

### 2-2.11 Subsurface Drains

#### General

The various categories of subsurface drainage are discussed in Chapter 840 of the Highway Design Manual (HDM). This Section 2-2.11 covers edge drains, underdrains, and horizontal drains, which are the more commonly used subsurface drains. The terminology, "edge drains," as used in this section includes associated structural section drain facilities as is discussed on page 840-2 of the HDM. Subsurface drains should be shown on the project plan layouts. If sufficient space does not allow this type of work to be shown on the project plan layouts, it may be shown on the drainage plan sheets. Where subsurface drainage systems are large and complex, they may require separate sheets of plans. If edge drains are to be installed, they shall also be shown on the project's typical cross sections. If underdrains are to be installed to drain the pavement structure, they shall also be shown on the project's typical cross sections.

#### Edge Drain Plans

Where separate sheets are used to show installation of edge drains, the base mapping for the project is typically used as the background for these plans. The background information is shown as existing (dropped out) and new drainage work is shown as solid lines. These plans provide a visual representation, in plan view, of placement of edge drain facilities. These plans do not repeat the roadwork items shown on the project plan layouts

Identify size of drains and the types of drain outlets, vents, and cleanouts. Identify location of items by plus station and station offset distance.

Edge drain outlets and vents should connect to drainage facilities, such as drainage inlets, drainage pipes, and overside drains, whenever possible. If such features are not available, the Standard Plans show various methods to handle edge drain outlets, vents, and cleanouts. The type of edge drain outlets, vents, and cleanouts used shall be labeled in the same manner as shown in the Standard Plans.

The first sheet of the edge drain plans should contain notes, legends, symbols, and a list of abbreviations. Do not include standard plan abbreviations or acronyms as part of the listed abbreviations.

Each sheet of the edge drain plans shall have the following note included on it: "APPROVED FOR EDGE DRAIN WORK ONLY."

If no edge drain work is to be performed within the corresponding limits of a project plan layout sheet (road work items), do not include a edge drain plan sheet for that area. The number of project plan layout sheet may not be the same as the number of edge drain plan sheets.

### Edge Drain Profiles

Typically, profiles of edge drains will not be required, because the profile grade of the drains match the profile grade of the pavement structure they are installed within.

### Edge Drain Details

These details, typically will not be required in the project plan set, because the standard plans show installation details, including various methods to handle edge drain outlets, vents, and cleanouts.

In some instances, inclusion of drain details in the project plan set may be necessary to fit site conditions. These details would be those for which there are no standard plans or when a standard plan detail is modified.

Drawings on the edge drain detail sheets are not drawn to a specific scale. Drawings are drawn at a one to one proportion, but then enlarged to fit the border sheet. Each sheet is to be labeled "No Scale." Sufficient dimensioning shall be shown on the detail so that the facilities are buildable and the quantities are calculable.

### Edge Drain Quantities

Items should be summarized on a separate quantity list and shall not be included within the summary of drainage quantities. The quantity list should be included as part of the project's summary of quantities sheets.

This quantity list should contain a summary of the edge drains, drain outlets, vents, and cleanouts to be installed. Identify sizes of drains and the types of drain outlets, vents, and cleanouts. Identify location of these

items by plus station and station offset distance.

The column headings for bid items shall read the same as the description for the bid item shown in the Engineer's Estimate.

Where all of the edge drain quantities can be shown in a table on one quantity sheet, quantity totals for each bid item column shall appear at the bottom of the table. Where more than one sheet is necessary to show the edge drain quantities, the totals for each bid item shall appear at the bottom of the table on each individual sheet. The totals for the bid items shall be identified as "SHEET TOTALS." Sheet totals for each bid item shall appear on the last sheet of the edge drain summary of quantities. Sheet totals shall be totaled and shown as "GRAND TOTAL" or "TOTAL."

### Underdrain and Horizontal Drain Plans

These plans provide a visual representation, in plan view, of placement of underdrain and horizontal drain drainage facilities. When separate sheets are used to show installation of underdrains or horizontal drains, the base mapping for the project is typically used as the background for these plans. The background information should be shown as existing (dropped out). The underdrain work should be shown as solid lines. The portion of the new horizontal drain pipe embedded in the hillside should be shown as a dashed line. The portion of new horizontal drain pipe projecting from the face of the slope should be shown as a solid line.

Where horizontal drains are laid out in a grid pattern on a large slope, it may be helpful to develop an isometric view in addition to the standard plan view or profile.

The size, length, grade, and type of pipe involved shall be shown on the plan sheets. Show depth and spacing of drains. Show locations of outlets and cleanouts (risers). Identify location of items by plus station and station offset distance.

Underdrain outlets typically discharge into a storm drain or culvert. The type of riser used for underdrains shall be labeled in the same manner as shown in the standard plans.

Horizontal drains typically require a collector system to remove intercepted water from the site.

The first sheet of horizontal drain or underdrain plans should contain notes, legends, symbols, and a list of abbreviations. Do not include standard plan abbreviations or acronyms as part of the listed abbreviations.

Each sheet of the underdrain plans and horizontal drain plans shall have the applicable following note included on their respective sheets: "APPROVED FOR UNDERDRAIN WORK ONLY" or "APPROVED FOR HORIZONTAL DRAIN WORK ONLY." Where both types of drains are shown on the same plan sheets, the note should read: "APPROVED FOR UNDERDRAIN AND HORIZONTAL DRAIN WORK ONLY."

If no horizontal drain or underdrain work is to be performed within the corresponding limits of a project plan layout sheet (road work items), do not include a horizontal drain or underdrain plan sheet for that area. The number of project plan layout sheets typically are not the same as the number of horizontal drain or underdrain plan sheets.

### Underdrain and Horizontal Drain Details

Underdrain typical details are shown in the standard plans. No standard plan details are available for horizontal drains. Horizontal drain details, including the collector system to remove intercepted water, are to be shown on the detail sheets.

Drawings on these detail sheets are not drawn to a specific scale. Drawings are drawn at a one to one proportion, but then enlarged to fit the border sheet. Each sheet is to be labeled "No Scale." Sufficient dimensioning shall be shown on the details so that the facilities are buildable and the quantities are calculable.

### Horizontal Drain and Pipe Underdrain Quantities

Items should be summarized on a separate quantity table and shall not be included within the summary of drainage quantities. The quantity list should be included as part of the project's summary of quantities sheets.

The quantity list shall show the materials to be used with their locations identified by area and stationing. Station location references shall match those shown on the plan sheet. If the project uses only post miles to identify limits of work and construction, then the locations of horizontal drain or underdrain work should also be identified by post mile.

The column headings for bid items shall read the same as the description for the bid item shown in the Engineer's Estimate.

Where all of the underdrain or horizontal drain quantities can be shown in a table on one quantity sheet, quantity totals for each bid item column shall appear at the bottom of the table. Where more than one sheet is necessary to show the underdrain or horizontal drain quantities, the totals for each bid item shall appear at the bottom of the table on each individual sheet. The totals for the bid items shall be identified as "SHEET TOTALS." Sheet totals for each bid item shall appear on the last sheet of the underdrain or horizontal drain summary of quantities. Sheet totals shall be totaled and shown as "GRAND TOTAL" or "TOTAL."