Assessing Coding & Marking of Highway Structures in Emergency Situations

M. Veletzos¹, M.J. Olsen², A.R. Barbosa³, P. Burns⁴, Z. Chen⁵, G. Roe⁶, and K. Tabrizi⁷

¹Associate Professor, Dept. of Civil Engineering, Merrimack College
²Associate Professor, School of Civil & Construction Engineering, Oregon State University
³Assistant Professor, School of Civil & Construction Engineering, Oregon State University
⁴Design Engineer, Magnuson Klemencic Associates
⁵Associate Professor, Dept. of Civil & Mechanical Engineering, University of Missouri-Kansas City
⁶Principal Engineer, MPN Components
⁷Executive Vice-President, Advanced Infrastructure Design, Inc.

Tuesday, June 26 – Friday, June 29
Assessing, Coding & Marking of Highway Structures in Emergency Situations

- Background
- Assessment Process
- Coding and Marking
- Training
- Conclusion
NCHRP Report 833 Objectives

- **Develop** a process for assessing highway structures in emergency situations.
- **Develop** guidelines for coding and marking.
- **Produce** training and implementation material.
- **Prepare** materials in a format that facilitates acceptance and adoption (e.g., AASHTO).
- **Improve** coordination with other agencies who are involved in emergency response.
Background
Assessment Procedures

- DOTs have developed hazard specific guidelines
  - Primarily earthquakes and bridges
- ATC-20 well established for buildings
- Procedures defined between two to four response levels
- Two to four step evaluation flowcharts

Coding and Marking Guidelines

- Very little published information
- Well established system for routine bridge inspections (NBIS)
- Use of green, yellow, and red is common
- More technical methodology could be implemented
- Limited Digital Coding
Q: Does your agency have written assessment procedures for special inspections of highway structures specific to emergency situations?

- Manual or training material in place: 22%
- Informal methods in place: 30%
- No method in place: 40%
- Other: 8%

Q: Does your agency have guidelines for coding and marking of highway structures during an emergency situation?

- Manual or training material in place: 30%
- Informal methods in place: 24%
- No method in place: 34%
- Not aware: 12%

Number of responses = 50 DOTs
Research Products

Volume 1: Research Overview
Volume 3: Coding and Marking Guidelines
Smart App Developers Guide
Training Materials
Assessment Process
Vol 2: Assessment Process Manual (APM)

- Target Audience: Senior Managers
- Background on emergency events
- Planning and preparation
- Assessment process
- Coding and marking guidelines
- Coordination and communication
- Supporting technology
Highway Structures

- Bridges
- Tunnels
- Culverts
- Walls
- Embankments
- Overhead Signs
Emergency Events

- Earthquake
- Tsunami
- Hurricane and Storm Surge
- High Winds
- Tornado
- Flooding
- Scour
- Fire
- Other _____________________________
Assessment Stages for a Structure

Rapid Assessments (NCHRP Report 833)

- FR = Fast Reconnaissance
- PDA = Preliminary Damage Assessment

Per Manual of Bridge Evaluation

- DDA = Detailed Damage Assessment
- EI = Extended Investigation
Response Levels

Guidance on...

- **Scope**
- **Resource Mobilization**
Coding and Marking
Vol 3: Coding and Marking Guidelines

- Target Audience: PDA Responders
- Field Manual
- Support uniform communication
- Background
- PDA of highway structures
- Damage tables
- Damage photos
Assessment Forms

Inspector and structure information

Final Posting

Damage summary and overall comments

Element damage levels

Recommendations
Marking Placard and Decals

XDOT
(Agency)

PDA
(Assessment stage)

12/04/12
(Date)

1600
(Time)

0000000L1405026
(QR Code)

(Structure ID)

Unsafe
(Posting)

AB XY
(Inspector’s initials)

No through traffic allowed in the area
Create safety zone (close bridge)?
Repairable? Detailed Assessment?

UNSAFE

No heavy traffic allowed in the area
No specific safety zone required

LIMITED USE

ER vehicles allowed in the area
Create safety zone?
Remediation measures required?

LIMITED USE

No damage observed

INSPECTED
Training
Training Modules

• General training
  60 minute webinar for all relevant individuals

• Specialized Managing Engineer Training
  8 hour training for management and lead inspectors

• Basic PDA Respondents Training
  6 hours training for emergency responders

• PDA Quick Refresher
  30 minute refresher for emergency responders
Conclusions
Conclusions

• Overview of comprehensive and uniform process
• Wide range of highway structures and emergency situation
• NCHRP Report 833 Documents available for immediate use
  • Assessment Process Manual
  • Coding and Marking Guidelines
  • Training Materials
  • Smart App Development Guidelines
• Implementation in progress
  • Official AASHTO guidance document
  • ...but need support to spread the word!
Acknowledgements

• Project Team Members
  Michael Olsen (PI), Andre Barbosa, Patrick Burns, Oregon State University; Zhiqiang Chen, U. Missouri Kansas City; Gene Roe, MPN Components; Kaz Tabrizi, Advanced Infrastructure Design

• Funding provided by Transportation Research Board through the National Cooperative Highway Research Program

• Questionnaire respondents

• Dr. Amir Hanna, NCHRP Program Officer

• Technical review panel
  Nevin Myers (PennDOT), Chair; Herby Lissade (Caltrans); Pingbo Tang (ASU); Erik Anderson (TennDOT); Everett Matias (FHWA)
THANK YOU!