922 Miscellaneous Structures

922.1 General

Miscellaneous Structures sheets provide details and data when the information is not provided in the ***Standard Plans*** or ***Standard Specifications***.

These sheets are typically placed in the associated component plans set. Miscellaneous structures include:

- Supports for high mast lighting, traffic mast arms, and overhead signs
- Signal strain poles
- Rest area structures or buildings
- Barrier walls (traffic or sound)
- Retaining or gravity walls
- Bridge approach slabs
- Toll facilities

For guidelines on structural detailing, refer to the ***Structures Detailing Manual***.

922.2 Retaining Walls

Non-proprietary retaining walls require design and construction details in the Structure Plans component.

Proprietary retaining walls require a set of control plan details to be included in the Structure Plans component for projects with bridges. Place the control plan details in the appropriate component plans when there are no bridge plans. Examples of control plan details are included in the ***Structures Detailing Manual***.

See ***FDM 262*** for retaining wall plans submittal procedures. See the ***Structures Manual*** for plan content requirements.

Vendor Drawings for proprietary wall systems listed on the ***APL*** are provided on the Forecasting and Performance Office website.

922.3 Approach Slabs

Approach slab sheets provide details and information that are not addressed in ***Standard Plans, Indexes 400-090*** and ***400-091***.

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.

922.4 Concrete Box Culverts

Place these sheets in a Structure Plans component, even when there are no bridge plans. In accordance with the ***BOE Manual***, load pay items and quantities in the structures category.

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

(1) Plan and Elevation Sheets:

(a) Plan view 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 the begin and end stations of the culvert (outside face of sidewalls); length of the culvert; subsurface exploration locations (e.g., boring locations); culvert end treatments (e.g., headwall and wing wall orientation); scour protection; slope protection; limits of stream work; utilities; traffic railing and pedestrian/bicycle railing type.

(b) Elevation view showing: Elevation vertical scale; profile grade line and vertical data; existing stream bottom and ground line (along PGL); utilities.

(2) A longitudinal section along the culvert centerline showing: Culvert or bridge identification number; invert elevations; existing stream bottom or original ground; culvert stationing at centerline; typical highway section (including rail treatments); 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; utilities (either attached to the fascia, or in the embankment, traffic railing or sidewalk); wing walls; headwalls; cutoff walls; references to the appropriate ***Standard Plans***.

(3) Data Sheets: Box Culvert Data Table and Reinforcing Bar List.

(4) Miscellaneous details showing: 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 grates, guardrail or fencing details when applicable; removal of existing culvert(s); cofferdams or water diversion.

(5) Notes 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; restrictions for work in streams; estimated quantities.

(6) A Load Rating Summary sheet is required for box culverts classified as bridge culverts (per ***FDM 265.1***).

922.5 Three-Sided Concrete Culverts

These sheets are to be placed in a Structure Plans 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 and Elevation Sheets

(a) 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.

(b) Elevation view showing the configuration of the most appropriate type of 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.

(2) 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).

(3) Complete details for a cast-in-place footing design, including design loads and assumptions for the spread footings.

(4) Complete details for cast-in-place wingwalls, including geometry and reinforcement details.

(5) Include the applicable details in ***FDM 922.4***.

(6) 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 shop 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 shop drawings and approved by the Engineer.