Observational Method for Estimating Future Scour Depth at Existing Bridges

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ABSTRACT

Bridge scour can cause damage to bridge foundations and abutments. Bridges with foundations that are unstable for calculated and/or observed scour conditions are termed scour critical bridges. There are approximately 17,000 scour critical bridges in the United States. This designation comes in part from the use of over-conservative methods that predict excessive scour depths in erosion resistant materials. Other methods capable of overcoming this over-conservatism are uneconomical because they require site-specific erosion testing. This paper proposes a new bridge scour assessment method. The new method, termed Bridge Scour Assessment 1 (BSA 1) is the first part of a three level bridge scour assessment procedure that was developed for the Texas Department of Transportation. It does not require site-specific erosion testing and eliminates the over-conservatism in current methods. BSA 1 uses charts that extrapolate or interpolate measured scour depths at the bridge to obtain the scour depth corresponding to a specified future flood event. The scour vulnerability depends on the comparison between the predicted and allowable scour depths. This paper also includes a new hydraulic-hydrologic analysis procedure for the determination of flow parameters required in the scour analysis. This procedure was developed for the State of Texas, and is economical and reasonably reliable from a hydrologic standpoint. This procedure is versatile as it can be applied to any region with sufficient flow gages. The 11 case histories used to validate BSA 1 showed good agreement between predicted and measured values. BSA 1 was then applied to 16 bridges where 6 out of 10 bridges classified as scour critical by current methods were found to be stable. These indicate that the method allows for more realistic evaluation of bridges for scour

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