



**Department of  
Transportation**



**Office of  
Structures**

# Joint Elimination, Link Slabs, And UHPC



**Jim Scarlata, PE**  
Structures Design Bureau  
[Jim.Scarlata@dot.ny.gov](mailto:Jim.Scarlata@dot.ny.gov)

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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

- ➔ 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



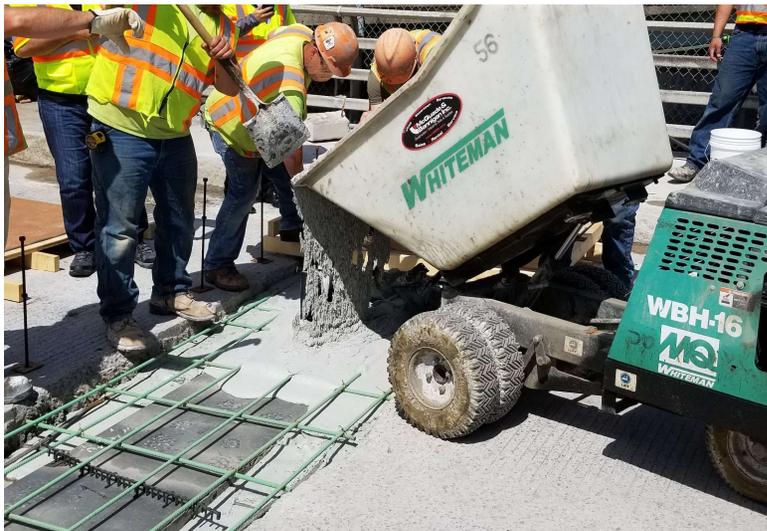
## Concrete End Diaphragm



## Conversion to Integral Abutments



## UHPC Link Slabs





# 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

## ➔ Joint Elimination

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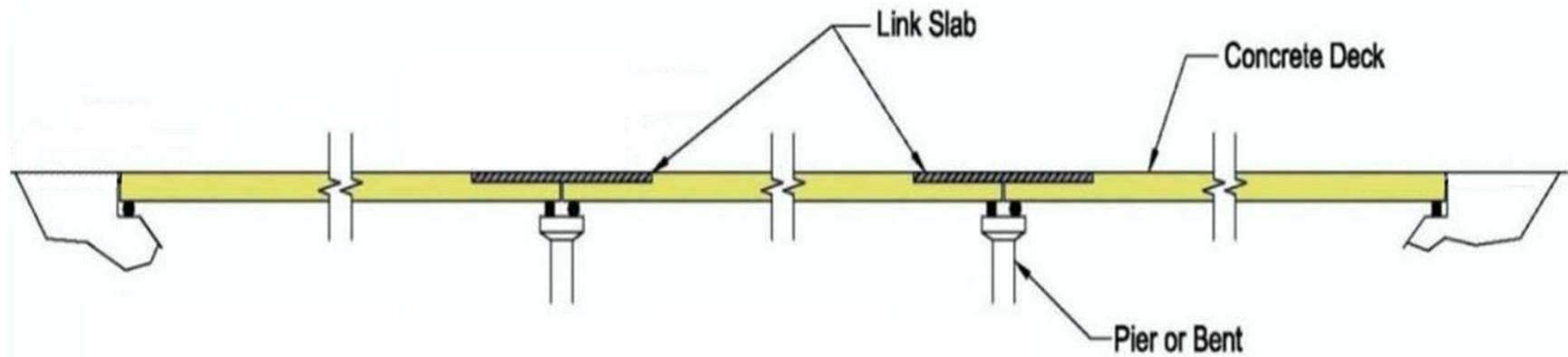
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- ❑ Link Slabs – What, Why, and How
- ❑ What Makes a Good Candidate

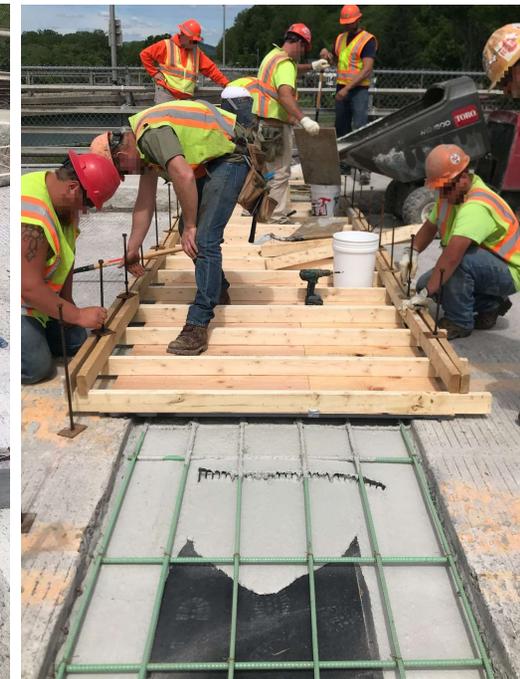
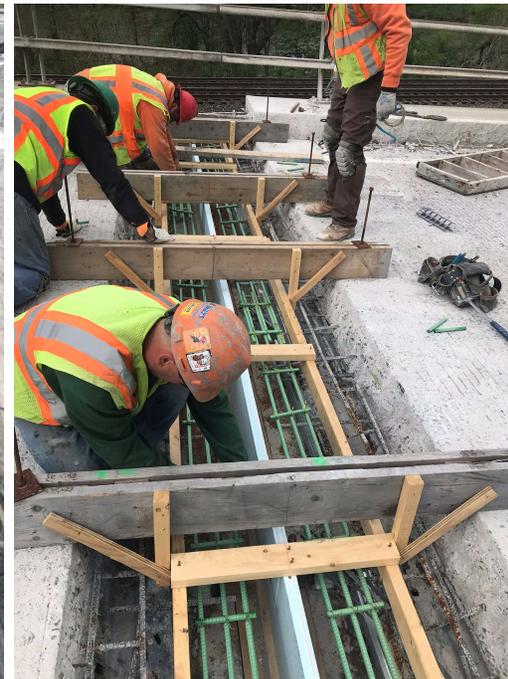
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## ➔ Question & Answer

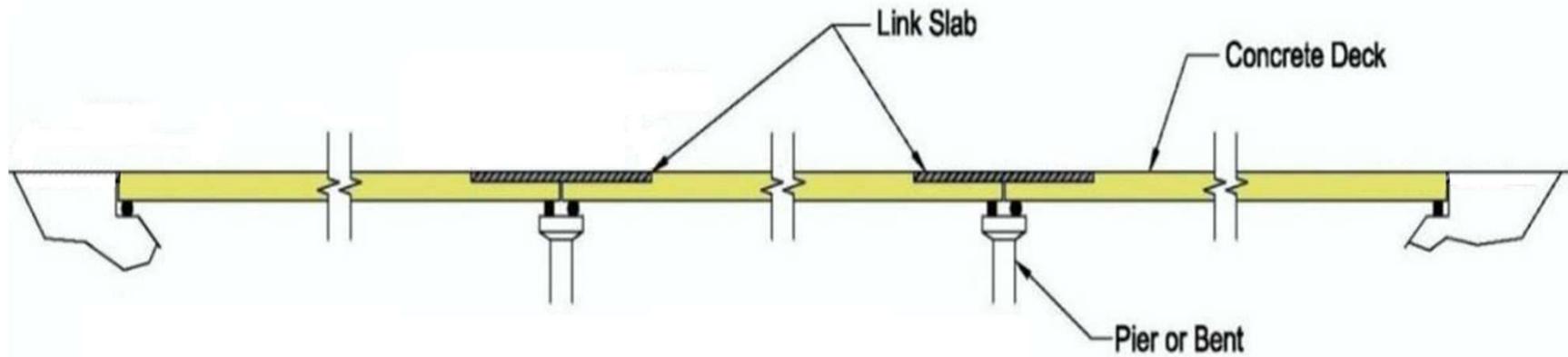
# Link Slabs



## 3 Span With Link Slabs



# Link Slabs

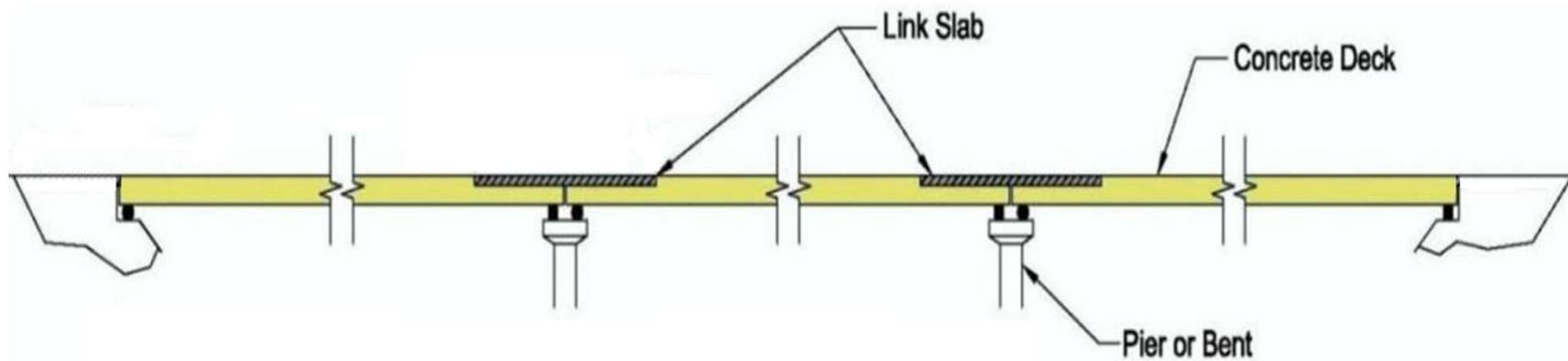


## 3 Span With Link Slabs

### ➔ Joint Elimination



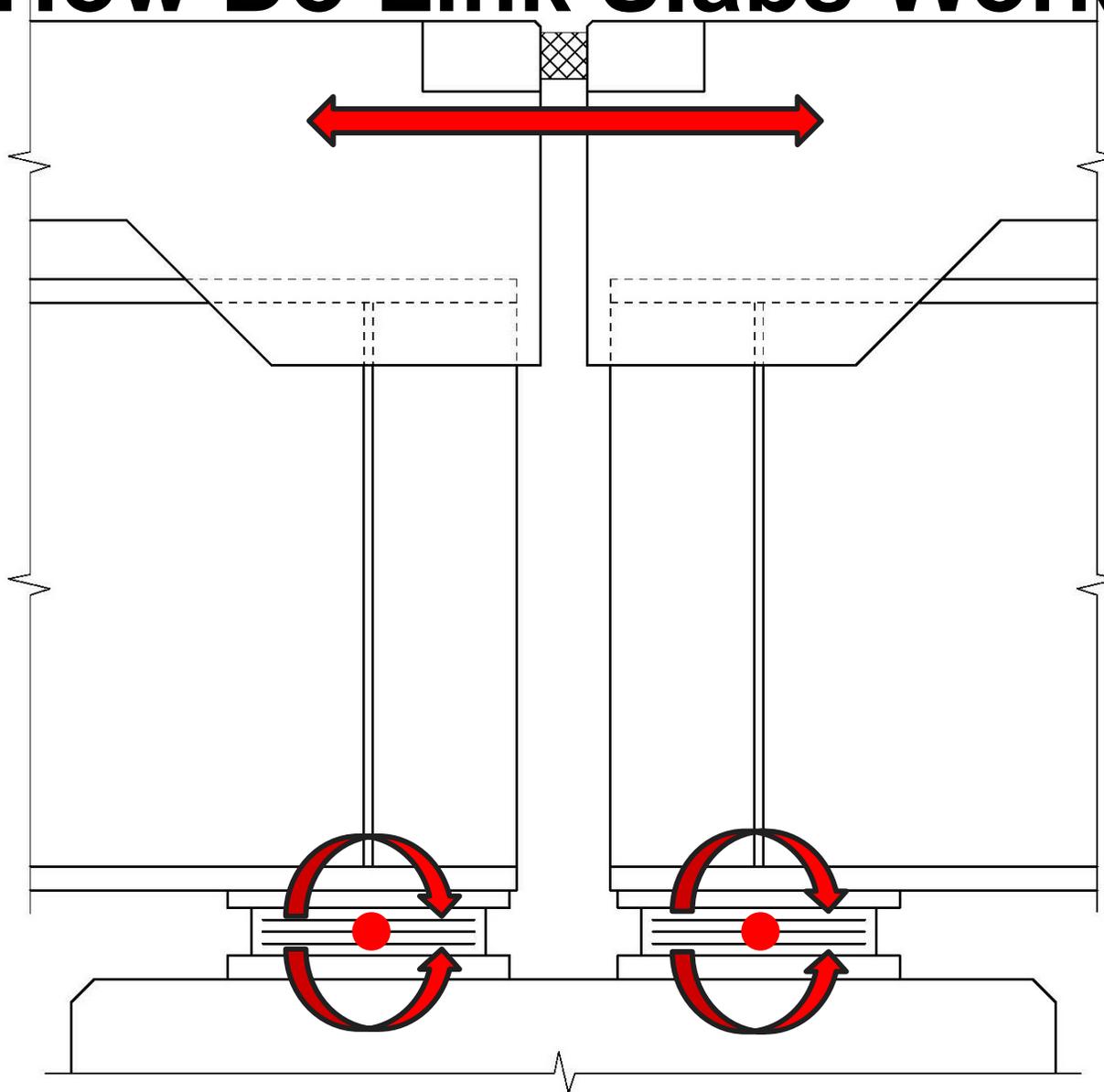
# Link Slabs



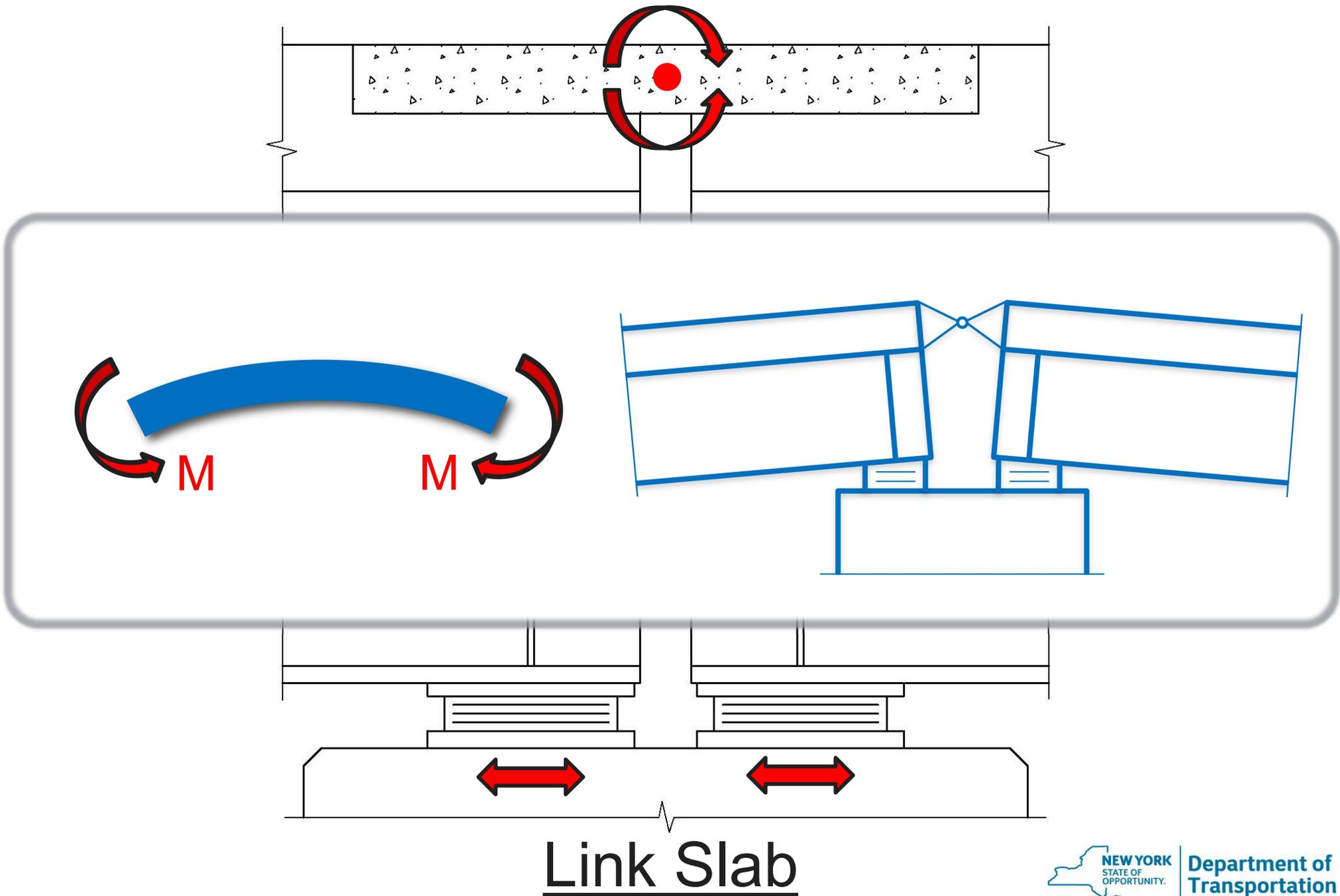
## 3 Span With Link Slabs

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

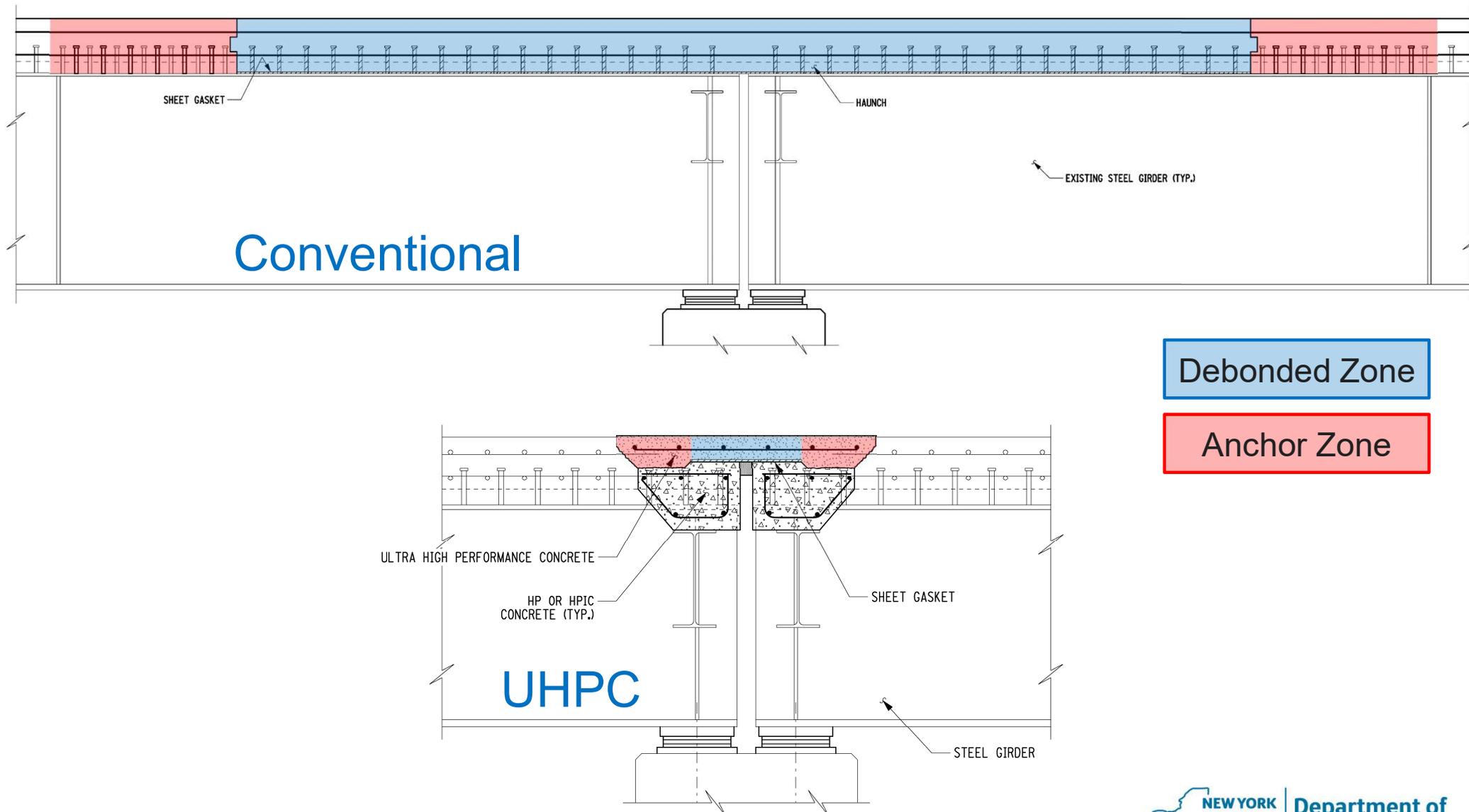
# How Do Link Slabs Work?



Deck Joint



# Conventional vs. UHPC Link Slab



Debonded Zone

Anchor Zone

# Benefits of UHPC Link Slabs

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



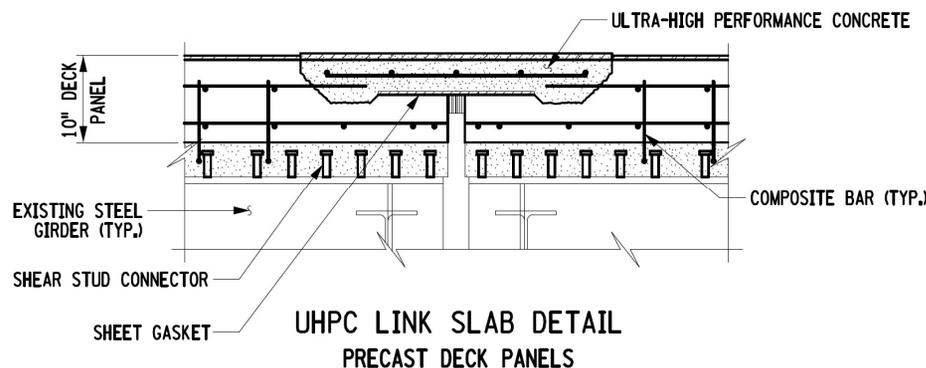
Credit: MDPI Sustainability Journal

# 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

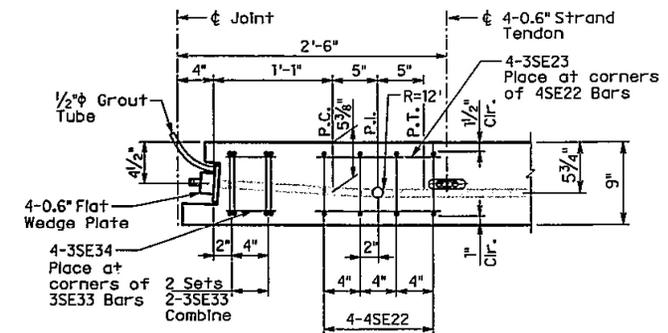


# UHPC Link Slabs for Joint Elimination

## Scoping Considerations

### ➔ Obstacles

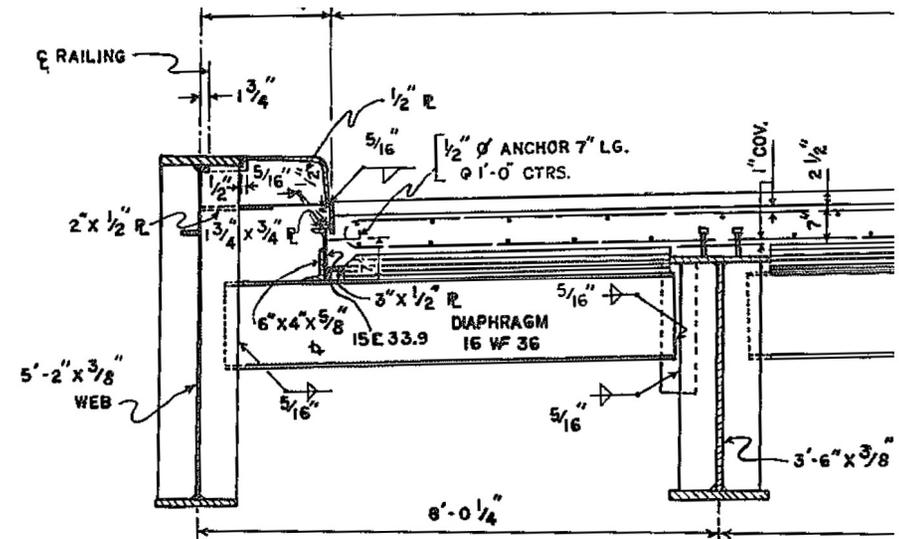
- ❑ Highly skewed supports - bearing layout, horizontal load distribution
- ❑ Railing mounted on top flange
- ❑ Post-tensioned deck
- ❑ Joint over Pin & Hanger



SECTION F-F

LONGITUDINAL POST-TENSIONING ANCHOR

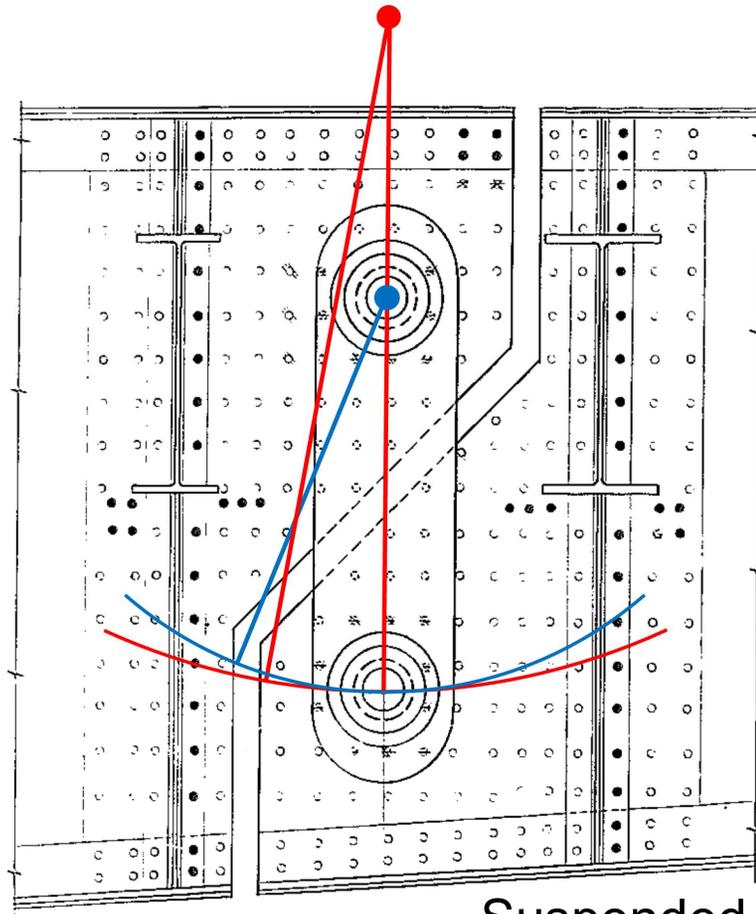
Scale: 1/2" = 1'-0"



# UHPC Link Slabs for Joint Elimination

## Pin and Hanger

- ➔ Theorized tension increase in pin and hanger



Cantilever Span

Suspended Span



# 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

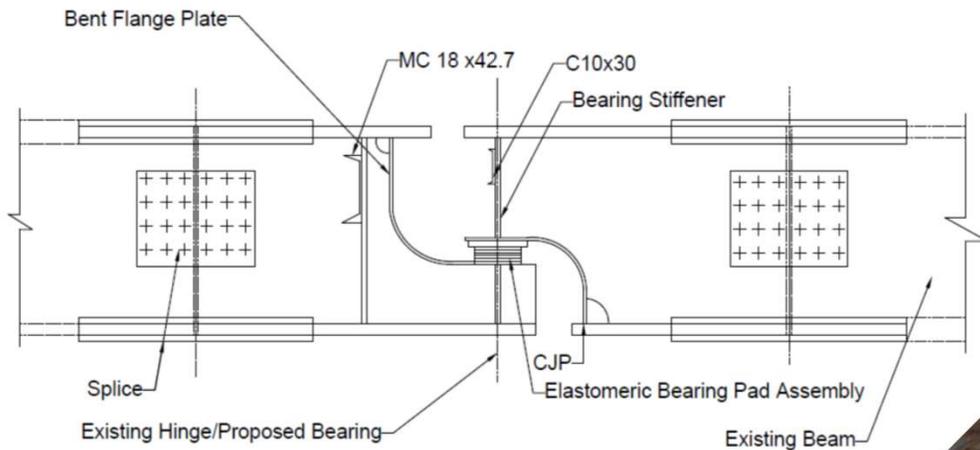
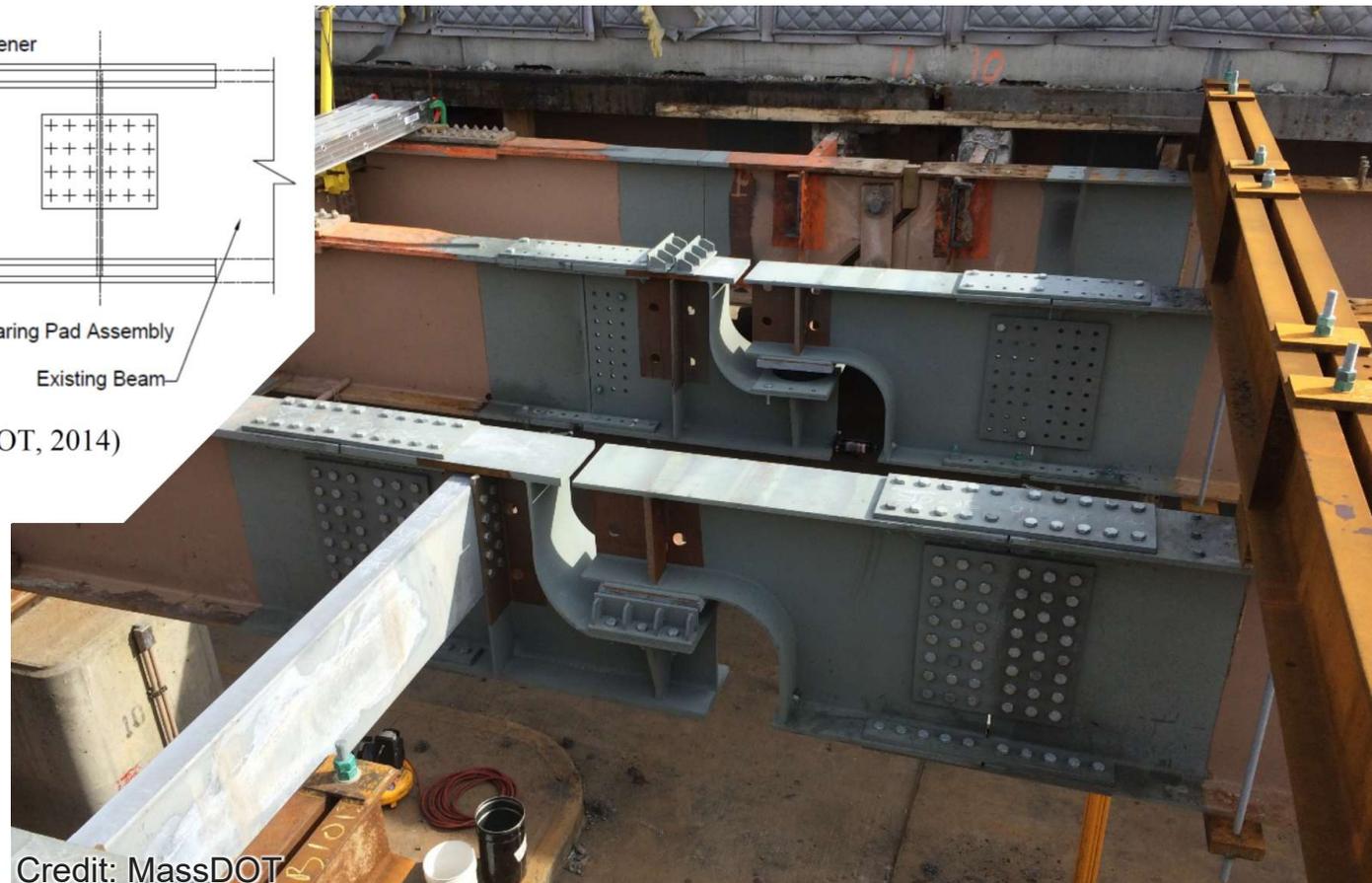


Figure 3.8 Ship lap joint detail (Mass DOT, 2014)



Credit: MassDOT

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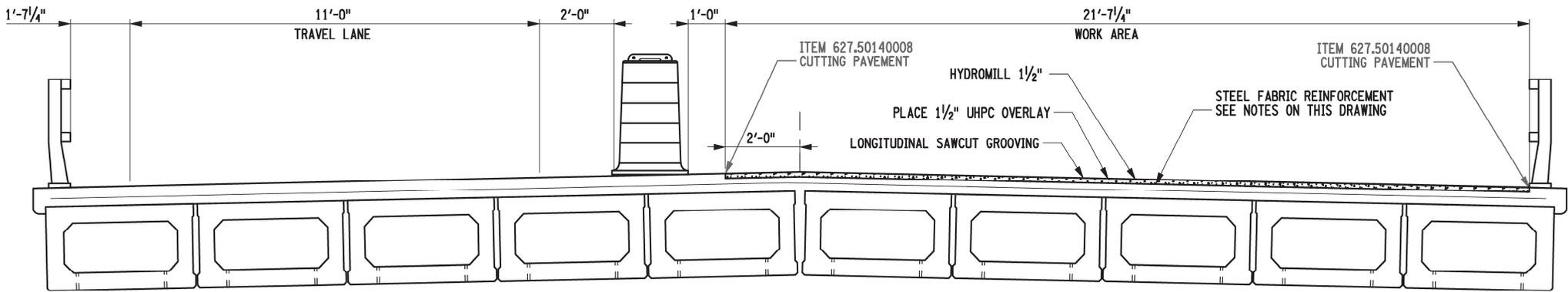
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## ➔ Question & Answer

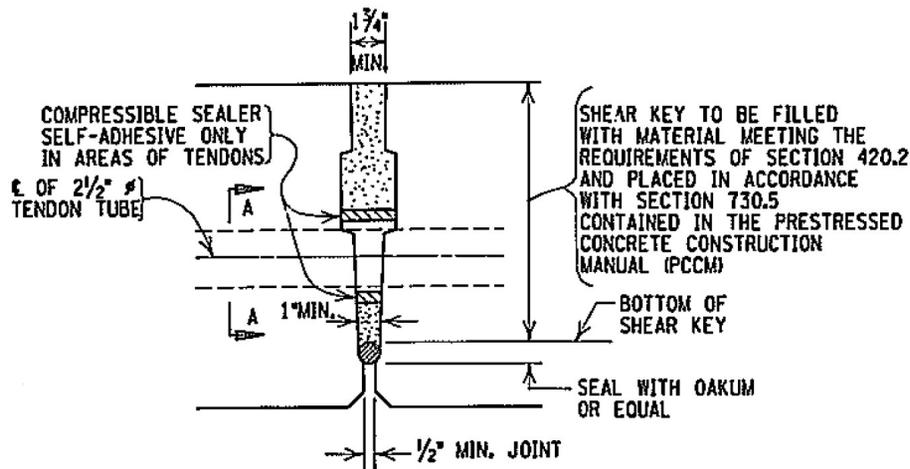
# UHPC Overlay for Adjacent Box Beams



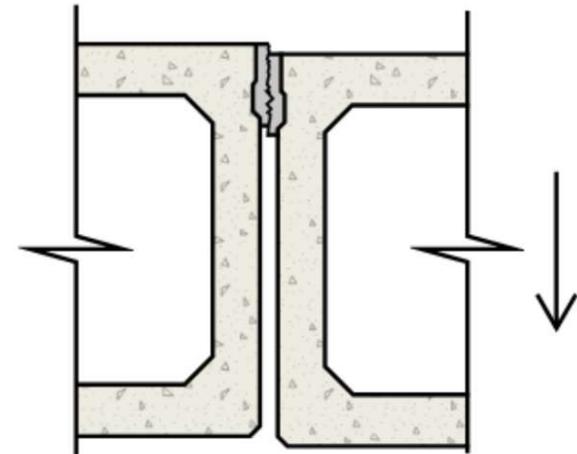
# UHPC Overlay for Adjacent Box Beams



Typical Section



SLAB UNIT SHEAR KEY DETAIL



# UHPC Overlay for Adjacent Box Beams



# UHPC Overlay for Adjacent Box Beams



04/10/2018

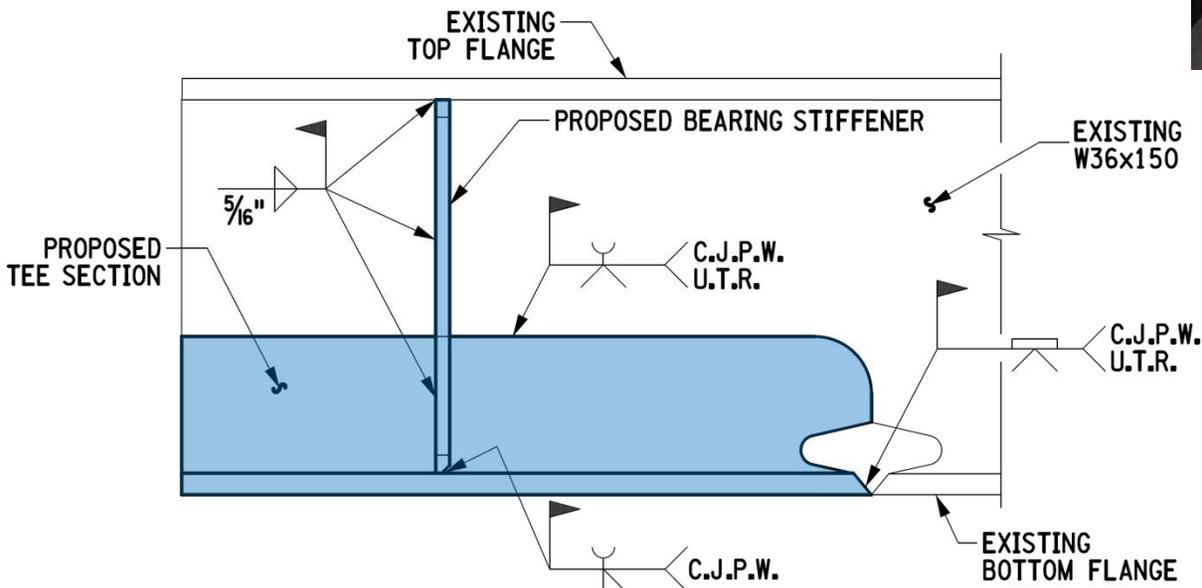
# UHPC Overlay for Adjacent Box Beams



# UHPC Overlay for Adjacent Box Beams



## Conventional Steel Beam End Repair Solutions

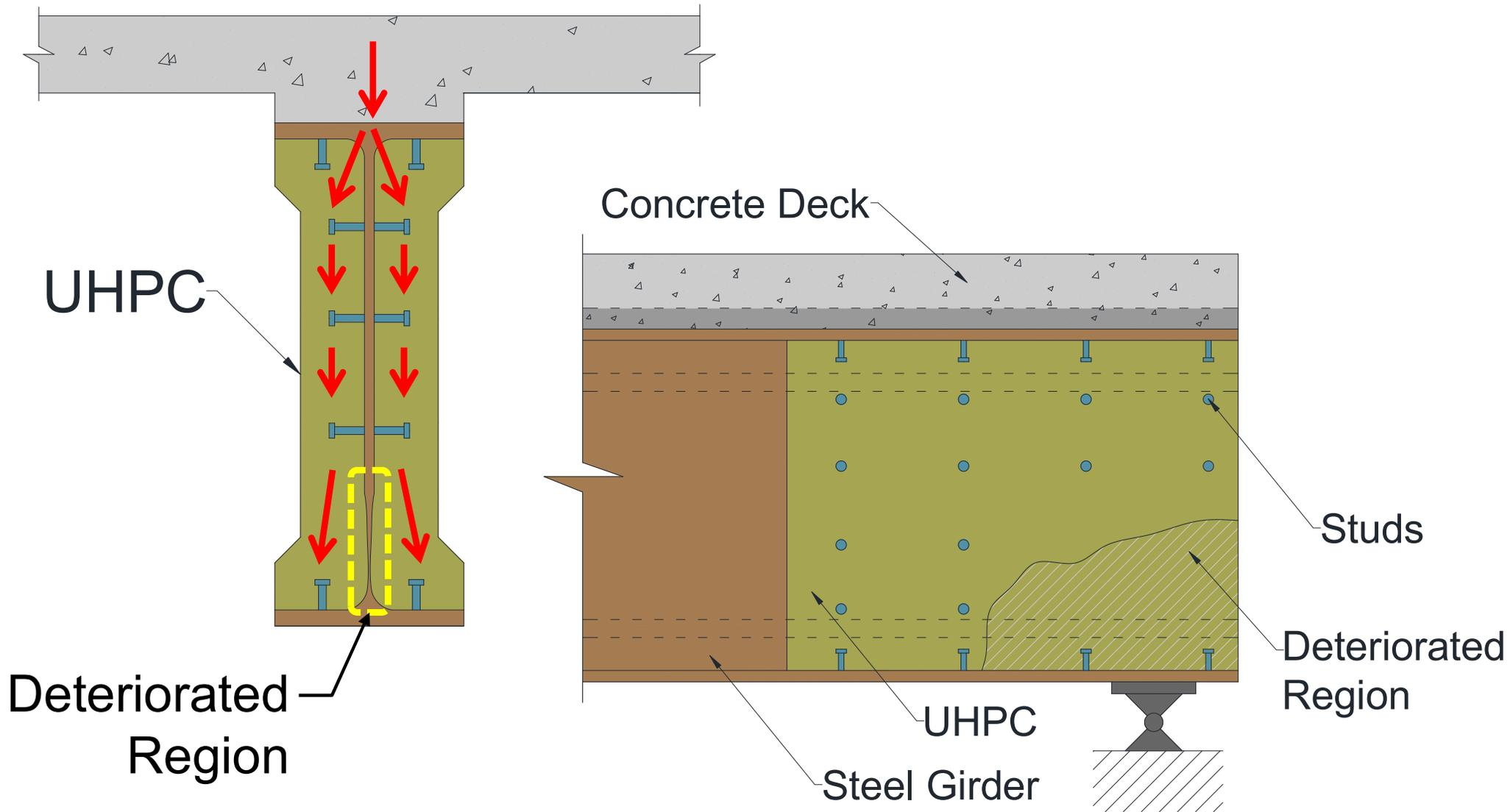


# UHPC Beam End Repair



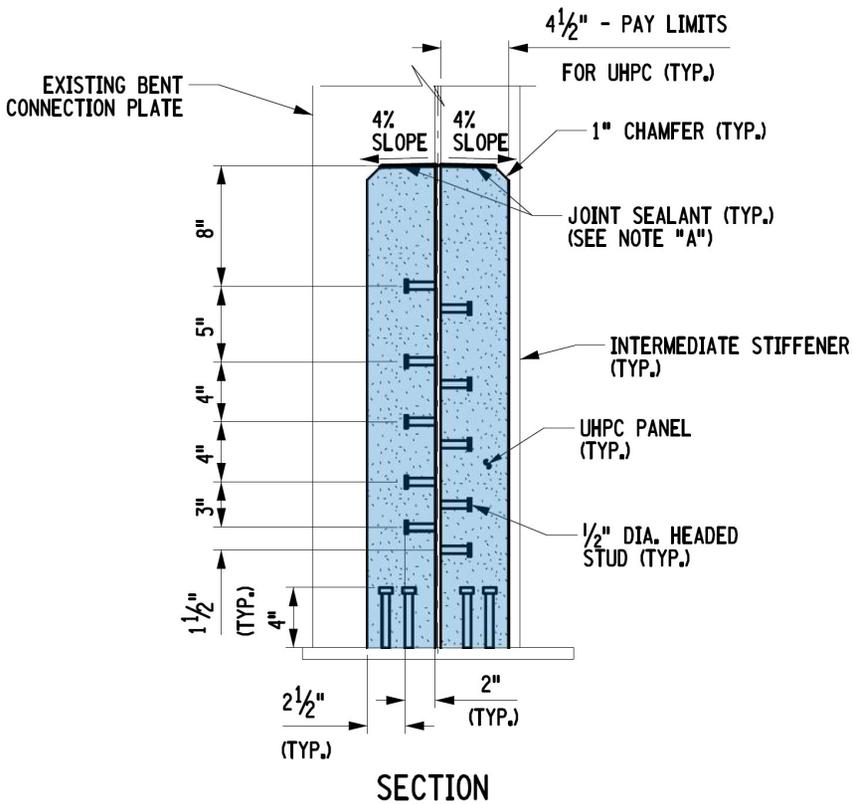
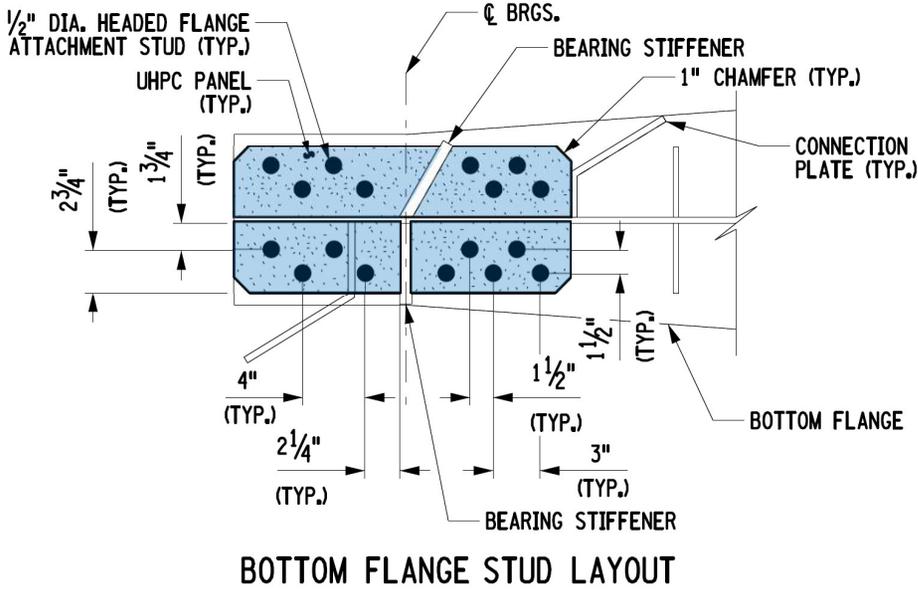
Credit: University of Connecticut

# UHPC Beam End Repair



Credit: FHWA

# UHPC Beam End Repair



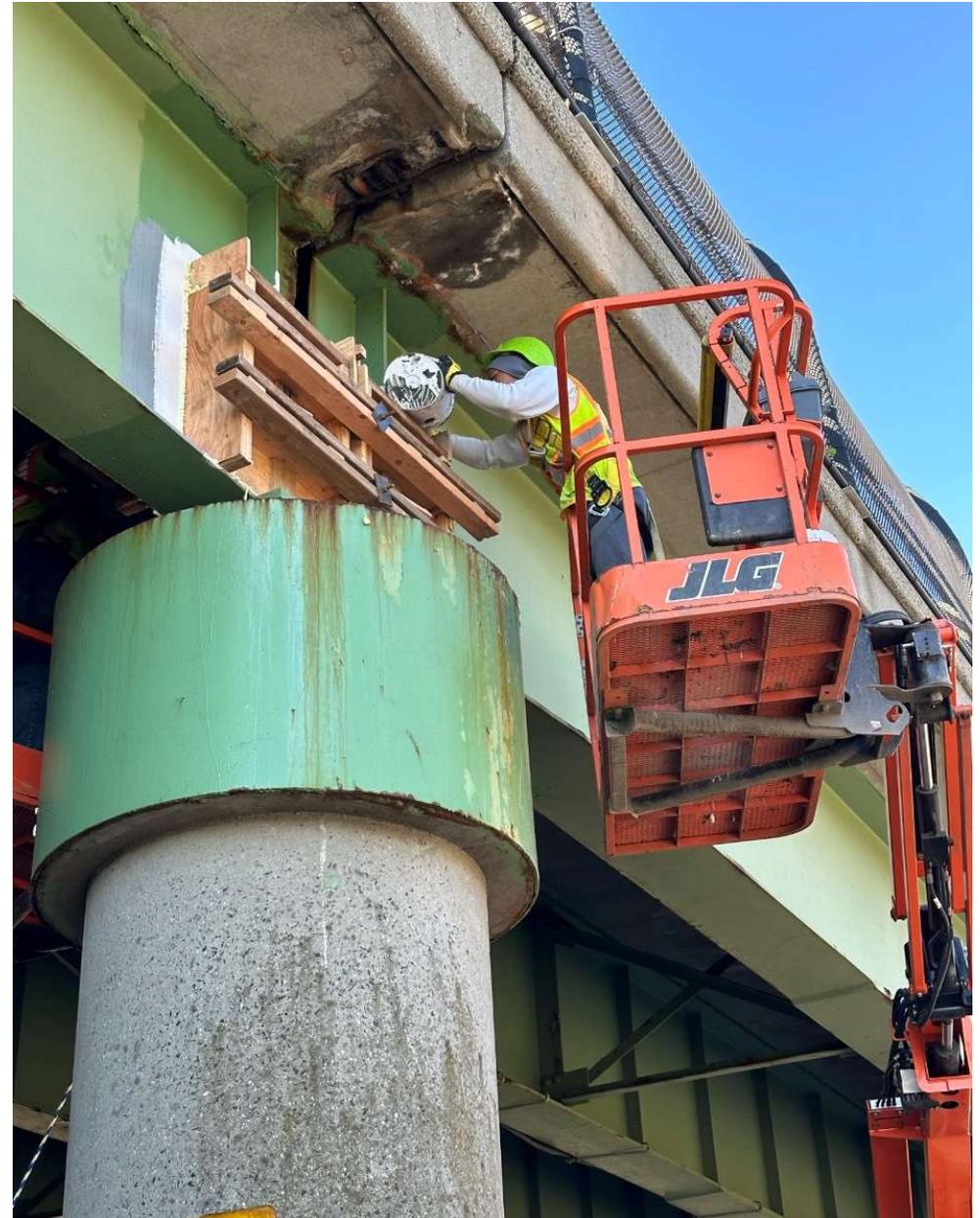
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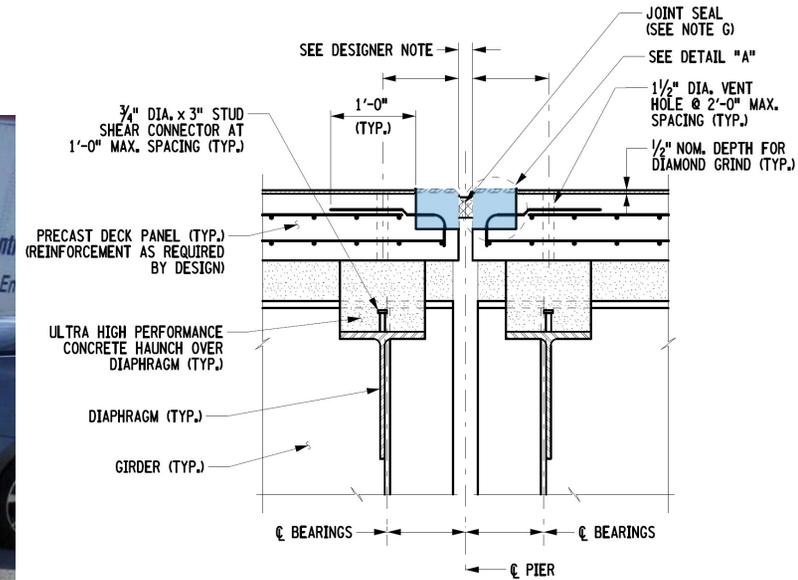
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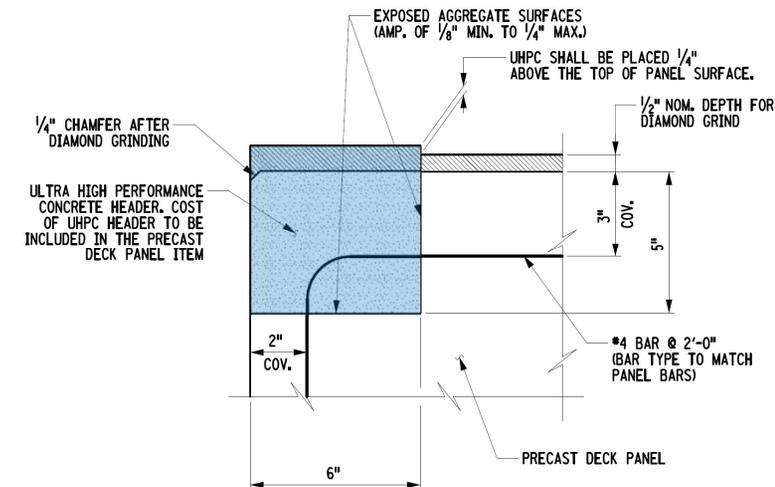
# UHPC Beam End Repair



# UHPC Joint Headers



ARMORLESS JOINT AT PIER





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