AASHTO AS 13-0024
Support for the HSCOBS Technical Committee on Moveable Bridges (T-8) in a Technical Advisory Role for Specification Updates – Span Lock Design Study

Presented to AASHTO T-8, June 23, 2014

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URS
PRESENTATION OUTLINE

- Purpose of Study
- Project Status Report
PURPOSE OF STUDY

- Advance the industry's knowledge of span lock behavior
- Provide information and recommendations to T-8
- Improve the general practice of span lock design
- Improve the provisions of the AASHTO LRFD Movable Highway Bridge Design Specifications with regard to design of span locks
PURPOSE OF STUDY

- Determine appropriate impact factors for use in design and evaluation of span locks
- Quantify the effects of operating clearances and wear on span lock loading and dynamics
- Quantify the effects of bascule span deflection and end rotation on span locks
- Identify alternative materials for span lock wear components that improve service life
PROJECT STATUS REPORT

Screening Evaluation

- Completed initial screening of FDOT double-leaf bascule bridges
- Identified viable candidates for field testing
  - Hillsborough Avenue Bridge, Tampa, FL, FDOT D7
  - Sunrise Boulevard Bridge, Ft. Lauderdale, FL, FDOT D4
  - US41 / Hatchett Creek, Venice, FL, FDOT D1
Global Model of Bascule Girders, Floor Beams and Span Lock Assembly
ANALYSIS – Hillsborough Ave Bridge

Expanded View of Span Lock
ANALYSIS – Hillsborough Ave Bridge

Plain Bending Stress

Loadcase: 3:Increment 3 Load Factor = 1.00000
Results file: Hillsborough.mys
Entity: Stress - Solids
Transformation XY Angle: 0.0
Component: SX

Maximum 31.3144 at node 7285
Minimum -30.8383 at node 1452
Plain Bending Stress in Lock Bar
ANALYSIS – Hillsborough Ave Bridge

Contact Stress in Guide and Receiver Shoes
FIELD INSTRUMENTATION

- Met with FDOT Materials Laboratory Staff
- Developed Instrumentation Fixture Sketch
- Met with FDOT Staff at Hillsborough Avenue Bridge to plan instrumentation and traffic control
Instrumentation Fixture Sketch

Notes:
1. All frame members are made out of steel (Galvanized).
2. S2S Series Channel P1200 with Electroplated Zinc Finish. Channel hole pattern is either HS 7 or HS 11. Alternative naming is Aluminum P1200 Channel hole pattern is either HS 7 or HS 11.
3. Selected Laser Triangulation Sensor is LUC-120-40-64.
   Stand off 120 in, Range +20 in. Resolution = 5 micrometers.

DEFLECTION / ROTATION INSTRUMENTATION
Project Delays

- Hillsborough Ave. Bridge Construction Delayed approximately one year
  - Traffic control issues
  - Construction phasing changed – eliminated detour phase that was the opportunity for field testing
- Revised span lock field instrumentation program
  - Instrumentation and testing will now be performed on the new span lock (as opposed to the existing)
  - FEA modeling will need to be redone to model new span lock system
Alternate Material Research

Desirable Span Lock Bushing Material Properties
- High Strength
- Impact resistant
- Wear resistant
- High to Medium Machinability
- Corrosion resistant
- Low friction
- Self lubricating
Potential Alternate Span Lock Bushing Materials

- Bronze Alloys
- PTFE Composites
- Ultra High Molecular Weight (UHMW) polyethylene
- Plastic Composites
  - Rulon® - Plastic/PTFE
  - Ultracomp® - Polyester /Graphite Composite
Next Steps

- FDOT is constructing instrumentation fixture
- Instrumentation and testing of Hillsborough Ave preliminarily scheduled for July, 2014
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Questions?