REHABILITATION RETROFITS

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GAI Consultants, Inc.

INDOT Bridge Conference | February 16, 2017

Link Slabs

LINK SLABS

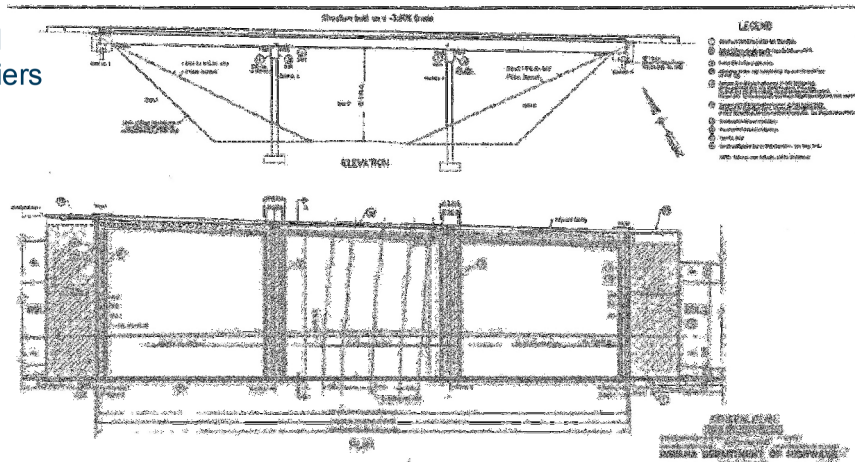
- Purpose to eliminate problematic joints.
- Stephanie discussed currently preferred joints to use
  - Lifespan less than rehabilitation cycle of 20± years.
- Jeremy discussed preferred integral and semi-integral end bent details.
  - Works at end bents only.

LINK SLABS

- I-64 over Captain Frank Road
  - Built 1965
  - Simple Span Prestressed I-beam bridge
  - Reconstructed 1992
  - Overlay and joint elimination

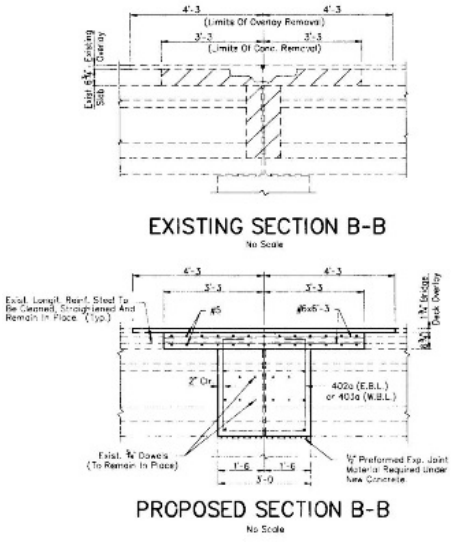
LINK SLABS

- I-64 over Captain Frank Road
  - Removed Deck and Diaphragms over Piers
  - Also widened superstructure and overlaid deck.



LINK SLABS

- I-64 over Captain Frank Road
  - Removed Deck and Diaphragms over Piers
  - Poured New Capwidth Diaphragm
  - Added #6 Bars in Deck over old Joint
  - Now “Continuous” for LL
  - No need to worry about RES moments due to age of beams



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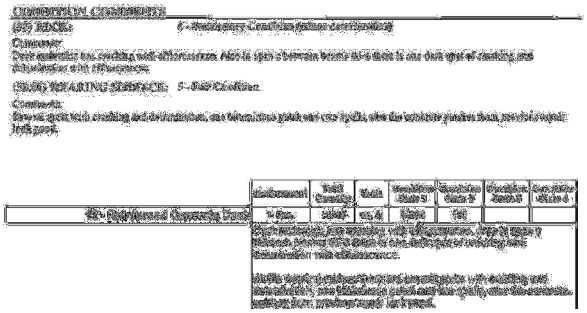
LINK SLABS

- I-64 over Captain Frank Road
  - From 11/19/2015 SI&A



LINK SLABS

- Behavior and Design of Link Slabs for Jointless Bridge Decks, PCI Journal May-June 1998, Caner and Zia
  - Investigated both concrete and steel beam link slabs.
  - Developed simplified equation for predicting cracks in deck for link slabs.
    - $\omega = 0.076\ \beta\ f_s\ (d_c\ A)^{1/3}$
    - ω = surface crack width in units of 0.001 in.
    - β = ratio of distances to neutral axis from extreme fiber to centroid of main reinforcement.
    - f_s = Reinforcement stress (ksi)
    - d_c = concrete cover (in)
    - A = effective area per bar (sq. in.)

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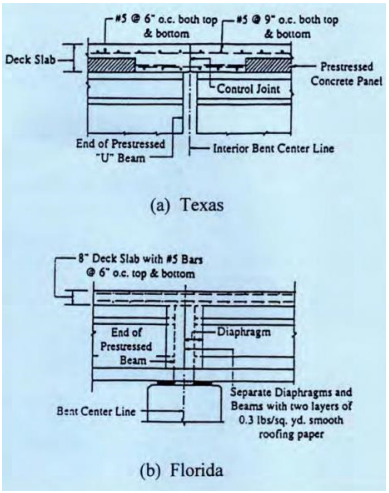
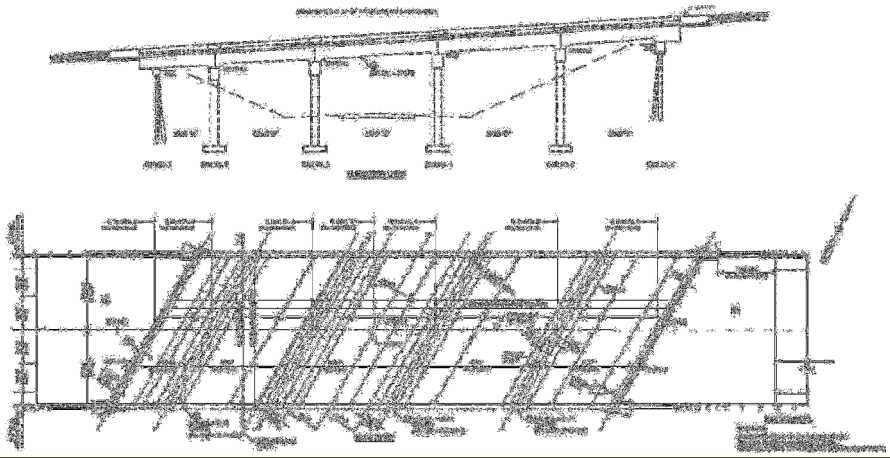
LINK SLABS

- Behavior and Design of Link Slabs for Jointless Bridge Decks
  - Some Details used by other DOT's:
    - Control Joints in Slabs
    - Reduced Reinforcing through Joint
    - Bond Break and no Composite action near Joint
    - Separating Diaphragm from Beam with Roofing Felt



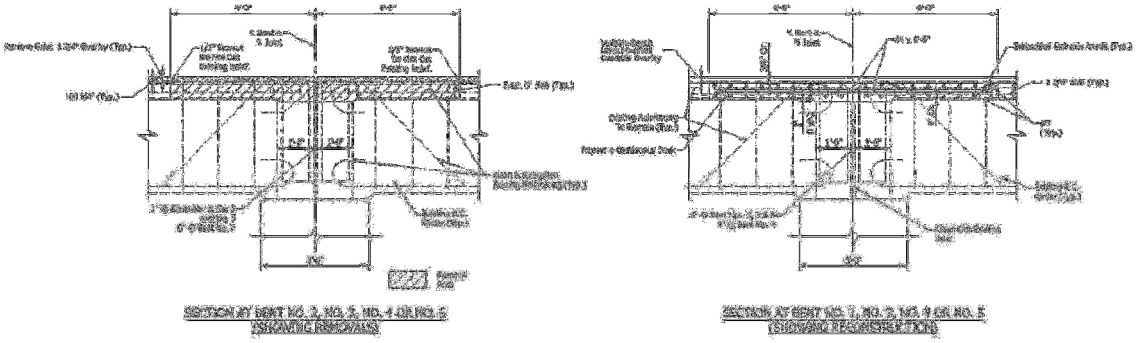
LINK SLABS

- Recent Experiments:
  - SR 64 over SR 37, B-35006



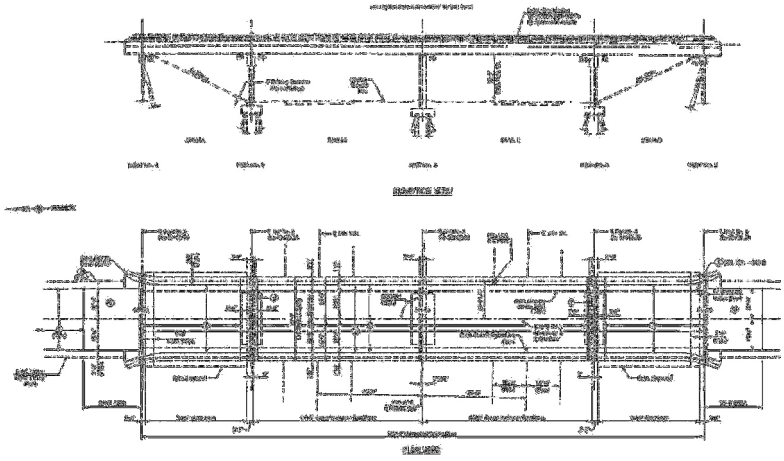
LINK SLABS

- Recent Experiments:
  - SR 64 over SR 37, B-35006
  - Only made deck continuous. Did not replace diaphragms.



LINK SLABS

- Recent Experiments:
  - Owensville Road over I-64, B-35003



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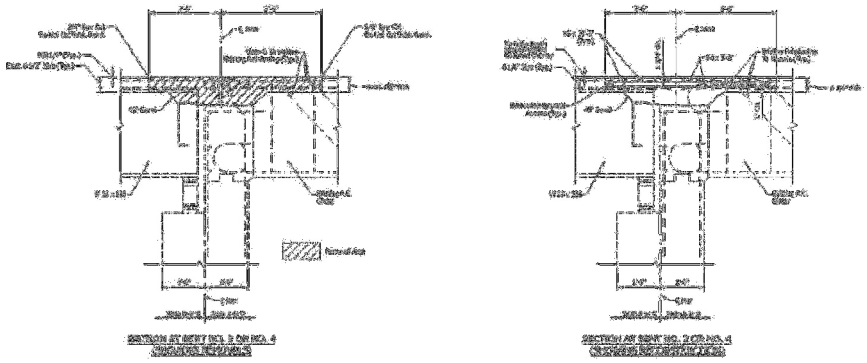
LINK SLABS

- Recent Experiments:
  - Owensville Road over I-64, B-35003
  - 2 Span Continuous Steel Beam with Concrete Girder End Spans
  - Only Deck Continuous



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Rocker Bearing Replacement

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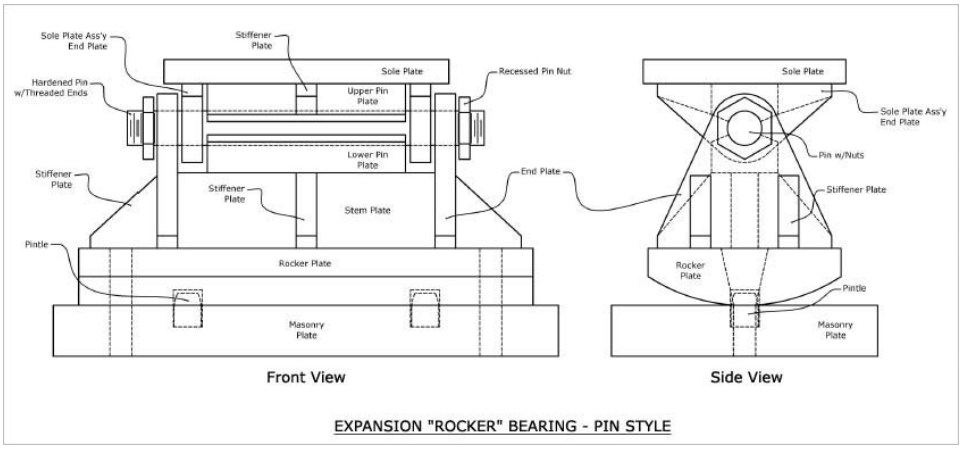
ROCKER BEARINGS

- Found throughout Indiana on Steel Beam / Girder Bridges.

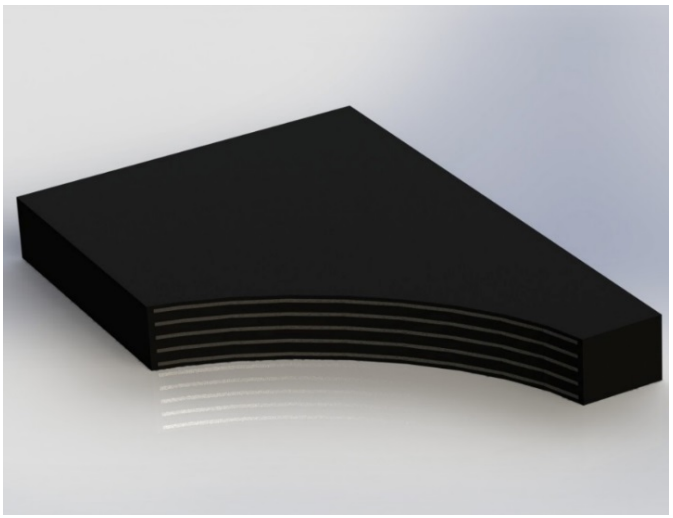
ROCKER BEARINGS

- INDOT Used Pintles top and bottom.
- No Pins typically used

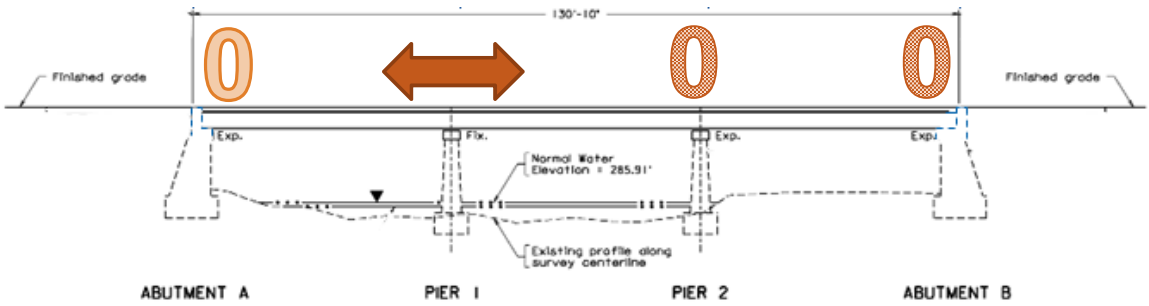


ELASTOMERIC BEARINGS

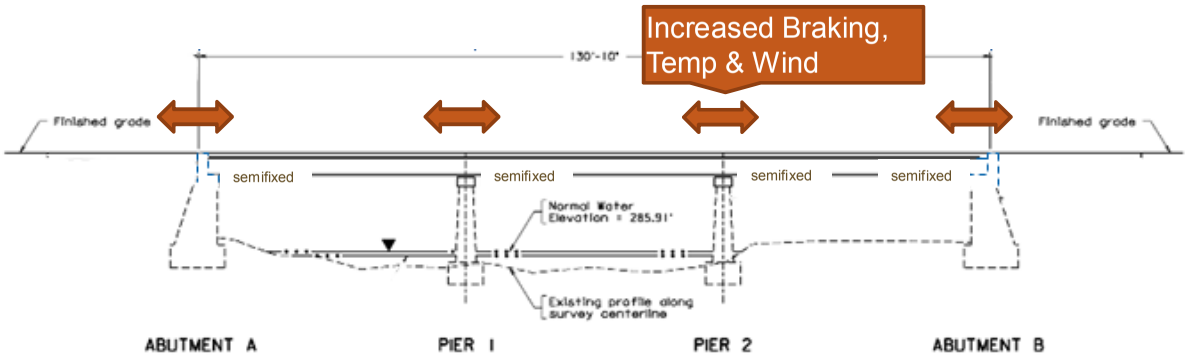
- Elastomeric Bearings don't rust
  - Low Profile
  - Less Expensive
  - Easy to Install



BEARING REPLACEMENTS



BEARING REPLACEMENTS



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Zinc Anodes

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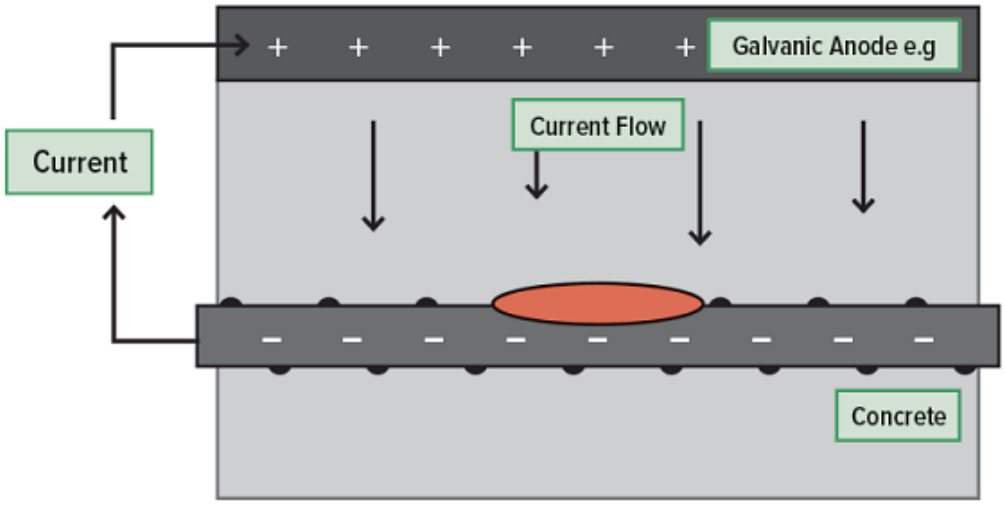
ZINC ANODES



ZINC ANODES

- Amount of zinc dependent on a number of factors such as current, rebar density, etc
- Normally pucks spaced 18-24” are sufficient for decks and most areas
- See presentation from 2016 conference for more information

ZINC ANODES

- Bid price about $25 each
- Cheap insurance against premature corrosion
- If there's corrosion on epoxy coated steel deck then coating is compromised
- Bridge Asset Managers' input…

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Concrete Patching

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CONCRETE PATCHING

- Not all patching is created equal.
- Class A Patching Spec getting a major overhaul today.



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CONCRETE PATCHING

- New Pay Items
  - Patching Concrete Structures, Horizontal Surface SFT
  - Patching Concrete Structures, Overhead Surface SFT
  - Patching Concrete Structures, Vertical Surface SFT
- Each one will have different preapproved materials.
- Since no bid history exists, approximate with low, medium and high values.
  - Horizontal $50 per SFT
  - Overhead $400 per SFT
  - Vertical $100 per SFT

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CONCRETE PATCHING

- Pneumatically Placed Mortar
  - "Stickier" than Class A Patching and sometimes works better.
  - More Expensive due to equipment mobilization.
  - $100 - $200 per SFT, higher for small quantities.
  - Rule of thumb, don't use for under 500 SFT areas.
  - Don't forget WW Mesh
- INDOT knows the current specifications do not represent the best current practices and intend to update them in the future.

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Drain Sealing

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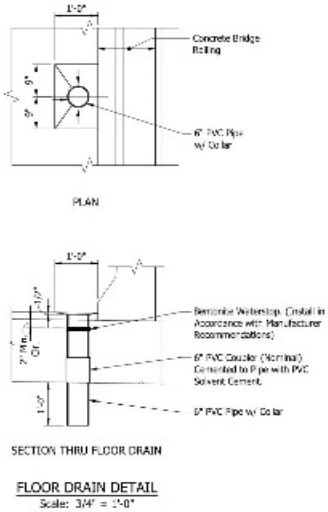
DRAIN SEALING

- The Problem:
  - Water and Chlorides Leak around PVC joint
    - Concrete Shrinkage
    - Differential Expansion
  - Chlorides Collect Near Bottom Reinforcing
  - Corrosion and Spalling around Drain

DRAIN SEALING

- Some Solutions:
  - Make sure water can flow to drain
    - Sitting water can wick behind PVC
  - Add Waterstop around Pipe
    - Interrupt water flow
    - Coupler intended to hold drain in place but doesn't act as waterstop
  - Add bead of silicone caulk around outside of Pipe on top of deck



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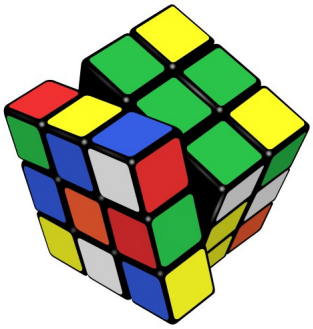
IN CLOSING

INNOVATIONS

- Notice problems that aren't solved by Standard Details, Specs or Pay Items.
- Try Something.
  - Vet ideas with PM, Bridge Asset Manager, etc.
- Do No Harm
  - Even if your solution doesn't work it will seldom make the situation worse
  - …and may make it better.



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Questions?

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