

## Chapter 14

### Drainage Structures

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# Chapter 14

## Drainage Structures

### 14.1 General

Drainage structure sheets show the drainage structures, their location, cross section, flow line elevations of all weirs or slots, top of grates, culverts and top of manhole elevations, and similar data. Drainage structure sheets also show the vertical relationships of the entire drainage system. During the process of design/placement of the drainage structures, potential conflicts with existing or proposed utilities must be identified and resolved early, thereby avoiding costly time delays during the construction phases.

All projects require the plotting of drainage structures. When only cross drains are to be constructed or modified, drainage structures may be plotted on the cross section sheets. Otherwise drainage structures should be plotted on separate drainage structure sheets, utilizing the cross section sheet cell available in the FDOT Engineering/CADD Systems Software (see *Exhibit DS-2*). See *Chapter 22* of this Volume for additional requirements for box and three-sided culverts utilized as drainage structures.

### 14.2 Required Information

For rural projects, show the existing ground line at the location of the structure, with the existing elevation placed immediately below the ground line at the survey baseline. Do not show existing structures, except those to be incorporated into the proposed drainage system or otherwise modified. These must be shown and their flow line elevations noted. Where storm drains run laterally or diagonally across the project, the drawing should show the pipe cover.

Show the roadway template and proposed structures, with the proposed profile grade elevation, placed above the grade point. Locate the structure by station and offset to the centerline of construction. Provide flow line information at each structure and at each culvert end. Structures are to be plotted in detail according to the applicable index of the *Design Standards*, with walls, grates, tops, pipes, etc. shown.

Include the size and length of each proposed structure on the cross drain sections. Box and three-sided culvert lengths must be shown on the drainage structure sheet.

Depict sections for skewed cross drains along the centerline of the structure. Clear zone distances are to be measured at right angles to the traffic lane for all structures.

All structure locations must be checked and R/W shown where the R/W may have potential impact on construction of a structure.

For each drainage structure, note all necessary information, including, as appropriate: size, end treatment and flow lines, as well as structure, index and station number. Place the note as close to the structure as possible, preferably below the plotted structure. Provide elevations for manhole tops, and ditch bottom inlet grates and slots. Show grate elevations for gutter inlets and edge of pavement elevations for curb and gutter inlets.

Alternate "G" or other special grate treatment must be included with the inlet note. Additional details, such as special bedding, 36" manhole rings, etc., must be indicated. Show flow direction arrows.

Show material options on the Optional Materials Tabulation Sheet. (See **Exhibits SDS-2a** and **SDS-3a** at the back of **Chapter 8** of this Volume).

Modification for Non-Conventional Projects:

Delete paragraph above. See Chapter 6 of the **Drainage Manual** for Optional Material documentation requirements.

If existing structures are to be filled and/or plugged and are to remain in place, show them in the plans with an appropriate note.

Applicable notes to be shown on the first drainage structure sheet are given in **Exhibit 14-1**.

## 14.3 Utility Conflicts

Plot all major underground utilities, as defined in **Chapter 5 of Volume 1**, in conjunction with the structures so that conflicts may be detected during design, and to alert construction forces of potential conflicts.

In the case of longitudinal pipes, a section should be plotted for each location of a crossing of any major underground line.

Utilities that have been verified (Quality Level "A" locate) must be noted and plotted to scale in the appropriate locations on the Drainage Structure Sheets, Cross Section Sheets and bridge foundation plans. These utilities should be labeled with the following symbol:

$V_{vh}$  = Verified Vertical Elevation and Horizontal Location

## 14.4 Sheet Setup

Plot structures as sections along the centerline of the structure. They must be shown on a standard cross section format with the sections spaced sufficiently apart to avoid overlapping of structures or notes. Reference offsets from the appropriate baseline or centerline to the location reference point, which may vary by Index, as indicated in the **Design Standards**. Beginning at the bottom of the sheet, show the sections successively by stations and number them sequentially, from the beginning to the end of the project. Show the structure number and location station near the right border of the sheet.

If a structure must be shown out of order, place a note in the correct sequence, referring to the sheet where the structure is shown. Use the same scale that is used for roadway cross sections, with the centerline of construction placed near the center of the sheet.

### **Exhibit 14-1 Drainage Structure Notes**

These notes, when required, are to be placed on the first drainage structure sheet.

1. Special attention is directed to the fact that portions of some drainage structures extend into the stabilized portion of the roadbed and extreme caution will be necessary in stabilization operations at these locations.
2. All drainage pipes have optional materials. The Optional Materials Tabulation Sheet(s) shows all materials allowed and indicates which material is plotted in the plans and used as the basis for pay quantities.