Hydraulic Structure Selection Flowchart

Use this chart after completing an initial hydraulic analysis when you are considering using multiple box culverts versus bridge-type structures. Use for Trunk Highway structures; local agencies may use additional criteria as appropriate.

START

Is large woody debris a concern?

Y

Use a single-span structure.

N

Complete a scour analysis and confer with Foundations and Design.

END

Is sedimentation a concern (silt in multiple barrels?)

Y

Are there environmental concerns?

- Fish passage
  - Aquatic organism passage
  - Trout stream

N

Are there soils or foundation concerns?

Y

Are skew > 15°?

N

Maintenance of water: Is it possible to install multiple lines of culverts and properly maintain water flow?

Y

Can this be remedied by setting main channel culvert lower and side culverts at floodplain elevation?

Can any of these concerns be mitigated?

- Span bankfull with single culvert (max standard size is 16' x 12')
  - Set side culverts at floodplain elevation
  - Recess culvert(s)
  - Provide “natural bottom” bedding
  - Include baffles or “buffalo chips” to provide resting spots
  - Provide a low-flow channel

N

Is it feasible/cost-effective to deal with the soils as a culvert-type structure (geotextile, reinforcement, etc.)? Confer with Foundations.

Y

Is it possible to install with greater than 15° skew, limited to 30°? Check site constraints (row, etc.).

N

Use bridge structure.

END

Y

Use bridge or 3-sided structure*.

Complete documentation to go above those limits (3 lines and/or 48' span):
1. Cost analysis. May include life cycle costs.
2. More robust hydraulic analysis.

Does documentation justify multiple culvert design?

Y

Complete a scour analysis and confer with Foundations and Design.

END

N

Proceed with multiple culvert design.

Y

Is the required structure greater than 3 lines and 48' total span?

Y

Are there any other site considerations that would preclude the use of multiple lines of culverts?

- Navigation
  - Other unique features (i.e., recreation, dams, grade control)
  - Other resource agency plans along the stream or within the watershed

N

Are there soils or foundation concerns?

Y

Is skew > 15°?

N

Maintenance of water: Is it possible to install multiple lines of culverts and properly maintain water flow?

N

Complete documentation to go above those limits (3 lines and/or 48' span):
1. Cost analysis. May include life cycle costs.
2. More robust hydraulic analysis.

Does documentation justify multiple culvert design?

END

Y

End

*Follow 3-sided tech memo: 16-02-B-01