

**OFFICE OF STRUCTURES
STRUCTURE HYDROLOGY AND HYDRAULICS DIVISION**

CHAPTER 11 APPENDIX H

**Check List for Conducting Scour Evaluations
and Scour Assessments for County Bridge and
Bottomless Arch Culvert Projects**



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OFFICE OF STRUCTURES
MANUAL FOR HYDROLOGIC AND HYDRAULIC DESIGN

Chapter 11 Appendix H
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for County Bridge and Bottomless Arch Culvert Projects

The Office of Structures Manual for Hydrologic and Hydraulic Design contains detailed instructions and guidance for the conduct of scour evaluations and scour assessments. The scour evaluation requires a comprehensive report including hydrologic, stream morphology, hydraulic and bridge scour studies. The scour assessment study, on the other hand, is a simplified method for use on structures where there is a low risk of damage from scour. Its purpose is to demonstrate that the structure can be classified as a low risk structure.

There is a considerable amount of information set forth in the manual that needs to be obtained and applied in conducting scour evaluations and scour assessments. This check list has been developed for county engineers and their consultants for the purpose of presenting the scour evaluation process as a step by step procedure.

Please note that project development study results may not always be available in the order listed below.

Step 1- Preliminary Actions

- a. Organize an interdisciplinary scour team
- b. Determine the appropriate method for conduct of the scour study:
 - Scour assessment study – See H&H Manual, Chapter 11, Appendix F. If this method is appropriate, follow the guidance in Appendix F
 - Do not continue with this checklist.
 - Scour evaluation study: If a scour assessment study is not appropriate, continue with the scour evaluation study by going to step 2 below

Step 2 – Hydrology Study

Obtain information on the design flood for scour and the check flood for scour

References: Chapter 11 and Chapter 8

Step 3 – Highway Project Studies

Determine the design details regarding the following:

- Bridge foundation and superstructure geometry
- Types of foundation – spread footing, pile cap, etc,
- Borings and subsurface investigations regarding the characteristics of the stream channel and flood plain
- Approach road geometry and profile

Step 4 – Hydraulics Study

Use HEC-RAS to compute the water surface profile upstream of, through and downstream of the bridge for the design flood for scour and the check flood for scour. Important aspects of this study include:

- Downstream initial water surface elevations
- Accurate cross-sections and “n” values for the channel and flood plain
- Flow distribution between channel and flood plain, and between overtopping flows and bridge flows when appropriate.
- Flow velocities and depths at the approach section and at the bridge section.

Step 5 – Stream Morphology Study

There are three major items that need to be addressed with regard to the stream morphology study (See Chapter 11, Appendix G):

- Type of scour – live bed or clear water – if this cannot be determined, use ABSCOUR 10 to check for both conditions and use the one with the deepest scour
- Degradation – use the SHA research studies to estimate the degradation at the location of the bridge (See Chapter 11, Appendix G. and Chapter 14, Stream morphology Studies)

- Channel movement – If there is a potential for movement of the channel:
 - Analyze the pier for scour as if the pier were located at the channel thalweg.
 - Use the special procedure in ABSCOUR 10 to analyze the abutment for the condition that the stream thalweg moves into the abutment.
 - See Chapter 11 Appendix G

Step 6 – Scour Evaluation Study (ABSCOUR 10)

Use the information obtained in Steps 2 through 5 to fill out the data cards listed in the ABSCOUR 10 program. Consider the following guidance

- Import the HEC-RAS cross-sections to verify the accuracy of the selected ABSCOUR sections. Adjust ABSCOUR cross-sections to best fit the HEC-RAS sections at the approach section and the bridge.
- Verify that the hydraulic characteristic of the ABSCOUR sections are reasonable as compared with the HEC-RAS sections.
- Do not use override functions in the project information card for initial scour computations. These functions are available if evaluation of the scour computation results indicates the need for adjustment of the ABSCOUR computations.
- Print out the ABSCOUR 10 reports and note scour depths for abutments and piers. Include long-term degradation as appropriate. Print out the scour cross-section at the bridge.

Step 7 – Review

Review the scour computations and determine if they are reasonable. Use sensitivity analysis to check the relative importance of various factors affecting the degree of scour. This step will be important if certain information, such as soils data, may not be precise.