NORTH CAROLINA
Department of Transportation

Temporary Steel Panel Bridges

Manufactured Products Group, Metals Section

05/28/2019

Submittal Requirements for Temporary Panel Bridges

- Verify method of construction (different details for same drawings, continuity in drawing details) connection details for bolster beam (Typically set on concrete seat, verify method used in field).

- Temporary structures shall comply with the current PSP 002 Construction, maintenance and Removal of Temporary Structure at Station (Revised 9/27/2012), PSP 003 Construction, Maintenance and Removal of Temporary Structure at Station (Revised 9/27/2012), PSP 006 Temporary Bents and/or the *NCDOT Standard Specifications for Roads and Structures*.

Submittal Requirements for Temporary Panel Bridges

- All critical bolted connections in the temporary structure require new high strength bolts. Indicate the location of the critical connections and recommended bolt size with tightening procedures in the detail drawings of the structure.

- The use of used high strength bolts is limited to non-critical connections and is subject to approval

Pre-Construction Questions for Panel Bridges

- Contact M&T to verify condition of material prior to assembly.
- Stephen Burke (Eastern Region Area Divisions 1-6 & 8)
  - Materials and Tests Unit, Manufactured Materials Group
  - sburke@ncdot.gov
  - Mobile: (919) 524-5203
- Steve Walton (Western Region Area Divisions 7 & 9-14)
  - On behalf of the Materials and Tests Unit, Manufactured Materials Group
  - HDR Engineering
  - Steven.Walton@hdrinc.com
  - Mobile: (336) 406-6502

Pre-Construction Questions For Panel Bridges

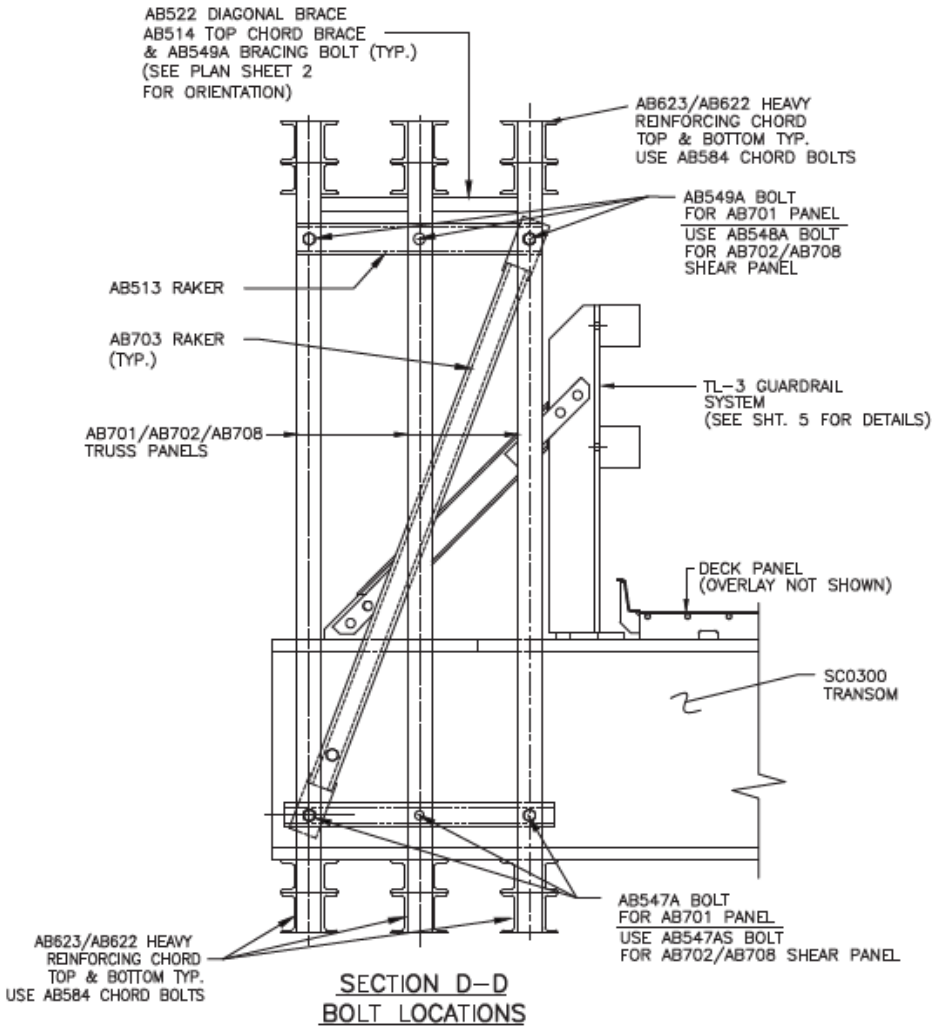
- For new high strength bolts required for critical connections, furnish the Engineer a copy of the manufacturer's certified test report for each component.
  - Meets ASTM F3125
  - Melted and manufactured in the United States (Reference: NCDOT *Standard Specifications* Section 106-1(B)
  - With the exception of critical connections, used bolts shall facilitate hand tightening of the nut and bolt combination for the length of the thread.

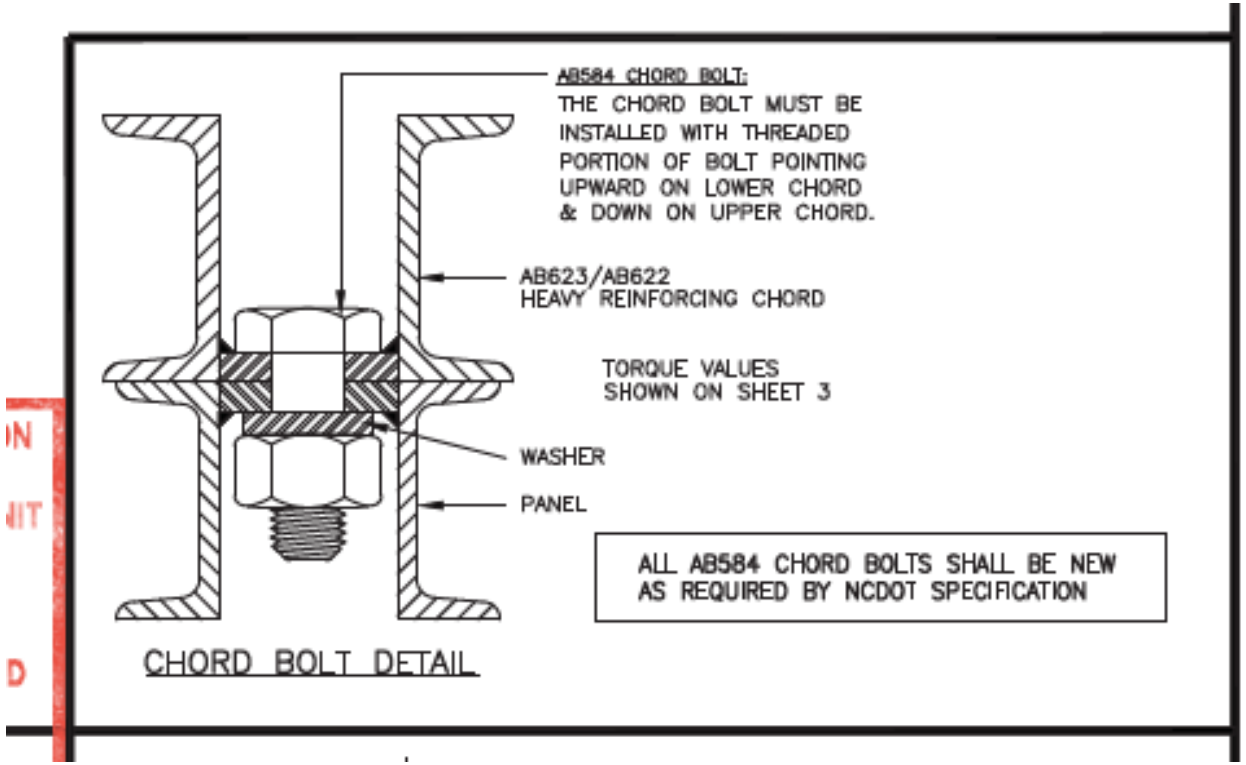
Storage of Fastener Components

Construction of Temporary Panel Bridges

- Acrow Critical Connection Detail
- Bolt List Example

Acrow Critical Connection Detail

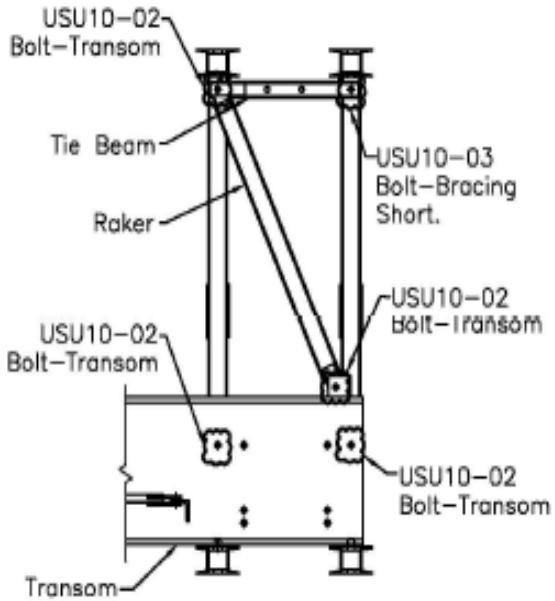




Acrow Bolt List Example

BRIDGE BOLTS				
BOLT	NAME	DIA ø	UNDER HEAD LENGTH ±1/8"	TORQUE VALUE
AB584	CHORD BOLT	1–1/4"	3–1/2"	650FT/LBS
AB549A	SHORT BRACE BOLT	1"	2–3/4"	450FT/LBS
AB548A	LONG RAKER BOLT	1"	4"	450FT/LBS
AB547AS	TRANSOM SHEAR BOLT	1"	5–1/2"	450FT/LBS
AB547A	TRANSOM BOLT	1"	4–1/4"	450FT/LBS
AB546	DECK T BOLT	3/4"	N/A	110FT/LBS
AB536A	BRACE BOLT	1"	3–1/2"	450FT/LBS

Mabey Critical Connection Identification



TRUSS SECTION

NOTES:
Bolts shown ◘ are "CRITICAL"
And Must Be New Bolts.

Mabey Fastener Tightening

NOTES

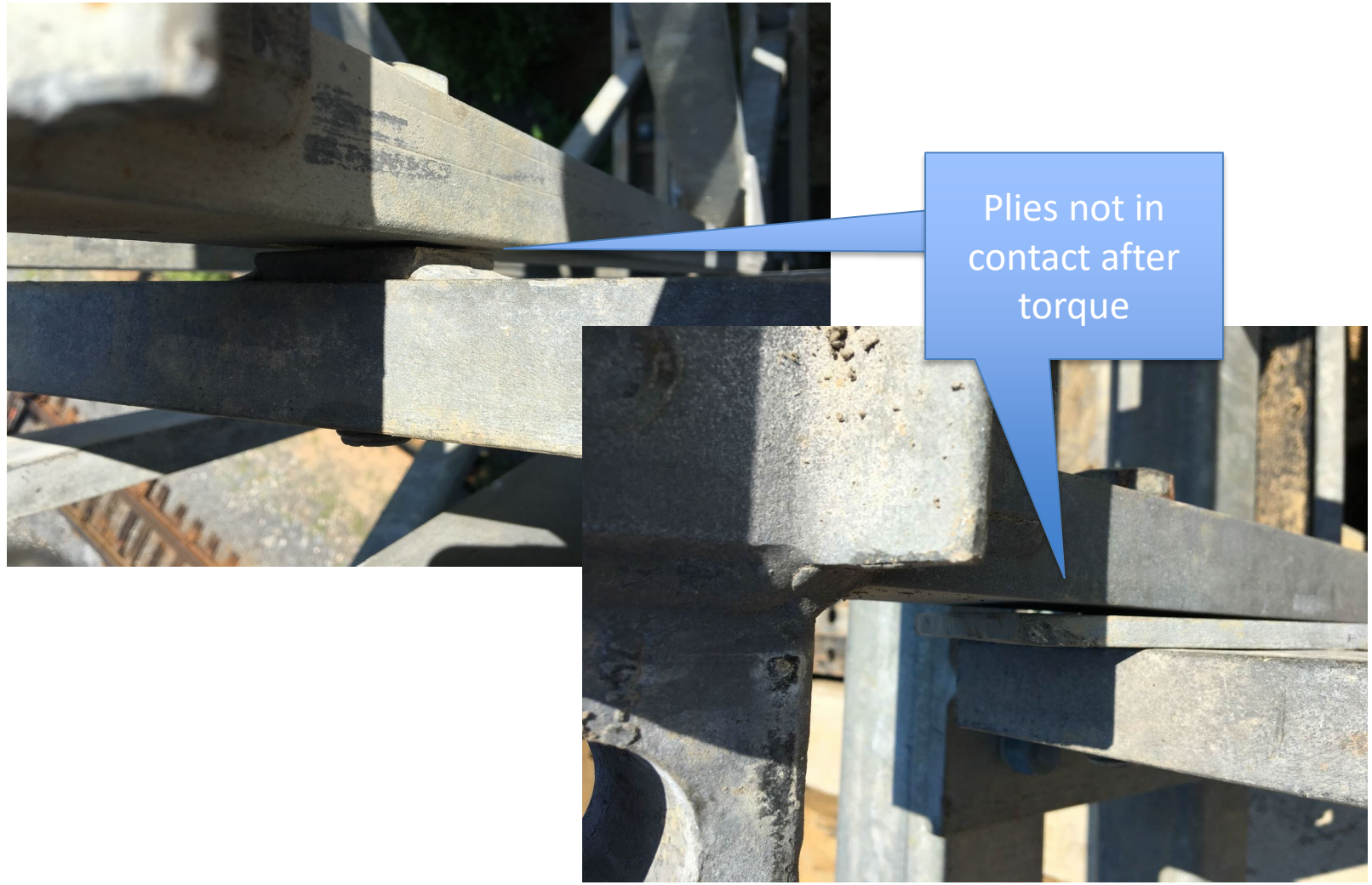
1. LIVE LOAD IS HL-93
2. ABUTMENTS AND ANCHOR BOLTS BY CONTRACTOR
3. DUE TO THE NATURE OF MODULAR BRIDGING DIMENSIONAL TOLERANCES CAN ACCUMULATE. MABEY RECOMMENDS THE FOLLOWING:
   A. CONSTRUCT BACKWALLS AFTER BRIDGE IS IN PLACE
   B. CAST 3" DIA VOIDS AT ANCHOR BOLT LOCATIONS
   C. GROUT IN ANCHORS AFTER BRIDGE IS IN POSITION
4. NO DRILLING, WELDING OR ALTERATIONS OF ANY KIND TO MABEY-SUPPLIED EQUIPMENT WITHOUT WRITTEN PERMISSION OF MABEY ENGINEERING DEPT. EQUIPMENT MUST BE USED IN THE MANNER INTENDED, ACCORDING TO THE SUPPLIED DRAWING(S) AND CALCULATIONS.
5. ALL EXPANSION BEARINGS SHALL BE GREASED AT INSTALLATION.
6. ALL BOLTS SHALL BE SNUG TIGHT.

Snug Tightened Joints

RCSC Specification for Structural Joints Using High-Strength Bolts

<u>Section 9.1 Snug Tightened Joints</u>

After the *connections* have been assembled, it shall be visually ensured that the plies of the connected elements have been brought into *firm contact*



Field Welding

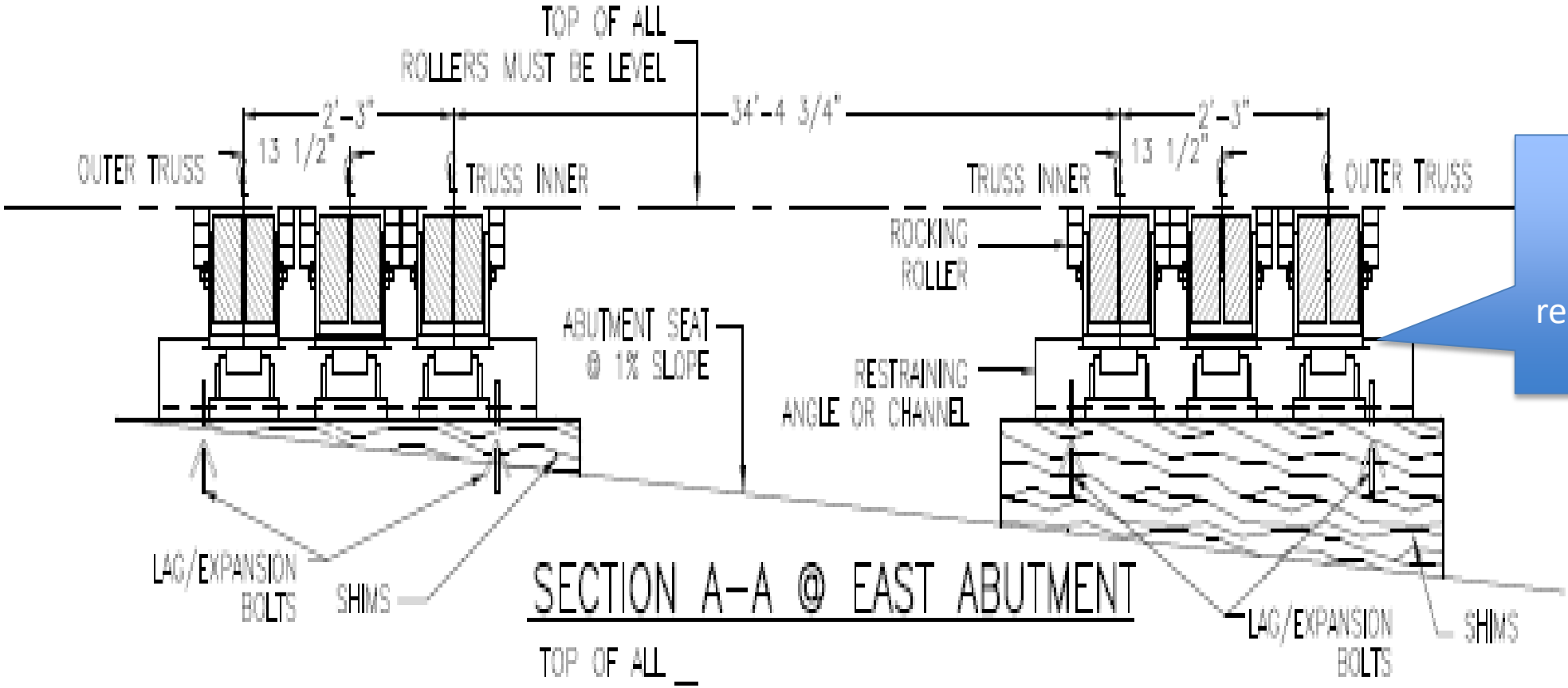
- Section 1072-18(C) Field Welder Qualifications
  - Does not distinguish between temporary or permanent structures

Typical Field Inspection Issues

- Section

Acrow Transom Beam Bearing

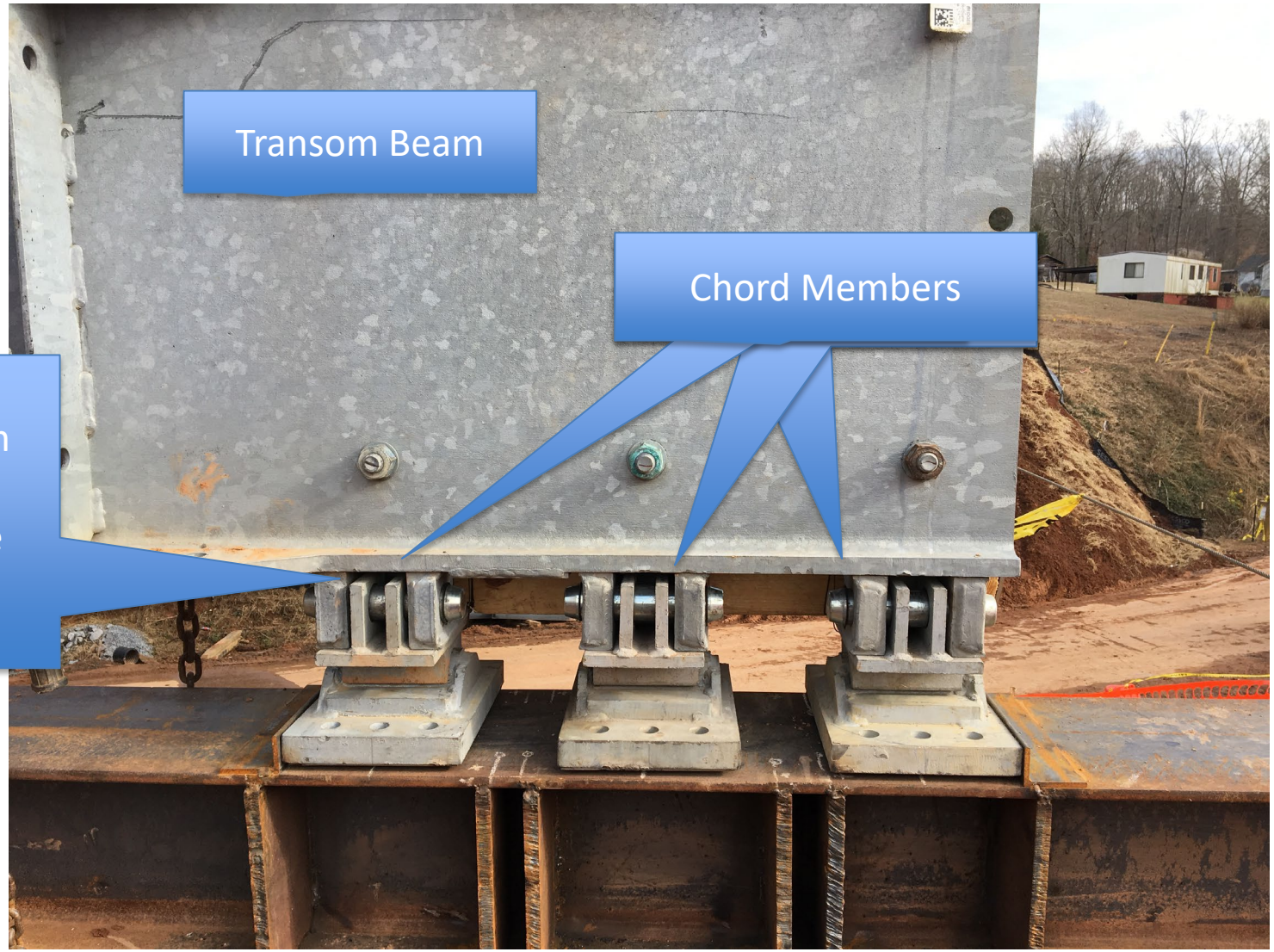
Typical Detail



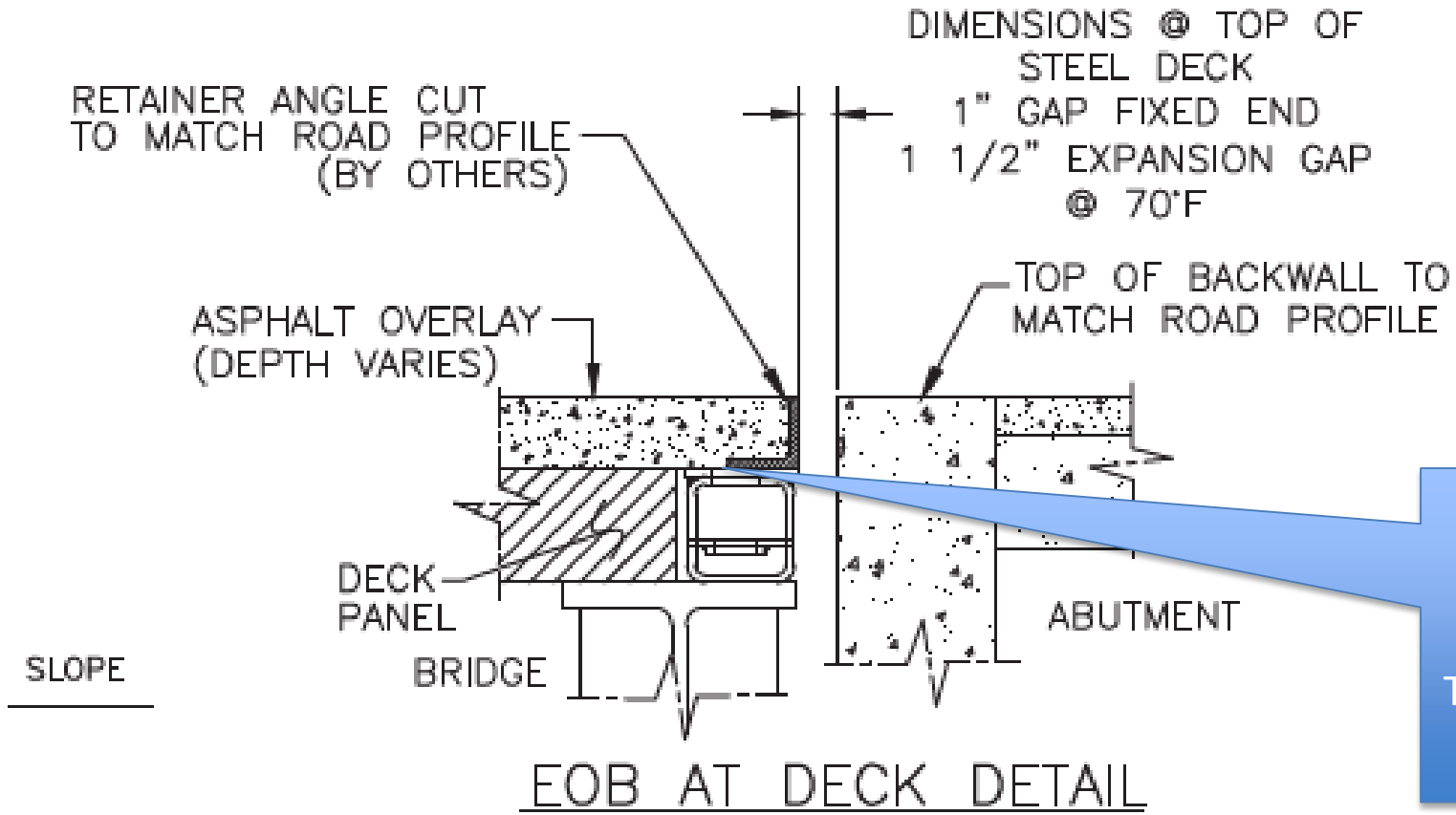
Verify bearing prior to releasing to traffic

Acrow Transom Beam Bearing

If the bottom flange of the transom beam in not bearing on the chord members it could potentially place panel bolts in shear

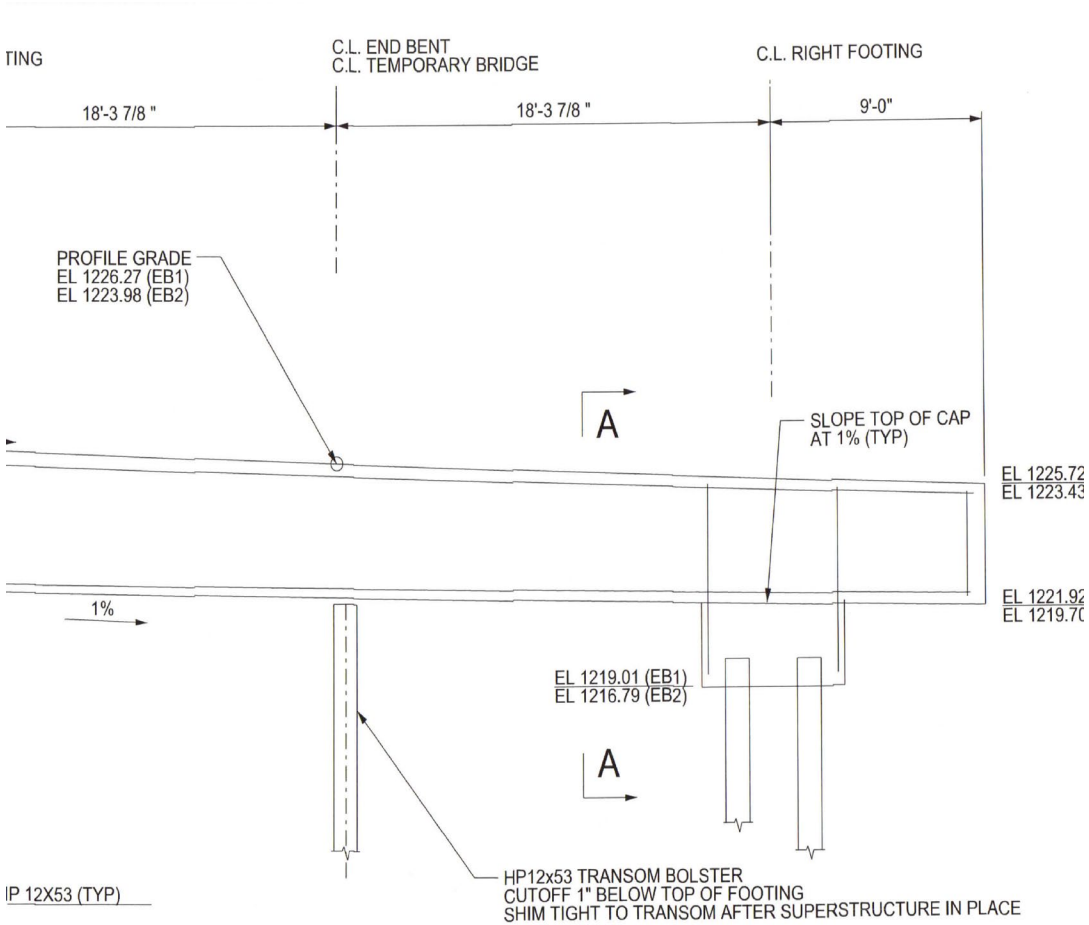


Acrow End of Bridge (EOB) Connection Detail

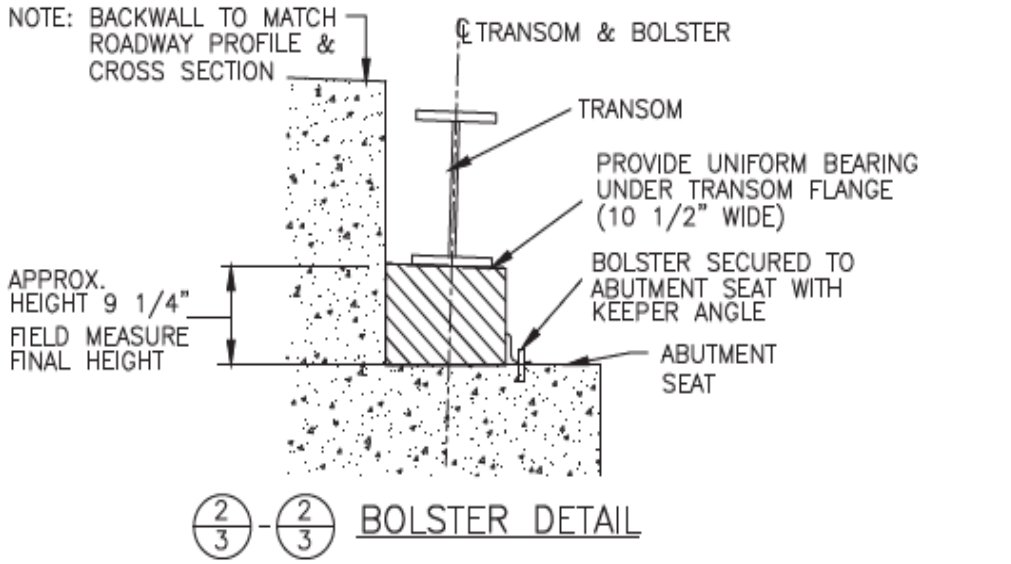


Retainer angle should have connection detail Typically intermittent fillet welded)

Acrow Bolster Beam Detail



This is an alternative substructure detail that does not show how the bolster is to be attached to the pile.

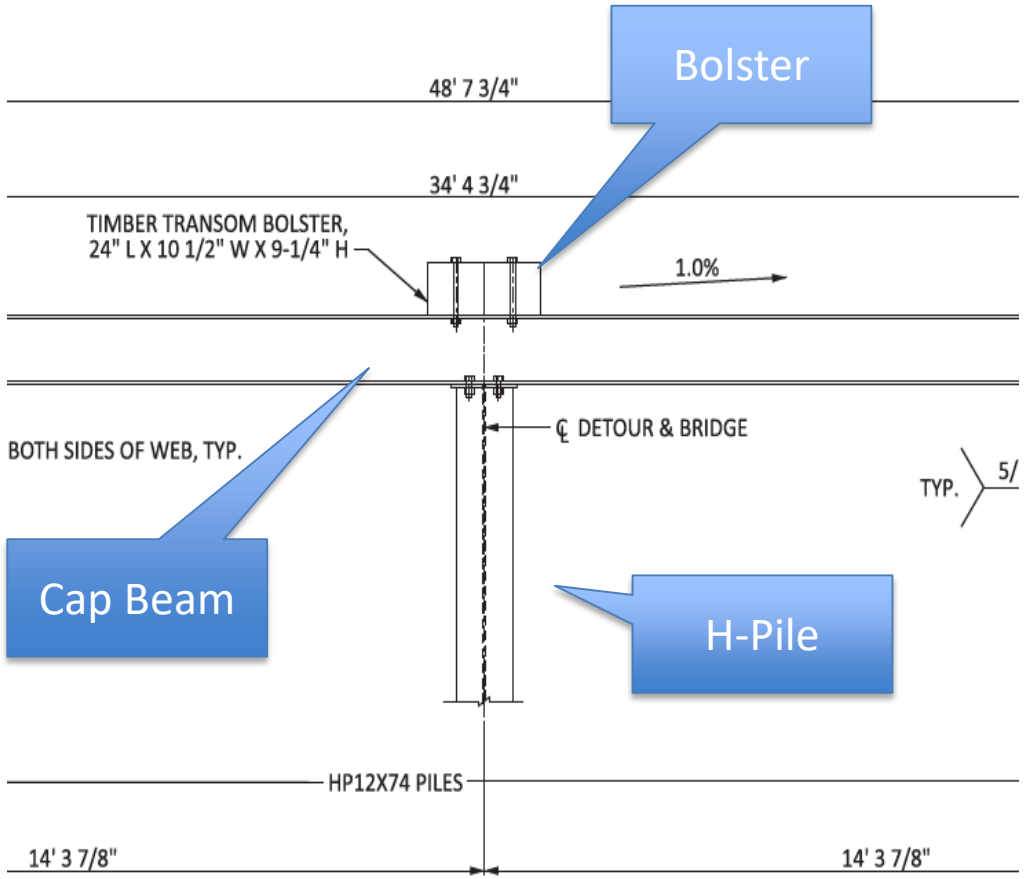


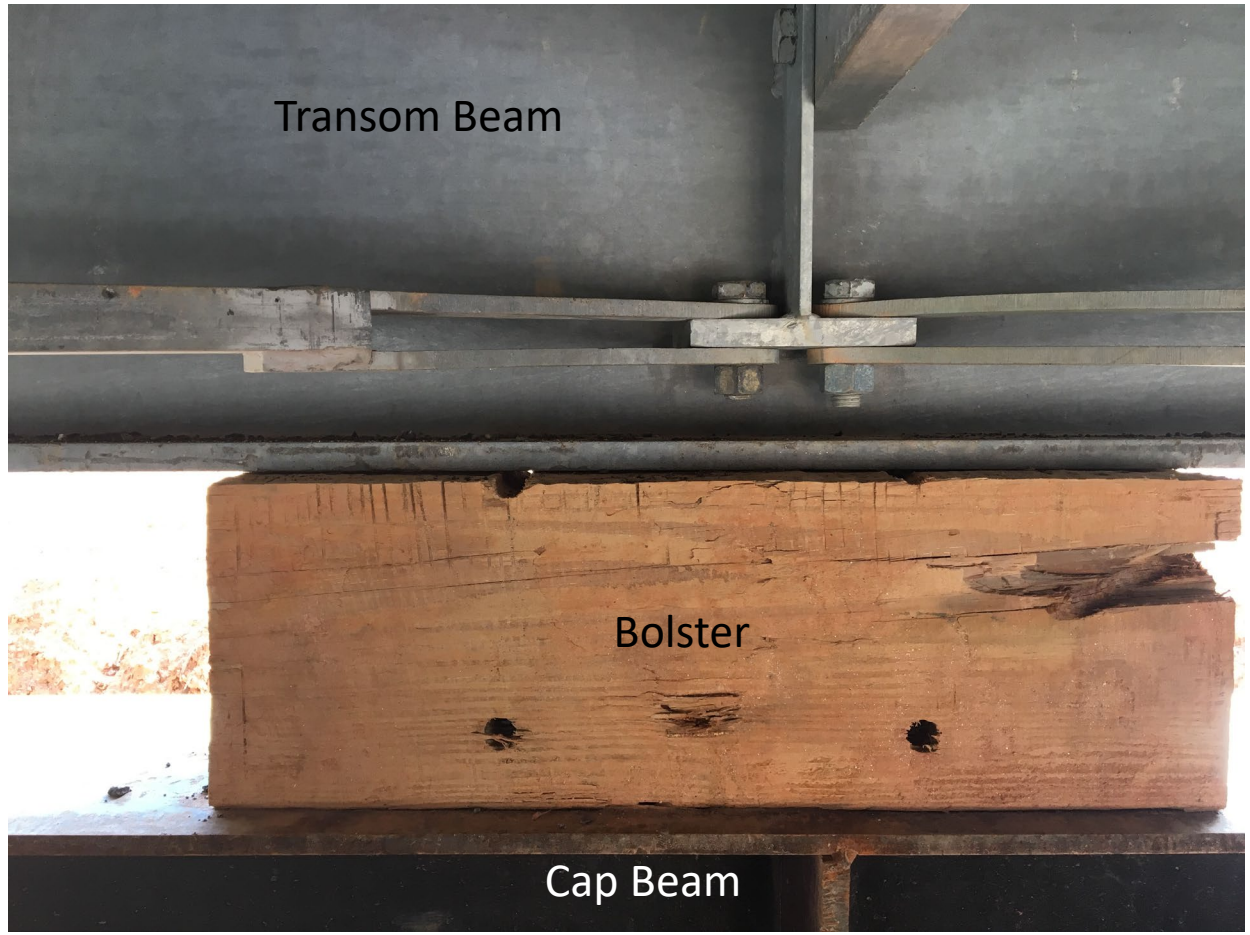
NOTE:
- HARDWOOD BLOCKING IS RECOMMENDED; FINAL BOLSTER DESIGN IS BY OTHERS
- INSTALL BOLSTER TO A TIGHT FIT AFTER BRIDGE & DECK ARE IN PLACE
- BOLSTER HEIGHT WILL VARY BASED ON TRANSOM TYPE/DEAD LOADS
- BOLSTER TO BE SECURED FROM MOVEMENT AFTER INSTALLATION
- BOLSTER TO MATCH SLOPE OF TRANSOM FLANGE

This is a typical structure plan supplied by Acrow.

Acrow Alternate Bolster Beam Detail

- Alternate sub-structure detail





Bolster not attached to the cap beam

Bolster Beam Attachment

Verify clearance from the end wall to the transom beam. Typically the transom beam is coped.

Bolster Beam Attachment

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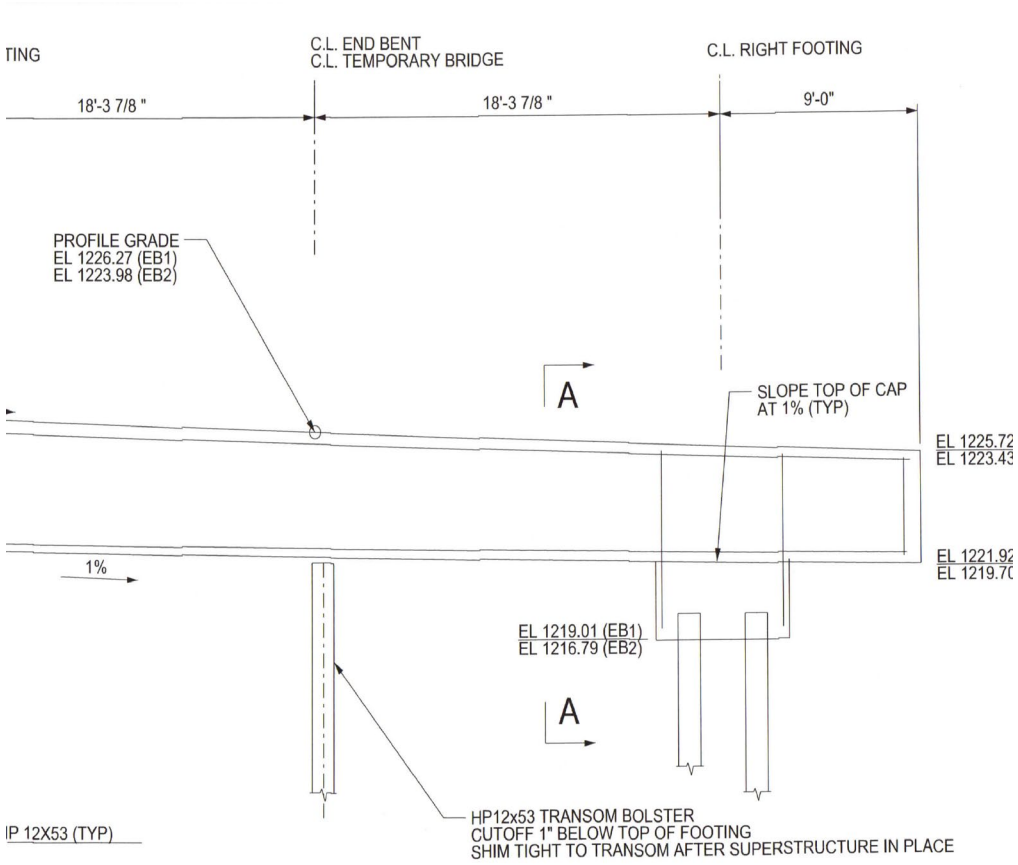
Bolster Beam Attachment



As Detailed

As Constructed (Burke County)

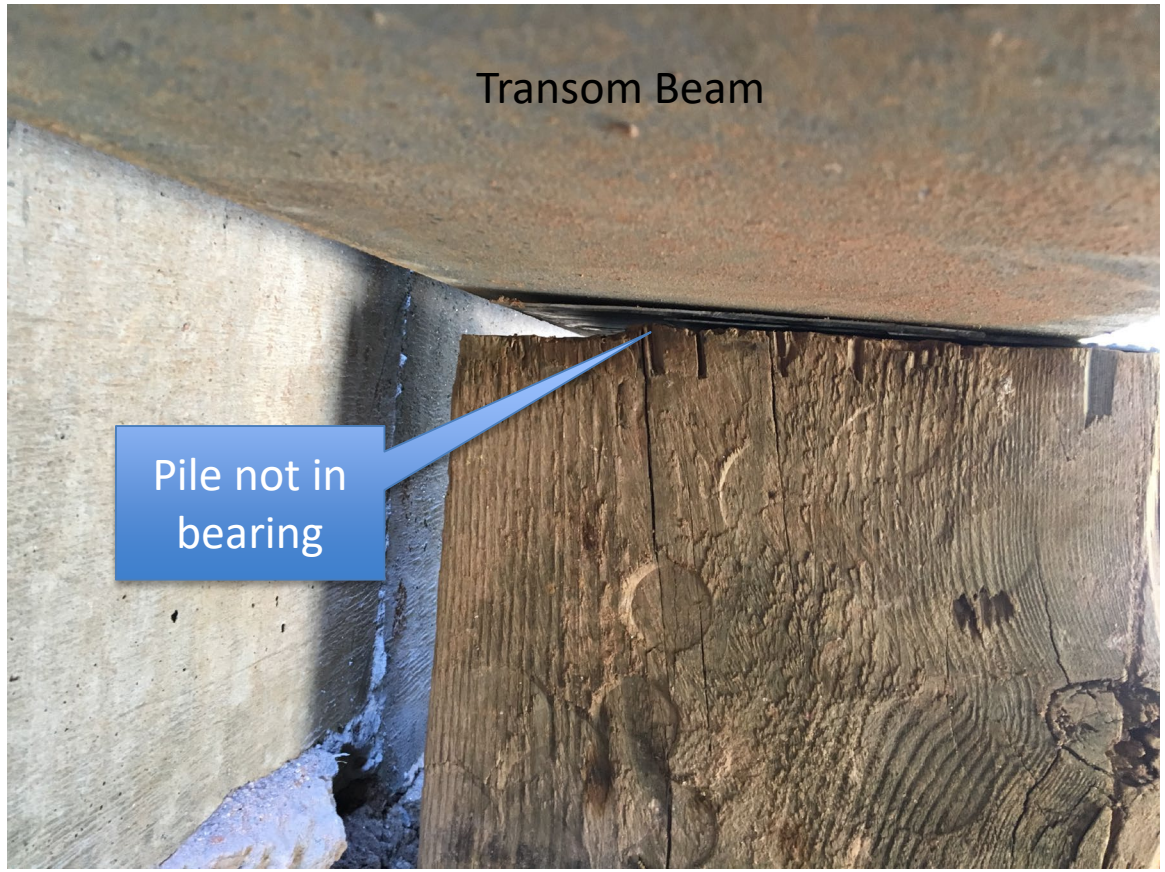
Bolster Beam Attachment

No detail provided. Contractor's alternate detail utilized.
No Engineering review or approval

Bolster Beam Attachment

Bearing important to dampen vibration during loading cycles

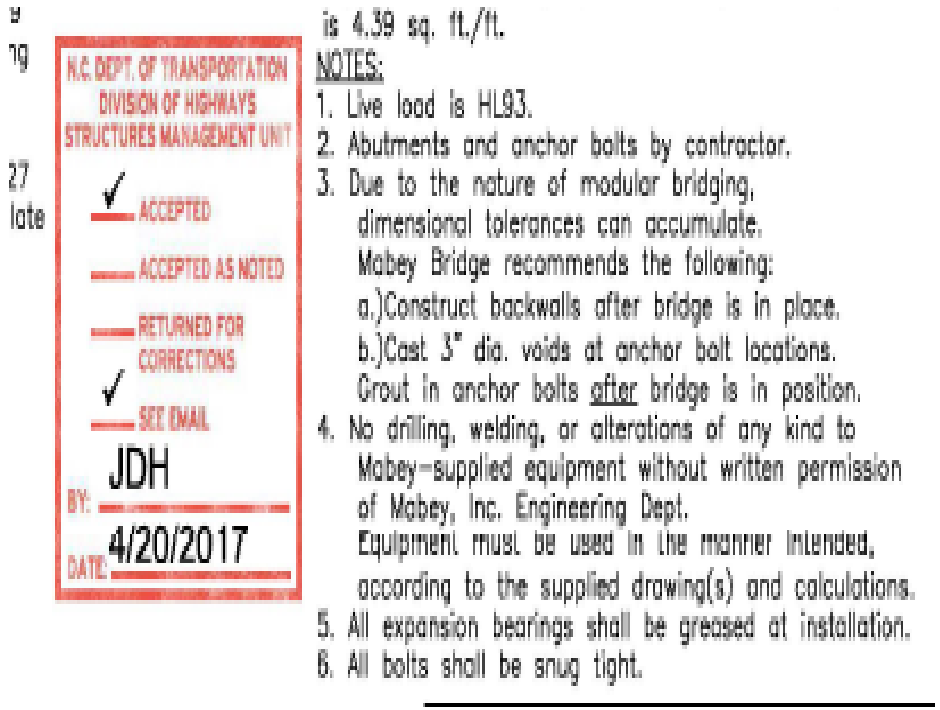
Top of pile not cut square



Bolster detail showing timber on H-Pile

Mabey Expansion Bearing Not Greased

Page of 2 of 6 , Note 5 states:
“All expansion bearings shall be greased at installation.”



N.C. DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
STRUCTURES MANAGEMENT UNIT

✓ ACCEPTED

ACCEPTED AS NOTED

RETURNED FOR CORRECTIONS

✓ SEE EMAIL

BY: JDH

DATE: 4/20/2017

is 4.39 sq. ft./ft.

NOTES:

1. Live load is HL93.
2. Abutments and anchor bolts by contractor.
3. Due to the nature of modular bridging, dimensional tolerances can accumulate. Mabey Bridge recommends the following:
   a.)Construct backwalls after bridge is in place.
   b.)Cast 3" dia. voids at anchor bolt locations. Grout in anchor bolts after bridge is in position.
4. No drilling, welding, or alterations of any kind to Mabey-supplied equipment without written permission of Mabey, Inc. Engineering Dept. Equipment must be used in the manner intended, according to the supplied drawing(s) and calculations.
5. All expansion bearings shall be greased at installation.
6. All bolts shall be snug tight.

Bearing Attachment

No detail provided.

No Engineering review or approval

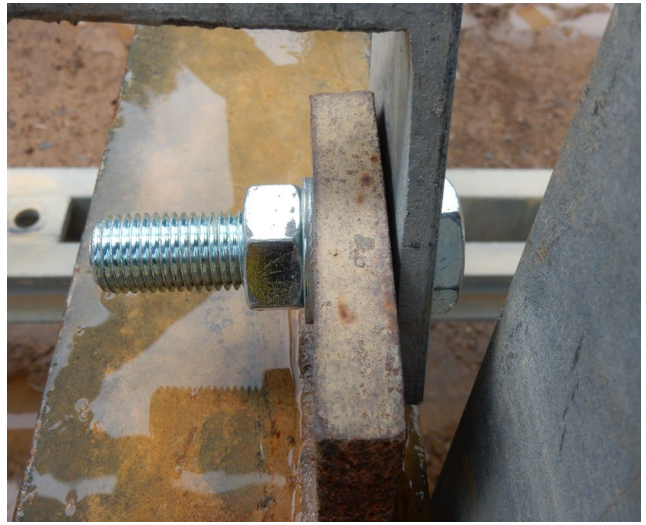
Gaps in Connection Plies

Drawing page 2, Note 6:
All bolts shall be snug tight.

RCSC Specification for Structural Joints Using High-Strength Bolts

<u>Section 9.1 Snug Tightened Joints</u>

After the *connections* have been assembled, it shall be visually ensured that the plies of the connected elements have been brought into *firm contact.*



Thermal Cut Surfaces

AWS D1.5-2015, Section 3.2.2

The roughness of thermal cut surfaces shall be no greater than that defined by the American National Standards Institute, ANSI B46.1, *Surface Texture.* For material up to 100 mm [4 in] thick, the maximum surface roughness value shall be 25 !Jill [1000 ,.Un]. Steel and weld metal may be thermally cut, provided a smooth and regular surface free from cracks and notches is secured, and provided that an accurate profile is secured by the use of a mechanical guide.

Reentrant corners of base-metal cut edges

AWS D1.5-2015, Section 3.2.4

Reentrant corners of base-metal cut edges shall be formed to provide a smooth transition with a radius of not less than 25 mm [1 in] that meets the adjacent edges without offset or cutting past the point of tangency. The reentrant corners may be formed by thermal cutting, followed by grinding to meet the surface requirements of 3.2.2

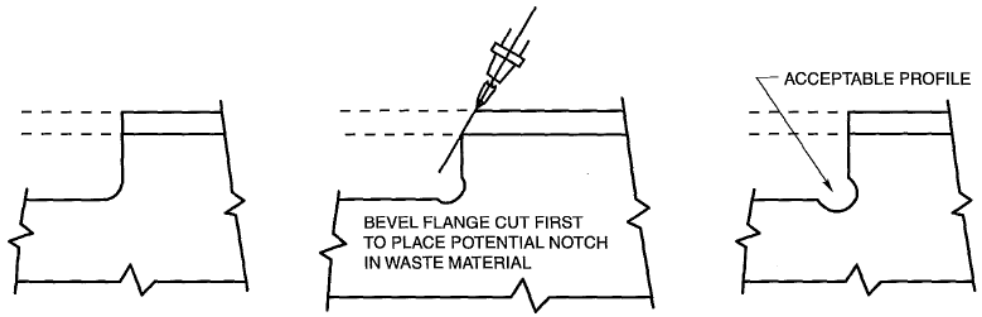
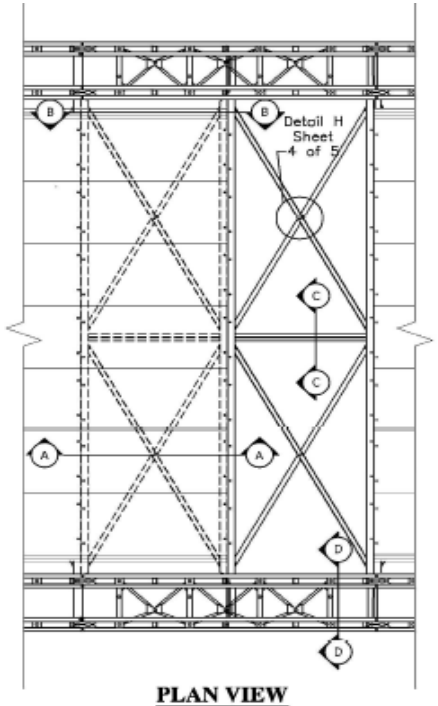


Figure C-3.2—Examples of Good Practice for Cutting Copes

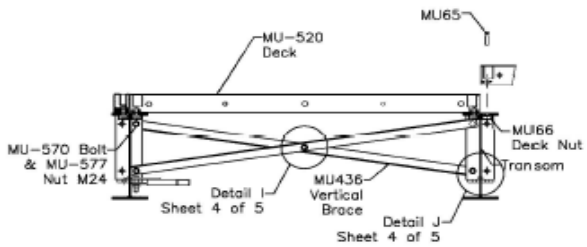
Welder Qualifications and Unapproved Modifications

Sway Bracing Missing

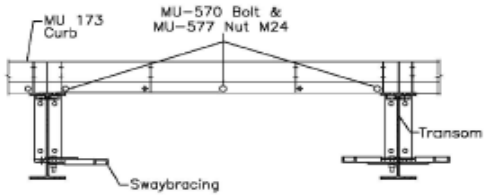
Page of 3 of 6 shows the plan view for plan bracing.



PLAN VIEW
(PLAN BRACING)



SECTION A-A
(VERTICAL BRACE, DECK TO TRANSOM CONNECTION)

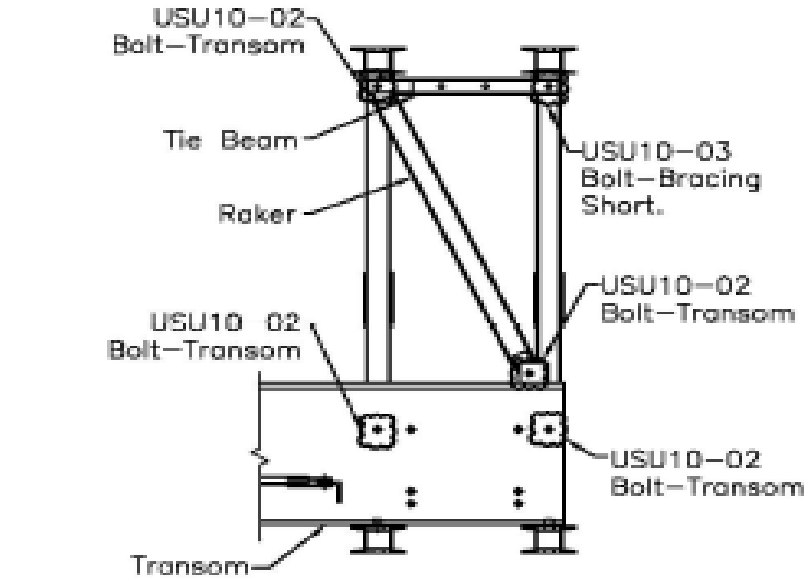


SECTION B-B
(CURB TO DECK CONNECTION)

Tie Beams Missing

Tie beams at the ends of the bridge missing. (Picture not available)

Page of 2 of 6 shows the plan view for the tie beam assembly on the truss section.



TRUSS SECTION

NOTES:
Bolts shown ◘ are "CRITICAL"
And Must Be New Bolts.

Damaged Material

The damage noted could not be determined whether it occurred on the jobsite or originally supplied.