

Joint Elimination, Link Slabs, And UHPC



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Presentation Topics

➔ Joint Elimination

- ❑ Why Eliminate Joints
- ❑ Current Practices in New York State

➔ UHPC Link Slabs

- ❑ Link Slabs – What, Why, and How
- ❑ What Makes a Good Candidate

➔ Other Preservation Strategies with UHPC

➔ Question & Answer

Issues

- ➔ Require frequent maintenance
- ➔ Can be hazardous to traveling public
- ➔ Prone to leakage, exposing underlying components to moisture and chlorides
- ➔ Trickle-down deterioration reduces bridge service life



Splicing of Girders



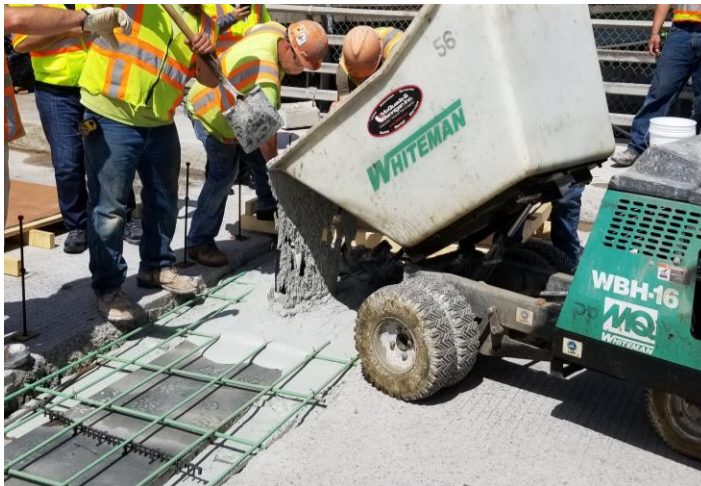
Concrete End Diaphragm



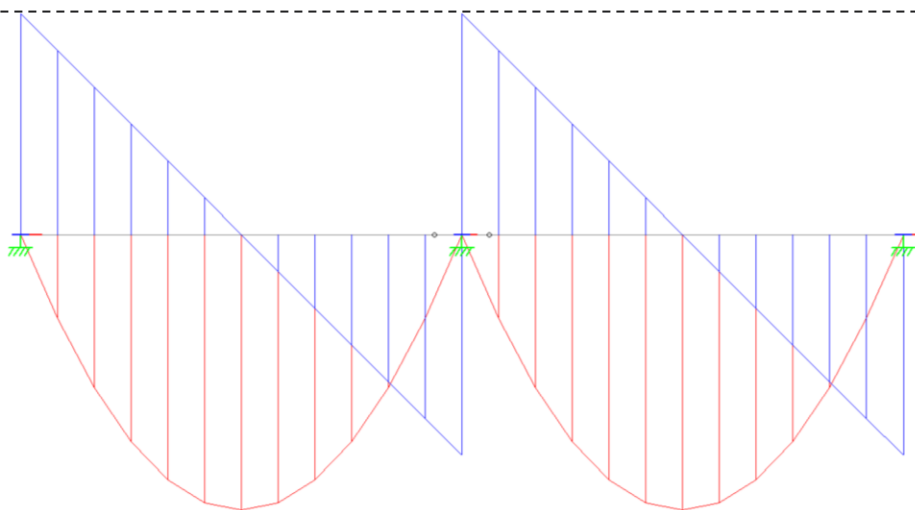
Conversion to Integral Abutments



UHPC Link Slabs



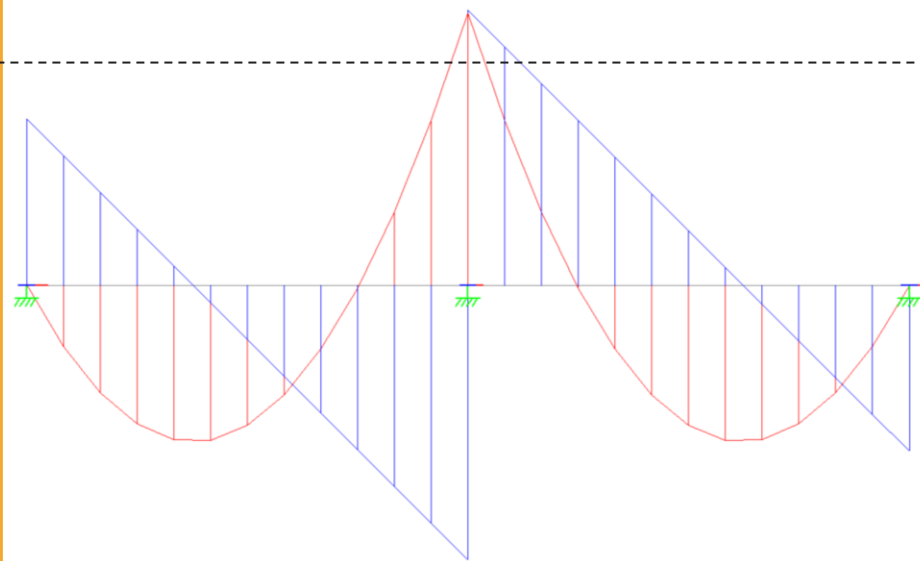
Without Continuity



Span 1

Span 2

With Continuity



Span 1

Span 2

Joint Elimination with Link Slabs

- ➔ Economical means of joint elimination
 - ❑ Reduce design time, structural removal, and reconstruction work
 - ❑ Avoid undesirable negative moments and higher beam reactions
 - ❑ Long and maintenance free service life
- ➔ Versatile
 - ❑ Superstructure type
 - ❑ Geometry

Presentation Topics

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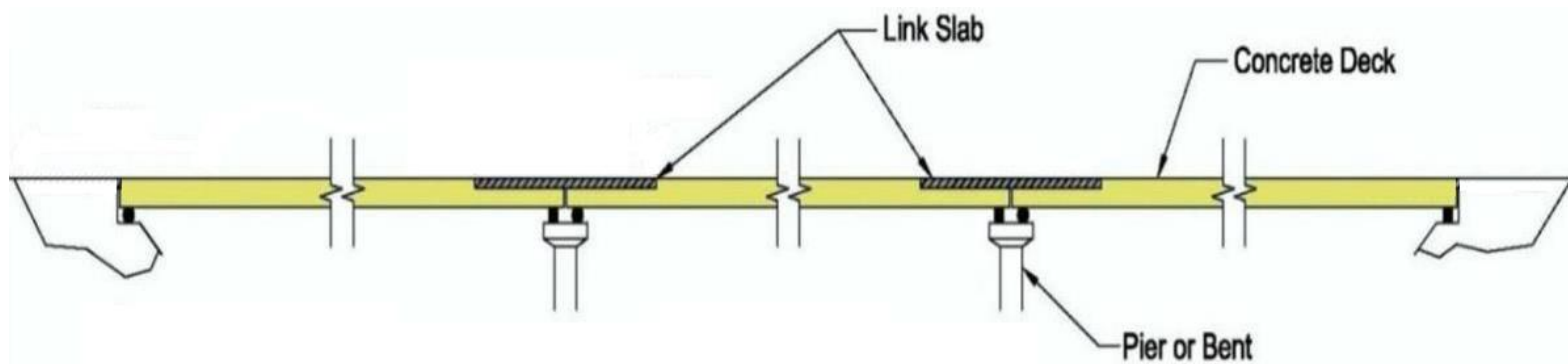
➔ UHPC Link Slabs

- ❑ Link Slabs – What, Why, and How
- ❑ What Makes a Good Candidate

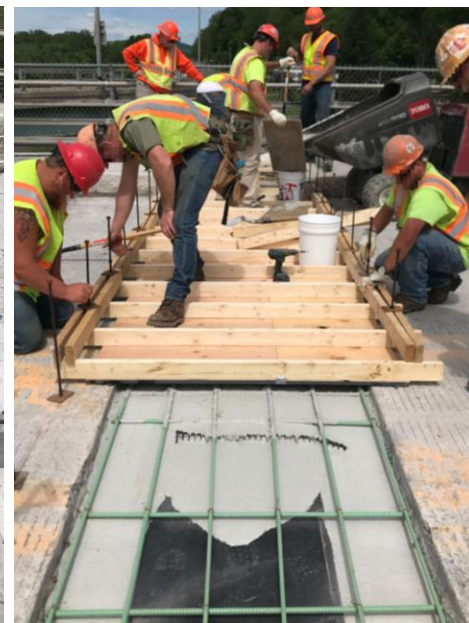
➔ Other Preservation Strategies with UHPC

➔ Question & Answer

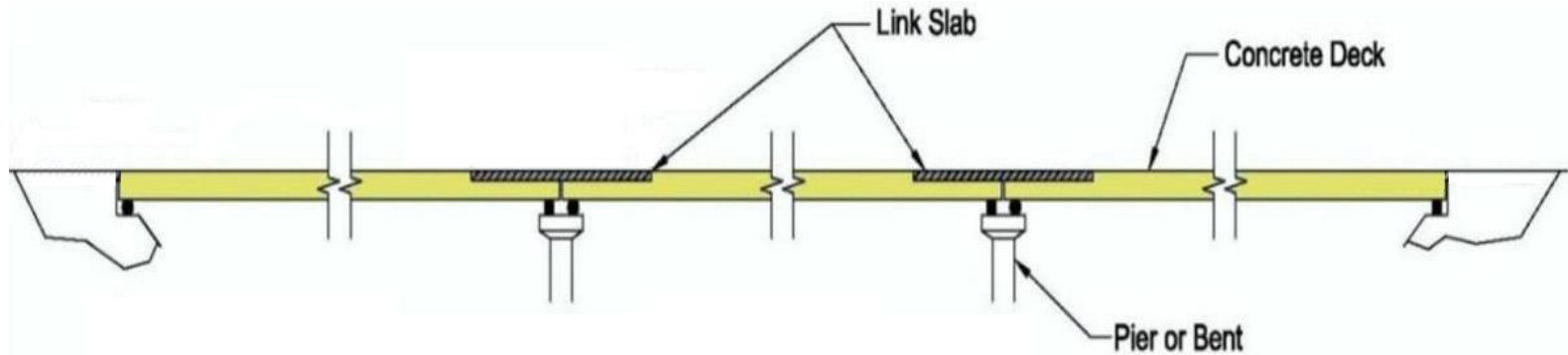
Link Slabs



3 Span With Link Slabs



Link Slabs

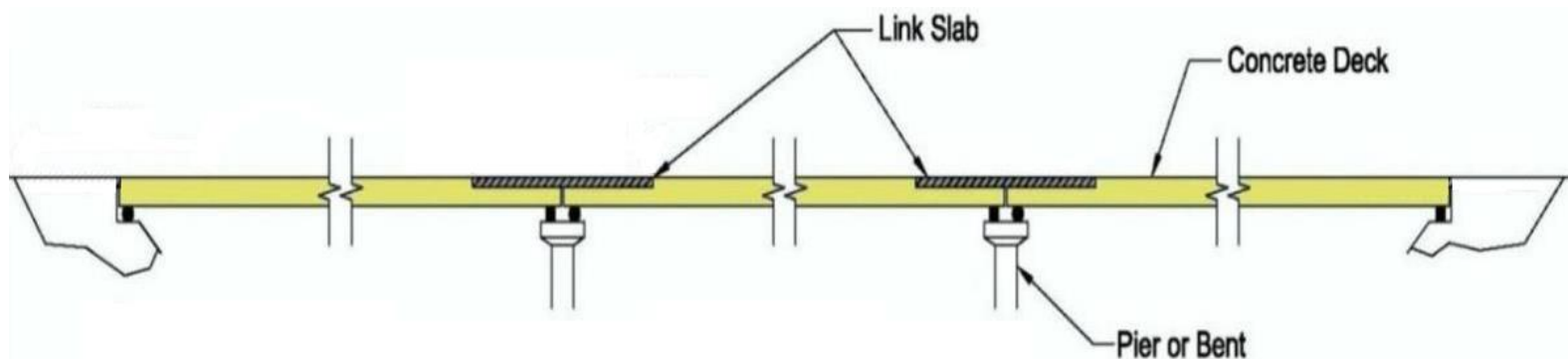


3 Span With Link Slabs

➔ Joint Elimination



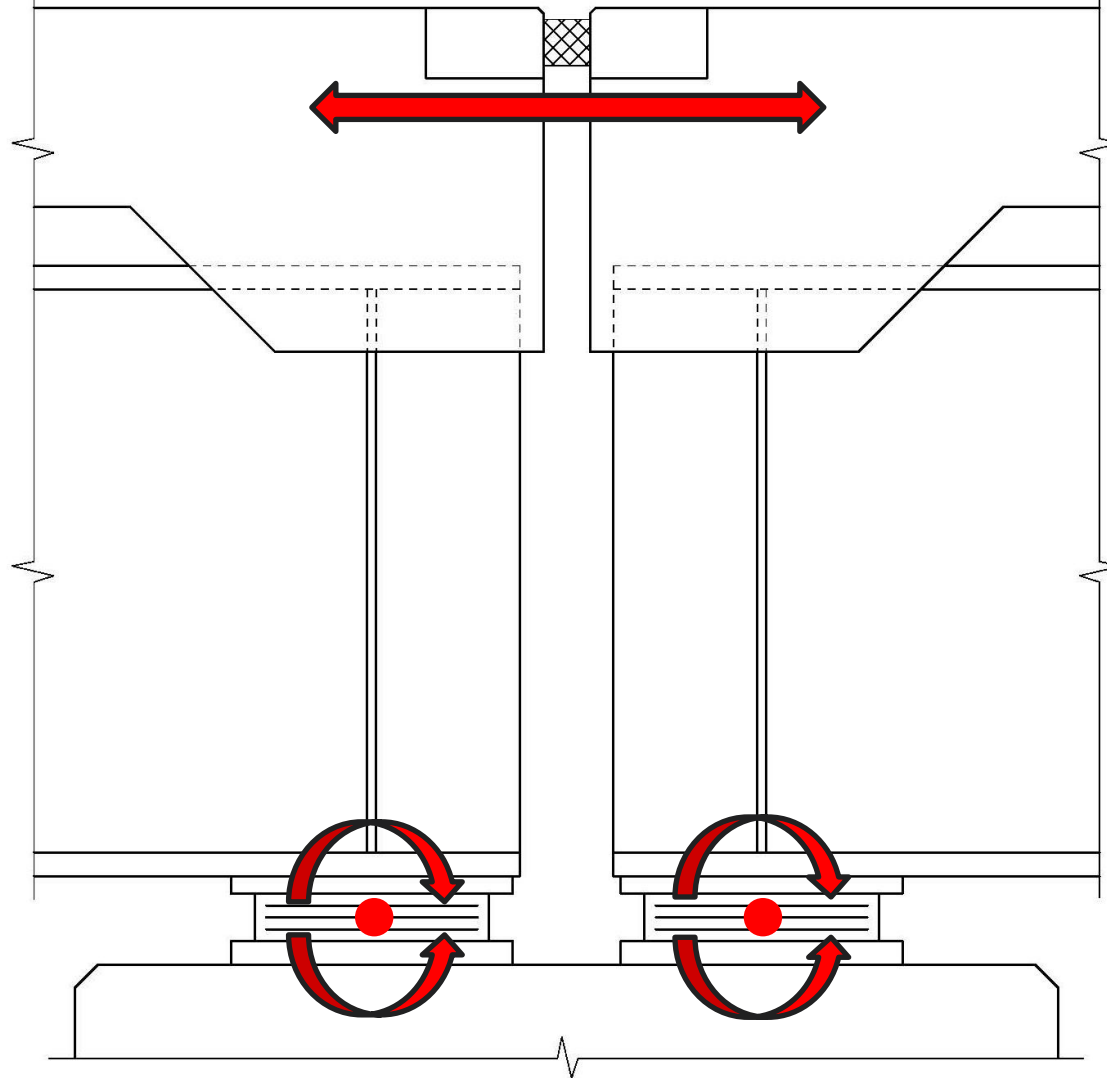
Link Slabs



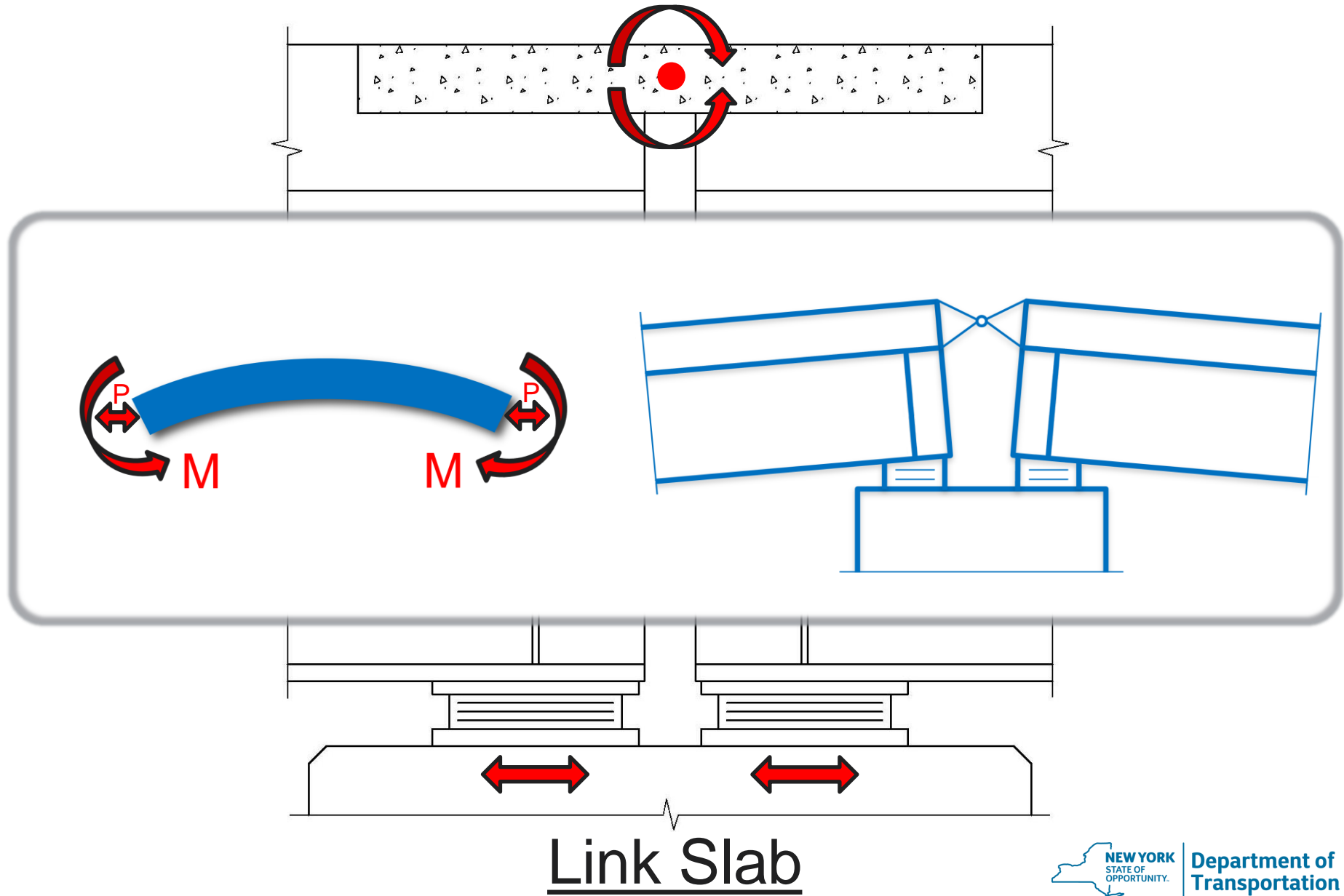
3 Span With Link Slabs

- ➔ Accelerated construction
- ➔ Complex framing geometry
- ➔ Continuous span uplift
- ➔ Continuous span cracking over piers
- ➔ Reduce seismic vulnerability

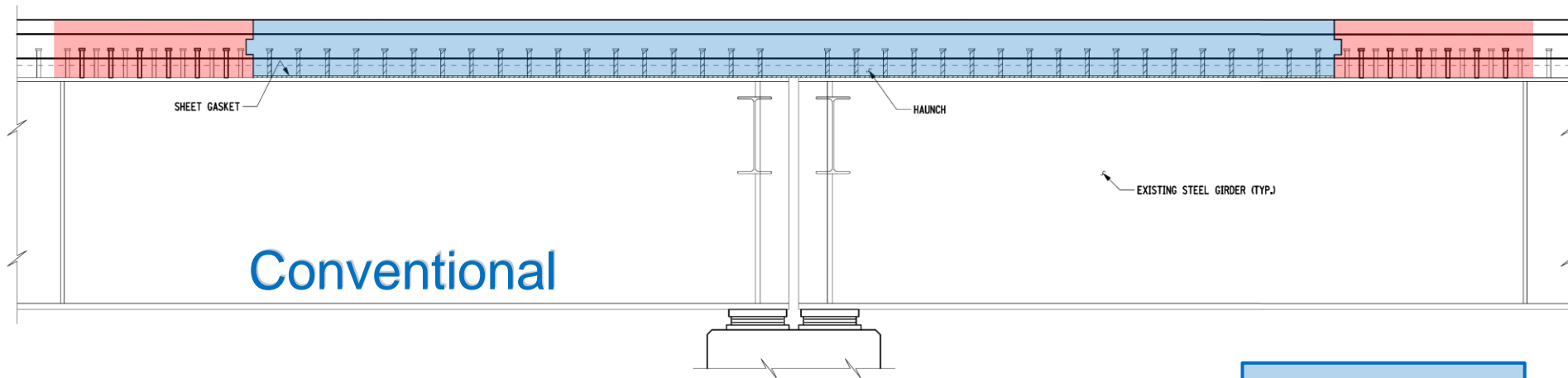
How Do Link Slabs Work?



Deck Joint



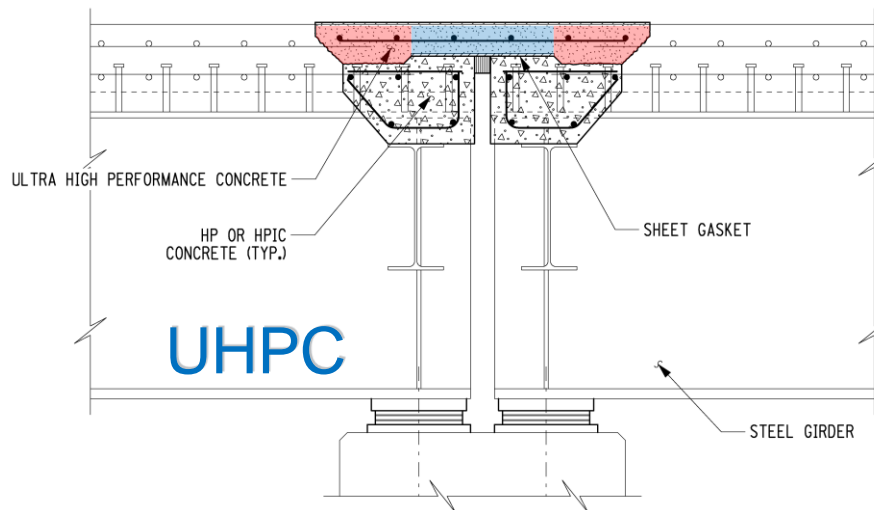
Conventional vs. UHPC Link Slab



Conventional

Debonded Zone

Anchor Zone

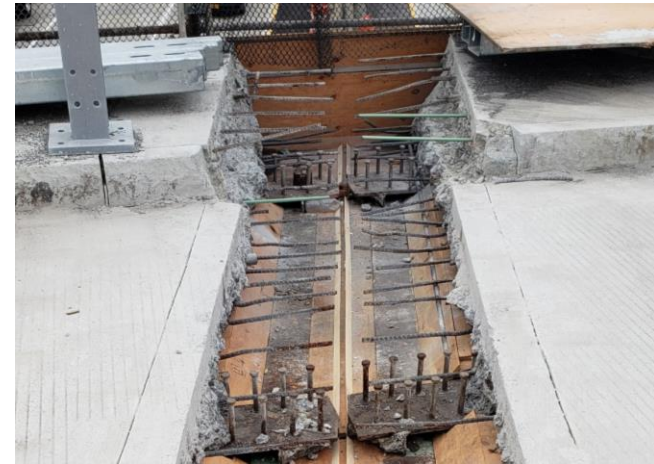


UHPC

STEEL GIRDER

Benefits of UHPC Link Slabs

- ➔ Only require reconstruction of deck ends
- ➔ Reduce construction duration
- ➔ Are highly durable and inherently ductile



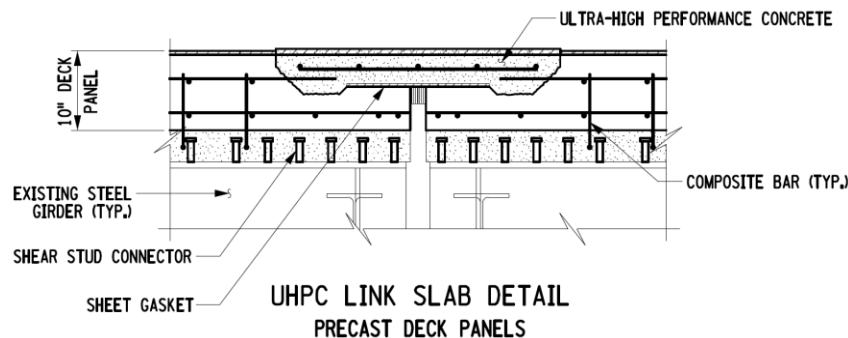
Credit: MDPI Sustainability Journal

UHPC Link Slabs for Joint Elimination

Scoping Considerations

➔ Ideal Conditions

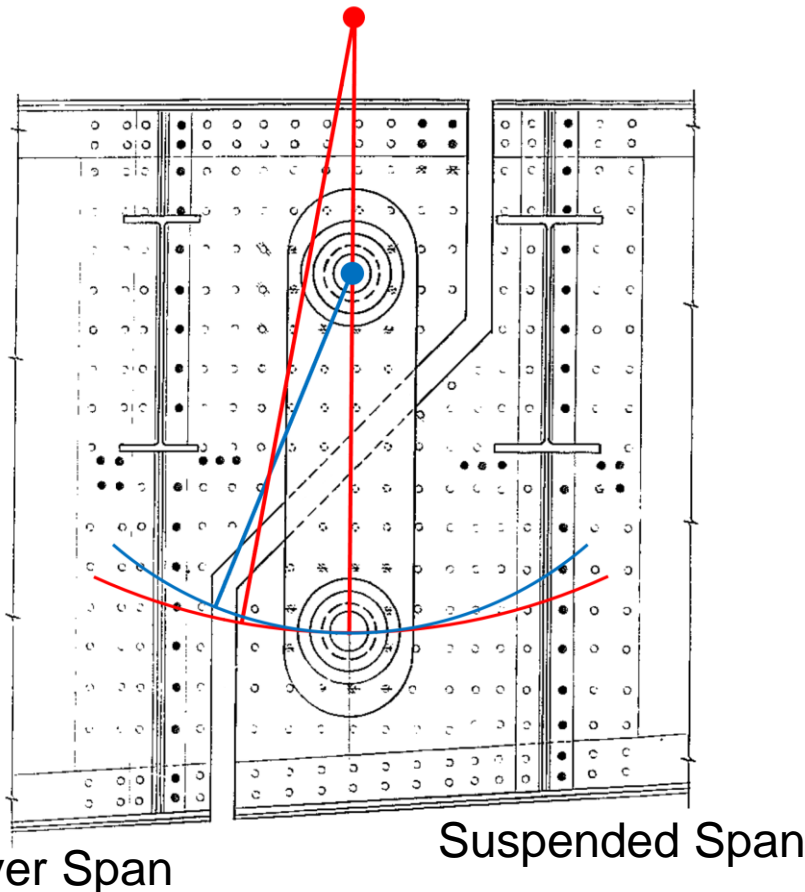
- ❑ Deck in fair or better condition
- ❑ Precast deck replacement
- ❑ No skew or slight skew
- ❑ Weekend closure permitted
- ❑ Bearings deteriorated and/or unstable



UHPC Link Slabs for Joint Elimination

Pin and Hanger

- ➔ Theorized tension increase in pin and hanger



UHPC Link Slabs for Joint Elimination

Pin and Hanger

- ➔ Sling Retrofit – Vulnerability removed, joint retained



UHPC Link Slabs for Joint Elimination

Pin and Hanger

➔ MassDOT Ship Lap Joint Detail

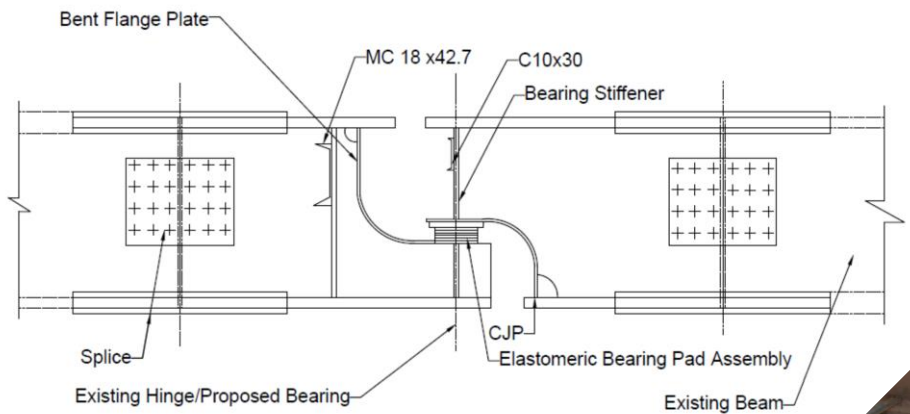


Figure 3.8 Ship lap joint detail (Mass DOT, 2014)



Credit: MassDOT

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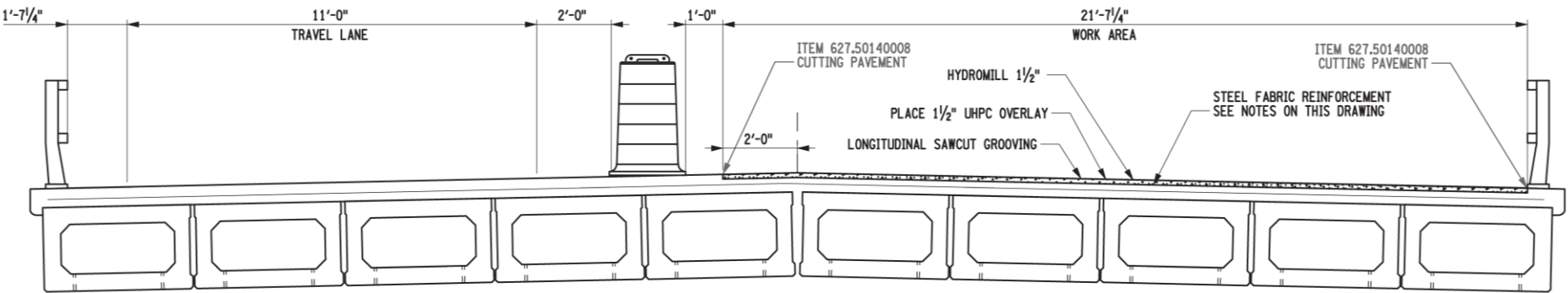
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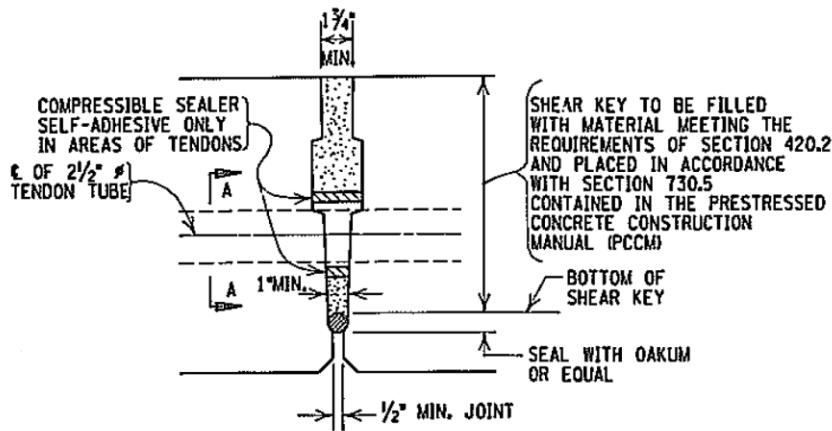
UHPC Overlay for Adjacent Box Beams



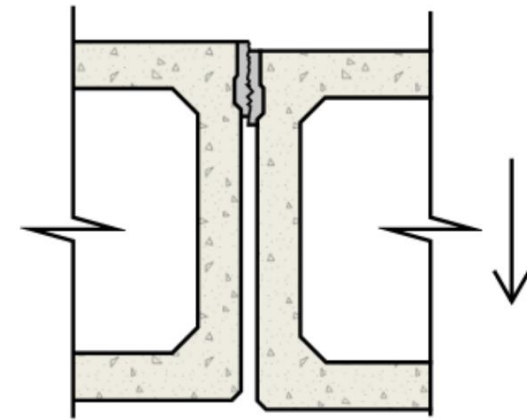
UHPC Overlay for Adjacent Box Beams



Typical Section



SLAB UNIT SHEAR KEY DETAIL



UHPC Overlay for Adjacent Box Beams



04/10/2018



04/10/2018

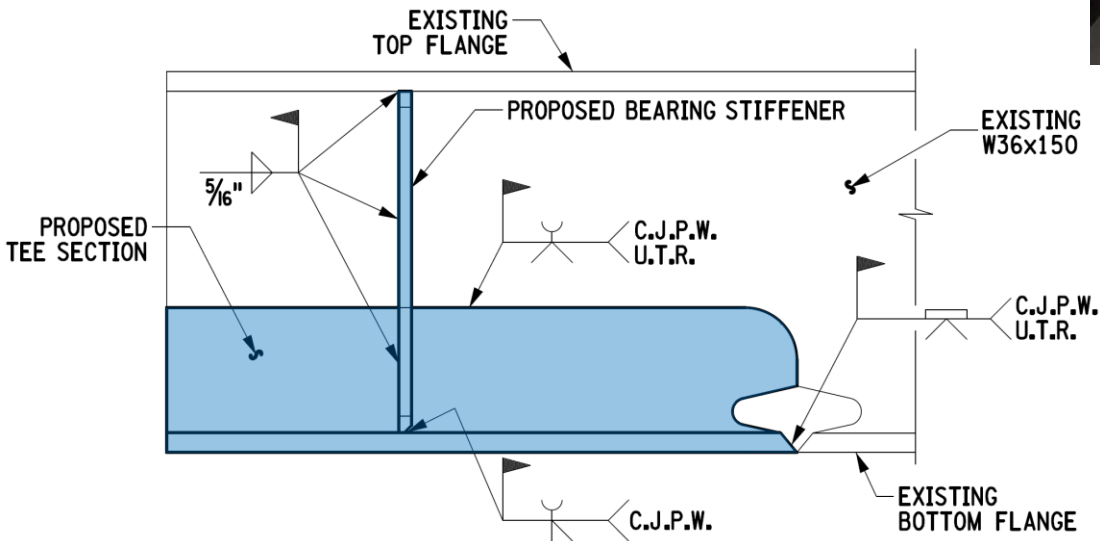
UHPC Overlay for Adjacent Box Beams



UHPC Overlay for Adjacent Box Beams



Conventional Steel Beam End Repair Solutions

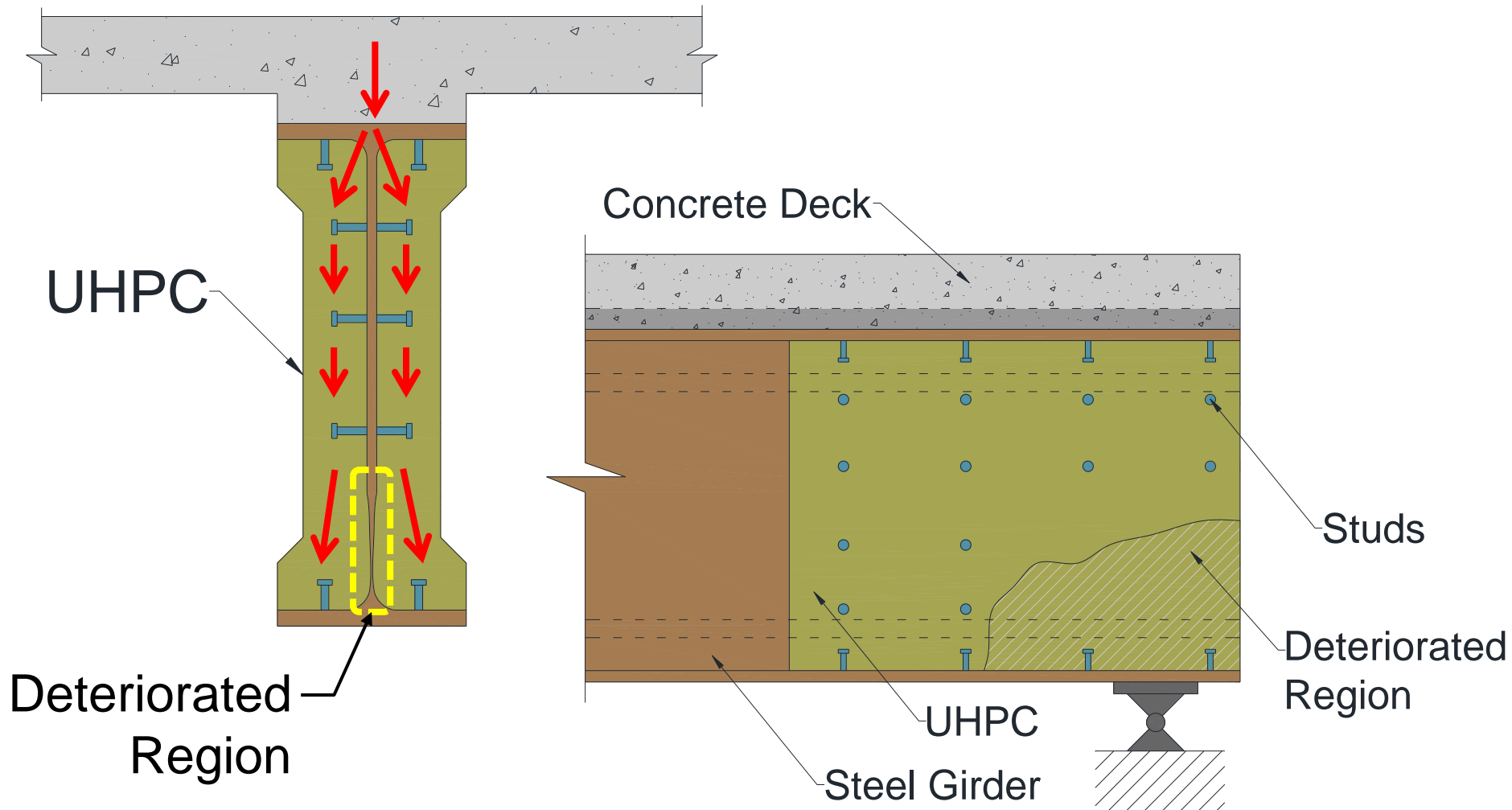


UHPC Beam End Repair

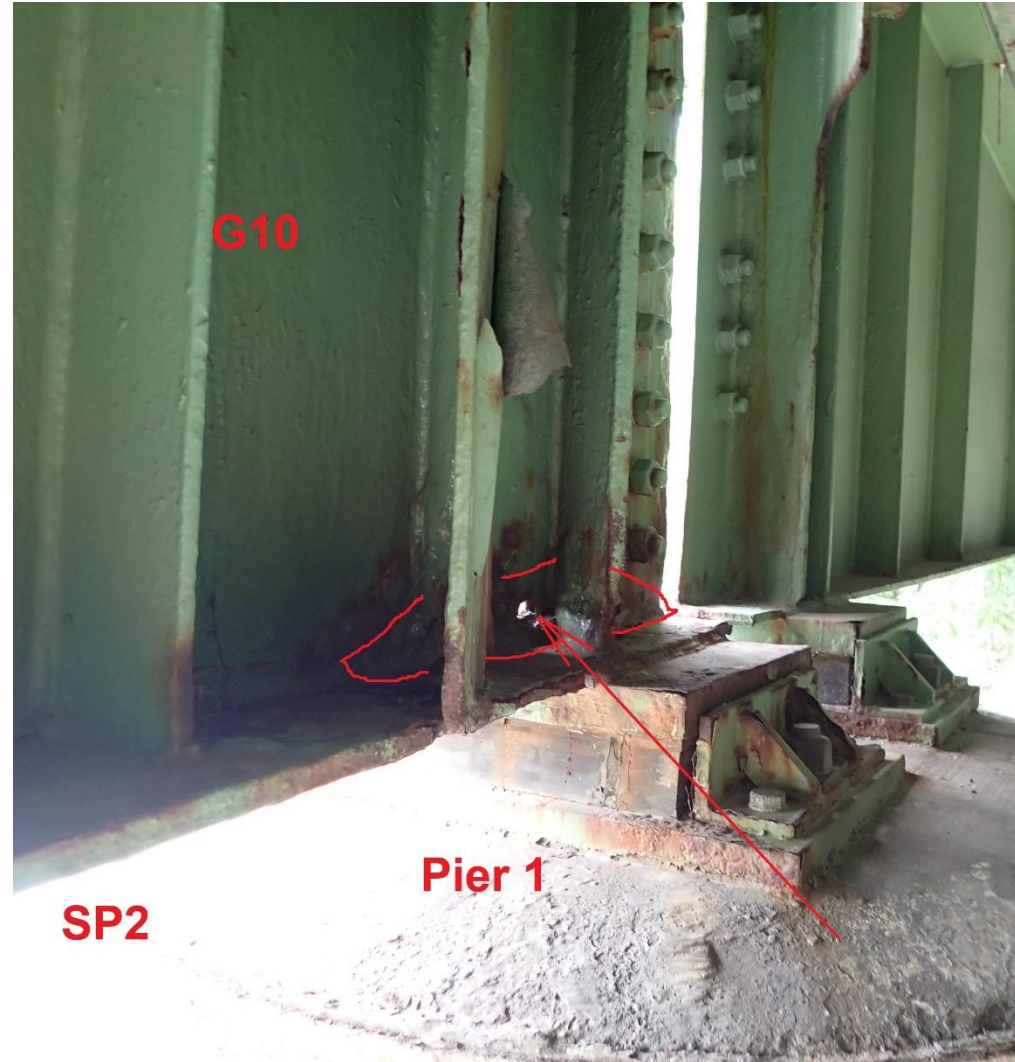
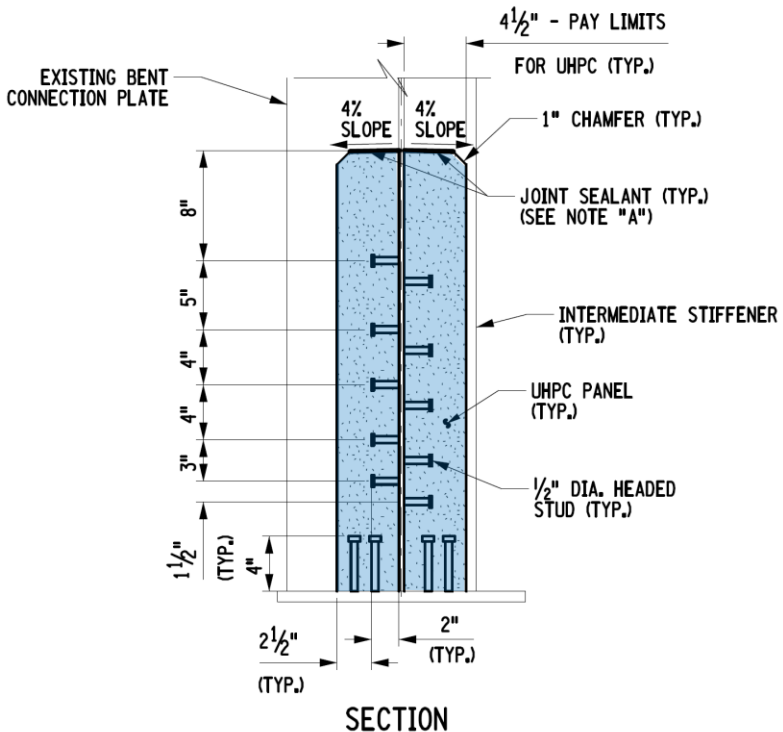
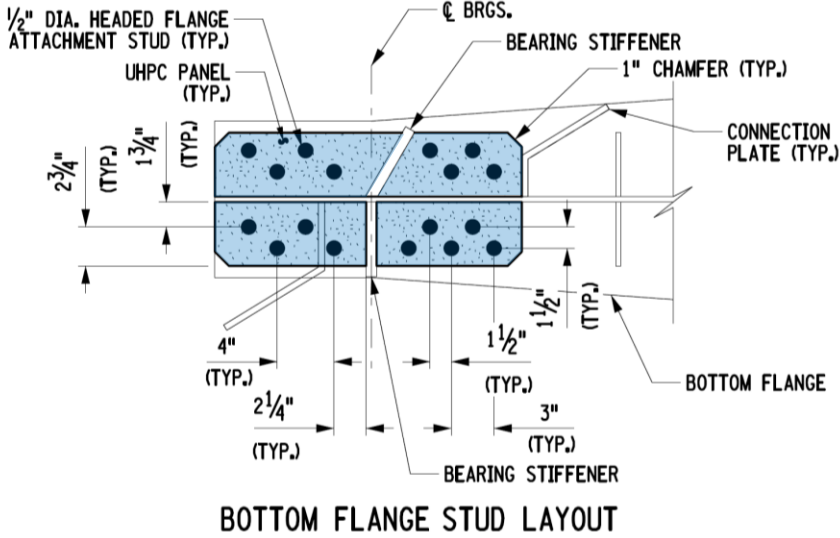


Credit: University of Connecticut

UHPC Beam End Repair



Credit: FHWA





UHPC Beam End Repair



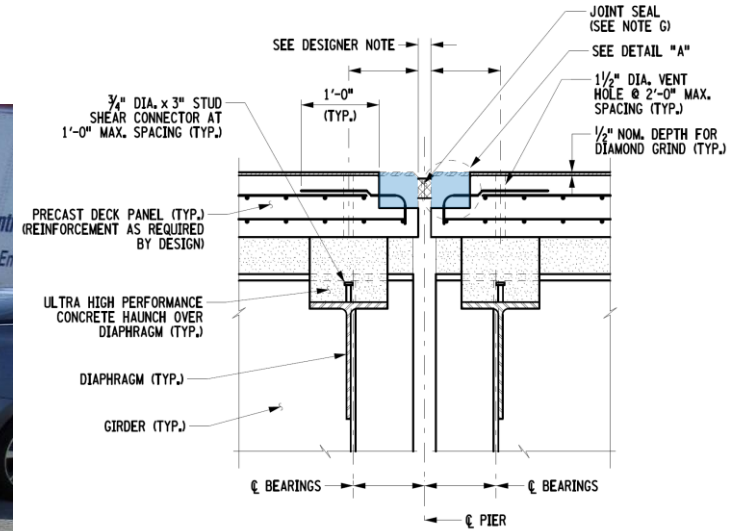
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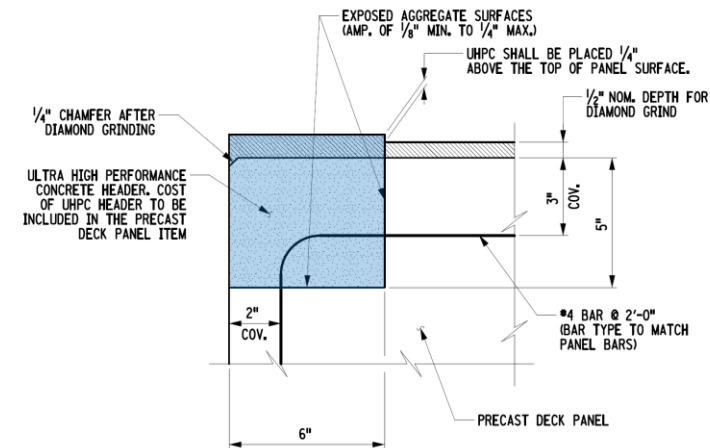


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UHPC Joint Headers

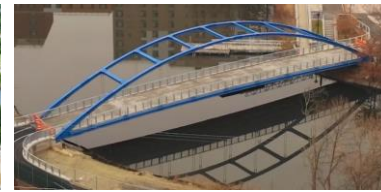


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Transportation



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Structures



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