

Chapter 22

Miscellaneous Structures Plans

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Chapter 22

Miscellaneous Structures Plans

22.1 General

Miscellaneous structures not included in the bridge plans shall be included in the appropriate component plans. This includes box or three-sided culvert details, high mast lighting supports, traffic mast arm supports, signal strain poles, overhead sign supports, rest area structures or buildings, barrier walls (traffic or sound), retaining walls and toll facilities.

For guidelines on structural detailing, refer to the *Structures Detailing Manual* (Topic No. **625-020-200**).

22.2 Approach Slabs

As of the July, 1999 letting, approach slab details sheets are included in the structures plans. However, some roadway elements may need to be carried onto the approach slab, and in these cases special attention must be given to clarifying in the plans which elements are to be included as part of the roadway.

The stabilization required under the approach slabs shall be paid for using the standard roadway pay item and the quantity included in the roadway plans. In addition, roadway elements such as guardrail, earthwork, sidewalks, approach slab surfacing, etc., which are part of the roadway approaches to the bridge and which interface with the approach slabs areas, will also be included and paid for in the roadway quantities.

22.3 Retaining Walls (Cast in Place, Proprietary, Temporary)

When cast in place retaining walls other than standard gravity walls are required, complete design and construction details, including pay items and quantities are required in the contract plans. The same is true for steel or concrete sheet piles for either permanent or temporary retaining walls.

Proprietary walls are handled differently than cast in place, steel and concrete sheet pile retaining walls. A set of control plan details must be developed for retaining walls. (See **Chapter 30, Volume I** for a discussion concerning the requirements for control plan details).

On projects with bridges the control plan details shall be included in the bridge plans. When there are no bridge plans the control plan details shall be included in the appropriate component plans. Examples of control plan details are included as exhibits at the back of this chapter.

Standard drawings from the preapproved wall companies are included in the **Design Standards** (available as Interim Index Drawings).

22.4 Concrete Box Culverts

Complete design and construction details, including pay items and quantities are required in the contract plans for concrete box culverts. Include the following minimum design details:

1. Plan view (usually shown on the Plan-Profile sheet – see **Chapter 10, Exhibit PP-2**) showing: Grid north arrow; scale bar; existing highway boundaries including existing ROW monuments; new right of way line(s) including proposed ROW monuments; culvert or bridge identification number; culvert and highway alignment; survey baseline; profile grade line; direction of stationing; stream channel alignment; stream flow direction; skew angle of the culvert relative to the centerline of roadway; stationing along the profile grade line including begin and end station of culvert (outside face of sidewalls); length of culvert; subsurface exploration locations (e.g., boring locations); culvert end treatment (headwall and wing wall orientation); scour protection; slope protection; limit of stream work; utilities; traffic railing and pedestrian/bicycle railing type.
2. Elevation view (usually shown on the Plan-Profile sheet – see **Chapter 10, Exhibit PP-2**) showing: Elevation vertical scale; profile grade line and vertical data; existing stream bottom and ground line (along PGL); utilities.
3. A longitudinal section along the culvert centerline (usually shown on the Drainage Structures sheet – see **Chapter 14, Exhibit DS-2**) showing: Culvert or bridge identification number; invert elevations; existing stream bottom or original ground; culvert stationing at centerline; typical highway section (including rail treatment); design earth cover height (measured from the top of the top slab to the top of pavement); limits of scour protection (including any keyways or geotextile fabric lining); channel work; culvert end treatments; utility (either attached to the fascia, or in the embankment, traffic railing or sidewalk); wing walls; headwalls; cutoff walls; reference to the appropriate Design Standard Indexes.
4. Data Sheets (see **Chapter 7.3**):
 - a) For LRFD Designs: Box Culvert Data Table and Reinforcing Bar List.
 - b) For LFD Designs: Box Culvert Data Sheet.
5. Miscellaneous details showing (usually shown on Box Culvert Detail sheets, located after the Drainage Structure sheets): Construction phasing information (affects lengths of precast segments and potential need for skewed segments) including appropriate excavation support and protection systems (e.g., critical temporary walls); traffic railing details including connection details; slope and/or stream bank protection; channel section detail; culvert-end safety grate, guardrail or fencing details when applicable; removal of existing culvert(s); cofferdams or water diversion.

6. Notes (usually on the Box Culvert Data Sheets) indicating: Live loading requirements (HL-93 or HS-25); hydraulic data (show 100-year design flow or the design flow used and the minimum hydraulic area perpendicular to flow below the Design High Water); environmental classification for durability; minimum concrete class and reinforcing steel grade; assumed soil weight, angle of internal friction and nominal bearing capacity; differential soil settlement height and effective length (when significant); precast culvert limitations; any special joint waterproofing requirements; erosion and sediment control and stormwater pollution prevention plan requirements; restrictions for work in streams; estimated quantities.

22.5 Three-Sided Concrete Culverts

Complete footing, wingwall and channel lining designs and construction details are required for three-sided culverts. However only conceptual culvert barrel and headwall design details need to be provided. Include the following minimum design details in the roadway plans and place directly after the Drainage Structure sheets:

1. Plan view showing the orientation of the ends of the structure. The two most typical options for culverts on a skew are ends parallel to the centerline of the roadway (skewed ends) or ends perpendicular to the centerline of the structure (square ends). The end treatment depends upon the skew, whether it is in a fill section or at grade, the location within the right of way, conflicts with utilities, phased construction details, the alignment of the feature crossed, and other site limitations.
2. Elevation view showing the configuration of the most appropriate type unit (e.g., frame or arch). Any limitations on using a larger span must be shown. (Some manufacturers only fabricate units at fixed increments of span length, therefore showing the limitations will allow the manufacturers to bid using special units or the next larger span length of their standard units). Show other acceptable structure types in separate partial elevation views. Limiting spans and heights must be shown for all alternatives.
3. No precast manufacturer should be eliminated from consideration for a given project. However, specific project requirements that may exclude some manufacturers must be identified (such as fabrication on a skew or a desired arched appearance).
4. Complete details for a cast-in-place footing design, including design loads and assumptions for the spread footings.
5. Complete details for cast-in-place wingwalls, including geometry and reinforcement details.
6. Estimated quantities for concrete and reinforcing steel for cast-in-place elements, but do not include separate pay items.
7. Payment limits shall be identified as the length of the total structure along a longitudinal centerline of the structure.
8. The applicable details in **Section 22.4** shall also be included.
9. See **Exhibit 22-1** for a list of applicable notes that may be required.

Exhibit 22-1 Three-sided Concrete Culvert Notes

The following notes shall be included adjacent to the plan or elevation views, as applicable:

1. The assumed foundation vertical reaction is ____ kips/ft. The assumed foundation horizontal reaction is ____ kips/ft. The Contractor must submit a revised foundation design to the Engineer if the actual loads of the supplied structure exceed these assumed values. Any revised foundation design must be included in the shop drawings and submitted for approval at the same time as the design calculations for the three-sided structure.
2. (In cases where squaring of the unit ends would create a geometric conflict with right of way, utilities, phase construction or site geometry, include the following note):
Due to site restrictions, only skewed end units are acceptable.
3. (If site constraints do not eliminate the squaring of the ends, include the following note):
Squared end units may be substituted for skewed end units with no change in the payment limits and no additional cost to the Department.
4. (When traffic railings are attached to skewed headwalls and site constraints do not eliminate the squaring of the ends, include the following note):
If the Contractor proposes to substitute square ends, details of the traffic railing attachment must be provided in the shop drawings and approved by the Engineer.

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