Agenda

- Bridge Management Update
- Bridge Rating and Design Update
- Task Force Members
FY2015 Licensees

41 State Departments of Transportation +
Manitoba, FHWA, District of Columbia
& Puerto Rico

<table>
<thead>
<tr>
<th>County/City</th>
<th>State</th>
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<tbody>
<tr>
<td>Los Angeles Co</td>
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<td>Penn. Turnpike</td>
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<td>Richmond Metro Auth</td>
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Map Key

<table>
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Bridge Management 5.2 Stages

- Phased releases
  - Version 5.1.2/5.1.3 (Mar 2012 / May 2013)
    - New inspection and inventory functionality, integration with mapping
  - Version 5.2.1 (Feb 2014)
    - Core program framework, risk assessments, integrated utility functions, network corridors + AASHTO 2013 Elements
  - Version 5.2.2 (Mid-2015)
    - Implementation of new deterioration models and multi-objective analysis
  - Version 5.2.3 (Planned 2016)
    - Enhancements to Deterioration Modeling
    - Integrated project and program planning
    - All administrative features
Bridge Management 5.2 Stages

- Inspection
- Bridge Groups, Risk, Utility Functions
- Deterioration Modeling, Preservation Action, and Projects
- Enhanced Deterioration Modeling, Enhanced Project/Program Planning, and Administration Features

5.1.2  5.1.3  5.2.1  5.2.2  5.2.3
MAP-21 Requirements

1. Collecting, processing, storing, and updating inventory and condition data for all NHS bridge assets;  
   **Currently supported for bridges.**

2. Forecasting deterioration for all NHS bridge assets;  
   **In BrM 5.2.3 we will have full implementation for all NHS bridges.**

3. Determining the life-cycle benefit-cost analysis of alternative strategies (including a no action decision) for managing the condition of all NHS bridge assets;  
   **Currently partially supported in BrM 5.2.2 for bridges, and will be fully supported in BrM 5.2.3.**
4. Identifying short- and long-term budget needs for managing the condition of all NHS bridge and pavement assets; 
Will be fully supported in BrM 5.2.3.

5. Determining the optimal strategies for identifying potential projects for managing pavements and bridges; and
Will be supported in BrM 5.2.3 for bridges.

6. Recommending programs and implementation schedules to manage the condition of all Interstate highway pavements, non-Interstate NHS highway pavements, and NHS bridge assets within policy and budget constraints.
Will be supported in BrM 5.2.3 for bridges.
Bridge Management 5.2.1 SP2

• Released in January 2015
• Key Features
  • FHWA Bridge Element submission and validation checks
  • Upgrade to the latest version of Crystal Reports (2013)
  • Enterprise version of SP2 has been upgraded to be 64 bit compatible
  • Specific TAG identified upgrades, enhancements, and stabilizations to the product
Bridge Management 5.2.1 SP3

- Will be released in May 2015
- Minor fixes/enhancements
  - Addresses a page load issue encountered by users with a significant amount of element records tied to a single bridge.
  - Stores and displays ampersands (“&”) as ampersands. This was not done previously in all prior versions of the software.
Bridge Management 5.2.2

- Currently in Beta Testing
- Planned Release in Summer 2015
- Key Features
  - Deterioration Modeling including Weibull shaping parameters and protection factors for protective elements
  - Project Planning and Analysis Module
  - Conversion of the database from Metric to U.S. Customary units
  - New Inspection Process to better handle inspection dates and data for the NBI submittal
  - Application Programming Interface (API)
  - Database GUID conversion
Metric Assessment Report

• Working with FHWA to include logic used for NBIS Metric Assessment Reports

• Ability to use current data to check NBIS Metric compliance

• Since these are just reports, we can add these at any time. Recently received the information from FHWA

• Allow state and FWHA to better track interim deadlines for their Corrective Action Plans
Planned Release in 2016
Fully supporting the FHWA Identified Rule Making
Key Features
  - Capability to perform life cycle cost analysis
  - Capability to perform network level analysis
  - Dashboards for easy data visualization and tracking performance measures.
  - Enhanced User Help System
In the Design phase currently
AASHTOWare Bridge Rating Design Update

AASHTO Bridge Design Rating Website
http://aashto.mbakercorp.com
AASHTOWare Bridge Rating

Current Participation

Map Key
- Consultant Licenses = 573
  - Licensee
  - Non-Licensee

Agency Licenses = 39

City/County/Territory
- Phoenix, AZ
- Puerto Rico
- Maricopa, AZ
- NY City, NY
- Army Corps of Engr.
- NJ Turnpike
- Washington D.C.

Country
- Manitoba, Canada
AASHTOWare Bridge Design

Current Participation

City/County/Territory
Cincinnati, OH

Agency Licenses = 17 Licensee
Consultant Licenses = 35 Non-Licensee

Map Key

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<th>Agency Licenses</th>
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Country

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<td>Manitoba, Canada</td>
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Consultant Licenses = 35
Agency Licenses = 17
Comprehensive Bridge Software

AASHTOWare Bridge Design and Rating

“A Software Success Story”

A 16 year history of the development progression from common to complex bridge analysis for more than 40 agencies and 600 consultants!
Steel Girder Superstructures

- Rolled shapes
- Welded plate girders
- Built-up I shapes
P/S Concrete Superstructures

Precast shapes

- I beams
- Boxes
- Multi-stem Tee
- U beams
Reinforced Concrete Superstructures

- Tee beams
- Slabs
- I beams
Multi-cell boxes

Reinforced Concrete

Post-tension Concrete
Trusses

- Deck
- Through
- Combination
- Counters
Floor Systems

- Girder-Floorbeam-Stringer
- Girder-Floorbeam
- Truss-Floorbeam-Stringer
- Truss-Floorbeam
- Floorbeam-Stringer
Floor Systems

- Floor trusses
R/C Box Culverts
3D Analysis – R/C Multi-girder
3D Analysis – P/S Multi-girder
3D Analysis - Steel Multi-girder

Straight – 3D

104.7 deg. 104.7 deg. 104.7 deg.
3D Analysis – Curved Steel Girder
AASHTO Spec Checking

Spec Check Detail for 5.9.4.2.1 Compression Stresses

6 Concrete Structures
5.9 Prestressing and Partial Prestressing
5.9.4 Stress Limits for Concrete
5.9.4.2 For Stresses at Service Limit State After Losses - Fully Prestressed Component
5.9.4.2.1 Compression Stresses
(AASHTO LRFD Bridge Design Specifications, Fourth Edition - 2007)

PS I Wide - At Location = 50.0000 (ft) - Left Stage 3

Input:
- Girder f'c = 6.50 (ksi)
- Slab f'c = 4.00 (ksi)

Section Properties: Gross
- A0 = 767.20 (in²)
- ε’0 = 29.69 (in)
- S0 = 15421.29 (in³)
- εb = 14812.64 (in³)
- Scc = 63853.46 (in³)
- Sbc = 20086.00 (in³)
- slabc = 63853.46 (in³)
- Fc = 10452.00 (kip)
- slabc = 63853.46 (in³)

Service I Loads:
- MDL = 3997.50 (kip-ft)
- MDL = 540.00 (kip-ft)
- POS MGS = 0.00 (kip-ft)
- NEG MGS = 0.00 (kip-ft)
- POS MLI = 2673.56 (kip-ft)
- NEG MLI = 0.00 (kip-ft)

Summary:

Final Compressive Stresses Due to Permanent and Transient Loads:
(Service I: FS + DL + LI)

Final allowable compression stress limit = -3.90 (ksi)

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<td>(ksi)</td>
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<tr>
<td>FS:</td>
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<tr>
<td>DL:</td>
<td>-1.70</td>
</tr>
<tr>
<td>C&amp;S:</td>
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<tr>
<td>LI:</td>
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<tr>
<td>Sum =</td>
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<tr>
<td>At Life =</td>
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AASHTO Spec Checking

Multiple versions supported...

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<tr>
<th>Analysis Method Type</th>
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Automated Prestressed Concrete Beam Design

- Completed the software design
  - Phase 1 – Single Beam Design
  - Phase 2 – Framing Plan Design

- Nearly complete with the user interface development for Phase 1

- Release of Phase 1
  - 1st quarter 2016
Modernization Update

The modernization proposes to create more powerful, easier to use tools to assist agencies in designing and load rating their inventory in a more cost-effective manner.
Modernization Update

Why Modernize?

- Life span of the Bridge Design/Bridge Rating predecessor, mainframe BARS, was 20+ years
- It has been nearly 20 years since the design and development of the current system began and 16 years since it’s April 1999 release (formerly known as Virtis)
- The design is based on the technology of the late 1990s.
Modernization Update

Why Modernize?

When development started:

• Windows 95 or NT was common and was replacing Windows 3.11
• Needed a 386DX processor
• Needed minimum 4 MB RAM (8 MB recommended)
• Hard drives in the 40-100 MB size were common

• There have been 7 versions of Windows OS since development began:
  • Windows 95, 98, ME, XP, Vista, 7, and 8
Modernization Update

Why Modernize?

Currently:

- Windows 7 or 8 – 64 bit
- Memory – 16 to 32 GB common
- Hard drives in 1 or 2 TB are common, very fast solid state drives becoming common in 250-500 GB range

Tremendous changes in OS and hardware over the last 15-20 years
Modernization Update

Why Modernize?

• Recent addition of 3D analysis pushes the computational limits of the current system

• Software tools for development have significantly improved

• User expectations have matured

• Hardware has improved, need to take full advantage of new hardware capabilities
Modernization Update

Benefits:

• Significantly upgrade the core technology to a modern software architecture that better utilizes current and future hardware, and the latest software development technologies

• Improve and simplify the user interface - easier to use for beginners without losing modeling flexibility for advanced users

• Improve reporting capabilities

• Reduce maintenance costs

• Reduce implementation time for new features
Modernization Update

Progress:

• Conducted a workshop with stakeholders to identify the requirements that drive the software design.
  • Guided by 3rd party from Carnegie-Mellon University

• Completing an architecture design that will satisfy those requirements.

• Preparing conceptual user interface mockups of the modernized user interface.
  • Will require user review and suggestions

• Solicitation for funding later this year (2015)
Modernization Update

In conclusion...

*Improve efficiency* for more than 600 consultants and 40 agencies.

“*It’s all about the data!*” Licensing agencies have an enormous investment in their bridge data. *The data and your investment will be preserved.*
### AASHTOWare Bridge Task Force

<table>
<thead>
<tr>
<th>Role</th>
<th>Name</th>
<th>State</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chair</td>
<td>Todd Thompson</td>
<td>South Dakota</td>
</tr>
<tr>
<td>Vice Chair</td>
<td>Eric Christie</td>
<td>Alabama</td>
</tr>
<tr>
<td>Member – BrM</td>
<td>Bruce Novakovich</td>
<td>Oregon</td>
</tr>
<tr>
<td>Member – BrM</td>
<td>Thomas Martin (new)</td>
<td>Minnesota</td>
</tr>
<tr>
<td>Member – BrM</td>
<td>Mark Faulhaber</td>
<td>Kentucky</td>
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<tr>
<td>Member – BrM</td>
<td>Beckie Curtis (new)</td>
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<tr>
<td>FHWA Liaison – BrM</td>
<td>Derek Constable (new)</td>
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<tr>
<td>Member – BrR</td>
<td>Joshua Dietsche (new)</td>
<td>Wisconsin</td>
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<tr>
<td>Member – BrD</td>
<td>Jeff Olsen</td>
<td>Montana</td>
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<td>Tom Saad</td>
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User Group Training Meetings

- **Bridge Design and Rating**
  RADBUG
  August 4-5, 2015
  Albany, NY

- **Bridge Management**
  BrMUG
  September 22-23, 2015
  Park City, UT
Questions & Comments

Thank you for your continued support!