4.75 mm)	0-50
No. 30 (600 m)	0-35
No. 100 (150 m)	0-10
No. 200 (75 m)	0-4

In addition, the fraction passing the No. 40 (425 µm) Sieve shall have a liquid limit not greater than 30 and shall be nonplastic. The material shall also have a minimum angle of internal friction of 35 degrees.

**C. Geotextile Fabric:** The geotextile fabric shall conform to Section 831.

**D. Drainage Fabric:** The drainage fabric shall conform to Section 831.

**E. Drainage Tubing:**

1. **Corrugated Polyethylene Drainage Tubing:** Corrugated polyethylene drainage tubing shall conform to Section 990.

2. **Profiled Wall PVC Pipe:** PVC pipe and fittings shall meet the physical requirements specified for polyethylene pipe and shall meet the material requirements of ASTM D 3034.

**F. Black Steel Pipe:** Shall conform to ASTM A53.

### 430.3 CONSTRUCTION REQUIREMENTS

**A. Granular Bridge End Backfill**

Prior to placement of backfill, the ground surface on which the backfill is to be placed shall be shaped to the established lines and grades, scarified to a minimum depth of 6 inches and

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recompacted to a minimum of 95% of maximum dry density as determined by SD 104 (AASHTO T99).

The underdrain system shall be installed prior to placement of the backfill. The underdrain system shall consist of four inch (100 mm) diameter perforated drainage tubing, installed across the full curb width of the structure, on impervious soil and drained away from the roadway through four inch (100 mm) diameter nonperforated drainage tubing. The drain outlets shall consist of four inch (100 mm) diameter standard black steel pipe connected to the drainage tubing and screened at the outlet ends with a metal screen or grating to prevent entrance of rodents. The underdrain system shall be installed at a minimum slope of 0.01 foot (10 mm) per one foot (1 m) to drain toward the outlet ends.

Select granular backfill shall be satisfactorily vibratory compacted in lifts not to exceed one foot (300 mm).

Granular bridge end backfill shall not be placed until at least 24 hours after the completion of the deck pour. In addition, backfill placement shall be considered as a superimposed load as per the table in Section 460.3 K for abutments and sills; and also applies for abutment wingwalls.

### **B. Mechanically Stabilized Earth (MSE) Bridge End Backfill**

The MSE Bridge End Backfill shall be constructed in accordance with the following:

1. The MSE Bridge End Backfill shall not be placed until at least 24 hours after completion of the deck pour.
2. Unless otherwise shown on the plans, the MSE Bridge End Backfill shall be placed six inches inside the outer edge limits of the approach slab to eliminate interference with the placement of the guardrail posts for the bridge end guardrail. Corrective action will be required for any MSE Bridge End Backfill that protrudes beyond the limits of the approach slab.
3. Polyethylene sheeting shall be placed as detailed in the plans and shall be a minimum thickness of 6 mils (0.152 mm). Care shall be taken not to puncture the polyethylene sheeting during the backfilling operation.
4. A 6 inch (150 mm) void shall be created between the MSE Bridge End Backfill and the back face of the abutment. This void may be created using a honeycomb cardboard form, a temporary slip form or other approved method. The use of styrofoam type forms with a dissolving agent will not be allowed. If cardboard forms are used, they shall conform to the following:
  - a. Initial installed minimum compressive strength shall be 15.0 psi (103 kPa). Maximum final compressive strength shall be 1.0 psi (6.9 kPa) after saturation with water.

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- b.** The strength reduction from initial installed compressive strength to final compressive strength shall be controlled and must be complete prior to construction of the approach slab.
  - c.** The cardboard shall be kept dry during installation of the MSE Bridge End Backfill.
  - d.** The 6 inch (150 mm) void shall be created by saturating the cardboard form following the installation of the MSE Bridge End Backfill. The cardboard form shall be placed such that all of the corrugations can easily be saturated with water and care shall be taken to assure that no waxed surfaces of the cardboard form are oriented such that water penetration will be hindered. The cardboard form shall be thoroughly saturated in place. The saturation process shall be such the cardboard form may be removed without damage to the geotextile fabric and that the saturation process does not cause any erosion of the MSE Bridge End Backfill or other materials surrounding the abutment. The cardboard form shall be thoroughly wetted and removed prior to placement of the approach slab. One acceptable method of saturating the cardboard form is to wrap the cardboard form in polyethylene sheeting prior to setting the form such that when water is applied to the form, the polyethylene sheeting will hold the water in the form to achieve thorough saturation. Once the form is thoroughly saturated, the polyethylene sheeting is punctured to remove the water and the polyethylene sheeting and cardboard form removed from the void.
- 5.** If a temporary slip form is used, it shall not displace any of the MSE Bridge End Backfill not damage the geotextile fabric during removal of the form.
- 6.** Immediately prior to placement of the MSE Bridge End Backfill, the ground surface on which the MSE Bridge End Backfill is to be placed shall be scarified to a minimum depth of 6 inches (150 mm) and recompact to a minimum of 95% of maximum dry density as determined by SD 104 (AASHTO T99).
- 7.** An underdrain system shall be installed with the MSE Bridge End Backfill as detailed in the plans and in accordance with Section 430.3.A.
- 8.** The following requirements apply to the installation of the MSE Bridge End Backfill:
  - a.** Each layer of granular material shall be placed in 6 inch (150 mm) lifts.
  - b.** Any equipment used to install the MSE Bridge End Backfill shall be operated in such a manner that the geotextile fabric is not damaged. To avoid damage to the geotextile fabric, the equipment used to place, spread and compact the granular material over the geotextile fabric shall not be operated on less than 6 inches (150 mm) of granular material.

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- c.** At a minimum, the granular material shall be compacted by use of a walk behind vibratory roller. Any other proposed compaction methods shall be submitted to the Bridge Construction, through the proper channels, for approval. Plate compactors or rammers will not be allowed.
- d.** The equipment used for placing and compacting the granular material in the MSE Bridge End Backfill shall comply with the following:

  - 1.** Maximum wheel load = 10,000 lbs (4,500 kg).
  - 2.** Maximum contact pressure = 60 psi (410 kPa).
  - 3.** Rutting in excess of 3 inches (75 mm) will not be allowed. Equipment loads are to be lessened if rutting in excess of 3 (75 mm) inches is encountered. All ruts shall be repaired by filling with additional granular material.
- 9.** The geotextile fabric used in the MSE Bridge End Backfill may be oriented in any direction. To minimize the horizontal deflection of the vertical faces of the MSE Bridge End Backfill, it is extremely important to make sure that the geotextile fabric is tight and relatively free of folds and wrinkles during placement of the granular material and before removal of the form for the 6 inch (150 mm) void. The geotextile fabric shall be folded as necessary to form corners and edges in such a manner that the geotextile fabric remains taut during subsequent placement of the granular material. Cutting of the geotextile fabric at the corners will not be allowed.
- 10.** The granular material shall be placed over the geotextile fabric within 24 hours of placement of the fabric.
- 11.** Prior to placement of the MSE Bridge End Backfill, drainage fabric shall be attached to each wingwall with a construction adhesive. During placement of the granular material, the drainage fabric shall be secured between the side of the excavation and the granular backfill material as detailed on the plans such that any material adjacent to the wingwalls is retained from falling into the void area.
- 12.** Any geotextile fabric that is torn or punctured shall be repaired by the Contractor at no additional cost to the Department. The repair shall consist of a patch of the same type of material placed over the ruptured area such that it overlaps the existing fabric a minimum of 3 feet (1 m) from any edge of any part of the rupture. A sewn patch meeting the same requirements for seam strength as that of the fabric being repaired is allowed.
- 13.** The placement and compaction of each layer of granular material must be inspected and approved by the Engineer prior to placement of the next layer.
- 14.** Seams in the geotextile fabric that are normal to the abutment backwall or wingwalls

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and seams that are parallel to the abutment backwall or wingwalls and more than 13 feet (4 m) away may be constructed by overlapping the fabric a minimum of 2 feet (0.6 m). All other seams, as well as those in which the 2 foot (0.6 m) minimum overlap cannot be accomplished, shall be sewn. All seams shall be inspected by the Engineer and any deficient seams repaired by the Contractor prior to placement of the next layer of granular material.

15. Geotextile fabric that is joined by sewn seams shall have strength properties at the seam equal to the specified strength requirements of the specified geotextile fabric. All seams shall be exposed for ease of inspections. High strength polyester, polypropylene or kevlar thread shall be used for sewn seams. Nylon threads shall not be used. The edges of the fabric shall be even at the seam and shall be completely penetrated by the stitch. The strength across the seam shall be equal to the tensile strength requirement for the fabric.
16. During periods of shipment and storage, the geotextile fabric shall be enclosed in a heavy duty opaque wrapping such that the fabric is protected from direct sunlight, ultraviolet rays, mud, dirt, dust or debris. The fabric shall not be subjected to temperatures greater than 140EF (60EC). Any fabric left unprotected shall not be used.
17. Certified Test Results for the geotextile fabric shall be submitted to the Engineer and to the Geotechnical Engineering activity a minimum of 2 weeks prior to use of any geotextile fabric. The Certified Test Results shall provide the test result for each of the tests listed in Section 831. The Contractor shall furnish a signed certification stating that the test results submitted represent the geotextile fabric used on the project. The Contractor shall also furnish a sample of the geotextile fabric that is 3 feet by 3 feet (1 m by 1 m). The sample shall be labeled with the manufacturer's name, product name, machine direction, the lot and batch numbers, the date of sampling and the project number. If sewn seams are to be used, a sewn seam sample shall be submitted for testing.
18. Any excavated material that is not used for the backfill of abutments, may be used to construct the spill cones around the end of the wingwalls as directed by the Engineer.

### 430.4 METHOD OF MEASUREMENT

- A. **Bridge End Backfill Excavation:** The quantity specified on the plans is the theoretical quantity based on a vertical sided excavation. The plan quantity will be the quantity accepted basis for payment. Field measurement for Bridge End Backfill Excavation will not be made.
- B. **Granular Bridge End Backfill:** The quantity specified on the plans is the theoretical quantity based on a vertical sided excavation. The plan quantity will be the quantity accepted for payment. Field measurement for Granular Bridge End Backfill will not be made.

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- C. MSE Bridge End Backfill:** The quantity specified on the plans is the theoretical quantity based on a vertical sided excavation. The plan quantity will be the quantity accepted for payment. Field measurement for MSE Bridge End Backfill will not be made.
- D. MSE Geotextile (Fabric):** The quantity specified on the plans is the theoretical quantity of the surface area covered by the fabric and included the amount of geotextile fabric required for re-embedment. The quantity specified on the plans does not include any geotextile fabric required for overlaps. The plan quantity will be the quantity accepted for payment. Field measurement for MSE Geotextile (Fabric) will not be made.
- E. Bridge End Backfill Underdrain Pipe:** The plan quantity will be the quantity accepted for payment, and will include drainage tubing and black steel pipe. Field measurement for Bridge End Backfill Underdrain Pipe will not be made.

### 430.5 BASIS OF PAYMENT

- A. Bridge End Backfill Excavation:** The accepted quantity will be paid for at the contract unit price per cubic yard (cubic meter). Payment will be full compensation for all labor, equipment and all other items incidental to excavating the material to the limits shown on the plans.
- B. Granular Bridge End Backfill:** The accepted quantity will be paid for at the contract unit price per cubic yard (cubic meter). Payment will be full compensation for all labor, equipment, materials and all other items incidental to scarifying, reshaping and recompacting the area to be backfilled, furnishing and installing the polyethylene sheeting and drainage fabric and placing and compacting the granular material to the limits shown on the plans.
- C. MSE Bridge End Backfill:** The accepted quantity will be paid for at the contract unit price per cubic yard (cubic meter). Payment will be full compensation for all labor, equipment, materials and all other items incidental to scarifying, reshaping and recompacting the area to be backfilled, furnishing and installing the polyethylene sheeting and drainage fabric and placing and compacting the granular backfill material to the limits shown on the plans.
- D. MSE Geotextile (Fabric):** The accepted quantity will be paid for at the contract unit price per square yard (cubic meter). Payment will be full compensation for all labor, equipment, materials and all other items incidental to furnishing and installing the MSE Geotextile Fabric and shall include all costs involved in any additional fabric required for overlaps and sewn seams.
- E. Bridge End Backfill Underdrain Pipe:** The accepted quantity of pipe will be paid for at the contract unit price per foot (meter). Payment will be full compensation for labor, equipment, materials and incidentals.