

**ITEM 605 UNDERDRAINS**

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**605.01 Description.** This work consists of constructing unclassified pipe underdrains, pipe underdrains, rock cut underdrains with or without a filter fabric, construction underdrains, prefabricated edge underdrains and aggregate drains.

Use removed or excavated materials in the Work when the material conforms to the specifications; if not, then recycle or dispose of the material according to 105.16 and 105.19.

**605.02 Materials.**

|                             |             |
|-----------------------------|-------------|
| Concrete, Class C.....      | 499 and 511 |
| Reinforcing steel .....     | 509.02      |
| Filter fabric, Type A ..... | 712.09      |

Backfill unclassified pipe underdrains, pipe underdrains, rock cut underdrains with or without a filter fabric, construction underdrains and aggregate drains with granular material consisting of No. 8, 57, 9, or 89 size air-cooled blast furnace slag, limestone, or gravel. Use granular material with a maximum sodium sulfate soundness loss of 15 percent.

Backfill prefabricated edge underdrains with granular material consisting of No. 8 size air-cooled blast furnace slag, limestone, or gravel. Use granular material with a maximum sodium sulfate soundness loss of 15 percent.

For 605.02.A through 605.02.B, use the pipe of the same size and kind listed in the Proposal. If the kind of pipe is not specifically itemized in the Proposal, use types as listed below.

**A. Pipe for 605 Rock Cut Underdrains.**

|   |        |
|---|--------|
| Corrugated polyethylene drainage tubing<br>(perforated).....                          | 720.01 |
| Polyvinyl chloride plastic pipe .....   | 720.07 |
| Polyvinyl chloride corrugated<br>smooth interior pipe<br>(perforated per 720.01)..... | 720.10 |
| Polyvinyl chloride solid wall pipe<br>(perforated per 720.01).....                    | 720.08 |

**B. Pipe for 605 Unclassified Pipe Underdrains, Pipe Underdrains.**

|  |        |
|--|--------|
| Perforated concrete pipe .....           | 706.06 |
| Concrete drain tile, extra quality ..... | 706.07 |

|  |        |
|--|--------|
| Perforated vitrified clay pipe .....                             | 706.08 |
| Clay drain tile, extra quality .....                             | 706.09 |
| Corrugated steel underdrains, Type III.....                      | 707.01 |
| Corrugated polyethylene<br>drainage tubing, (perforated).....    | 720.01 |
| Polyvinyl chloride plastic pipe .....                            | 720.07 |
| Corrugated aluminum alloy pipe and<br>underdrains, Type III..... | 707.21 |

If the size of the underdrains required is a 6-inch (150 mm) pipe underdrain and the kind of pipe material is not specifically itemized, then 4-inch (100 mm) 720.01 perforated corrugated polyethylene drainage tubing may be used.

**C. Pipe for 605 Construction Underdrains.**

|  |        |
|--|--------|
| 6 inch (150 mm) Corrugated polyethylene drainage<br>tubing (perforated)..... | 720.01 |
|--|--------|

**D. Pipe for 605 Prefabricated Edge Underdrains.** Use pipe conforming to 712.10.

**605.03 Pipe Underdrains Construction.** Construct underdrains as follows:

**A. Excavation.** Excavate trenches to such dimensions allowing ample room for construction. Construct the trench width to at least 14 inches (350 mm) for 6-inch (150 mm) diameter underdrains, and to at least 6 inches (250 mm) for 4-inch (100 mm) diameter underdrains. Excavate the trench walls as vertical as possible, and excavate bell holes to allow proper placing of the underdrain. Remove obstructions encountered while excavating for the underdrains.

Excavate trenches measured vertically as shown in the Standard Drawings unless otherwise specified in the plans. Furnish a depth of 30 inches (760 mm) for construction underdrains unless otherwise specified in the plans. Excavate trenches for unclassified pipe underdrains to the depth specified in the plans.

Excavate trenches to a depth of 6 inches (150 mm) below the rock, shale or coal depth required in 204.05 for Rock Cut underdrains unless otherwise specified in the plans.

If underdrains are to be placed within or beneath an embankment, construct the embankment to the elevation of the top of the subgrade before trenching for the underdrain.

If filter fabric is specified, line the underdrain trench with filter fabric. Place the filter fabric to completely surround the granular material. Overlap the filter fabric at the top of the trench. Match the overlap to the trench width. At other seams, overlap filter fabric a minimum of 12 inches (0.3 m).

**B. Laying Underdrain.** Lay the underdrain true to line and grade with close fitting joints. Place the underdrain in the center of the trench. Use locking bands or smooth sleeve type couplers matching the underdrain material type to join 707.01, 720.01, 720.07, and 707.21. When bell and spigot underdrain is used, lay it with the bell end facing up grade. Set the underdrain on a solid bed shaped to fit the underdrain throughout its entire length. Make all necessary connections with branches, wyes, tees,

#### 605.04

transitions, and bends that match the underdrain material type. Close the upper ends of underdrains with suitable plugs.

Lay perforated underdrain so that the perforations are in the bottom half of the underdrain.

**C. Backfilling.** Inspect the underdrains before placing any granular material. Place the granular material for the full width of the trench around the underdrain, and extend it to the bottom of the pavement or base as shown on the plans. If underdrains are placed outside of the pavement or base area, extend the granular material to within 4 inches (100 mm) of the finished grade. Fill the remaining depth of the trench with 203 embankment material.

**D. Protection.** Place the pavement over the underdrain trench within 90 days after placing the trench backfill. If the trench remains open for longer than 90 days, remove and replace backfill contaminated by soil.

**605.04 Construction Underdrains.** Construct construction underdrains as follows:

**A. Excavation.** Construct the trench width to at least 10 inches (250 mm) with a minimum of 2 inches (50 mm) on each side of the underdrain. Excavate the bottom of the trench to allow proper placing of the underdrain. Remove obstructions encountered while excavating for the underdrains.

**B. Trench Depth and Backfill.** Construct the trench depth to that shown on the plans or 30 inches (750 mm). Backfill the trench with granular material for the full width of the trench and to the full height of the trench.

**C. Outlet.** Outlet the construction underdrains as possible into the ditch or drainage structures. There is no change in pipe types for the outlet.

**D. Removal.** Construction underdrains are not to be removed at any time. If the construction practice used requires the construction underdrains to be removed then install replacements as soon as possible.

**605.05 Prefabricated Edge Underdrains.** Install the prefabricated edge underdrains against the outside wall of a 4-inch (100 mm) trench, and backfill the trench adjacent to the pavement with granular material. Place the granular material in one or more lifts with a vibratory compactor run over the final lift to compact the granular material before placing the asphalt plug. Place the first layer of the granular material simultaneously with the trenching operation to hold the edge underdrains flush against the trench wall.

Splice the prefabricated edge underdrains as required before placing in the trench, using material furnished by the manufacturer and according to the manufacturer's directions. Require the manufacturer to furnish all material required for the splices, and furnish any equipment required for splicing. Construct splices to prevent separation of adjoining sections of the prefabricated edge underdrain panels.

**605.06 Underdrain Outlets.** Construct pipe outlets concurrently with underdrains. Provide all outlets on the slope with a precast reinforced concrete outlet according to Item 604 and a tied concrete block mat type 1 grouted according to 601.12.

Construct the underdrains outlets according to Item 603 using outlet fittings. Require the manufacturer to supply outlet fittings that transition between the underdrains and the

outlet pipe. Provide smooth-lined or corrugated outlet fittings. Have the underdrains and outlets on fractured slab projects, such as crack and seat, rubblized, or break and seat projects, in place and functional before fracturing the existing pavement.

Mark all underdrain outlets with a wooden lath prior to final seeding. Clean all debris from the outlets after final seeding.

**605.07 Aggregate Drains.** Construct the aggregate drains after the completion of granular pavement courses.

**A. Excavation.** Excavate trenches for aggregate drains to a minimum width of 12 inches (0.3 m) and to the depth shown on the plans. Slope the bottom of the trench to drain and keep it free from loose particles of soil. Excavate the trench to furnish a clean exposure of the granular pavement courses.

**B Placing and Backfilling.** Use granular material for the drains. Place the aggregate to a minimum depth of 8 inches (200 mm) above the bottom of the trench. The remaining depth of the trench backfill with suitable embankment material according to Item 203.

**605.08 Method of Measurement.** The City will measure Unclassified Pipe Underdrains, Pipe Underdrains, Construction Underdrains, Rock Cut Underdrains, and Prefabricated Edge Underdrains by the number of feet (meters) completed and accepted in place, measured from end to end of each run.

The City will measure Aggregate Drains by the number of feet (meters) completed and accepted in place, measured along the bottom of the trench.

**605.09 Basis of Payment.** The City will pay for pipe outlets under 603 Conduit, Type F.

The City will pay for precast reinforced concrete outlets under 604 Precast Reinforced Concrete Outlet.

The City will pay for tied concrete block mats type 1 grouted under 601 Tied Concrete Block Mat.

Rock Cut Underdrains are placed in rock and all required trenching in the rock is included under Rock Cut Underdrain.

The City will pay for accepted quantities at the contract prices as follows:

| Item | Unit         | Description                                     |
|------|--------------|---|
| 605  | Foot (Meter) | ____ " (____ mm) Unclassified Pipe Underdrains  |
| 605  | Foot (Meter) | 6" (150 mm) Construction Underdrains<br>720.01  |
| 605  | Foot (Meter) | ____ " (____ mm) Pipe Underdrains               |
| 605  | Foot (Meter) | Aggregate Drains                                |
| 605  | Foot (Meter) | ____ " (____ mm) Rock Cut Underdrains           |
| 605  | Foot (Meter) | ____ " (____ mm) Prefabricated Edge Underdrains |