

AASHTOWare Bridge Update



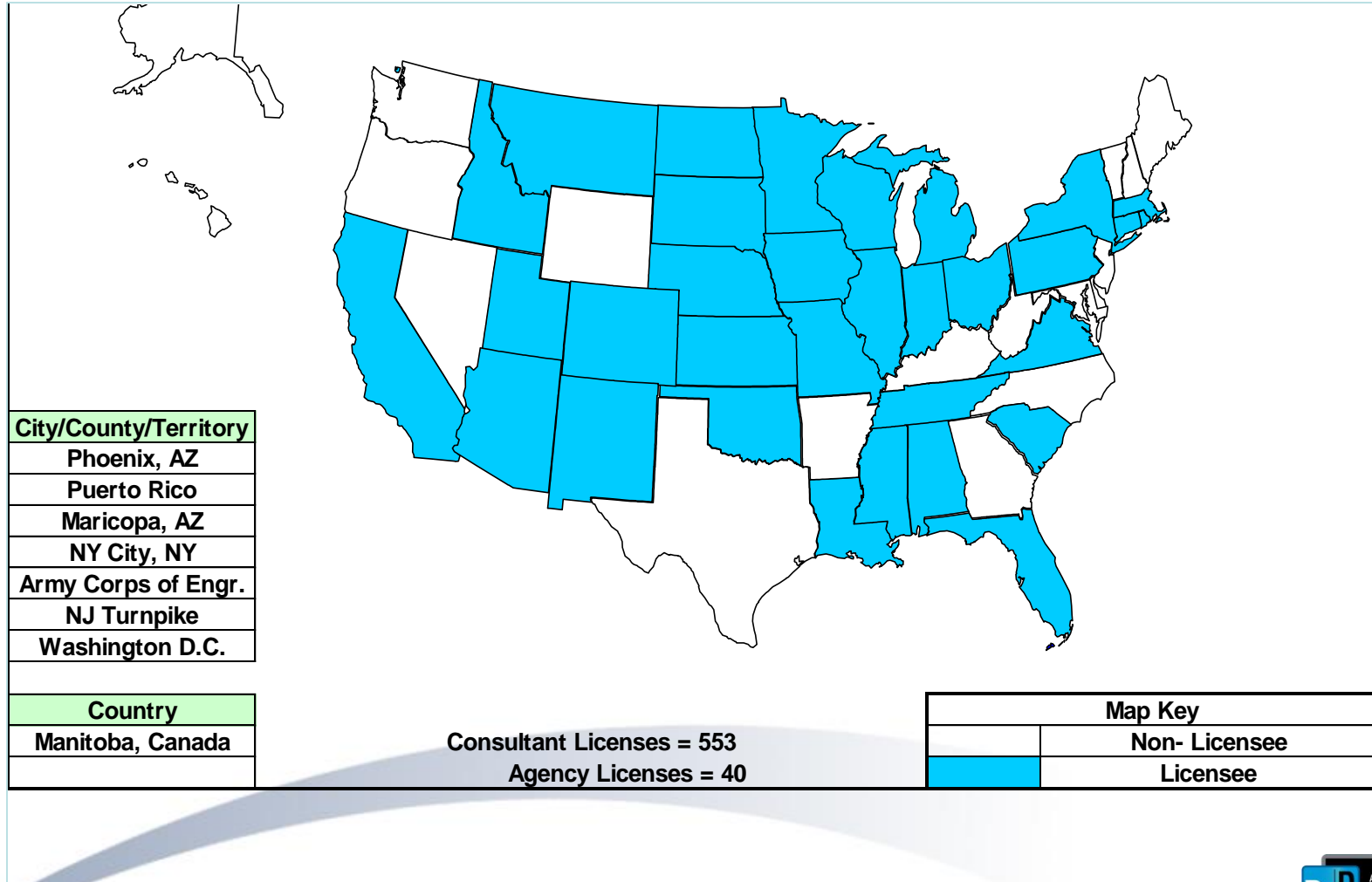
**Todd Thompson, Chair
Chicago, Illinois**

Agenda

- Bridge Rating and Design Update
- Task Force Members
- Beta Testing TAG Members

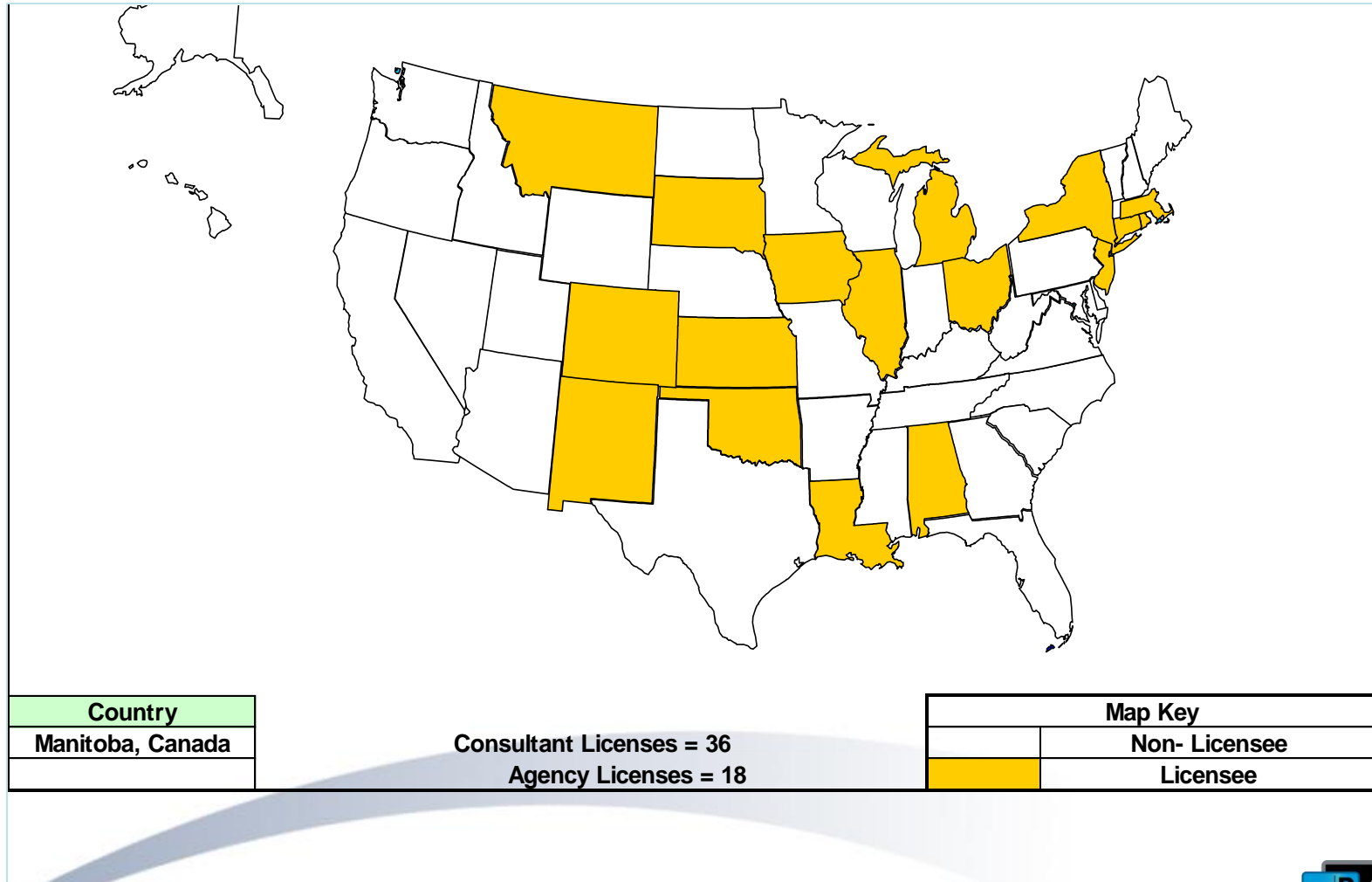
AASHTOWare Bridge Rating

Current Participation (FY 2016 ending June 30)



AASHTOWare Bridge Design

Current Participation (FY 2016 ending June 30)



Releases since last year

- 6.7.1 – March 2016
 - Multi-cell Concrete Box Enhancements
 - Substantially funded by CALTRANS

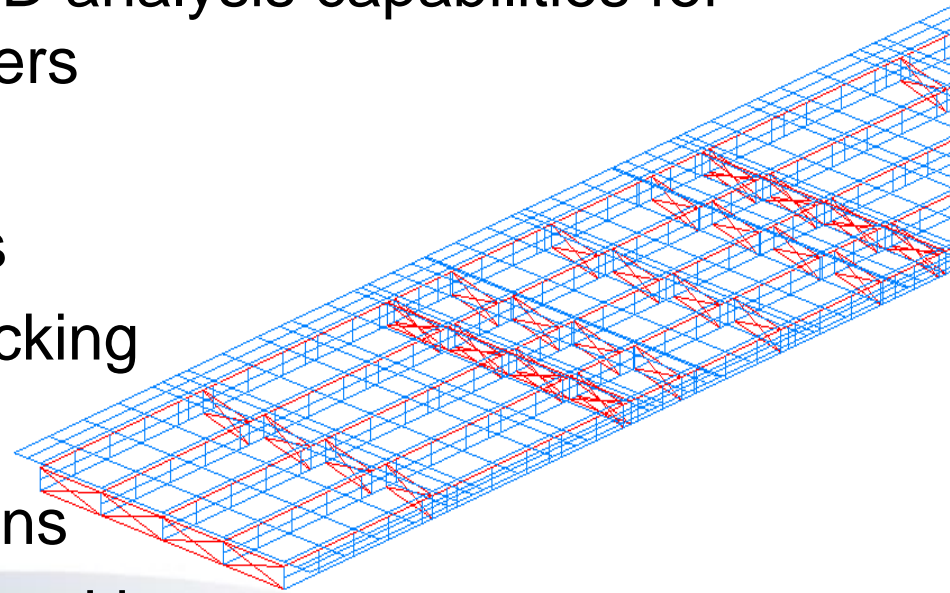
Releases since last year

- 6.8 – July 2016
 - PS Design Tool Phase 1
 - Rating Tool
 - Regression Comparison Tool
 - Numerous Maintenance Issues
 - User voted enhancements

Enhancements for 6.8 – July 2016

Curved Girder Part 3 – Diaphragm and Lateral Bracing Rating

- Enhances the existing 3D analysis capabilities for straight and curved girders
- Cross Frame Definitions
- Cross Frame Spec Checking
- Lateral Bracing Definitions
- Lateral Bracing Spec Checking



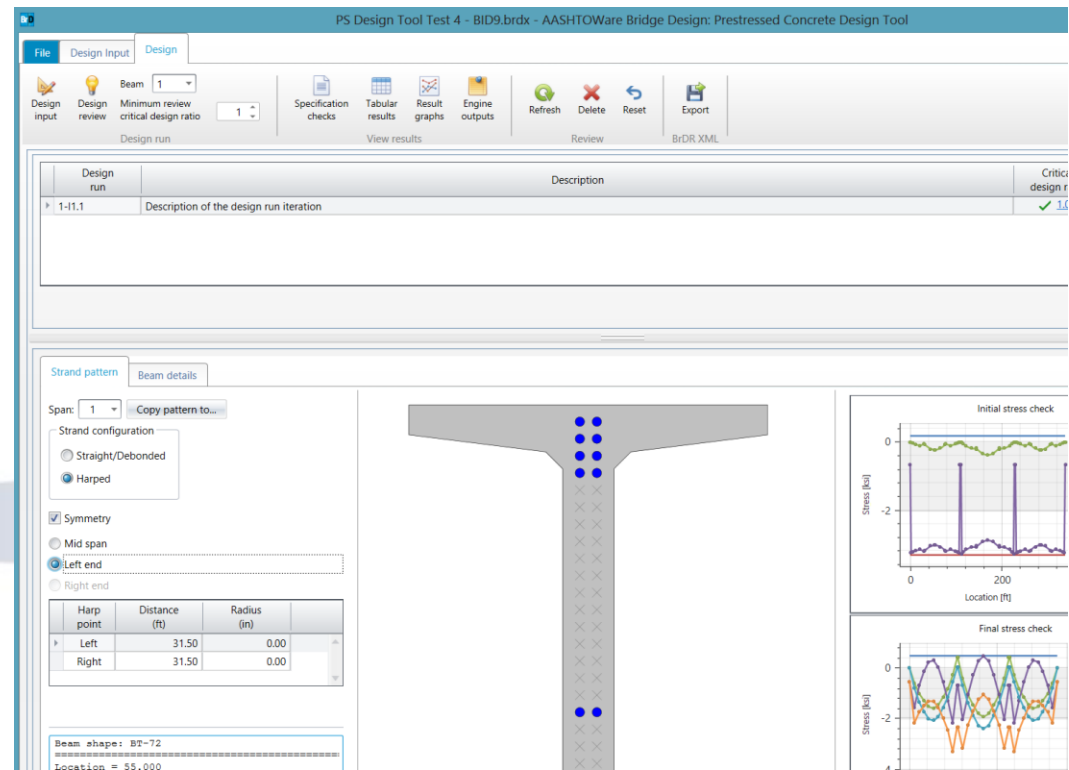
Enhancements for 6.8 – July 2016

- Nonstandard Gage analysis for Floor Systems
- Refinements to the strain-compatibility computation of PS beam flexural capacity

Enhancements for 6.8 – July 2016

Prestressed Concrete Beam **Design Tool** – Phase 1

- I beams
- Box beams
- Tee beams
- Debonded or harped strands
- Simple span
- Continuous spans



Enhancements for 6.8 – July 2016

Prestressed Concrete Beam **Design Tool** – Phase 1

- Enter basic geometry
- Enter load descriptions
- Enter design parameters
- Initiate a design run

- Phase 1 - girder line
- Phase 2 - full description of bridge

Enhancements for 6.8 – July 2016

Prestressed Concrete Beam Design Tool – Phase 1 Specification Checking Details

PS Design Tool Test 4 - BID9.brdx - Design Run 1-11.1

Specification checks

Articles: All articles
Format: Bullet list

Specification filter

- Superstructure Component
 - Prestress Calculations
 - Stage 1
 - Stage 2
 - Stage 3
 - 1
 - Span 1 - 0.00 ft.
 - Span 1 - 6.16 ft.
 - Span 1 - 11.00 ft.
 - Span 1 - 22.00 ft.
 - Span 1 - 33.00 ft.
 - Span 1 - 44.00 ft.
 - Span 1 - 55.00 ft.
 - Span 1 - 66.00 ft.**
 - Span 1 - 77.00 ft.
 - Span 1 - 88.00 ft.
 - Span 1 - 99.00 ft.
 - Span 1 - 102.79 ft.
 - Span 1 - 109.00 ft.
 - Span 1 - 110.00 ft.

Specification reference	Pass/Fail
✓ 2.5.2.6.2 Criteria for Deflection	Passed
📄 5.11.4.2 Bonded Strand	General Comp.
✓ 5.4.2.1 Compressive Strength	Passed
📄 5.4.2.5 Poisson's Ratio	General Comp.
📄 5.4.2.6 Modulus of Rupture	General Comp.
✓ 5.5.3.1 Fatigue Limit State - General	Passed
NA 5.5.3.2 Reinforcing Bars	Not Required
📄 5.5.4.2 PS Strength Limit State - Resistance Factors	General Comp.
📄 5.7.2.2 Rectangular Stress Distribution	General Comp.
✓ 5.7.3.2 Flexural Resistance (Prestressed Concrete)	Passed
✓ 5.7.3.3.2 Minimum Reinforcement	Passed
✓ 5.8.2.5 Minimum Transverse Reinforcement	Passed
✓ 5.8.2.7 Maximum Spacing of Transverse Reinforcement	Passed
✓ 5.8.3.3 Nominal Shear Resistance	Passed
📄 5.8.3.4 Procedures for Determining Shear Resistance	General Comp.
✓ 5.8.3.5 Longitudinal Reinforcement	Passed
✓ 5.8.4.4 Minimum Area of Interface Shear Reinforcement	Passed
✓ 5.8.4 Interface Shear Transfer	Passed

Enhancements for 6.8 – July 2016

Prestressed Concrete Beam Design Tool – Phase 1 Specification Checking Details

```
Spec Check Detail for 5.7.3.2 Flexural Resistance (Prestressed Concrete)

5 Concrete Structures
5.7 Material Properties
5.7.3 Flexural Members
5.7.3.2 Flexural Resistance
(AASHTO LRFD Bridge Design Specifications, Seventh Edition - 2014, with 2015 Interims)

PS I Wide - At Location = 66.0000 (ft) - Left      Stage 3

-----
Cross Section Properties
-----
Name: BT-72
Girder f'c = 7.00(ksi)      Girder f'ci = 5.50(ksi)
Slab f'c = 4.00(ksi)

Effective Slab Width      = 123.00(in)
Effective Slab Thickness  = 8.00(in)
Haunch Width              = 42.00(in)
Haunch Thickness          = 0.50(in)
Beam Height                = 72.00(in)

Total Aps = 7.20(in^2)
Total CGS = 7.52(in)

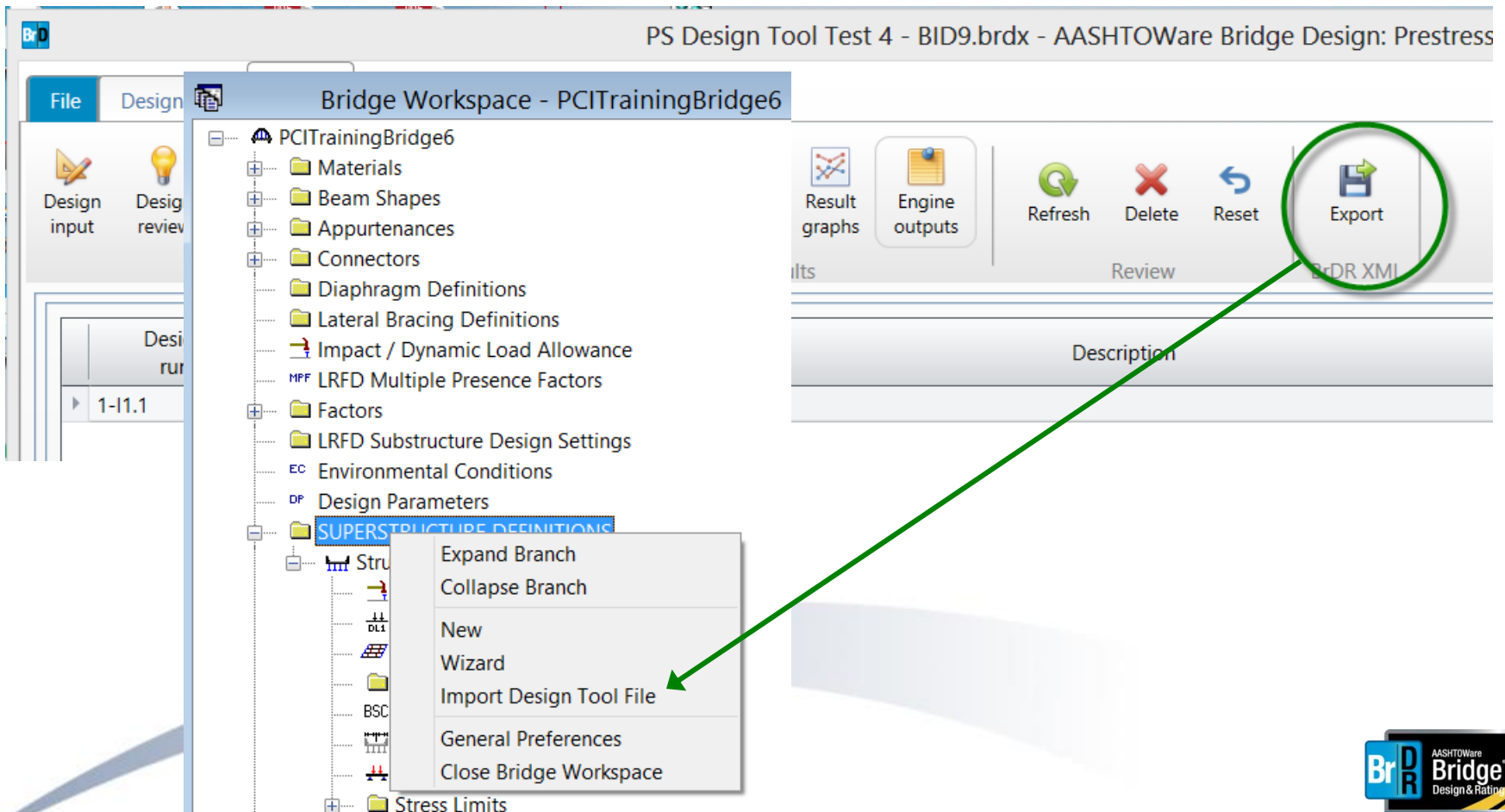
Eff Aps = 7.20(in^2)
Eff CGS = 7.52(in)

Flexural Reinforcement
-----
As      Dist. From
(in^2)  Bottom
        (in)
2.40    77.13
3.72    77.06
10.81   74.50

Note: If the capacity has been overridden, the Resistance is computed as override phi*override capacity.
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Enhancements for 6.8 – July 2016

Prestressed Concrete Beam Design Tool – Phase 1 Export the design to BrD



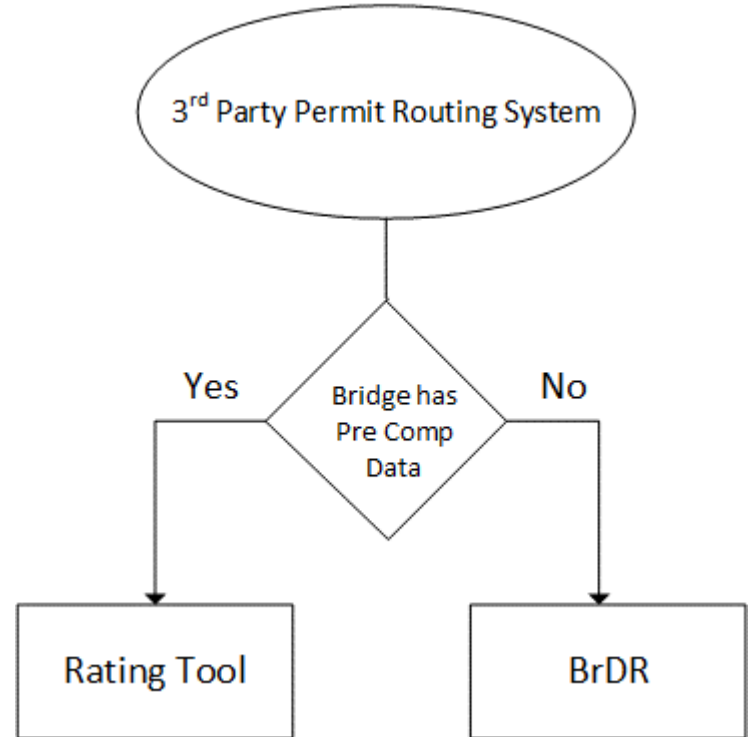
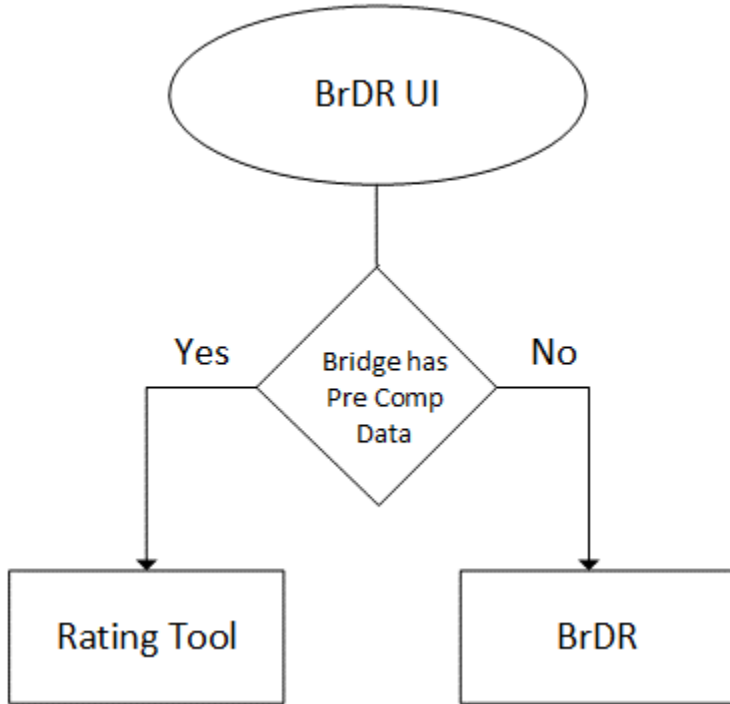
Enhancements for 6.8 – July 2016

Rating Tool – Phase 1

- New tool for computing rating factors very quickly by using precomputed analysis data
- Tool can be used by permitting systems or within BrR to compute ratings for a list of bridges and/or vehicles
- LFR capability
- Steel and concrete multi-girder straight superstructures
- LRFR, floor systems and trusses in subsequent phases

Enhancements for 6.8 – July 2016

Rating Tool – Phase 1



Enhancements for 6.8 – Sept 2016

Regression Comparison Tool

- New tool to assist with regression testing of BrDR

Regression testing is a form of testing that verifies that the work performed to add new features and capabilities did not break or inappropriately alter the existing code causing incorrect results or behavior.

- A large part of the testing is regression testing
- Based on NCHRP Report 485 – Bridge Software – Validation Guidelines and Examples

Enhancements for 6.8 – Sept 2016

Regression Comparison Tool

- Improve the efficiency of regression testing
- Can be used for :
 - ✓ Comparison of two versions of BrDR (Regression Testing)
 - ✓ Comparison of two editions of the specification
 - ✓ Comparison of two analysis engines within BrDR
- Includes features that help find differences and identify the cause of those differences
- Will greatly help our Beta Testers or anybody wanting to confirm the new version of software before migrating to next version

Beta Testing TAG

- Review GUI/Screen Mockups
- Review new or revised flow charts of design/analysis tasks
- Test the application before each release with their agencies data
- Some attend a week testing session at the Contractors Office

AASHTOWare Bridge Task Force

Chair	Todd Thompson	South Dakota
Vice Chair	Eric Christie	Alabama
Member – BrM	Bruce Novakovich	Oregon
Member – BrM	Thomas Martin	Minnesota
Member – BrM	Mark Faulhaber	Kentucky
Member – BrM	Beckie Curtis	Michigan
FHWA Liaison – BrM	Derek Constable	FHWA
Member – BrR	Joshua Dietsche	Wisconsin
Member – BrD	Jeff Olsen	Montana
Member – BrD	Dean Teal	Kansas
Member – BrR	Amjad Waheed	Ohio
FHWA Liaison – BrDR	Tom Saad	FHWA

Thank you