

Drawing for Bridges shall be arranged in the following sequence as applicable.

GENERAL INFORMATION - SUMMARY OF QUANTITIES  
GENERAL LAYOUT  
ENGINEERING GEOLOGY  
BRIDGE HYDRAULIC INFORMATION  
CONSTRUCTION LAYOUT  
FOOTING, PILING AND CAISSON LAYOUT  
ABUTMENT DETAILS  
WINGWALL DETAILS  
PIER DETAILS  
GIRDER DETAILS  
SUPERSTRUCTURE DETAILS  
CAST-IN-PLACE OR PRESTRESSED GIRDER DETAILS  
EXPANSION DEVICE DETAILS (if in the superstructure)  
PRECAST PANEL DETAILS  
DRAIN DETAILS (if in the superstructure)  
BEARING DETAILS  
BRIDGE RAIL DETAILS  
FENCE DETAILS  
APPROACH SLAB DETAILS  
EXPANSION DEVICE DETAILS (if in the approach slab)  
DRAIN DETAILS (if in the approach slab)  
EXCAVATION AND BACKFILL DETAILS  
STRUCTURE BACKFILL (FLOW-FILL) DETAILS  
SLOPE PAVING DETAILS  
BRIDGE DECK ELEVATIONS

## **GENERAL LAYOUT**

### **PLAN VIEW**

Check Items:

1. Horizontal Control Line: Projected Line, Survey Line, Centerline Roadway, Centerline Median, Centerline Structure, or others.
2. Profile Grade Line or Lines; label and dimension to Horizontal Control Line.
3. Alignment Information: Horizontal Curve Data, bearings, and station marks at 100 feet of upper and lower roadways. Give the station tie at centerline intersection.
4. Skew angle of bridge.
5. Label the Back Face of Abutments and Centerline of Piers.
6. Stations at Back Face of Abutments and Centerline of Piers along Horizontal Control Line.
7. Horizontal roadway dimensions of upper and lower roadways including traveled lane widths, shoulder widths, ditches, toe of slope, sidewalks, etc for the current and future alignments.
8. For structures over Railroads, give the minimum horizontal clearance measured perpendicular from centerline of railroad tracks to piers and retaining walls adjacent to the tracks.
9. The name and direction of flow for streams and canals.
10. Show channel improvement dimension (Net Channel Width), verify from Hydraulics Report.
11. If twin structures are shown, label each with its own structure number.
12. Show approach slabs.
13. Location of minimum vertical clearance over Roadways, Railroads and Pathways.
14. Show contour lines.
15. North Arrow.
16. All known utilities.
17. Miscellaneous structures, such as retaining walls, pipes, etc.
18. Show type of slope protection. If slope paving is used, show outline and define limits.

19. Direction and rate of fill or cut slopes. Show approximate location of toe and top of slopes.
20. Show existing structures (dashed), label with structure number, and note if the existing structure is to be removed.

#### **LONGITUDINAL SECTION**

##### Check Items:

1. Show elevation lines at 2 feet intervals along each side and identify the elevations at 20 feet intervals.
2. Label stations across the bottom at 100 feet.
3. Show span lengths and total overall length and where measured if located away from where section is taken.
4. Label Back Face Abutments, Centerline Piers, and Centerline Bearings.
5. Show Finished Grade Elevations at the back face of abutments and at centerline of piers and note where located, if other than where section is taken.
6. If the bridge is on a straight grade, show grade and the station and elevation of the nearest P.I.
7. If the bridge is on a vertical curve, use a profile grade diagram showing the grade back, grade ahead, the station and elevation of the P.I., the length of the vertical curve, and the location of the structure. This diagram shall be titled "PROFILE GRADE".
8. Show the pile, caisson, or spread footing drawn to the correct elevation, when applicable.
9. Show the slope protection.
10. Show the "Existing Ground Line" (dashed) and indicate where located if other than where section is taken.
11. Note "fixed" or "expansion" bearings (F or E) at Piers and Abutments.
12. Show minimum actual vertical clearance to roadway or railroad below. For railroad, give clearance in metric and English Units.
13. Show design high water elevation and verify from Hydraulics report.
14. On stream crossings, show the drainage area and design discharge.
15. Channel changes and Roadway improvements shall be crosshatched and noted as "Unclassified Excavation (Included in Roadway Quantities)".
16. Show approximate limits of scour.
17. Title the longitudinal section "SECTION" with a note immediately below giving the line where the section was taken; such as "Taken at Horizontal Control Line" or "Taken at Profile Line".
18. For parallel structures of the same type, a single longitudinal section will suffice. This section, titled "SECTION" is taken for one structure with a note giving the line where the section was taken and the structure number. Also note that the parallel structure is similar.

#### **TYPICAL SECTION**

##### Check Items:

1. Width of curbs, sidewalks, traveled lanes, shoulders, etc. and total width out to out.
2. Label Projected Line or Horizontal Control Line.
3. Location of Profile Line.
4. Roadway slope or superelevation.
5. Show bridge rail and indicate type.
6. Show type of girder.
7. Structure depth.
  - A. Prestressed girders and rolled beams; give depth of girder.
  - B. Cast-in-place T-beams and box beams; give depth from top of concrete deck to bottom of beam.
  - C. Welded plate girders; give depth of web.
  - D. Parabolic girders of all types, give maximum and minimum depth.
8. Show portion of typical pier above the finished ground line, when applicable. Do not show abutment.
9. For parallel structures, show a section for each structure.
10. Show Electrical Conduits
11. Show limits Structural Concrete Coating.

12. Show Fence Chain Link, with height.
13. Show Hot Bituminous Pavement and Waterproofing Membrane, or Concrete Sealer over Bridge Deck Finish.

## **ENGINEERING GEOLOGY**

Check Items:

1. Standard North Arrow.
2. Show the outline of the structure in both the Plan and Elevation views.
3. Show footings on the Elevation view, at their correct elevations.
4. Show piling and caissons, on the Elevation view, to their correct tip elevations.
5. Stations along Station Line.
6. Elevation reference on both left and right sides of the Elevation view.
7. Station Line terminology (Survey Line, Projected Line, etc.).

## **BRIDGE HYDRAULIC INFORMATION**

Check Items:

1. Net and excavated channel width and elevation.
2. Riprap limits, size, thickness, and upper and lower riprap elevations.
3. Design year and 500 year scour lines.
4. Pertinent water surface elevations.
5. Centerline of channel and direction of flow.

## **CONSTRUCTION LAYOUT**

Check items:

1. Standard North Arrow
2. Label horizontal control line and give bearing, if structure is on tangent.
3. For structures on a curve, label and give the bearing of the layout line and point of tangency, or the end points for a chord.
4. Show stationing
5. All centerlines
6. Curb offsets
7. All required angles
8. Bench mark
9. Electrical conduit
10. Drains
11. Title the plan "CONSTRUCTION LAYOUT". For more than one structure, title each plan as above, and add the structure number.
12. Label back face of abutments, centerline of bearings, centerline of piers.
13. Dimensions widths of curbs and sidewalks
14. Show CE project number in proper locations.
15. Typical notes
16. Complete title block

## **FOOTING AND PILING LAYOUT**

Check Items:

1. Show CE Project number in proper location.
2. Standard North Arrow.
3. Proper identification of "layout line" or "work line"
4. Bearing of "layout line".
5. Proper identification of "horizontal control line" or lines.
6. "Work lines" referenced to "layout line" by means of dimensions.
7. Stationing

8. "Bent lines", properly identified.
9. Dimensions along "layout line" for locating intersection points of "bent lines".
10. Indicate angles that are generated between the "layout" or "work" lines and the "bent lines".
11. Dimensions necessary for locating all footings, piling, and Caissons.
12. Indicate all spread footings, piling, or caissons.
13. Give piling size, type, maximum pile load, and estimated tip Elevations.
14. Indicate the size of the spread footings.
15. Identify centerlines of piling, caissons, and footings.
16. Title the plan in accordance with the particular condition.
17. Check for typical notes.

## **ABUTMENT DETAILS**

### Check Items:

1. Show CE Project number in proper location
2. Horizontal Control Line, in the PLAN view
3. Layout Line, in the PLAN view
4. Stationing
5. Location and identification of centerlines
6. Elevations
7. All necessary dimensions
8. Skew angle of bridge and other pertinent angles
9. Anchor Bolts or Leveling Pads
10. Show footings in the PLAN view as well as in the ELEVATION and SECTION.
11. Check all intersecting planes of reinforcing steel for the proper clearances.
12. Check expansion device to insure that it fits properly at the abutment
13. Check bearing plates, anchor bolts, and girders to insure that they fit properly at the abutment.
14. Title PLAN, ELEVATION, and SECTIONS in accordance with their particular conditions.
15. Label back face abutments in the PLAN and TYPICAL SECTION.
16. Label centerline of bearings.
17. Check for typical notes.

## **PIER DETAILS**

### Check Items:

1. Show CE Project number in proper location.
2. Label Horizontal Control Line in the PLAN view.
3. Layout Line, in the PLAN view.
4. Stationing.
5. Location and identification of centerlines.
6. Elevations.
7. All necessary dimensions.
8. Skew angle of bridge and other pertinent angles.
9. Anchor Bolts and note.
10. Show footings in the PLAN view as well as in the SECTION and ELEVATION.
11. Pier nose angle.
12. Check all intersecting planes of reinforcing steel for the proper clearances.
13. Check bearing plates to insure that they fit properly at the piers.
14. Bearing pads.
15. Title PLAN, ELEVATION, and SECTION in accordance with their particular conditions.

16. Check for typical notes.

## GIRDER FRAMING PLAN

### A. GIRDER ELEVATION

The GIRDER ELEVATION is an elevation of the girder showing the following, as applicable:

1. Flange plate sizes and lengths.
2. Web plate size and length
3. Shear connector locations.
4. Longitudinal stiffener size and location.
5. Welds
6. Tension and compression areas in the flanges. This will also serve to delineate the areas in which the transverse stiffeners are cut away from the flanges.
7. A tabulation showing dead load deflections for the girder only, slab only, and total shall be shown with the GIRDER ELEVATION if "Camber and Dead Load Deflection" sheets are not used.

### B. DIAPHRAGM DETAILS

DIAPHRAGM DETAILS show a plan and elevation view of the diaphragms and crossframes. Complete diaphragm details are not required. The following details show general design features:

1. Size and orientation of member (with acceptable alternates).
2. Thickness of gusset and attachment plates.
3. Size and required length of weld for each typical connection.
4. Correct number of bolts shown for each typical connection.
5. Number, size, and spacing of shear connectors.
6. Location with respect to Girder flange (intermediate diaphragm) or top of deck (end diaphragm).
7. Total depth (intermediate).

Notes to be included with the Diaphragm Details

1. "The intermediate diaphragm bolted connections shall be torqued before the concrete slab has been placed. Holes in gusset plates shall be slotted vertically 1" X 13/16".  
(for 3/4" Ø H. S. bolts) (1-1/8" X 15/16" for 7/8" Ø H.S. bolts)
2. Seal remaining contact surfaces between members and gusset plates with 3/16" fillet weld.

### C. TRANSVERSE STIFFENER DETAILS

The details showing the Transverse (Vertical) Stiffeners shall include an elevation of each different type keyed to the GIRDER ELEVATION.

The following items shall be shown:

- (a) Width and thickness.
- (b) Cutaway dimension from tension flange.
- (c) Clip (cut, snip, chip, etc.) at compression flange.
- (d) Size and location of welds
- (e) Show the longitudinal stiffener if it appears at a given stiffener type. Holes for diaphragm bolts need not be shown on the stiffener details.

### D. BEARING STIFFENER DETAILS

The details for the bearing stiffeners require much the same detail as the transverse stiffeners with the following exceptions:

- (a) The stiffeners are ground to bear or full penetration welded against the bottom flange and welded to the top flange at the

ends of the girder.

(b) Where the girder is continuous over a pier, the stiffener shall be ground to bear or full penetration welded against the bottom flange and tight fit to the top flange.

#### E. LATERAL BRACING DETAILS

The details for the lateral bracing shall include:

- (a) Member size and orientation with acceptable alternates.
- (b) Gusset plate thickness, orientation, and location.
- (c) Welds
- (d) Bolts
- (e) Call out for minimum practical dimension from stiffeners, splices, other lateral braces, etc.

#### F. SPLICE DETAILS

The splice details shall include:

- (a) All plate sizes, including filler plates.
- (b) Bolts spacing and size.

#### G. MISCELLANEOUS DETAILS

FABRICATION DETAIL shall be included for welded plate structures show limitations for various types of web and flange shop splices.

LONGITUDINAL STIFFENER DETAILS shall be included when the design requires longitudinal stiffeners. The details shall show:

1. Minimum dimension to vertical stiffeners, splices, etc. (usually 6").
2. Shape of end of stiffener
3. Bulk of vertical stiffeners on opposite side of web.

#### H. SHEAR CONNECTOR DETAILS

SHEAR CONNECTOR DETAILS show clearances, minimum, and number and size of stud actually used. A detail or note shall be used to show acceptable alternates.

#### I. FALSEWORK SUPPORT

FALSEWORK SUPPORT shows size and location of studs used for attachment of concrete forms to the girder.

#### J. FLANGE WIDTH TRANSITION

FLANGE WIDTH TRANSITION is shown when a flange splice is required between plates of varying width.

#### K. CAMBER AND DEAD LOAD DEFLECTION

This sheet uses the output of the CAMBER computer program to provide the dimensions the shop requires for cutting the girder web so that the structure will conform to the vertical alignment upon completion. The blocking dimensions are used by the shop to assemble the girders in the finished configuration so that the undersized field splice holes will be accurately reamed. For structures with no skew or horizontal curvature, only one girder need be input with a heading such as "Girders 1 thru 5". Other structures (skewed and/or curved) will require separate input for each girder, unless the skew and curvature (vertical and horizontal) are small. The translucent output (including the dead load deflection) is taped on to blank sheets and handled the same as Bridge Geometry sheets.

**SLAB**

The details for the slab are essentially the same as described elsewhere for other types of structures. Some points which may require additional attention:

- (a) Special reinforcement may be required, especially in areas where the slab is in tension.
- (b) The outside edges of the deck should be the same thickness as the deck, and the underside of the overhang tapered to the bottom of the top girder flange.
- (c) Bottom longitudinal reinforcing in the overhang shall match the curb stirrups as shown on the curb details.
- (d) Haunches between the slab and girder shall be the width of the top flange for composite designs, and extended four inches on each side of the flange for noncomposite designs. The dept of the haunch shall be from the bottom of the slab to the bottom of the top flange and noted on the plans "Haunch varies "\_\_\_\_" at Centerline Bearing and Centerline Girder."
- (e) If expansion devices are required, they will be referred to the Standards CDOT drawings.
- (f) An end block detail at the end of the slab will be required for expansion joints. The configuration shall agree with the expansion device details and the detail notes. Special attention should be given to the placement of the reinforcing near the expansion device.
- (g) For structures on skew where the end diaphragms are not parallel to the end of the slab, the bottom of the end block shall be made a uniform width sufficient to extend over the flange of the end diaphragm.

### **BEARING DETAILS**

Bearings will usually be shown on standard CDOT sheets. All blanks on the sheet shall be filled in and unnecessary portions removed. A special detail may be required for unusual requirements, hinges in girders, etc. Clearances between bearing plates and parapets, and girder flanges and parapets, shall be carefully checked. Required cuts on the corners shall be shown in the details. If the cuts are very large, redesign may be necessary.

### **RAILING DETAILS**

Railing will usually be shown on standard CDOT sheets. Special details may be required for architectural considerations, unusual requirements, etc.

.