Washington State Department of Transportation

Bridge Scour Evaluation

Date	Agency	
Bridge Number	Bridge Name	
Evaluated By		
Superstructure Type	Superstructure Continuity? ☐ Yes ☐ No	Any Spread Footings? ☐ Yes ☐ No

Evaluation

☐ Yes ☐ No **Evaluation**: Are foundation elevations known? If not, consider the bridge scour critical (using engineering judgment and any other information available).

☐ Yes ☐ No **Evaluation**: Does the thalweg (the deepest portion of the stream; the main channel) meander back and forth across the floodplain? If so, the potential for a scour critical condition is increased.

☐ Yes ☐ No **Evaluation**: For a spread footing, is the bottom of the seal (or footing, if the seal is not used) above the thalweg? If so, the bridge is scour critical; no need to proceed further.

☐ Yes ☐ No **Evaluation**: For a pile supported footing, is the pile tip elevation 10 feet or less below the thalweg? If so the bridge is scour critical; no need to proceed further.

Bridge Is Scour Critical ☐ **Yes** ☐ **No**

Evaluation Criteria

- Foundation elevations are (or are not) known and available.
- The thalweg meanders back and forth across the floodplain.
- Pier scour is always measured from the thalweg, even if the pier is in the overbank.
- For a spread footing, if the calculated depth of scour is below the footing, the bridge is scour critical.
- For a pile supported footing, if calculated depth of scour is 10' or less above pile tip elevation, the bridge is scour critical.
- Scour should be calculated for 100 year flood. If not shown on bridge plan layout, check FEMA map. If not mapped by FEMA, use high water shown on layout or the USGS Regression equations found in the WSDOT Hydraulics Manual (M23-03).

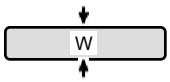
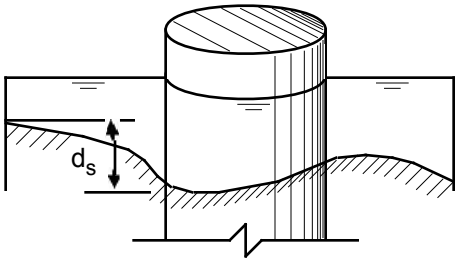
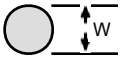
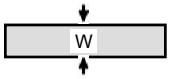
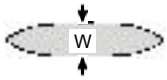
Evaluate Interior Piers for Scour

(*For bridges with no interior piers, proceed to Page 4*)

If the column only protrudes above the thalweg, use the following method to calculate pier scour, d_s.

Local Scour Allowances for Piers Aligned Parallel to Flow

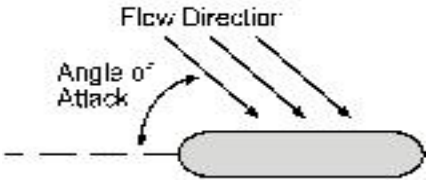
Note: If the depth of flow exceeds 5w, d_s aligned = 3w

Pier Shape in Plan	Pier Shape in Profile	Suggested Allowance for Local Scour*
		$d_s$aligned = 2w
		$d_s$aligned = 2w
		$d_s$aligned = 2w
		$d_s$aligned = 2w

K_2 - Alignment Factors

(Interpolate Between Values)

Angle of Attack	Length-To-Width Ratio of Pier in Plan		
	4	**8**	**12**
0°	1.0	1.0	1.0
15°	1.5	2.0	2.5
30°	2.0	2.5	3.5
45°	2.5	3.5	4.5



w = _____ $d_s = d_s$aligned x K_2

$d_s$aligned = _____

K_2 = _____ **d_s =** _____ **x** _____ **=** _____

Does pedestal, if used, and/or footing protrude above the thalweg?
If yes, continue with **Step A**; if no, skip to **Step B**.

Step A Use the larger of d_s as determined for the column only as calculated above, or from the following equation:

$d_s = 1.5K_sK_2(w)^{0.7}(y)^{0.3}$ where: d_s= depth of scour.

K_s = Shape factor, as indicated below. Use only if the pier is aligned with the flow; otherwise, use 1.0.

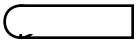
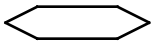
K_2 = Alignment factor, see page 2.

w = Width of the pedestal if only the pedestal protrudes above the thalweg, or;

Width of footing if the footing or footing and pedestal protrude above the thalweg.

y = Height that the pedestal, footing or footing and pedestal protrude above the thalweg.

K_S - Shape Factors

Nose Form	Length : Width	Shape	K_S
Rectangular or Square			1.00
Semicircular			0.90
Elliptic	2:1		0.80
	3:1		0.75
Lenticular	2:1		0.80
	3:1		0.70
Round			0.90
Cylinder / Group of Cylinders (i.e. piles, columns)			0.90
Sharp			0.80

K_s = _____, K_2 = _____, w = _____ , y = _____

d_s = 1.5 (_____) (_____) (_____)$^{0.7}$ (_____)$^{0.3}$ = _____

Step B

Thalweg Elevation _____

Bottom of foundation (footing or seal elevation, or pile tip for pile columns)_____

Scour elevation = Thalweg Elevation - d_s = _____ - _____ = _____

If Scour Elevation is lower than the bottom of the foundation elevation or within 10 feet of the pile tip, the bridge is Scour Critical.

Bridge Is Scour Critical ☐ **Yes** ☐ **No**

Evaluate End Abutments for Scour

- Adequate and practical formulae for determining anticipated local scour due to an end abutment do not exist; each bridge must be evaluated individually.
- Existing riprap should be evaluated by the bridge inspector.
- If there is no riprap in place, **or** if existing riprap appears to be in place, and **can be bypassed** by migration of the stream at the upstream end of the riprap, treat the end abutment like an interior pier.
- If existing riprap appears to be in place, and **cannot be bypassed** by migration of the stream at the upstream end of the riprap, the bridge **is not** scour critical.

Bridge Is Scour Critical ☐ **Yes** ☐ **No**