NCHRP 20-68A
“US Domestic Scan Program”

Domestic Scan 15-02
Bridge Scour Risk Management

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“Bridge Scour Risk Management”

- This scan was conducted as a part of NCHRP Project 20-68A, the U.S. Domestic Scan program

- The program was requested by the American Association of State Highway and Transportation Officials (AASHTO), with funding provided through the National Cooperative Highway Research Program (NCHRP)
The Program is a multi-year project conducting 3-4 scans per year.

Each scan is selected by AASHTO and the NCHRP 20-68A Project Panel.

Each scan addresses a single technical topic of broad interest to many state departments of transportation and other agencies.

The purpose of each scan and of Project 20-68A as a whole is to accelerate beneficial innovation by:

- facilitating information sharing and technology exchange among the states and other transportation agencies;
- identifying actionable items of common interest.
“The scan team will focus on practices for inspection, monitoring, countermeasure selection and placement, and risk management for scour-critical and scour-susceptible bridges individually and in networks of varying sizes.”
"By documenting and sharing successful practices the scan team will produce a valuable resource for use by bridge owners, state and local bridge inspectors, bridge designers and bridge management staff in reducing the risk to the travelling public due to flooding and scour."
Team’s Approach

Desk Scan, Literature Search, Identify Agencies and prepare questions.

Is the evaluation team multidisciplined?

Yes  No

Combine Responses

Host Workshop
Risk Analysis

Risk Analysis to prioritize U.S.

Neural Networks for Probability of Failure

Vulnerability Analysis /Tables

NY's culvert approach

When a storm is big enough, not only SC Bridges are at risk
States need to form scour committees with interdisciplinary capabilities (i.e., Engineers from Geotechnical, Structural, and Hydraulics areas)
Due to limited resources, States should consider using Risk Analysis to prioritize how to best apply their limited resources rather than using vulnerability analysis to identify scour critical bridges.
Topic 1: General Procedures and Risk Analysis

Risk Rating = Likelihood x Severity

- Catastrophic: 5
- Significant: 4
- Moderate: 3
- Low: 2
- Negligible: 1

Likelihood:
1. Improbable
2. Remote
3. Occasional
4. Probable
5. Frequent

Severity:
1. Catastrophic
2. Unacceptable
3. Undesirable
4. Acceptable
5. Desirable

Actions:
- STOP
- URGE NT ACTION
- ACTION
- MONITOR
- NO ACTION

http://2.bp.blogspot.com/-eAu3qdV-MRY/Tas3zsQqbsI/AAAAAAAAAhc/tXtb6j421to/s1600/risk%2Bmatrix.png
Topic 1: General Procedures and Risk Analysis

- Scour is a nation-wide threat. AASHTO should create a multidisciplinary task force that would develop guidelines and specifications for scour mitigation design and to serve as a clearing house for new innovations.
Materials testing for cohesive soils or rocks can be performed for more accurate results.
States are recommended to use 2D/3D models that are shown to be very useful in advanced cases. There is a need to identify the conditions or parameters when the 2D models can be applied.
Encourage States and other agencies, involved with 2D modeling, to participate in NHI courses and other training workshops.
Topic 3: Monitoring and Field Inspection of Scour Critical Bridges

- States should establish collaborative partnerships with USGS and other agencies to facilitate sustainable data collection for scour predictions.
Topic 3: Monitoring and Field Inspection of Scour Critical Bridges

- AASHTO and FHWA should establish partnerships with USGS and other agencies for innovative applications to advance the State-of-Art of flooding on highway infrastructure.
Topic 3: Monitoring and Field Inspection of Scour Critical Bridges

- States should work proactively with FHWA for use and acceptance of advanced technologies for under water inspection (e.g., sonar) to improve data collection and divers’ safety.
Continued and future research is needed to enhance the capabilities of various systems to measure real-time scour. Moreover, communication and dissemination of various research projects is needed to raise awareness of accomplishments.
Topic 4: Design, Construction, and Sustainability of Countermeasures

- States should have procedures for inspecting countermeasures during construction and routine inspections.

<table>
<thead>
<tr>
<th>CS TABLE 10 – SCOUR PROTECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Defects</td>
</tr>
<tr>
<td>Scour or Erosion</td>
</tr>
<tr>
<td>Material Defect (scaling, abrasion, spalling, corrosion, cracking, spitting and decay)</td>
</tr>
<tr>
<td>Damage (unraveling, displacement, separation, and sagging)</td>
</tr>
</tbody>
</table>

The channel protection device or scour countermeasure are unstable, missing or no longer effective.
AASHTO should establish a body to help disseminate the information related to the performance of various types of countermeasures.
It is recommended that States consider additional information (e.g., cross section, whether the bridges on the detour route are scour critical, etc.) to enhance their POA which could be useful to the stakeholders.
Topic 5: Plan of Action (POA)

- States are recommended to develop emergency protocols for widespread flood events.
Topic 5: Plan of Action (POA)

- States should create risk-based prioritization for implementing POA during flood events, which could be based on specific triggers for specific bridges.
Final Report and other material will be made available on the web at

www.domesticscan.org

2017