Scour Requirements for Bridge Rehabilitations

Crystal Weaver
Hydraulics Manager, INDOT

March 11, 2014
Agenda

- Policy background and timeline
- Requirements for bridge rehab scour evaluations
- Requirements for scour critical and non-scour critical bridges
- Hydraulic report requirements
Background

- Late 1980’s: Scour becomes a nationwide concern after two bridge failures.
- 1988: FHWA requires all bridges to be rated on scour vulnerability under NBI.
- 1991: INDOT begins designing all new bridges to resist scour.
Background

■ 1997: INDOT Scour Committee divides all bridges into high, medium, and low risk categories.


■ 1998: Standard drawings for scour protection at three/four sided structures developed.
Background

- 1999: INDOT & FHWA agreement requires all bridges to be evaluated for scour when rehabbed.
- 1999: Hydraulics & Bridge Rehab sent out two design memoranda detailing need for scour design during rehab.
- 1999-Present: This memo is still in effect.
Requirements

- Use 1% Annual EP only.
  - Follow IDM Chapter 202 on hydrology.
- Use FEMA FIS model, if available.
- Use survey from existing bridge plans.
  - Can supplement with GIS/DEM information.
Requirements

- Model in HEC-RAS.
- Follow IDM 203-3.03(04), Scour – Hydraulic Modeling Using HEC-RAS.
- Determine if structure is scour critical.
Scour Critical

- Scour Critical: If scour depths are lower than the low pile/footing depths of the structure. Unknown foundations are automatically scour critical.

- Countermeasures *are required*.

- Follow IDM Figures 203-2D for riprap sizing, and 203-3B for scour countermeasures.
Not Scour Critical

- Not Scour Critical: Scour depths are higher than the known low pile/footing depths of the structure.
- Countermeasures should be provided.
  - Designer has option to use.
- No further countermeasures needed is an acceptable recommendation.
Scour modeling and countermeasures are reviewed by the Hydraulics Office.

Most submittals are occurring in conjunction with the Bridge Inspection Report.

If coordination with DNR is needed, may take longer.
Report

- Generally an abbreviated Bridge Hydraulics Report.
- Need calculations, model, and scour determination and recommendations.
- All standard Hydraulics Report requirements should be followed.
Hydraulic Data Summary

- Drainage area
- Q100
- Q100 elevation
- 1% Annual EP contraction scour
- 1% Annual EP total scour
- 1% Annual EP low scour elevation
- 1% Annual EP maximum velocity
- Flow line & low foundation elevation, if known
Conclusion

- A long standing policy.
- 1% Annual EP with existing survey is sufficient.
- Scour critical structures must have appropriate scour countermeasures.
- Report follows standard procedures.
Questions?