

324 Miscellaneous Structures Plans

324.1 General

Miscellaneous structures not included in the bridge plans must be included in the appropriate component plans. This includes 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](#).

324.2 Approach Slabs

Custom approach slab sheets for non-standard designs and supplemental approach slab detail sheets called for by [Standard Plans, Indexes 400-090](#) and [400-091](#) are included in the structures plans. However, some roadway elements may need to be carried onto the approach slab. In these cases, clarify in the plans which elements are to be included as part of the roadway.

Elements that are part of the roadway approaches to the bridge and interface with the approach slabs areas (e.g., stabilization, guardrail, earthwork, sidewalks, approach slab surfacing) are to be included and paid for in the roadway quantities.

Modification for Non-Conventional Projects:
Delete the last paragraph.

324.3 Retaining Walls

Non-proprietary retaining walls require complete design and construction details, pay items, and quantities to be included in the contract plans.

Modification for Non-Conventional Projects:
Delete the sentence above and replace with:
Non-proprietary retaining walls require complete design and construction details in the contract plans.

Proprietary walls require a set of control plan details to be included in the contract plans.

See **FDM 262** for retaining wall plans submittal procedures. See also the [Structures Manual](#) for plan content requirements.

On projects with bridges, include the control plan details in the bridge plans. When there are no bridge plans, include the control plan details in the appropriate component plans. Examples of control plan details are included in the [Structures Detailing Manual](#).

Vendor Drawings for proprietary wall systems listed on the [APL](#) are provided on the Program Management Office website.

324.4 Concrete Box Culverts

Certain sheets are to be placed in a structure component, even when there are no bridge plans.

Concrete box culverts require complete design and construction details, pay items, and quantities to be included in the contract plans. Include the following minimum design details:

Modification for Non-Conventional Projects:

Delete the above paragraph and replace with the following:

Concrete box culverts require complete design and construction details to be included in the contract plans. Include the following minimum design details:

- (1) Plan view (usually shown on the Plan-Profile sheet in the Roadway Component – see **FDM 312, Exhibit 312-1**) showing: Grid north arrow; scale bar; existing highway boundaries including existing R/W monuments; new R/W line(s) including proposed R/W 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 (e.g., 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 in the Roadway Component – see **FDM 312, Exhibit 312-1**) 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 in the Roadway Component – see **FDM 315, Exhibit 315-2**) 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 [Standard Plans](#).
 - (4) Data Sheets (see **FDM 307.3**): Box Culvert Data Table and Reinforcing Bar List are to be placed in a Structures Component.
 - (5) Miscellaneous details showing (usually shown on Box Culvert Detail sheets which are to be placed in a Structures Component): 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.
 - (7) A Plan and Elevation sheet and a Load Rating Summary sheet are required for box culverts classified as bridge culverts (per **FDM 265.1**). These sheets are to be placed in a Structures Component.

324.5 Three-Sided Concrete Culverts

These sheets are to be placed in a structure component, even when there are no bridge plans.

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 plans:

- (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 R/W, 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. Show any limitations on using a larger span (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. Show limiting spans and heights 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) Identify payment limits as the length of the total structure along a longitudinal centerline of the structure.
- (8) Include the applicable details in **FDM 324.4**.
- (9) Place the following notes adjacent to the plan or elevation views, as applicable:
 - (a) 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 working drawings and submitted for approval at the same time as the design calculations for the three-sided structure.

- (b) 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:
- (c) Due to site restrictions, only skewed end units are acceptable.
- (d) If site constraints do not eliminate the squaring of the ends, include the following note:
- (e) Squared end units may be substituted for skewed end units with no change in the payment limits and no additional cost to the Department.
- (f) 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 working drawings and approved by the Engineer.

Modification for Non-Conventional Projects:
Delete Item (6) above.