

Section 2502. Subdrains

2502.01 DESCRIPTION.

Furnish and install subdrains. Construct trench drains.

2502.02 MATERIALS.

- A. **Pipe:** Meet the requirements of Section 4143.
- B. **Engineering Fabric:** Meet the requirements of Article 4196.01, B, 2.
- C. **Porous Backfill Material:** Meet the requirements of Section 4131.
- D. **Corrugated Metal Pipe Subdrain Outlet:** Meet the requirements of Section 4141.

2502.03 CONSTRUCTION.

Install the size and type of subdrains shown in the contract documents. Install them at the locations and to the grades and elevations shown in the contract documents. Apply the provisions of Section 2403.

A. Standard Subdrains.

1. Unless the Engineer grants permission to construct the drain in sections, begin at the outlet and proceed continuously upgrade. The Engineer will furnish stakes and figures for the grade of the flow line.
 - a. Accurately place the pipe to line and grade.
 - b. Lay drain tile ends, when used, as closely together as possible.
 - c. Use special tile connections for junctions in tile lines.
 - d. Use a special connection when a pipe diameter change is more than 2 inches (50 mm).
 - e. Use properly fitting connectors for joints in metal and plastic pipes.
 - f. Use properly designed fittings for junctions of pipe lines.
 - g. Take necessary precautions to avoid damaging existing tile lines.
 - h. Connect such tile lines to the subdrain being installed.
2. Construct inlets to subdrains by filling the full width and depth of the trench with porous backfill material for the length specified.
3. Construct intakes according to design and locations specified. Intake construction includes placing pipe through the intake wall.
4. Allow the Engineer to inspect pipes before covering.
5. Unless porous backfill material is specified, carefully cover (blind) the pipe with soil or other approved material to a depth of approximately 6 inches (150 mm). Do not place sand or boulders directly against pipe. After the drain has been blinded, place backfill in the remainder of the trench using methods and materials approved by the Engineer.
6. When subdrains are placed beneath a highway or driveway or are placed within 5 feet (1.5 m) of the edge of an existing or proposed pavement of base course, place backfill material in layers no thicker than 6 inches (150 mm). Thoroughly tamp each layer with mechanical tampers.
7. The contract documents may also require construction of a granular blanket in connection with subdrains. Construct the granular blanket according to Article 2107.03, K. When installation of a granular blanket is required, place porous backfill material for subdrains prior to construction of the granular blanket.
8. Mark subdrain outlets with steel posts. Use steel posts meeting the requirements of Article 4154.09. Drive the posts 3 feet (1 m) into the ground and install 4 foot (1.1 m) plastic sleeves over the posts. If the Contracting Authority furnishes sleeves, install the sleeves they furnish. Use only one post to mark the location of a double outlet.
9. Use or remove excess excavated project material as directed by the Engineer.

B. Trench Drains.

1. Construct trench drains at locations, depth, and grade shown in the contract documents or as directed by the Engineer.
2. Fill the trench with uncompacted porous backfill material.

C. Longitudinal Subdrains.

1. Place continuous longitudinal subdrains as indicated.
2. **Install outlets as shown in the contract documents at approximately 500 foot (150 m) intervals. Provide additional outlets at the low points of vertical sag curves. The Engineer may adjust outlet location. Cover the outlet end of each subdrain with the specific outlet covering. Cap the blind end with a fitting recommended by the manufacturer.**
3. Place Class A crushed stone over porous backfill material at piers and at subdrain outlets as shown in the contract documents.
4. Compact material by tamping or vibration.
5. Other outlets may be by special connections which will be shown in the contract documents.
6. Ensure polyethylene tubing elongation does not exceed 5%.
7. Construct longitudinal and lateral shoulder subdrains as shown in the contract documents. Wet the aggregate backfill material prior to installation. The Engineer may require surface application of water. Place the subdrain aggregate backfill material as follows:
 - a. **24 inch (0.6 m) Depth Subdrain Trench.**
 - 1) Place aggregate backfill material in one lift above the subdrain pipe.
 - 2) Compact the lift to maximum consolidation using a vibratory compactor narrower than the trench.
 - b. **36 inch (0.9 m) Depth Subdrain Trench.**
 - 1) Place aggregate backfill material in one lift above the subdrain pipe.
 - 2) Compact the lift to maximum consolidation using a vibratory compactor and an approved trench roller, both narrower than the trench.
 - c. **42 inch (1.1 m) or Greater Depth Subdrain Trench.**
 - 1) Place aggregate backfill material in two lifts of approximately equal thickness above the subdrain pipe.
 - 2) Compact the first lift with a vibratory compactor narrower than the trench.
 - 3) Compact the second lift to maximum consolidation using a vibratory compactor and an approved trench roller, both narrower than the trench.
 - 4) Do not allow compaction to damage the subdrain pipe.
 - 5) When porous backfill material thickness immediately above the pipe is less than 1 foot (0.9 m), place aggregate backfill material in one lift and compact with a vibratory compactor.
8. Maximum consolidation will be determined by an initial trial section approximately 100 feet (30 m) long. Continue compaction on this section until maximum consolidation is achieved.
9. To prevent intrusion of porous backfill material, keep backfill material and engineering fabric (if included in the design) protected during subsequent pavement removal, concrete placement, or other work.
10. Use trench rollers with a maximum trench wheel weight (mass) of 6000 pounds (2700 kg).
11. Restore the shoulder and foreslope area as part of shoulder subdrain work.
 - a. **Unpaved shoulders.**
 - 1) Finish unpaved shoulders with a minimum depth of 4 inches (100 mm) of granular shoulder material.
 - 2) Compact granular shoulder material or earth with a minimum of three passes using a single vehicle tire loaded to 6000 pounds (2700 kg).

b. HMA Paved shoulders.

- 1) Finish HMA paved shoulders and other designated locations with a minimum depth of 6 inches (150 mm) of HMA base.
 - a) Tack the edges.
 - b) Place and compact the HMA base mixture in an initial 4 inch (100 mm) lift and a final lift which restores the surface flush with, and no more than 1/4 inch (5 mm) above the adjacent pavement surface.
 - c) Thoroughly compact each lift with a minimum of three passes using a single vehicle tire that is loaded to 6000 pounds (2700 kg) and is no wider than the trench, or equally compact using an approved trench roller.
 - 2) Proof roll areas that show evidence of paved shoulder settlement before completion of the project. Use a single vehicle tire no wider than the subdrain trench and loaded to 6000 pounds (2700 kg).
 - 3) Correct settlements greater than 1/4 inch (5 mm). Use a 3/8 inch (9.5 mm) mixture described in Section 2203, or a similar commercial mixture approved by the Engineer.
 - 4) Tack the surface, and spread and compact the mixture.
 - 5) Compaction may be accomplished with loaded truck tires.
 - 6) Obtain the Engineer's approval for compaction.
12. If a large boulder or obstruction other than a culvert is encountered, construct the subdrain as shown on the detail for trench repair at culverts, except the engineering fabric and 1 foot (0.3 m) of compacted earth are not necessary. An additional subgrade outlet will be necessary for the interrupted drainage.
13. If culverts and other facilities the Contracting Authority owns are damaged by trenching equipment, repair them as directed by the Engineer.
14. Load excavated material directly onto the transporting vehicle when subdrains are constructed on existing roads and removal of the excavated material is required. The contract documents may designate an area to place this material. If an area is not designated, and the Engineer does not designate one, remove the excavated material from the project according to Article 1104.08.
15. Construct backslope drains as shown in the contract documents. The aggregate may be placed in one lift and with no compaction. Fill and mound the remaining trench in one lift. Compact the earth in place. Level the earth to match the adjacent area.
16. Cover subdrains at piers with granular material described in Article 2502.02, as shown in the contract documents, after the porous backfill material is placed and compacted. Compact the granular material in the same manner as the porous backfill material.
17. Cover subdrain outlets with a rodent guard described in Article 4143.01, B.
18. Mark subdrain outlets, except for medians, with steel posts. Use steel posts meeting the requirements of Article 4154.09. Drive the posts 3 feet (1 m) into the ground and install 4 foot (1.1 m) plastic sleeves over the posts. If the Contracting Authority furnishes sleeves, install the sleeves they furnish. **If plastic sleeves are furnished by the Contracting Authority, install over posts.**
19. Use only one metal fence post to mark the location of a double outlet.

D. Limitations.

1. When the work is complete, ensure subdrain outlets are open and free of debris.
2. When the road is open to public traffic during construction, work or uncompleted work must be within the limits of a traffic control zone.

2502.04 METHOD OF MEASUREMENT.

Measurement for subdrain construction will be as follows:

A. Standard Subdrain.

To the nearest foot (meter) along the center line of the subdrain.

B. Longitudinal Subdrain.

Computed to the nearest foot (meter) from the following:

1. Longitudinal Subdrain (Backslope).

Lengths of backslope subdrains of each size, including subdrain placed in laterals and outlets, and the extension into the outlet pipe.

2. Longitudinal Subdrain (Shoulders).

Lengths of shoulder subdrains, calculated from centerline stationing for each size of shoulder subdrains and subdrains at piers, including lengths of perforated subdrains in laterals and outlets, and the extension into the corrugated pipe.

C. Subdrain Outlet.

By count of the size specified.

D. Intakes.

By count the number of the size and type specified.

E. Trench Drain.

To the nearest foot (meter).

2502.05 BASIS OF PAYMENT.

Payment for subdrain construction will be the contract unit price as follows:

A. Standard Subdrain.

1. Per foot (meter).

2. Payment will be full compensation for:

- Trenching,
- Removal of excess excavated material from the project,
- Furnishing and placing end caps, elbows, tees, and other necessary connections,
- Furnishing and placing porous backfill material where specified,
- Placing backfill in the trench and finishing the surface as directed by the Engineer, and
- All tools and labor necessary to construct the subdrain.

3. For subdrains built according to the contract documents, no extra compensation will be allowed for overdepth, rock excavation, tamping backfill material, and removal of surplus material from the project.

4. When the contract documents do not indicate the depth of excavation, the first 6 feet (1.8 m) of excavation will be included in the contract unit price. Payment will be made for overdepth excavation according to Article 2503.05.

B. Longitudinal Subdrain.

1. Longitudinal Subdrain (Backslope).

Per foot (meter) of each size placed.

2. Longitudinal Subdrain (Shoulders).

Per foot (meter) of each size placed.

3. Payment for longitudinal subdrains will be full compensation for the following:

- Excavation of the trench and removal of excess trench material from the project,
- Furnishing and placing subdrain pipe, laterals, elbows, tees, special connections, couplings, and adaptors according to the manufacturer's recommendations,
- Furnishing and placing porous backfill material,
- Furnishing and placing engineering fabric as required,

- Restoring the shoulder of shoulder subdrains and covering backslope subdrains with earth, including shoulder outlet locations, and
 - Proof rolling as specified.
4. When boulders result from excavation for longitudinal subdrains, the Engineer may order boulder pickup and removal from the project. When ordered, payment for this work will be at 10 (4) times the contract unit price for placing the longitudinal drains on the backslope or shoulder as appropriate, per cubic yard (cubic meter) of boulders.

C. Subdrain Outlet.

1. Each.
2. Payment is full compensation for the following:
 - Furnishing and installing corrugated metal pipe, double walled PE, or PVC pipe including the outlet coverings, grouted joints and special connections,
 - Drilling or forming into an existing drainage facility,
 - Associated excavation,
 - Placing specified backfill material,
 - Furnishing and installing steel posts and concrete patio block and installing plastic sleeves, and
 - Restoration of the site.

D. Intakes.

1. Each.
2. Payment is full compensation for all materials, labor, and equipment necessary for construction of the intakes, as specified, including excavation and removal of excess material from the project.

E. Trench Drain.

1. Per foot (meter).
2. Payment is full compensation for trenching, removal of excess excavated material from the project and furnishing and placing porous backfill material.