Rocker Bearing Issues

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Typical Bridge Bearing Types

- Sliding Plate Bearings
- Roller Bearings
- Elastomeric Bearings
- Spherical Bearings
- Pot Bearings
- Rocker Bearings
Rocker Bearing
Why Discuss Rocker Bearings?
Albany, NY (I-787, Exit 3 NB)

Bridge Closed, July 28, 2005

Rocker Bearing Failure
Albany, NY (I-787, Exit 3 NB)
Albany, NY (I-787, Exit 3 NB)

Contributing Factors:
- Misaligned / Over-expanded Bearing
- Overly Flexible Pier

Source: NYDOT
Pittsburgh, PA (Birmingham Bridge)
Bridge Closed February 8, 2008
Rocker Bearing Failure
Pittsburgh, PA (Birmingham Bridge)
Pittsburgh, PA (Birmingham Bridge)

Contributing Factors:

- Misalignment of Bearing
- Cumulative Bearing Ratcheting
- Horizontal Force – Deflection of Pier

Source: PennDOT
Pittsburgh, PA (Birmingham Bridge)

Figure 1 – Rocker Bearing Ratcheting Effect

Source: PennDOT
Pittsburgh, PA (Birmingham Bridge)

Figure 2 – Rocker Bearing Failure

INITIAL INSTALLATION, BEARINGS LEANING, VERTICAL REACTION

INCREASED BEARING LEAN, HORIZONTAL FORCE DEVELOPED PIER BEGINS TO MOVE

HORIZONTAL FORCE GREATER THAN ABILITY AT PIER TO RESIST IT, PIER DEFLECTS, BEARINGS TIP OVER

Source: PennDOT
Rocker Bearing Failure
Contributing Factors

• Corrosion (pack rust) below rocker or pivot point
• Section Loss, Debris
• Abnormal Behavior
  – Contracted position in warm weather, Expanded in cold
• Misalignment, Ratcheting
• Substructure Movement
Suffield Bridge, CT (Route 190)

Consists of 9 spans over Connecticut River & Amtrak
ADT = 26,200
Length = 1,345ft
Deck Area = 80,344sf
Suffield Bridge, CT (Route 190)

Pack Rust – Displacements
Suffield Bridge, CT (Route 190)

Flattened Rockers – Inhibited Movement
Suffield Bridge, CT (Route 190)

Documentation – Section Loss & Pack Rust
Suffield Bridge, CT (Route 190)

Impacts:

Pack Rust - Displacements

• Deferential Displacement
• Racking Floorbeams
• Pintles exposed
• Potential for walking

Flattened Rockers – Inhibited Movement

• Increased stresses on girders
• Lateral loading on substructures
Suffield Bridge, CT (Route 190)

Replacement Recommended

- New Expansion Bearings
  - designed by ConnDOT
  - On-site

- Replacement
  – October 2010
Gold Star Bridge, CT (Interstate - 95)

Largest Complex Bridge in CT
ADT = 120,000 +
Length = 6000ft
Deck Area = 1,000,000sf
Main Span: L = 540ft
140’ Vertical Clearance
Gold Star Bridge, CT (Interstate - 95)

Pack Rust
- Bearing Pin / Gusset Plate Interface

Frozen Rocker Bearings
Gold Star Bridge, CT (Interstate - 95)

Impacts:

Seized Rocker Pin
- No Movement
  - Increased stresses - Truss members
  - Lateral loading on substructures

Excessive Wear
- Pin / Gusset Interface
  - Non-uniform gaps and contact area.
Gold Star Bridge, CT (Interstate - 95)
Replacement Recommended

Intermediate Steps:

Determine the urgency of replacement:
- Instrumentation of Truss Members
- Quantify Induced Stresses
- Scheduling Bearing Replacement