BNSF BRIDGE 204.66
LIFT SPAN CONSTRUCTION

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USCG & Bridge Alteration

Truman-Hobbs Act, 1940 [33 USC 511-523]

- Authorizes the USCG to “order” the alteration of bridges found to be unreasonably obstructive to navigation
- T-H Act only applies to railroad or highway bridges that are in service
- Provides for the apportionment of cost between federal government & bridge owner
- Federal government bears the cost of that part attributable to the necessities of navigation
Navigation Benefits

- Why Replace?
  - Wider clearance
  - Reduced transit time
  - Accident Reduction
BNSF BRIDGE 204.66

- December 2001 Project Bid Solicitation
- Insufficient Funds
- 2009 American Recovery & Reinvestment Act
- $36.4M Add’l Funding Appropriated
- Successful Bid Solicitation w/ Contract Award in July 2009
- ARRA Requirements
- USCG Oversight
History

- Original Construction
  - 1867 Single Track
  - 1893 Double Track
- Mainline Service
Construction Requirements

- Maintain Navigation Service
- Winter Channel Shutdown
- Operational Deadline
- Maintain Rail Service
- Shutdown for Changeout
- Construction on Existing Alignment
Lift Span Replacement

Plan A

2012 AASHTO SUBCOMMITTEE ON BRIDGES AND STRUCTURES
SUBCOMMITTEE T-8
Drilled Shaft Construction

- Test cores
- Sheet pile from cofferdam
Drilled Shaft Construction

- Pier Movement
- Operational
  - Rail Joints
  - Swing Span Bearings
Options

- Stop drilled shaft construction
- Stabilize existing pier
- Research options and possible redesign
Lift Span Replacement
Plan B

2012 AASHTO SUBCOMMITTEE ON BRIDGES AND STRUCTURES
SUBCOMMITTEE T-8
Shift Lift Span 75’ East

- Advantages
  - Reduce or eliminate movement at existing piers
  - Use same lift span

- Additional Requirements
  - Revised Pier Cap Design
  - Additional Changeout
  - Addition of DPG Spans
  - Same Schedule Completion
    - Stage 1 – Spans adjacent to the lift span
    - Stage 2 – Lift span
Pier 6A Construction
• Driven Cased H-Pile
- Pier 6A Construction
- Falsework Deck
Stage 2 - Lift Span

2012 AASHTO SUBCOMMITTEE ON BRIDGES AND STRUCTURES
SUBCOMMITTEE T-8
Lift Span Erection
Swing Span Float-out
Lift Span Float-in

2012 AASHTO SUBCOMMITTEE ON BRIDGES AND STRUCTURES
SUBCOMMITTEE T-8
Lift Span Float-in
First train

- 34 hours after swing span carried its last
Navigation Deadline

- Open Navigation on March 1, 2011
- Complete Tower 9
- Counterweights
- Machinery Installation
- Channel Clearing
• Counterweight concrete pours
Counterweight Sheaves

- Sheave placement
  - 16’ pitch diameter
  - 30” diameter shaft
  - With bearings, 100,000 lbs
Counterweight Sheaves
Counterweight Ropes

- Cast Steel Blocks
- Zinc Spelter
- Stripe Orientation
Central Machinery

- 2 - 60 HP main drives
- 1 - 40 HP aux drive
- Main drives over-sped
Line Shaft

- Alternating floating
- Fully supported shafts
Lifting Girder Machinery
Expansion Bearing Casting

• Casting Tolerances
Expansion Bearing Casting

- Inspection Criteria

- Visual
  - ASTM A802 criteria for Level II and MSS SP-55
  - Liquid-penetrant exam in accordance with ASTM E165, or mag particle exam in accordance with ASTM E709

- Ultrasonic inspection
  - ASTM A609 Level 2 (Procedure A) or Level 3 (Procedure B) (thicker than 4 1/2 inches)
  - Level 1 (Procedure A) or Level 1 (Procedure B) for thinner castings.
Adversaries

- Difficult Drilled Shaft Construction
- Location Shift
- Frequent Flooding
- Schedule Compression
- Inclement Weather
Overcoming Adversity

- Coordination
- Decision Making
- Trust
- Flexibility
- Innovation
- Determination
- Perseverance