FHWA Bridge Program Initiatives - Bridge Design and Analysis

2017 RADBUG
Kansas City, KS

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Presentation Outline

- New Administration’s Initiatives
- Legislation Implementation
  - MAP-21 (Performance Management)
  - FAST Act
  - NTIS
- Key Steel and Concrete Bridge, Load Rating and Security Products and Initiatives
August 1, 2007

I-35W Bridge Collapse
December 15, 1967

Point Pleasant Bridge (Silver Bridge) Collapse
History of NBIS

- Congressional Order – Secretary shall work with the States to develop a national-level bridge safety inspection program
- Federal-Aid Highway Act of 1968
- Regulation implemented in 1971
  - 1978…Extended to all bridges
  - 1980…NBI added
  - 1987…FC and UW inspection added
  - 1993…Corrective action for Critical Findings
  - 2005…Qualifications for PMs and TLs
President’s Infrastructure Initiatives

- **Key Principles**
  - Make Targeted Federal Investments
  - Encourage Self-Help
  - Align Infrastructure Investment with Entities Best Suited to Provide Sustained and Efficient Investment
  - Leverage the Private Sector

- $200B to leverage $800B ($1T) in local and private investments – details in late summer

- Regulatory Reform Initiative – reduce unnecessary regulatory obstacles
MAP-21 Implementation

- National Bridge Inspection Standards
- Risk-Based Prioritization
- Critical Findings Database
Establish risk-based, data-driven frequency of inspections
Establish procedures for reporting critical findings and monitoring corrective actions
Requirement to conduct annual compliance reviews
Maintain a bridge inspection training program
Nationally Certified Bridge Inspectors
Risk-Base Data-Driven Intervals

- Building off of the framework from NCHRP 12-82: Reliability-Based Bridge Inspection Practices
- Risk = probability x consequence
- Considering…
  - Extended Interval Criteria
  - Clarification of Requirements for Fracture Critical Members
  - TPF-5(253): Evaluation of Member Level Redundancy in Built-Up Steel Members
Risk-Based Prioritization

- Classify bridges according to serviceability, safety and essentiality.
- Based on that classification, assign each a risk-based priority for preventative maintenance, replacement or rehabilitation.
The statute is silent on what this prioritization will be used for.

Concerns…
- Asset Management
- Transportation Performance Management
Critical Findings Database

- Update to NBIS will include a statutory requirement to report critical findings and follow up actions
- As a result...
  - Database
  - Data Dictionary
- NTIS…w/i 24 hours with regular updates or as requested.
- Identification of issues/trends…scour?
Performance Management (https://www.fhwa.dot.gov/tpm/)

- Rulemaking published 1/18/17, effective 2/17/17
- Provide the **most efficient investment** of Federal transportation funds
- Refocus on **national transportation goals**
- Increase **accountability and transparency**
- **Improve decision-making** through performance-based planning and programming
§ 490.407 National Performance Management Measures for Assessing Bridge Condition

Bridge Condition Measures - All NHS Bridges

- Percentage of NHS bridges classified as in Good condition
- Percentage of NHS bridges classified as in Poor condition
Changing the Language of the Federal-Aid Bridge Program

- Sufficiency Rating
- Functionally Obsolete
- Structurally Deficient → Poor
- Fracture Critical → NBIS Update
Fracture Critical

- 23 CFR 650 (C): A steel member in tension, or with a tension element, whose failure would probably cause a portion of or the entire bridge to collapse.
- Rooted in two bridge failures
- FHWA, AASHTO, AWS
- System Redundant Member
- Internally Redundant Member?
PERCENT OF BRIDGES IN POOR CONDITION IS DECREASING

Surface area of U.S. bridges rated Poor has decreased by 3.7 percentage points since 2002.

Poor Bridges by Deck Area

FAST Act Implementation

- Interstate Weight Limits
  - Emergency Vehicles
  - Covered Heavy-Duty Tow and Recovery Vehicles
Emergency Vehicles

- Guidance on rating for Emergency Vehicles
  - Configurations
  - Analysis
  - Posting requirements
- Guidance on Signs
- Published Q&As
Load Rating for Emergency Vehicles

- FHWA Memo Published Nov. 3, 2016 (https://www.fhwa.dot.gov/bridge/loadrating/161103.cfm)

- Interstate bridges must be load rated and posted, when necessary

- Two EV configurations defined

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Load Rating for Emergency Vehicles

- Bridges need to be rated at next inspection unless:
  - An operating or legal load rating factor for the AASHTO Type 3 vehicle of at least 1.85;
  - an inventory rating factor for the HS 20 design load of at least 1.0 using the LFR method, or
  - an inventory rating factor for the HL-93 design load of at least 0.9 using the LRFR method.
Load Rating for Emergency Vehicles

- If posted is necessary, use the following:

  EMERGENCY VEHICLE
  WEIGHT LIMITS
  SINGLE AXLE  XXT
  TANDEM       XXT
  GROSS        XXT

- An Action Plan is needed by March 31, 2017
Covered Heavy-Duty Tow and Recovery Vehicles
Covered Heavy-Duty Tow and Recovery Vehicles

- Interstate vehicle weight limits do not apply
- A vehicle that is transporting a disabled vehicle from the place where it became disabled to the nearest appropriate repair facility, and
- Has a gross vehicle weight that is equal to or exceeds the gross vehicle weight of the disabled vehicle being transported
National Tunnel Inspection Standards

- Initial Inspections Due, 08.13.2017
- Inspection Data Due, 03.15.2018
- NTIS Assessment Metrics
  - Implemented in 2018
  - Mini-pilot this summer with CO, MA, & MI
  - Seek review/comment from SCOBS
  - Publish in Federal Register
FHWA/NHI Bridge Design and Analysis Courses (www.nhi.fhwa.dot.gov)

- **NHI Course 130081:** LRFD for Bridge Superstructures (4 day) **

- **NHI Course 130092:** LRFR for Highway Bridges (4 day)

- **NHI Course 130093:** LRFD Seismic Analysis and Design of Bridges (4 ½ day) **

- **NHI Course 130094:** LRFD Seismic Analysis and Design of Tunnels, Walls and other Geotechnical Features (4 day)

- **NHI Course 130095:** LRFD Design and Analysis of Skewed and Horizontally Curved Steel Bridges (2 ½ or 4 ½ days)

- **NHI Course 132082:** LRFD for Bridge Substructures (4 day)
New FHWA/NHI Bridge Design and Analysis Courses (www.nhi.fhwa.dot.gov)

- NHI Course 130102: Engineering for Structural Stability in Bridge Construction (2.5-3.5 days)**
- NHI Course 130122: Design and Evaluation of Bridges for Fatigue and Fracture (2 day)
- Bridge Security Design Manual **
- Steel Bridge Design Handbook (updated)**

** Manuals can be found searching www.fhwa.dot.gov/bridges
Load Rating Program Peer Exchanges

- **Northeast States**
  - CT, MA, ME, NH, NJ, NY, PN, RI and VT
  - Aug. 4-6, 2014, Manchester, NH

- **Southeast States**
  - AL, FL, GA, KY, LA, MS, NC, SC and TN
  - Sept. 1-3, 2015, Atlanta, GA

- **Midwest States**
  - IA, IL, IN, MI, MN, MO, OH and WI
  - August 30 - September 1, 2016

- **Mid-Atlantic States +**
  - AR, DE, DC, KS, MD, PR, WV, VA
  - September 19-21, 2015, Sterling, VA

- Two Western State Exchanges planned in FY18.
Bridge Design and Analysis Products near completion

- Design Specifications for Non-composite Box Sections
- Cooperative Agreement with Lehigh
  - Manual for Refined Analysis of Bridges
    - Tubular Member Design for Bridges
    - Reliability in Special Bridge Systems
  - Strengthening of Bridge Members
  - Orthotropic deck details
Future Design and Analysis Guidance – Projects Underway

- Bridge Welding Manual
- Bridge Geometry Manual
- Shear Load Rating Guidelines for Concrete Bridges
- Load Rating Guidance for Tunnels and Tunnel Components
Bridge Information Modeling (BrIM):

- **Scope and Purpose**
  - *To facilitate development of bridge industry consensus standards for data description, modeling, and interoperability for integrated design, construction, and lifecycle management of bridges.*
BrIM Work Status

- Two reports published and available online:
  - BrIM Using Open Parametric Objects (CH2M)
  - BrIM Standardization (NIBS)
- Model View Definition (MVD) documentation available for implementation
BrIM Work Status

- Selected for 2017 Strategic Initiative ($1M dedicated funds)
- Planning to assemble working groups (technical and governance)
- Want to identify demonstration projects
To further support State’s efforts in meeting the NBIS’s requirements in load rating and FHWA's initiative of implementing the LRFR method, a series of webinars have been planned to provide continued awareness for local, regional, and State transportation agencies.

No. 16: Bridge Load Rating for Overweight Load Permitting – State’s Practice (3) (5/19/2015)
No. 17: Federal Bridge Formula Weights and State-Specific Legal Loads (10/21/2015)
No. 18: Load Rating and Posting for State-Specific Legal Loads (1) (2/24/2016)

Recordings are available at https://www.fhwa.dot.gov/bridge/loaddrating/
QUESTIONS?