



## § 650.305 Definitions.

- *Scour critical bridge.* A bridge with a foundation element that has been determined to be unstable for the observed or evaluated scour condition.



M-57 over Northwood Creek.  
Cause – Road improvements increased pressure flow.

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## Scour caused by flooding

- September 1986 – Flood Disaster in 30 counties
- Several major rivers exceeded 200 year flow rates
- 3600 miles of road way were impassable



M-63 over Ontonagon River near Ewen

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## Issues Related to Scour

- Dam Failures or Removals



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## Issues Related to Scour

- Dam Failures or Removals



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## Issues Related to Scour

- River Meandering



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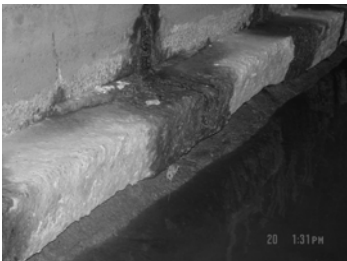
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## Issues Related to Scour

Adjustment of County Drains



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## Related to Scour

- Changed Approach Conditions



M-35 Portage Creek Bridge  
Cause – Beaver Dam & Flood  
Conditions.



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## Plan of Action for Scour Critical Bridges

- **§ 650.313. Inspection Procedures**
  - (e.3) Bridges that are scour critical. Prepare a plan of action to monitor known and potential deficiencies and to address critical findings. Monitor bridges that are scour critical in accordance with the plan.

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## Item 113 - Scour Critical Bridges

- U - Bridge with "unknown" foundation that has not been evaluated for scour. Since risk cannot be determined, flag for monitoring during flood events and, if appropriate, closure.
- 3 - Bridge is scour critical; bridge foundations determined to be unstable for calculated scour conditions

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**Item 113 - Scour Critical Bridges**

- 6 - Scour calculation/evaluation has not been made. (Use only to describe case where bridge has not yet been evaluated for scour potential.)
- 7 - Countermeasures have been installed to correct a previously existing problem with scour. Bridge is no longer scour critical.

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**Development of Plan of Action for Scour Critical Bridges**

- Interdisciplinary team
  - hydraulic
  - geotechnical
  - structural engineers.

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**Development of Plan of Action for Scour Critical Bridges**

- Prioritizing Need / Risk Management
  - Importance of the roadway
    - Route type, ADT, Detour length, access for a hospital or fire station ...
  - Piers (deemed greater risk than abutments.)
  - Network management

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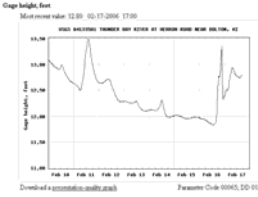
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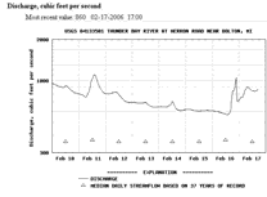
# USGS – Real Time Monitoring

Website: <http://waterdata.usgs.gov/mi/nwis/rt>

## Gage



## Discharge



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# Development of Plan of Action for Scour Critical Bridges

- Bridge monitoring during flood events
  - Safety measures (Inspector)
  - Critical water surface elevation (stage data)
  - Flow Rate (Discharge)
  - Identifying bridge distress or displacement



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# Development of Plan of Action for Scour Critical Bridges

- Closure Procedures
  - When to Close
  - Who has Authority
  - Notification
    - Internally
    - Local Officials
    - Media
  - Documentation of Closure
  - Detour



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## Development of Plan of Action for Scour Critical Bridges

### ■ Action: Reopening Procedures

- When to Reopen
- Who has Authority
- Notification
  - Internally
  - Local Officials
  - Media
- Documentation of Reopening




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## Guidance Document

### MICHIGAN DEPARTMENT OF TRANSPORTATION GUIDANCE DOCUMENT FOR MANAGEMENT OF SCOUR CRITICAL BRIDGES

|  |   |
|--|---|
| 1. DESCRIPTION OF A SCOUR CRITICAL BRIDGE ACTION PLAN..... | 2 |
| 2. MONITORING A BRIDGE WITH AN ACTION PLAN.....            | 3 |
| 3. EMERGENCY PROCEDURES.....                               | 6 |
| 4. MONITORING SCHEDULE AND RESPONSIBILITIES.....           | 8 |
| 5. SCOUR MEASURING EQUIPMENT.....                          | 9 |

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## MDOT Scour Critical Bridge Plan of Action Form

- Scour Vulnerability Rating
- NBIS Coding Information
- Countermeasure recommendations
- Countermeasure implementation schedule
- Monitoring plan
- Bridge Closure Plans
- Detour route

| SCOUR CRITICAL BRIDGE - ACTION PLAN   |             |                                       |              |                                       |      |                                       |        |
|---|-------------|---------------------------------------|--------------|---------------------------------------|------|---------------------------------------|--------|
| CS Structure No.  | Location    | Established                           | State Route  | Length                                | Span | ACI                                   | Access |
| 20074-0002  | 1000000000  | 10-07                                 | 1000000000   | 1000                                  | 100  | 1000                                  | 1000   |
| County  | State Route | Year                                  | Construction | Length                                | Span | ACI                                   | Access |
| 00000   | 000         | 000                                   | 0000000000   | 0000                                  | 000  | 0000                                  | 0000   |
| <b>1. Bridge Information Summary</b>  |             |                                       |              |                                       |      |                                       |        |
| 1. Abutment Foundation  |             | <input type="checkbox"/> Pier on Pile |              | <input type="checkbox"/> Pier on Pile |      | <input type="checkbox"/> Pier on Pile |        |
| 2. Pier Foundation  |             | <input type="checkbox"/> Pier on Pile |              | <input type="checkbox"/> Pier on Pile |      | <input type="checkbox"/> Pier on Pile |        |
| 3. Foundation Material  |             | <input type="checkbox"/> Masonry      |              | <input type="checkbox"/> Masonry      |      | <input type="checkbox"/> Masonry      |        |
| 4. Bridge Rating (Condition and Criticality)  |             |                                       |              |                                       |      |                                       |        |
| 5. Scour Details  |             |                                       |              |                                       |      |                                       |        |
| 6. Scour Evaluation Summary   |             |                                       |              |                                       |      |                                       |        |
| Scour Analysis: Level 1 <input checked="" type="checkbox"/> Scour Critical <input type="checkbox"/> Scour Susceptible <input type="checkbox"/> Low Risk <input type="checkbox"/> Not Done |             |                                       |              |                                       |      |                                       |        |
| Scour Analysis Date: _____ Date: _____  |             |                                       |              |                                       |      |                                       |        |
| Local Stability Date of Evaluation: _____ Scour Frequency: _____  |             |                                       |              |                                       |      |                                       |        |

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## MDOT Scour Critical Bridge Plan of Action Form

- Scour Vulnerability Rating
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## May Need to Re-evaluate Current Coding

- “May need to re-evaluate bridges coded scour critical to confirm that they should be on the scour critical list. The high cost of POAs has caused many states to re-evaluate their scour critical bridges because of the initial conservative approach to place some bridges in this category by assessment instead of analysis”

Dan Ghery  
FHWA Resource  
Center

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## NBIS Commentary

- Page 74432 The FHWA does agree with the commenters that the action plans for some bridges may be very similar and that monitoring and assessment after flood events may be done using different levels of effort depending on the degree of risk. The wording of this section was changed to reflect the need for some flexibility in the application of the action plans. Monitoring after flood events is described in the FHWA guidance manuals, “Evaluating Scour at Bridges” and “Bridge Scour and Stream Instability.”

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## Scour Countermeasure

- Many states allow rip-rap to serve as long term scour counter measures when combined with a monitoring plan

- May be handled differently for piers than abutments
- Item 113 go from 3 to 7?
- Some inspector training may be necessary to evaluate condition of rip-rap



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## SAFETEA - LU

- SEC. 1114. HIGHWAY BRIDGE PROGRAM.

- Highway Bridge Program funds can be used for installation of scour countermeasures.

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## Publications

- HEC-18 Evaluating Scour at Bridges
- HEC-20 Stream Stability at Highway Structures
- HEC-23 Bridge Scour And Stream Instability Countermeasures

- Chapter 2 - PLAN OF ACTION AND THE COUNTERMEASURES MATRIX

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### § 650.305 Definitions.

- *Critical finding.* A structural or safety related deficiency that requires immediate follow-up inspection or action.



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### § 650.313 Inspection procedures.

- (h) *Follow-up on critical findings.* Establish a statewide or Federal agency wide procedure to assure that critical findings are addressed in a timely manner. Periodically notify the FHWA of the actions taken to resolve or monitor critical findings.

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### MDOT Bridge Operations (Website)

- [www.michigan.gov/mdot](http://www.michigan.gov/mdot)
  - Click on "Doing Business", then
  - Click on "Bridge Operations"



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## Critical Structures

MDOT - Michigan Bridge Reporting System      Jurisdiction: Region - Metro

**Critical Structures**

[See Notes](#)

Total # of structures in Jurisdiction: 151%   # of structures for the criteria selected: 149

| Structure # | Bridge ID       | Year Facility Built/Carried | Features Intersected        | Freeway                   | Year Recon  | Inspection Date | Item 41 Rtg | Deck Rtg | SuperSt Rtg | Substr/Cul Rtg |
|-------------|-----------------|-----------------------------|-----------------------------|---------------------------|-------------|-----------------|-------------|----------|-------------|----------------|
| 6066        | 501500310006010 | 1948                        | M-97                        | CLINTON R                 | Non-Freeway | 1969 05/05/2005 | A           | 3        | 4           | 6              |
| 6069        | 501500510006010 | 1920                        | M-3 SB                      | CLINTON R                 | Non-Freeway | 10/31/2005      | A           | 3        | 3           | 4              |
| 6070        | 501500510006020 | 1964                        | M-3 NB                      | CLINTON R                 | Non-Freeway | 05/05/2005      | A           | 3        | 4           | 7              |
| 6080        | 501500610003080 | 1978                        | RAMP<br>G-AT<br>MOUND<br>RD | H696                      | Freeway     | 11/21/2005      | A           | 5        | 6           | 3              |
| 6081        | 501500610003090 | 1977                        | 10.5 MI<br>ROAD             | MND RD BRMPG<br>A&B O 696 | Non-Freeway | 06/26/2005      | A           | 5        | 5           | 3              |

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Thank You!




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