UHPC for Accelerated Bridge Construction (DOT Experience)

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NYSDOT

NEW YORK STATE OF OPPORTUNITY. Department of Transportation

Compression Behavior

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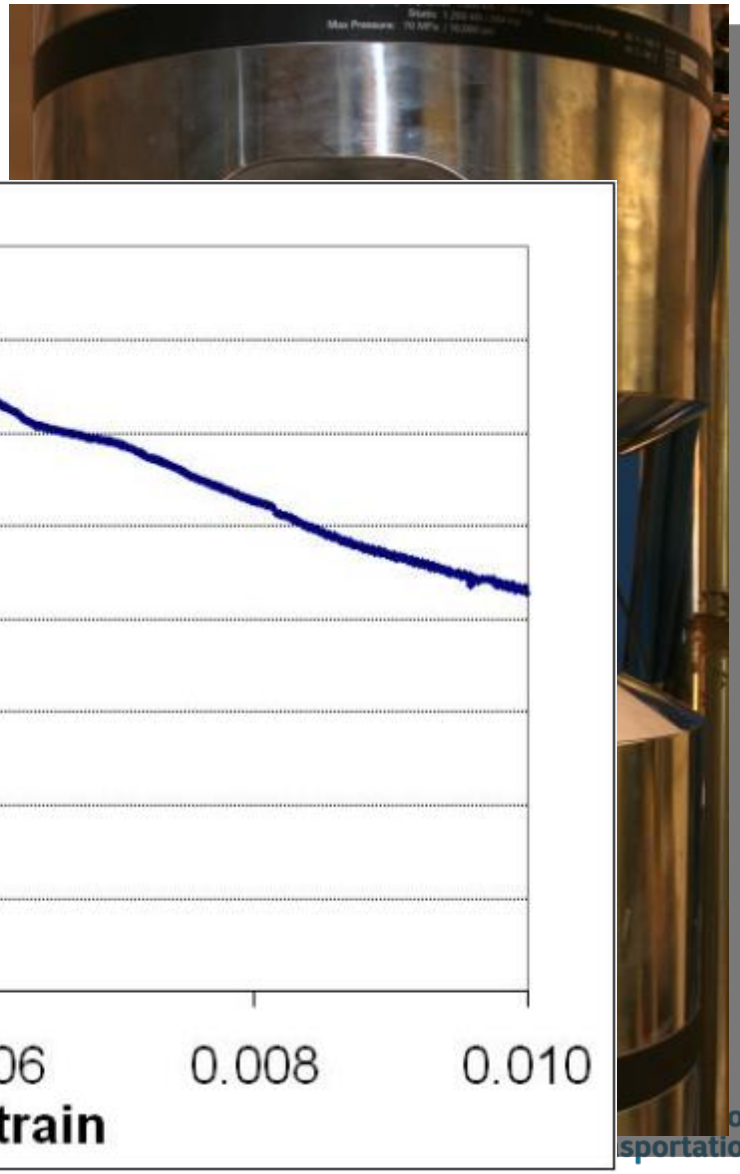
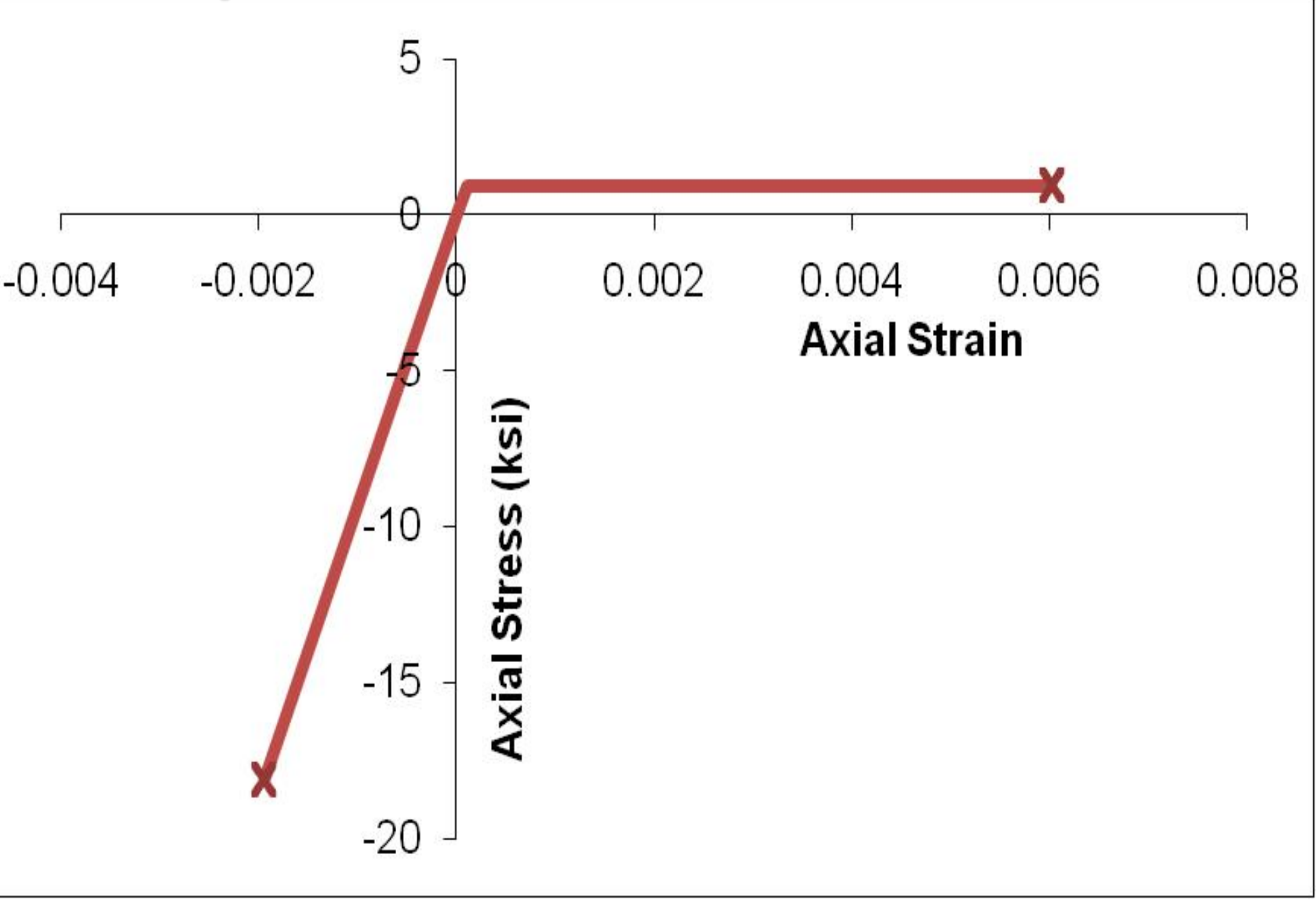
Tensile Behavior




5
0
-5
-10
-15
-20
-0.004
-0.002
0
0.002
0.004
0.006
0.008
Axial Strain
Axial Stress (ksi)

UHPC Connections

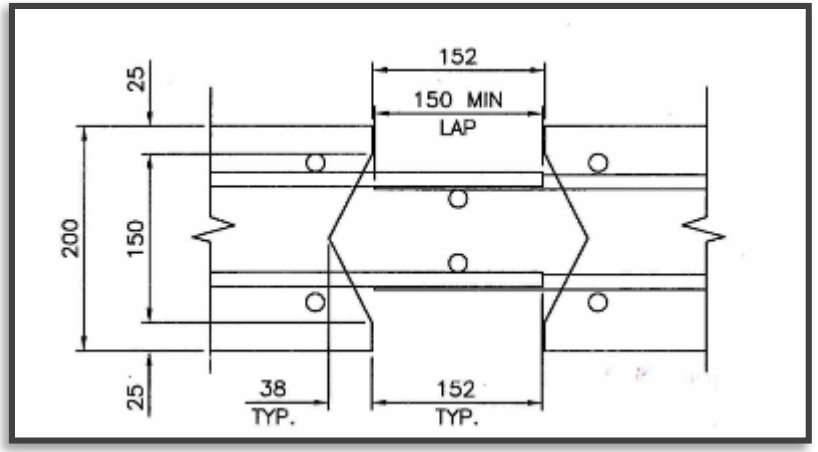
- Deck-to-Deck
- Deck-to-Girder
- Deck Beam-to-Deck Beam
- Column-to-Footing/Cap
- Girder-to-Girder
- Deck-to-Barrier
- Headers for Expansion Joint

Development Length Tests

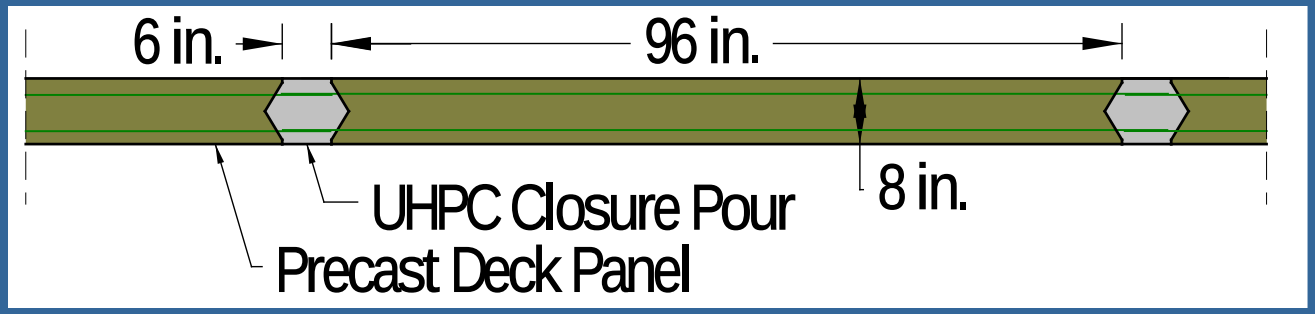
#4 BARS (BLACK & EPOXY) – 3” EMBEDMENT
#5 BARS (BLACK & EPOXY) – 4” EMBEDMENT
#6 BARS (BLACK & EPOXY) – 5” EMBEDMENT

Field-Cast "Splice" Connections

- Simple Lap-Splice Cxn.
- Smaller Grout Volumes
- Shortened Bar Lengths
- Emulates Monolithic Component

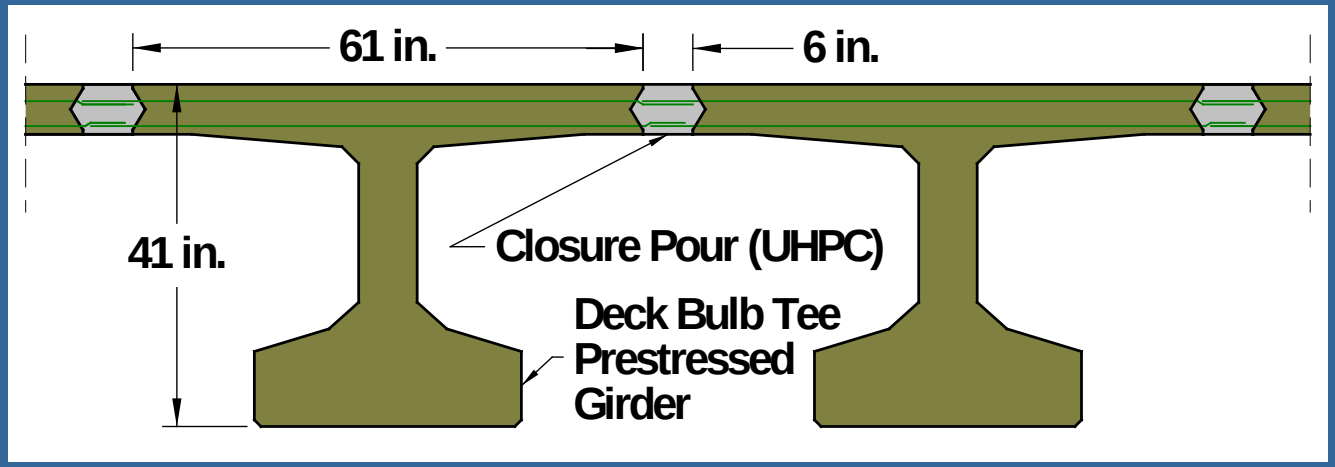


Field-Cast "Splice" Connections

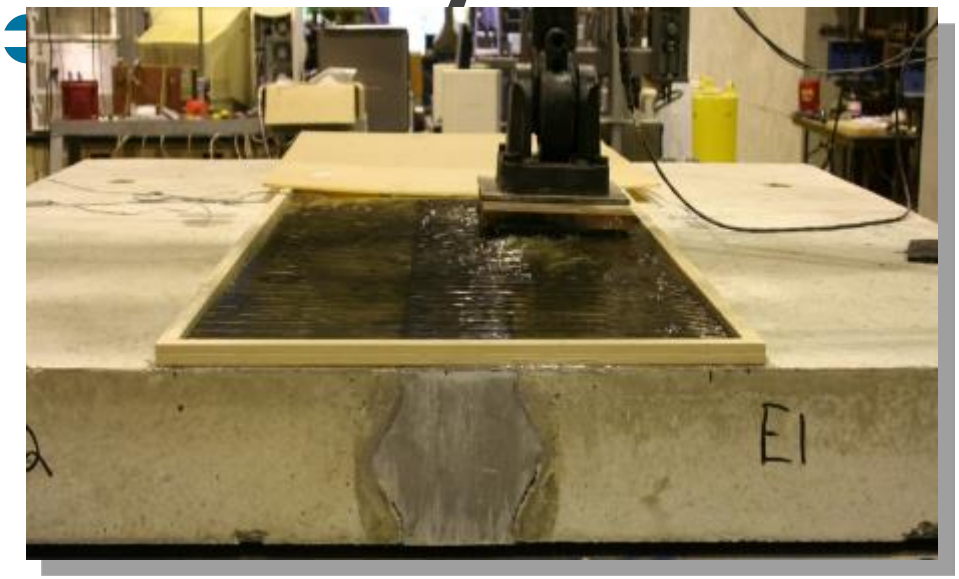


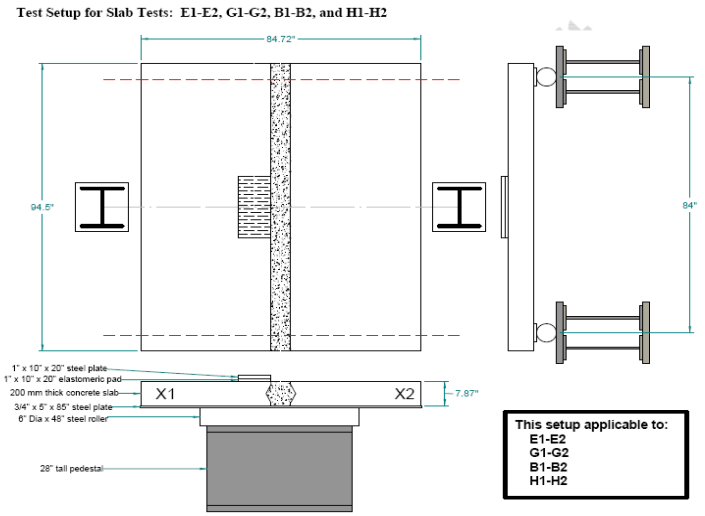
Precast Deck Panels and Slabs

Deck Bulb Tee Girders

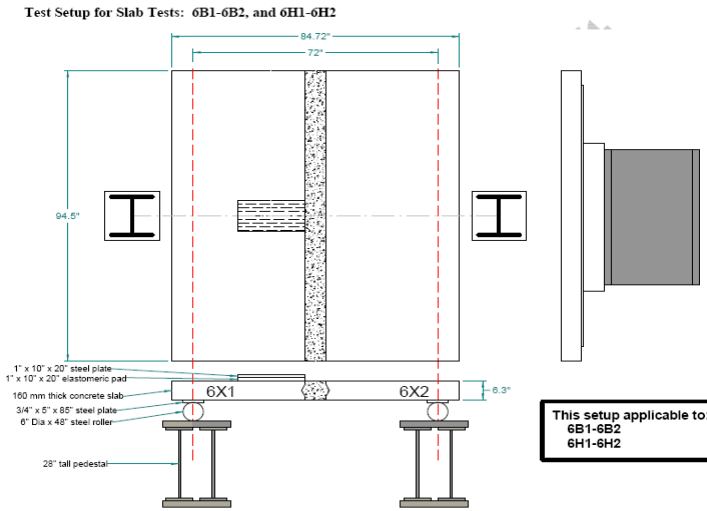


Joint Testing by FHWA for Strength Durability and Performance





- 8" THICK PANEL - #4 EPOXY COATED HAIRPIN BARS
- 8" THICK PANEL - #5 GALV. STRAIGHT BARS (6" LAP)
- 8" THICK PANEL - #5 BLACK STRAIGHT BARS (6" LAP)
- 8" THICK PANEL - #5 BLACK HEADED BAR (3 ½" LAP)
- 6" THICK PANEL - #5 BLACK STRAIGHT BARS (6" LAP)
- 6" THICK PANEL - #5 BLACK HEADED BARS (3 ½" LAP)



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Test Conclusions

1. Joint system emulates or surpasses C I P monolithic decks hence can be designed similar to CIP decks
2. No interface de-bonding during testing was observed
3. No de-bonding of reinforcing bars during testing


TEREX
TEREX
TEREX
05/19/2009


05/30/2009

Rte 23 over Otego Creek

Figure 35. Photo. Cracking apparent on top of deck at grout pocket near east end of test specimen prior to start of structural loading.

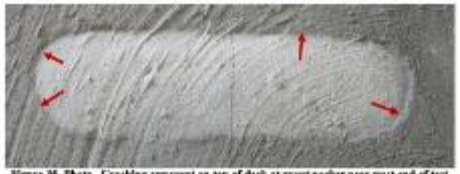
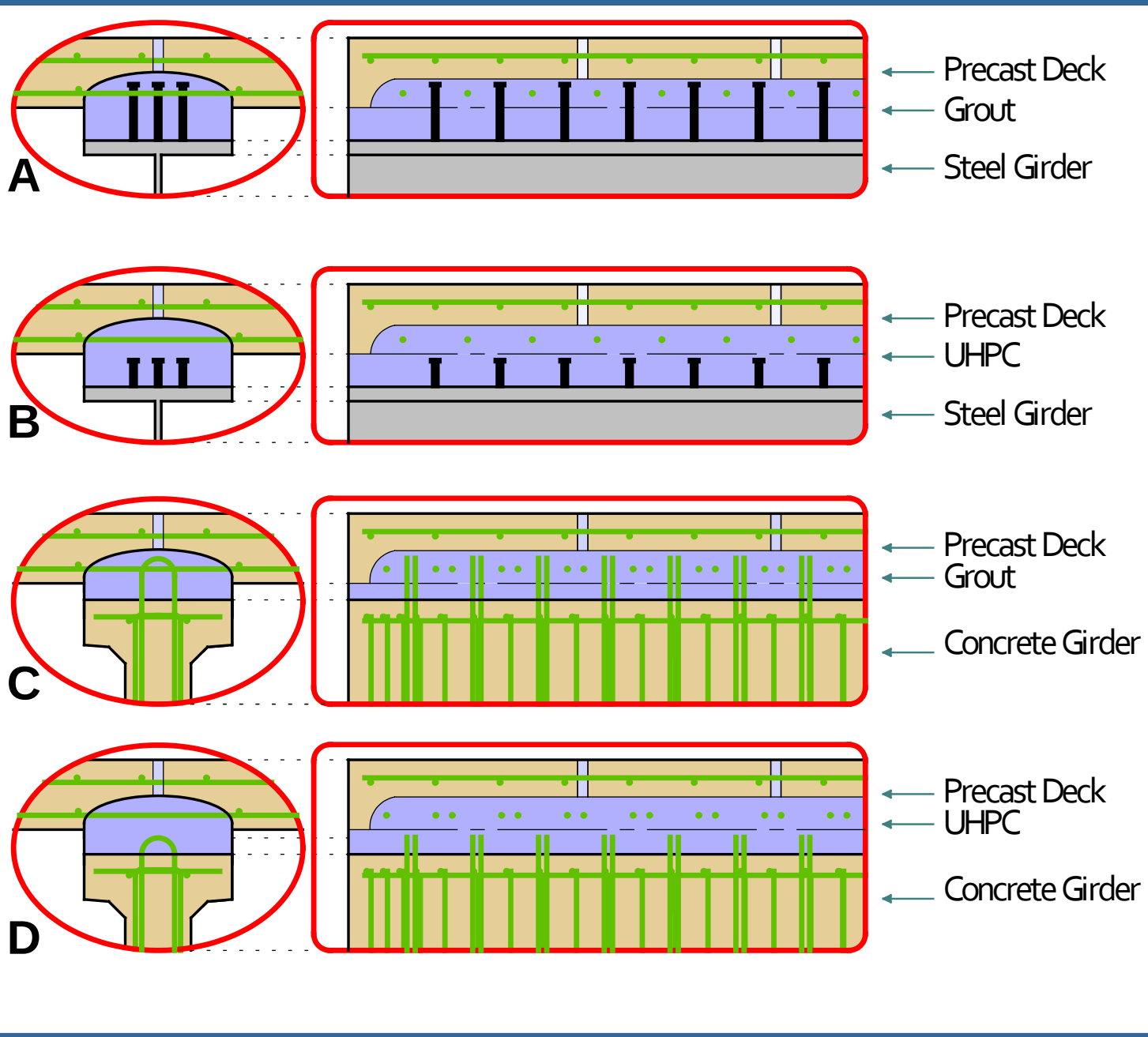


Figure 36. Photo. Cracking apparent on top of deck at grout pocket near west end of test specimen prior to start of structural loading.


A
Precast Deck
Grout
Steel Girder
B
Precast Deck
UHPC
Steel Girder
C
Precast Deck
Grout
Concrete Girder
D
Precast Deck
UHPC
Concrete Girder

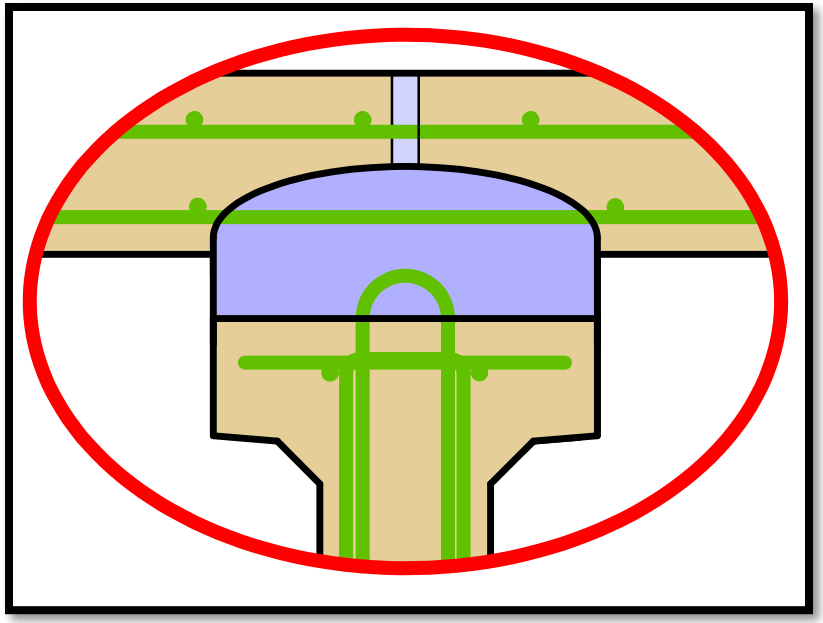
UHPC Composite Connection

Steel Girder Connection

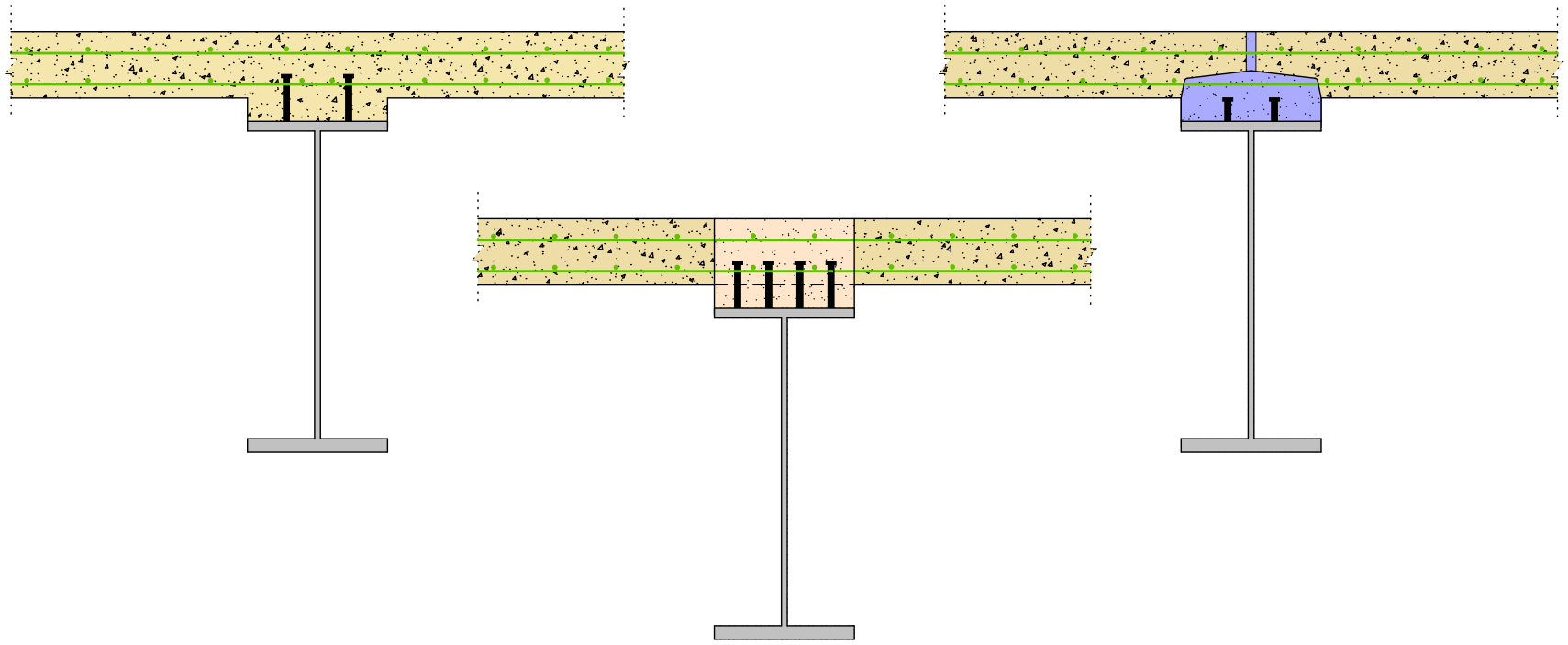
Concrete Girder Connection

Field-Cast Deck-to-Girder Connections

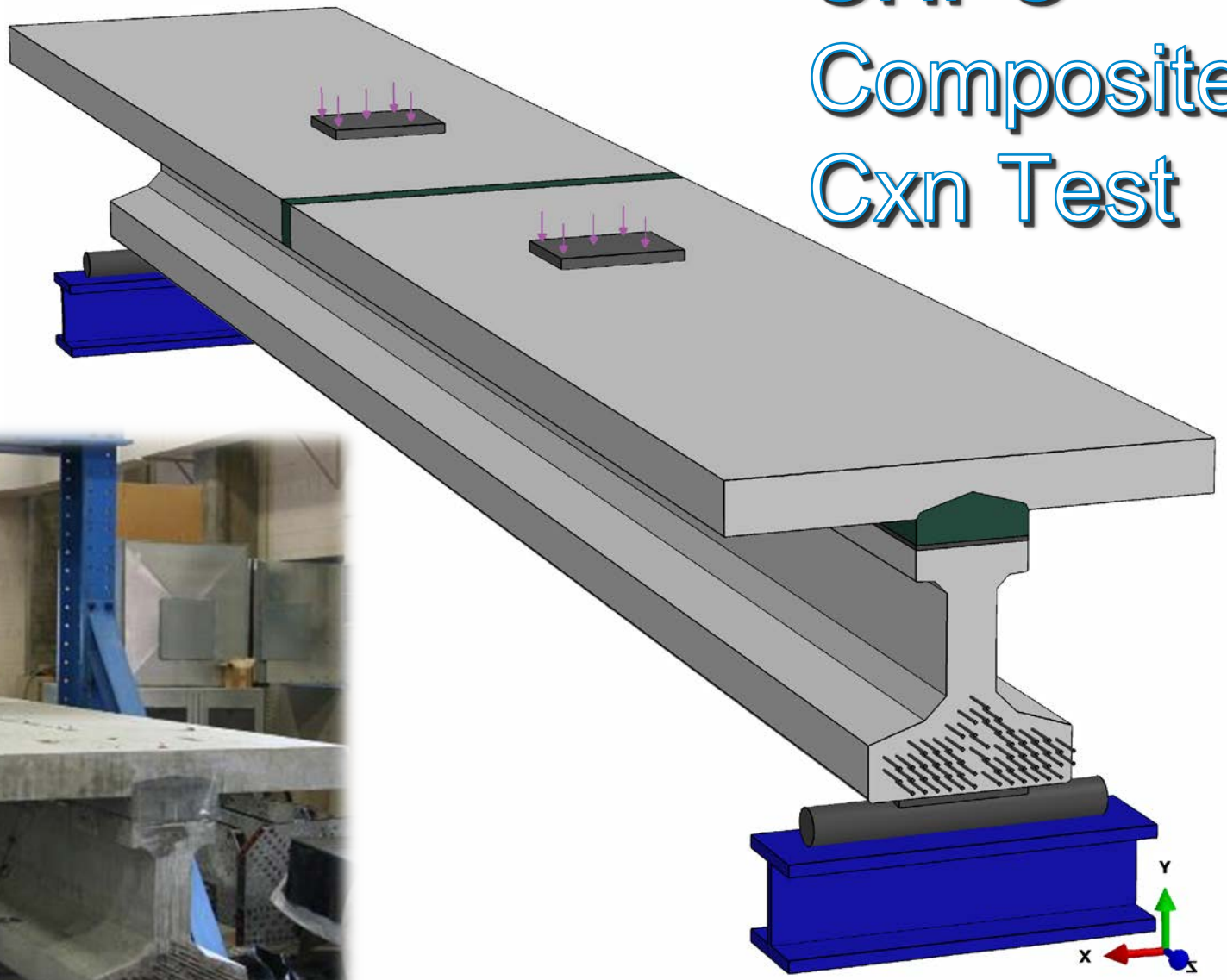
-
-
-
-



Field-Cast "Interface" Connections



UHPC Composite Cxn Test

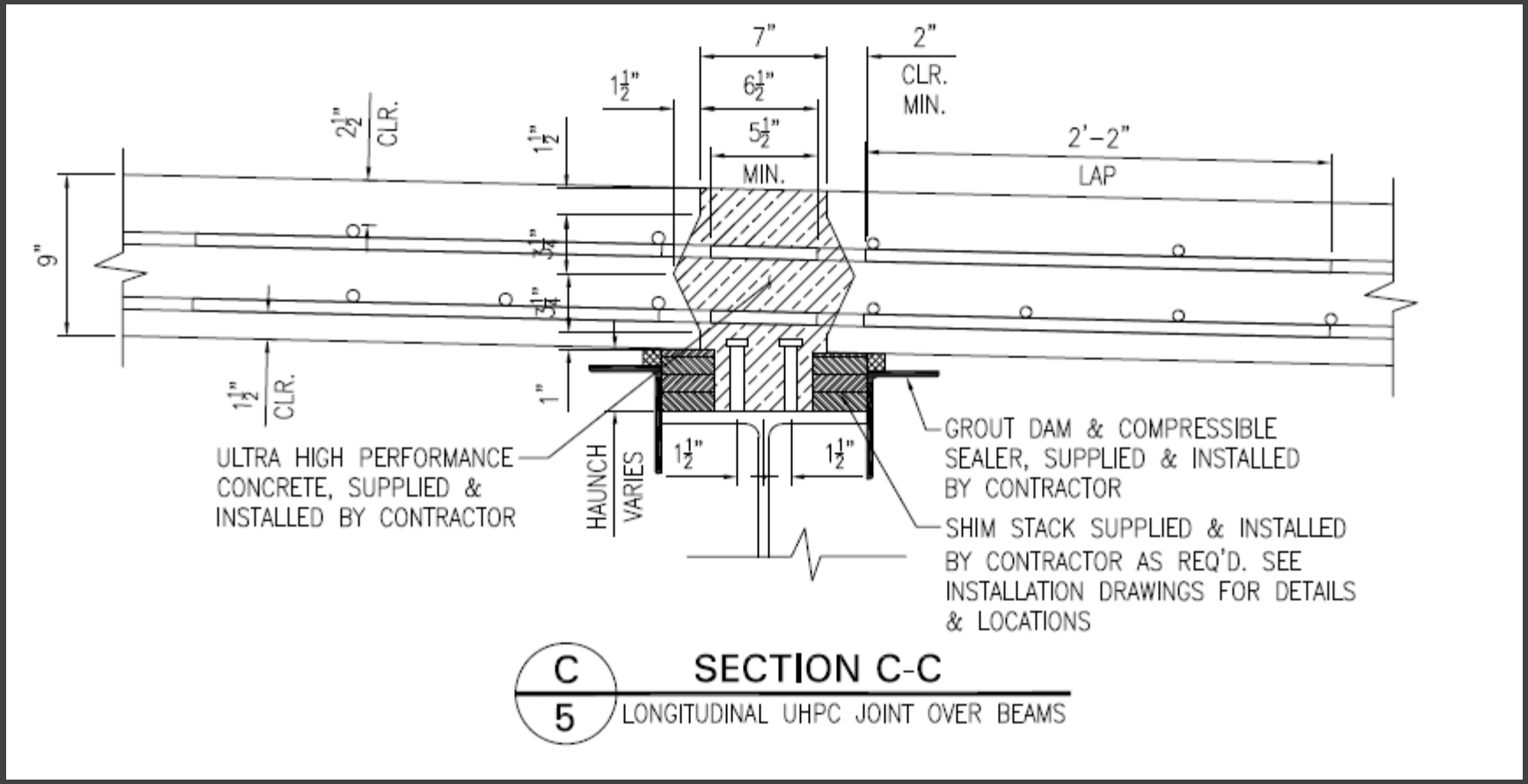


NYSDOT collaborated with the industry, trade associations and the FHWA in developing and testing Composite Connections between Precast Decks and steel/concrete girders using UHPC. The results are documented in the following report:

Composite Connections for Precast Concrete Bridge Decks.
NTIS Accession No. PB2012-107569
FHWA Publication No. FHWA-HRT-12-041

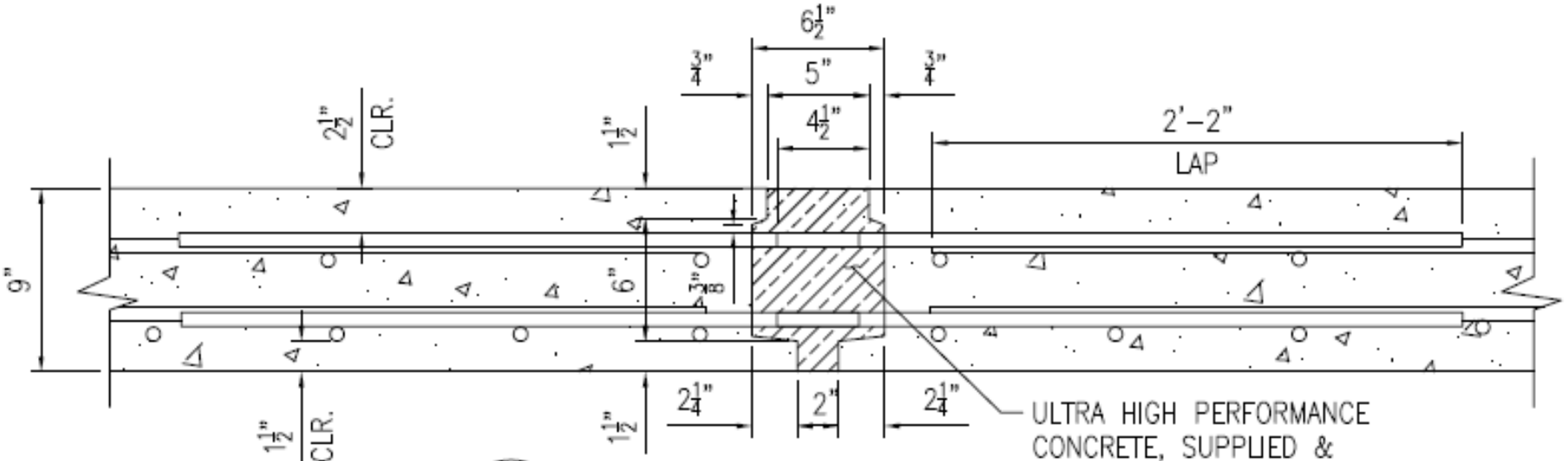
UHPC Composite Cxn Cyclic Testing at FHWA.wmv

- No Prestressing or PT
- Inverted Cast w/ Integrated Barrier
- Exposed Aggregate
- UHPC Connections
- ½” Sacrificial Surface…Ground
  - Closure time as low as 3 days
    Single span bridges
  - Two bridges with 3 spans each in 10 days



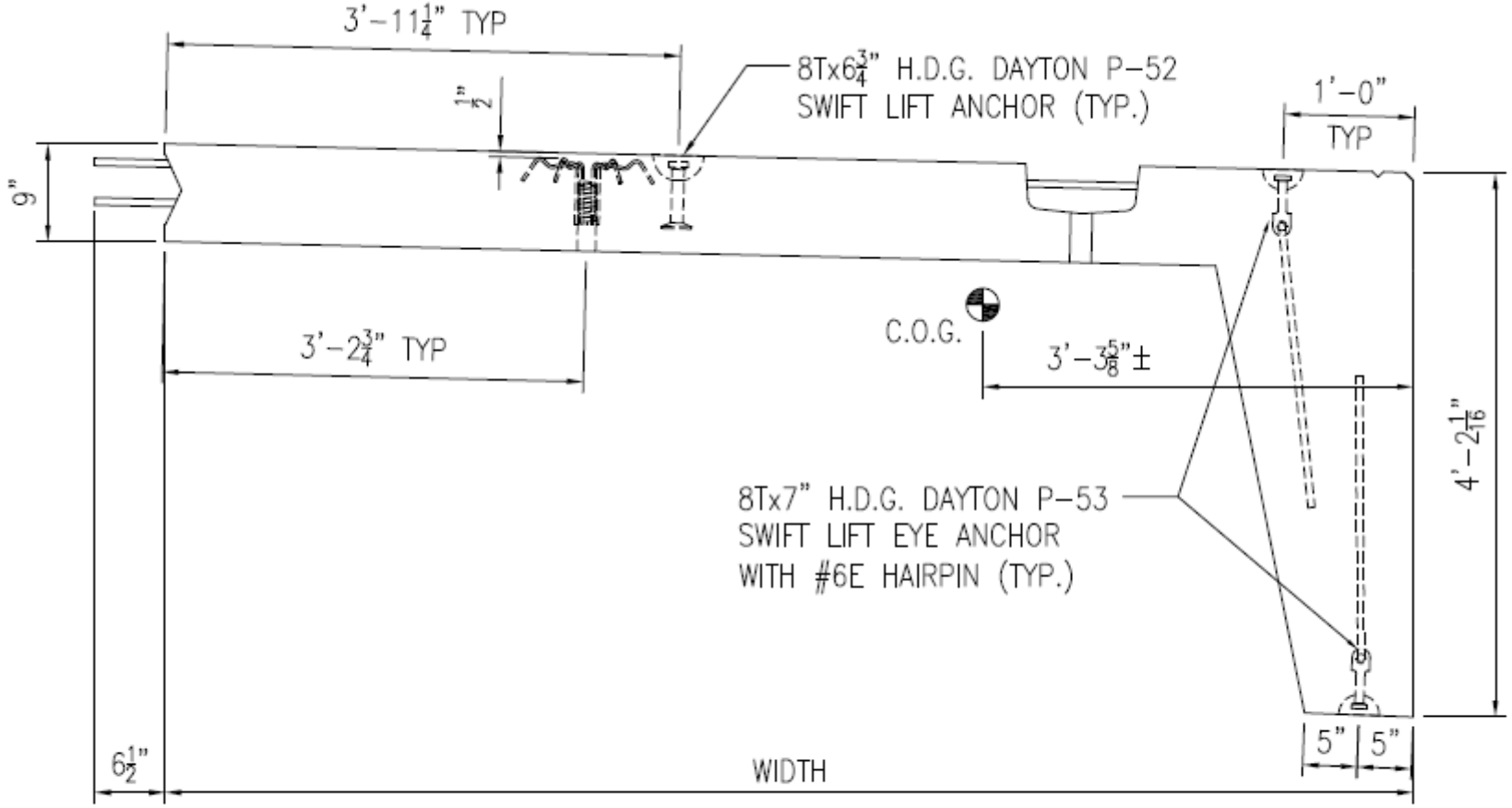
C/5 SECTION C-C

LONGITUDINAL UHPC JOINT OVER BEAMS



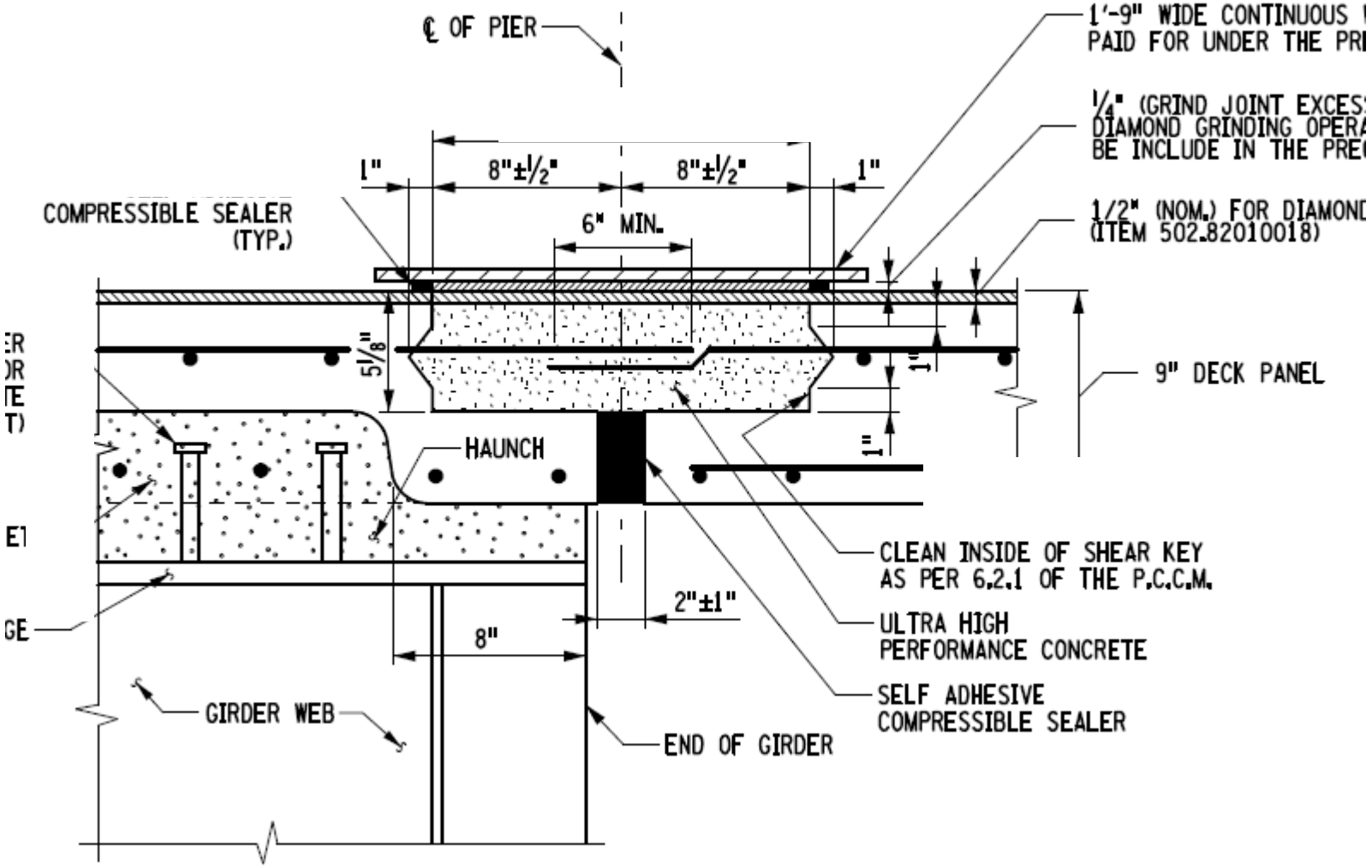
D/5 SECTION D-D

TRANSVERSE UHPC BETWEEN DECK PANELS

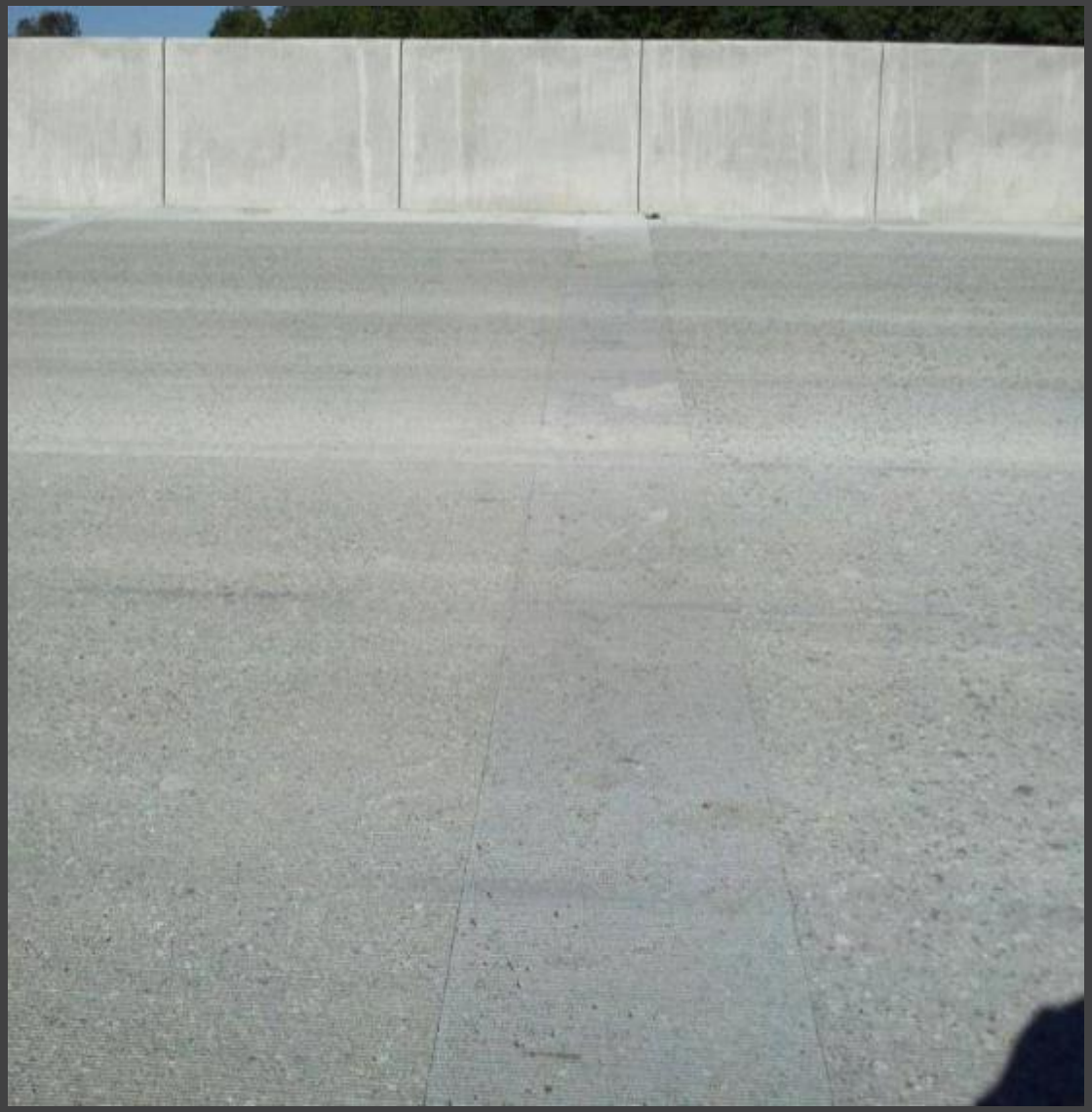


FORM STRIPPING SECTION F-F

TYPE 6 BRIDGE PANELS


℄ OF PIER
1'-9" WIDE CONTINUOUS
PAID FOR UNDER THE PR
1/4" (GRIND JOINT EXCES
DIAMOND GRINDING OPERA
BE INCLUDE IN THE PRE
1/2" (NOM.) FOR DIAMOND
(ITEM 502.82010018)
1"
8"±1/2"
8"±1/2"
1"
6" MIN.
COMPRESSIBLE SEALER
(TYP.)
5 1/8"
1"
1"
9" DECK PANEL
HAUNCH
CLEAN INSIDE OF SHEAR KEY
AS PER 6.2.1 OF THE P.C.C.M.
ULTRA HIGH
PERFORMANCE CONCRETE
SELF ADHESIVE
COMPRESSIBLE SEALER
2"±1"
8"
GIRDER WEB
END OF GIRDER

Finished Link Slab



Finished Link Slab