

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS

  

REGISTERED CIVIL ENGINEER	DATE
PLANS APPROVAL DATE	

  

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.



See "Generic Project Border Sheet" for basic border sheet information not shown on this sheet.

**DRAINAGE PROFILES:**

- Drainage profiles provide a visual representation of the drainage facilities in an elevation view (side view).
- Drainage profiles must show all the information needed (i.e., elevations, slope, type and size of pipe, etc.) to construct the drainage system.
- Place the labeling of each drainage system number under their individual profile.
- Show existing ground line and finished grade on drainage profiles so that the quantities of excavation and backfill needed to install, construct or remove a drainage facility may be determined. Structure excavation and structure backfill is included in the bid item(s) to install, construct or remove a drainage facility.
- Profiles of crossdrains that are perpendicular or at a skewed angle to the alignment line are to be displayed left to right as if the viewer were standing on the alignment line looking up station (direction of increasing stations, similar to the display of typical cross sections). The station reference for these drainage systems is to be the point at which the crossdrain culvert alignment intersects the roadway alignment line or profile grade.
- Display profiles of drains, that are in a longitudinal position in relation to the alignment line, from left to right, as if the viewer were standing on the right of way line on the right side of the route or road alignment. Reference the begin and end points of these culverts and any intervening angle points in the culvert's horizontal alignment to the nearest roadway station line by station offset distances and station pluses.
- A system profile should be shown entirely on one profile sheet. If a profile is long enough to have a match line, stack the profile with the beginning station on top and the next section below that.
- The offset distance and station reference for the location of drainage structures, shown on the drainage profiles, are to be shown to the nearest hundredth of a foot. Show offset distance first, then the station reference.
- Culvert crossdrains are typically constructed on slopes between zero and 5 percent. The slope is based on the gradient of the stream or waterway they are to convey. Crossdrain profiles typically are drawn at a horizontal to vertical scale ratio (H/V) of one. Commonly used scales for drainage profiles are 1"= 5' for both horizontal and vertical or 1"=10' for both horizontal and vertical. The scale ratio of 1:1 produces greater details. There may be some instances where physical conditions of culvert installation will dictate the use of a scale ratio (H/V) other than one. When a horizontal scale of 1"= 20' or more is used, an exaggerated vertical scale typically (1"= 5') will be required to clearly depict the information on the profile. The scale ratio of 1:1 should be used for drainage work to extend existing culverts.
- Storm drains collect highway drainage and are constructed longitudinally to the highway alignment. These storm drains are typically constructed on slopes between zero and 5 percent. Profiles of storm drains may require a scale ratio (H/V) other than one. Due to the typically longer length of storm drains, a horizontal scale of 1"= 20' may be more appropriate with a vertical scale of 1"= 5' or 1"= 1'.

- In steeper terrain, downdrains typically are used to convey highway runoff and require a steeper gradient. The highway side slope dictates the slope of the downdrain. Profiles of downdrains may require a scale ratio (H/V) other than one.
- The slope of a culvert (S=) is most commonly shown by decimal but may also be shown by percentage. Show pipe slopes to 4 decimal places for ft/ft values or 2 decimal places for percent values. The method of identifying slope is to be consistent throughout the profiles.
- The length of a culvert is the slope length, not the horizontal length. The estimated slope length of pipe is the centerline length of the culvert expressed in decimal feet, to the nearest tenth of a foot. Where greater accuracy is dictated by site condition, the slope length of the culvert may need to be shown to the nearest hundredth of a foot.
- The estimated slope length of a pipe culvert that is shown on a drainage profile is to be the same length that is entered in the drainage quantities for that specific pipe culvert.
- Where a pipe is placed between successive drainage structures (inlets, junction boxes, etc.), the slope length of the pipe shown is to be the centerline length between the inside face of each structure (inside face to inside face). Where an end of a pipe is placed in a drainage structure, the pipe length is to be measured from the inside face of the structure along the centerline of the pipe to the other end of the pipe regardless whether it ends within another drainage structure, highway side slope, or other terminus.
- The pay length for each culvert installed during construction will be determined in the field in accordance with the Standard Specifications and the instructions in the Construction manual. This includes determination of the actual length of pipe necessary before cutting when a pipe is to be cut to fit an outlet structure, entrance structure, inlet or highway side slope.
- The quantity for each pipe culvert should not be increased to include the length required to reach the next 2-foot increment of pipe. Construction Surveys will stake the pipe alignment based on the profile of the pipe shown on the drainage profiles and make any field adjustments to fit site conditions. This is why we are not to arbitrarily increase the calculated length for each pipe culvert in Design. Quantities on plans are to be calculated quantities, never rounded quantities.
- Pipe culverts are to be labeled in the following order: diameter of pipe, length of pipe, and type of pipe material. Example of labeling: 24" x 78.5' CSP
- Caution should be exercised for the effect of skewed pipe alignment intersecting the interior wall of a standard drainage inlet. The standard plan inlet may require modification of the interior dimensions to accommodate the pipe opening due to the type, size, and skew of the pipe culvert.
- If a ladder is to be constructed on an inlet wall, it needs to be located under the short end of the grate to have the 2 1/2-foot of clearance from the face of the steps to the nearest obstruction on the climbing side of the ladder. Manholes that require ladders should have a 3-foot opening for the manhole cover to allow access inside the manhole.

**DRAINAGE DETAILS:**

- Drainage details included in the contract plans are those that are unique to the specific project and those for which there are no standard plans, or they are a detail from a standard plan which must be modified to fit project site conditions.
- Drainage details are drawn proportionally and adjusted to fit within the plan sheet border. Sufficient dimensioning must be shown on the details so the facilities are buildable and the quantities are calculable. Labeling and dimensioning take precedence over the graphics shown. The bidder and contractor are never expected to scale from the hard copy print of any contract plan sheet. Label the sheet "NO SCALE" in the lower right corner below the title of the sheet.
- If a detail is applicable to several systems, draw the detail one time and then list, below the detail, all system numbers for which the detail applies.
- Clearly show by offset and stationing the location of the flow line for each specific system within each project (where necessary). Standard Plans may only show the flow line for general situations. Example: Flow line for an inlet up against median barrier is the face of the barrier not the center of the inlet grate.

**DRAINAGE QUANTITIES:**

- The table of drainage quantities summarizes those drainage facilities and appurtenances (headwalls, wingwalls, drainage inlets, flared end sections, inlet and outlet structures, etc.), which are to be constructed, installed, removed, reset, remodeled, adjusted, modified, abandoned, reconstructed, or salvaged as shown on the drainage plans, profiles and details or in some instances where shown on the project plan layouts. See Section 2-2.10 of the PPM for more detailed information necessary to be included in the summary of drainage quantities.
- Where all of the drainage quantities can be shown in a table on one quantity sheet, quantity totals for each bid item must appear at the bottom of the table.
- Where more than one sheet is necessary to show drainage quantities, the individual sheet totals for each bid item are to appear at the bottom of the table on each sheet. The row of the table in which the bid item totals appear on each individual sheet, is to be identified as "SHEET TOTAL." Sheet totals for each bid item must appear on the last sheet of the drainage summary of quantities. Sheet totals must be totaled and shown as "GRAND TOTAL" or "TOTAL."
- Where there is not sufficient space on a single border sheet to accommodate the number of columns necessary to list all of the project's drainage bid items, see Section 2-2.10 of the PPM for the Caltrans preferred method to be used to display the listing of bid items.

Use appropriate SHEET NAME AND ID CODE for the work shown. See CADD Users Manual section 2.1

FT=43, TX=14.5, WT=0, LV=10, Upper Case  
Use "Center Center" justification

Text may be reduced to a minimum of TX=12 where space constraints are involved.

For text sizes see CADD Users Manual section 2.6

PROJECT DRAINAGE SHEETS,  
BASIC REQUIRED INFORMATION  
(SHEET 2 OF 2)

**DRAINAGE XXX**  
**D-XX**

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION  
Caltrans

PROJECT DRAINAGE SHEETS, SHEET 2 OF 2 RELEASED 5 / 4 / 2012