Public safety is our first responsibility.

FHWA Updates: Loads and Analysis-Related Activities

AASHTO SCOBS T-5 Annual Meeting, Saratoga Springs, NY, 4/21/2015

Lubin Gao, Ph.D., P.E.
Senior Bridge Engineer – Load Rating
Office of Bridges and Structures
Federal Highway Administration
• Develop guidance and training on bridge technologies that improve the safety, durability, and longevity of our nation’s bridges

• Advance the state of practice in bridge engineering

http://www.fhwa.dot.gov/bridge/
Post-Tensioned Box Girder Bridge Design Manual

This guidance document will provide a comprehensive manual to guide engineers in the analysis, design and construction of PT box girder superstructures. Comprehensive design examples will also be included for both straight and curved alignments as well as monolithic and non-monolithic connections to substructure.

Contact:
FHWA Office of Bridges and Structures
Reggie Holt: Reggie.Holt@dot.gov
Brian Kozy: Brian.Kozy@dot.gov
System Reliability in Special Steel and Concrete Bridge Systems

The main objective of this research is to identify steel and concrete bridge systems that have a reliability that is either greater or less than their individual component reliability and to develop guidance.

T-5 Members who reviewed the submittal:
Arielle Ehrlich,
Sue Hida and Lubin Gao

Progress Report for Subtask 8.1 - 50% Submittal Identification of Redundancy Factor Modifiers
February 1, 2015

Contact:
FHWA Office of Bridges and Structures
Brian Kozy: Brian.Kozy@dot.gov
Reggie Holt: Reggie.Holt@dot.gov
Manual for Refined Analysis
This guidance document is intended to summarize the fundamentals of 1-D, 2-D and 3-D (FEA) analysis, develop protocols for refined analysis for girder bridges (steel & concrete) including load application and results extraction. Comprehensive design examples will also be included for both concrete and steel bridges.

Contact:
FHWA Office of Bridges and Structures
Brian Kozy: Brian.Kozy@dot.gov
Reggie Holt: Reggie.Holt@dot.gov
Multi-Hazard Design

- **Multi-Hazard Design Criteria Frame Work**
  - MCEER Lead by Prof George Lee
  - Draft Report Completed in 2014

- **Multi-Hazard Design Guide Documentations**
  - GENEX Inc. Awarded late September 2014
  - FHWA Will organize an oversight Committee, including AASHTO SCOBS representatives (including T5)
  - 27 months

Contact:
FHWA Office of Bridges and Structures
Phil Yen: Wen-huei.Yen@dot.gov
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. 13: Bridge Load Rating for Overweight Load Permitting (10/20/2014)
No. 14: Bridge Load Rating for Overweight Load Permitting - State's Practice (1) (12/18/2014)
No. 15: Bridge Load Rating for Overweight Load Permitting - State's Practice (2) (03/25/2015)
No. 16: Bridge Load Rating for Overweight Load Permitting - State's Practice (3) – TBD, 2015

Recordings are available at https://www.fhwa.dot.gov/bridge/loadrating/
MAP-21 Comprehensive Truck Size and Weight Limits Study

Provisions in MAP-21, the Moving Ahead for Progress in the 21st Century Act (P.L. 112-141), require Study (MAP-21 §32801) addressing differences in safety risks, infrastructure impacts, and the need for truck size and weight (TSW) limits and trucks legally operating in excess of federal limits; compares alternative configurations (including configurations that exceed current federal TSW limits) to the freight diversion due to these alternative configurations.

- Project Milestones and Schedule
- Peer Review
  - The National Academies TRB-SASP-13-03

http://ops.fhwa.dot.gov/freight/sw/map21tswstudy/index.htm

Draft Desk Scans:
Bridge Structure Comparative Analysis
Http://ops.fhwa.dot.gov/freight/sw/map21tswstudy/deskscan/index.htm

Complete Compilation of Technical Report:
Upcoming

Contact:
FHWA Office of Bridges and Structures
Phil Yen: Wen-huei.Yen@dot.gov
### USDOT Comprehensive Truck Size & Weight Limits Study

#### Configuration

<table>
<thead>
<tr>
<th>Configuration</th>
<th># Trailers or Semi-trailers</th>
<th># Axles</th>
<th>Gross Vehicle Weight (pounds)</th>
<th>Roadway Networks that Vehicles are run on; (Scenarios are defined as the vehicle configuration and the roadways they run on)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Control Single</strong> 5-axle vehicle (3S-2)</td>
<td>1</td>
<td>5</td>
<td>80,000</td>
<td>STAA vehicle; has broad mobility rights on entire Interstate System and National Network including a significant portion of the NHS</td>
</tr>
<tr>
<td>1) 5-axle vehicle (3S-2)</td>
<td>1</td>
<td>5</td>
<td>88,000</td>
<td>Same as Above</td>
</tr>
<tr>
<td>2) 6-axle vehicle (3S-3)</td>
<td>1</td>
<td>6</td>
<td>91,000</td>
<td>Same as Above</td>
</tr>
<tr>
<td>3) 6-axle vehicle (3S-3)</td>
<td>1</td>
<td>6</td>
<td>97,000</td>
<td>Same as Above</td>
</tr>
<tr>
<td><strong>Control Double</strong> Tractor plus two 28 or 28 ½ foot trailers (2S-1-2)</td>
<td>2</td>
<td>5</td>
<td>80,000</td>
<td>Same as Above</td>
</tr>
<tr>
<td>4) Tractor plus twin 33 foot trailers (2S-1-2)</td>
<td>2</td>
<td>5</td>
<td>80,000</td>
<td>Same as Above</td>
</tr>
<tr>
<td>5) Tractor plus three 28 or 28 ½ foot trailers (2S1-2-2)</td>
<td>3</td>
<td>7</td>
<td>105,500</td>
<td>74,454 mile roadway system made up of the Interstate System, approved routes in 17 western states allowing triples under ISTEA Freeze and certain four-lane PAS roads on east coast</td>
</tr>
<tr>
<td>6) Tractor plus three 28 or 28 ½ foot trailers (3S2-2-2)</td>
<td>3</td>
<td>9</td>
<td>129,000</td>
<td>Same as Above</td>
</tr>
</tbody>
</table>
Approach

- Estimated the bridge structural impacts related to the introduction of alternative truck configurations to the fleet.
- Determined the percentage of bridges that will require load posting, strengthening or replacement as a result of the new configurations.
- Estimated/Addressed costs associated with the predicted postings, strengthening or replacements.

Data and Model

- Used representative bridges from the National Bridge Inventory to determine structural demands.
- Used AASHTOWare Bridge Rating program (ABrR).
- Used Load and Resistance Factor Rating (LRFR) Method Modeled Bridges.
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Thank you for your attention!

Lubin Gao, Ph.D., P.E.
Senior Bridge Engineer – Load Rating
Office of Bridges and Structures
Federal Highway Administration