WisDOT NC Region 2017 Construction Conference

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Bureau of Structures
February 22, 2017

BUREAU OF STRUCTURES

Structures Agenda

- Contacting BOS – When & Why
- Specification and Manual Updates
- Structures Construction Issues
- Ancillary (Wind Loaded) Structure Issues
- Fabrication & Materials Issues

Structures Agenda

- **Contacting BOS – When & Why**
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Contacting BOS – When & Why

- Anything “structural”
  - excessive construction loads
  - structural capacity
  - pile locations, etc.
- If in doubt, call us!
  - See Structures Contacts Handout

Region Structures Maintenance

- Tom Hardinger 715-421-8323
- Anthony Stakston 715-421-8345
- Brock Gehrig 715-365-5799

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Standard Spec Updates

- Structure Backfill: Type A, B
- Curing retaining wall parapets
- Price adjustment for piling
- Concrete sign support bases

Standard Spec Updates

- Adhesive Anchors
  - No longer type "L" and "S" anchors
  - Mechanical anchors not allowed
  - Adhesive anchor installation
  - Pullout testing

Const. & Mat'ls Manual Updates

- Updated guidance for bolting
- "Slip-critical" bolted connections

CONSTRUCTION AND MATERIALS MANUAL

Wisconsin Department of Transportation

TABLE OF CONTENTS

Chapter 1: General Provisions

December 2016

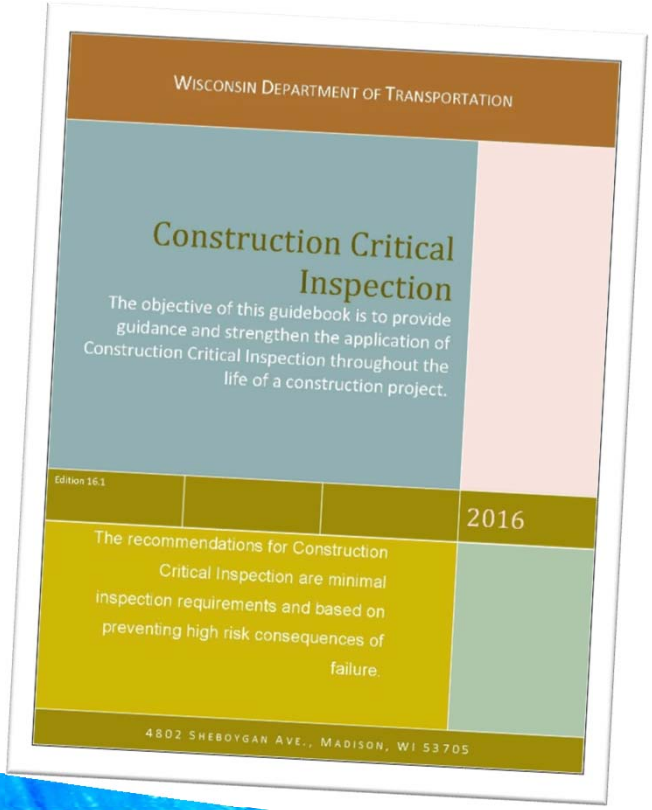
Page 1

Const. & Mat'ls Manual Updates

- Steel diaphragm to prestressed concrete girder web connections
  - Snug-tight plus 1/4 turn for through-bolts
  - 80 foot-pounds when connecting to a ferrule loop insert
  - Turn-of-nut or direct tension indicating (DTI) washer for steel-to-steel connections
  - Field rotational capacity testing is not required

Construction Critical Inspection

- http://wisconsindot.gov → DOING BUSINESS → Engineers and consultants → Structure and road resources → Standards and manuals
- Guidance on critical inspection
  - Roadway
  - Box Culverts and Retaining Walls
  - Temporary Structures
  - Bridges



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- **Structures Construction Issues**
  - **Wing Tip Erosion**
  - **Construction Loading**
  - **Bridge Decks – FHWA**
  - **Reinforcement**
  - **Backfill**
  - **Girder Damage**
  - **Joint Replacement**
  - **Bearing Anchor Bolts**
  - **Structural Approach Slabs**
- Ancillary (Wind Loaded) Structure
- Fabrication & Materials Issues

Wing Tip Erosion and Drainage

- Be sure grading around wing tips promotes proper drainage.
- Typically finished grade ends 6” above wing tip.
- Do not allow bituminous sealant around wing tips.
- The end of the structural approach slab is not the end of wing.

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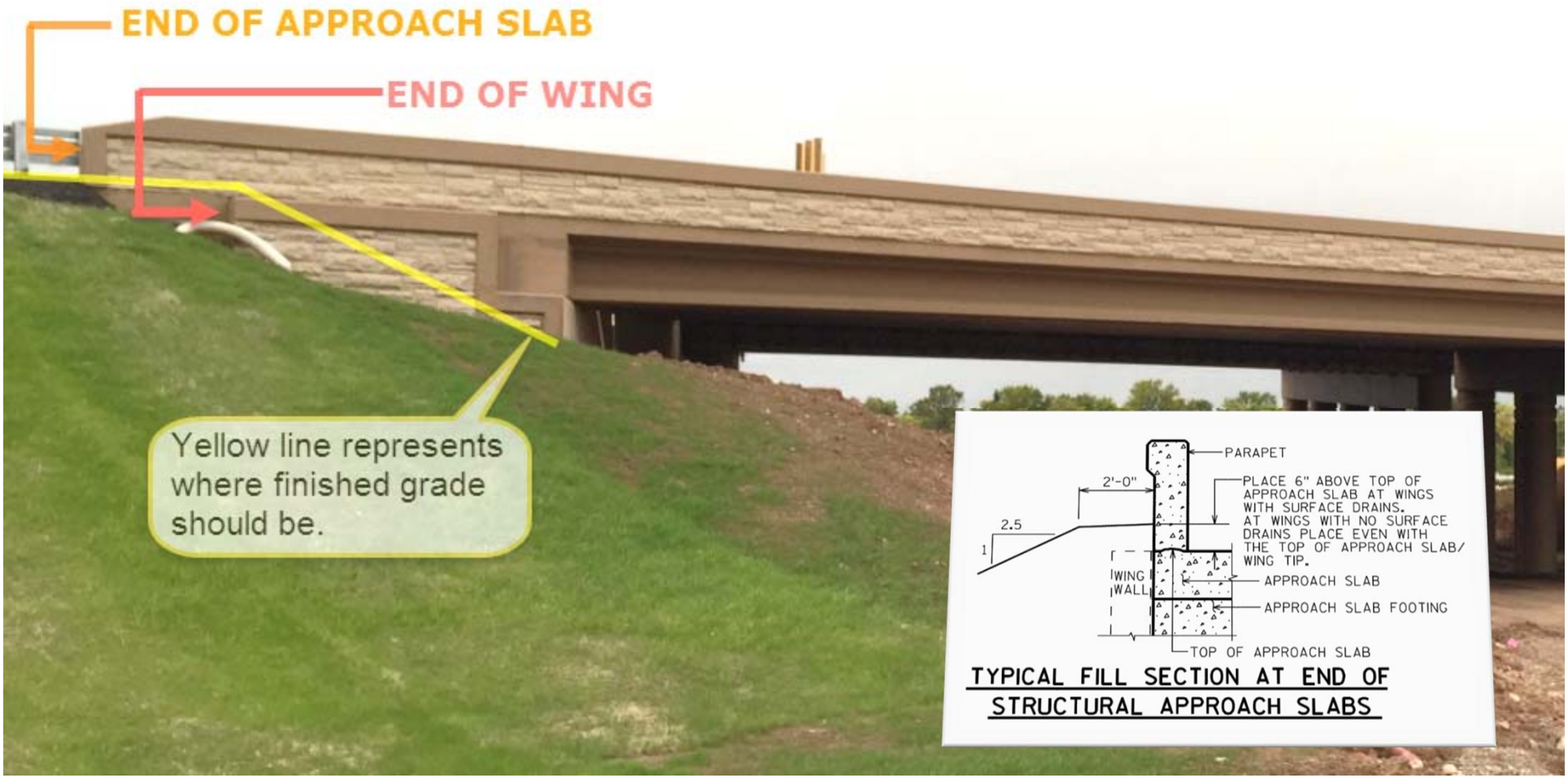
Wing Tip Erosion and Drainage



Construction Loads on Bridges

- Std. Spec 108.7.3 Loads on Structures
- Contractor's responsibility
- If directed by Engineer, contractor to analyze and submit to BOS for review
- Wisconsin P.E. required
- BOS will assist if unsure

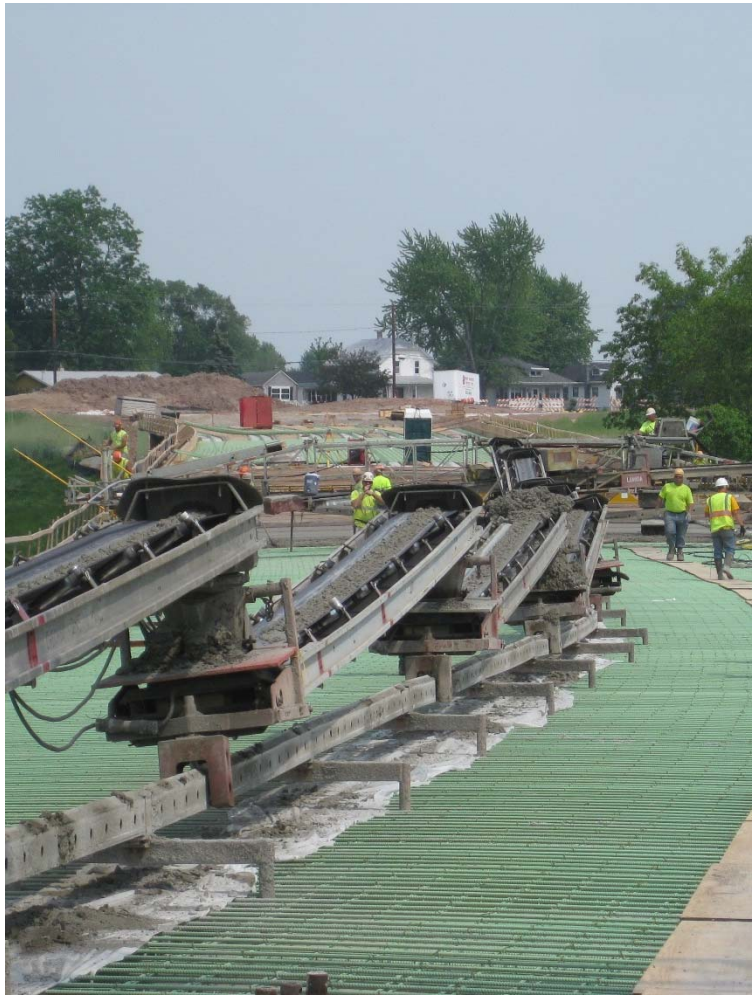
FHWA/WisDOT Joint Program Review: Bridge Deck Construction

- Purpose:
  - Determine if Standard Specifications are consistently administered throughout Regions
  - Identify best practices/ opportunities for improvement

- Team Members
  - FHWA
  - WisDOT: Regions, BOS, BTS, BPD, SE Freeways

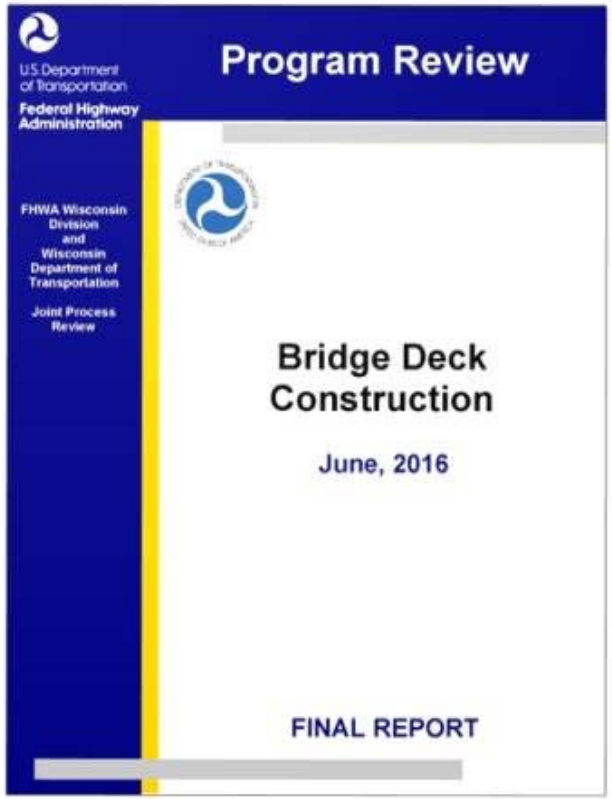
FHWA/WisDOT Joint Program Review: Bridge Deck Construction

- Scope:
  - Full depth concrete bridge decks & Grade E overlays
  - Visited 22 active projects
    - Neighboring states IL, IA
  - Target construction operations:
    - Formwork/rebar installation
    - Dry-run
    - Pre-pour meeting
    - Deck/overlay pour
    - QC/QV testing



FHWA/WisDOT Joint Program Review: Bridge Deck Construction

- Final Report published June, 2016
- Eight Observations:
  - *"Inspector QA roles and responsibilities aren't well understood"*



FHWA/WisDOT Joint Program Review: Bridge Deck Construction

- Dry runs
  - Timing – Avoid dry runs immediately before pour
  - Measurements
    - Inconsistent frequency
    - Spot-check vs. entire deck area
    - Heavy reliance on contractor measurements
    - Independent verification
  - Check finishing machine set-up
  - Use rigid straightedge under rollers, avoid 2x4's

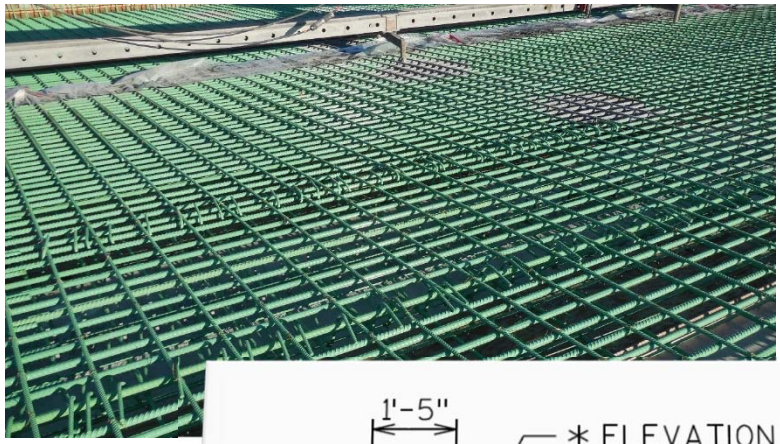
FHWA/WisDOT Joint Program Review: Bridge Deck Construction

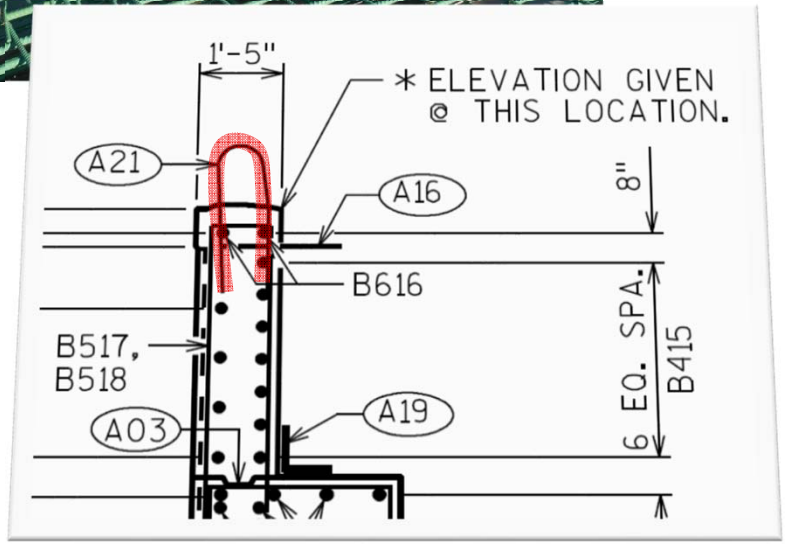
- Other Opportunities for Improvement
  - Written notification to contractor to proceed with deck pour
  - Inadequate staffing
    - Critical Inspection Guide
    - Deck pours - “continuous inspection”
    - Minimum two inspectors
  - Inspector inconsistency
    - One-day Bridge Construction Inspection Training

“Based on your forecasted evaporation rates and current forecasted evaporation rates, you are ok to proceed with the overlay pour as scheduled for tonight.”

Reinforcement Placement

- Correct Bar
  - Size
  - Coating
  - Bends
- Spacing
- Orientation
- Clear Distance
- Tied Firmly
- Adequate Lap Lengths
- All Bars Included

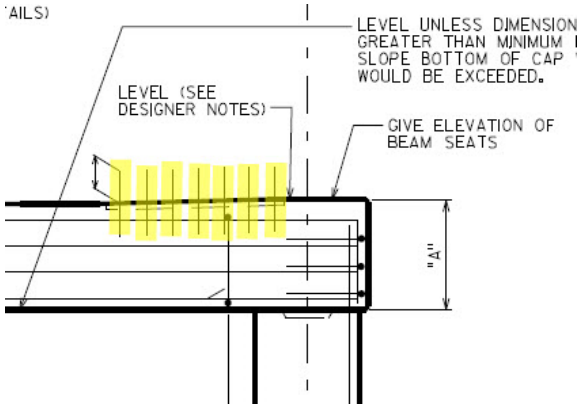


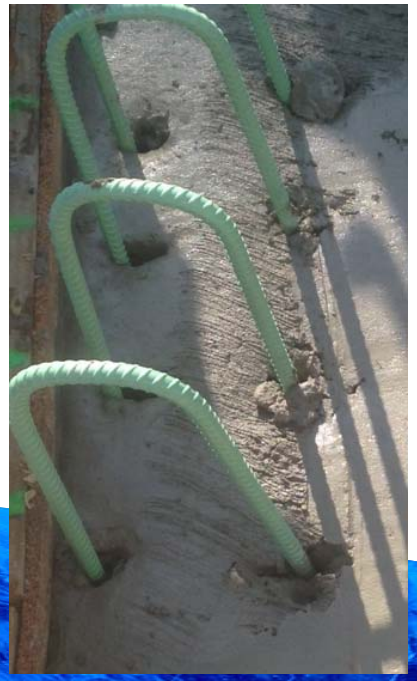


(A21) FOR PPT. BARS & DIMENSIONS, SEE "MODIFIED SINGLE SLOPE PARAPET 32SS" SHEET FOR DETAILS.

Stab Bars

- Only allowed when clearly stated on the plan
  - Example: Dowel bar between beam seats at fixed piers & abutments
- Otherwise, not allowed!
  - At cold joint, so creates pocket where water & salt can collect
  - Freeze thaw cycle & corrosion causes damage/spalling

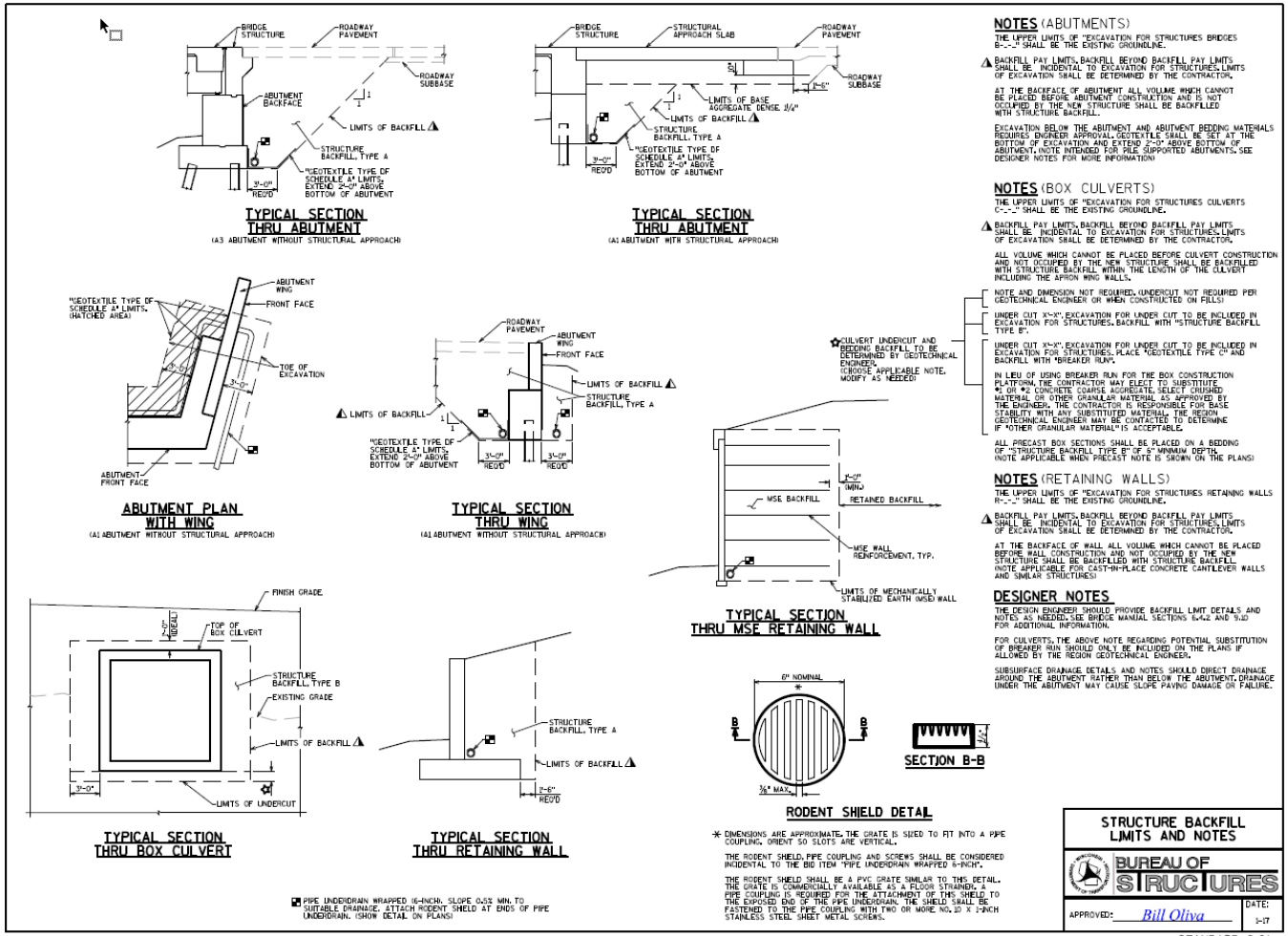




Structure Backfill – Type A & B

- Structure Backfill is now categorized as either Type A or Type B.
- The type of backfill and the limits of structure backfill are now required to be shown on the structure plans.
- **Bridge Standard 9.01** shows typical structure backfill details and notes to be used on structure plans.

Structure Backfill – Type A & B



Girder Damage During Removals

- "Damage will occur no matter what I do when removing a bridge deck." ➡ THIS COMMENT MAY COME FROM CONTRACTORS BUT IS NOT THE WAY WISDOT VIEWS THIS ISSUE

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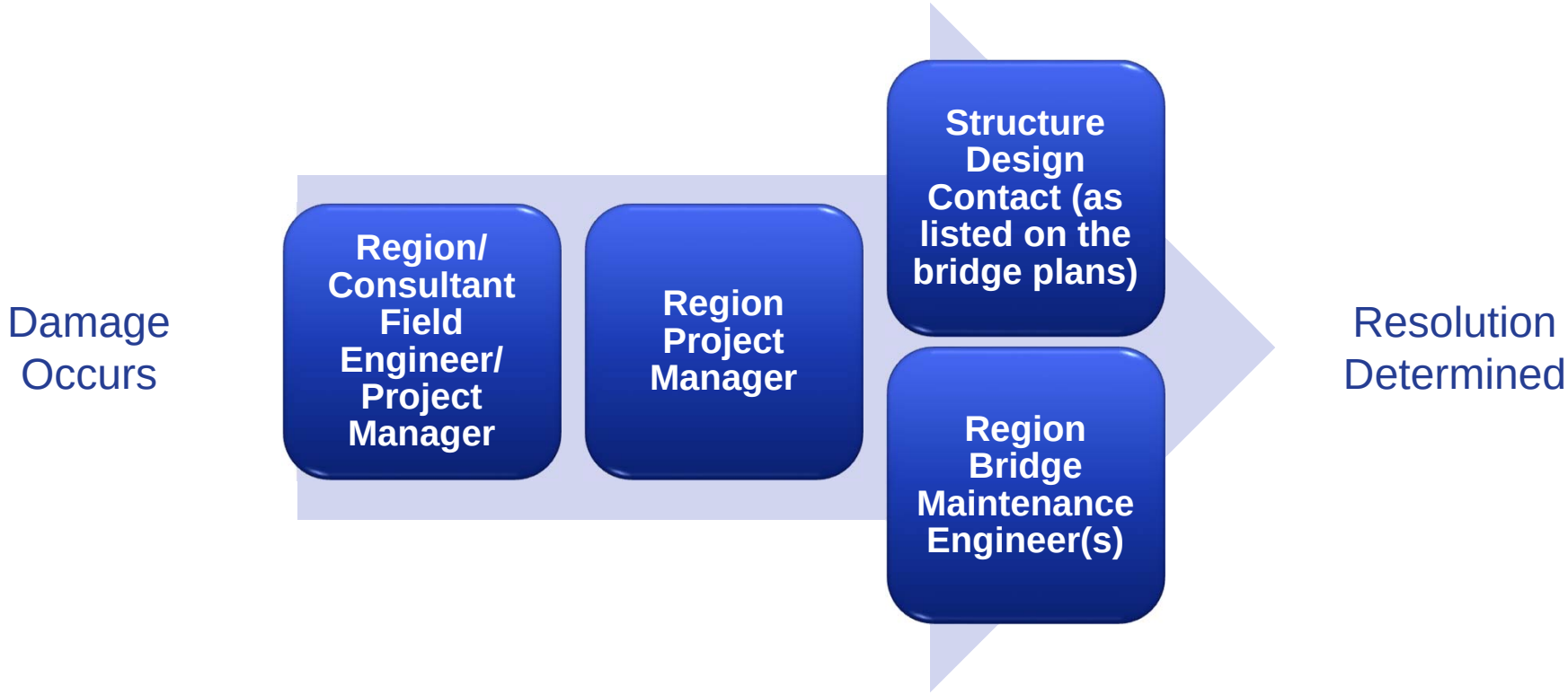
Girder Damage During Removals

Girder Damage During Removals

- Who to contact when girder damage occurs:

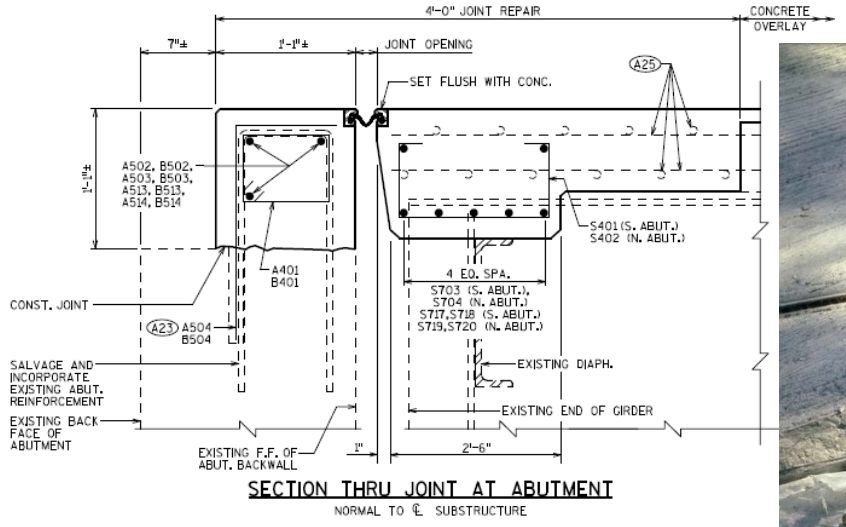


Joint Replacement Issues

- Recurring Issues:
  - Check that joint is set correctly prior to deck pour
  - Too high is no good, but too low is also no good
  - Plan note says to ‘set flush with concrete’

Joint Replacement Issues

- New Issue Discovered in the Past Year
  - Construction of joints with overlays has not followed the details in the structure plans
  - THE PAVING BLOCK AT THE ABUTMENT **SHOULD NOT** BE POURED UP TO THE UNDERSIDE OF THE OVERLAY, AND SUBSEQUENTLY OVERLAID



SECTION THRU JOINT AT ABUTMENT
NORMAL TO ℄ SUBSTRUCTURE

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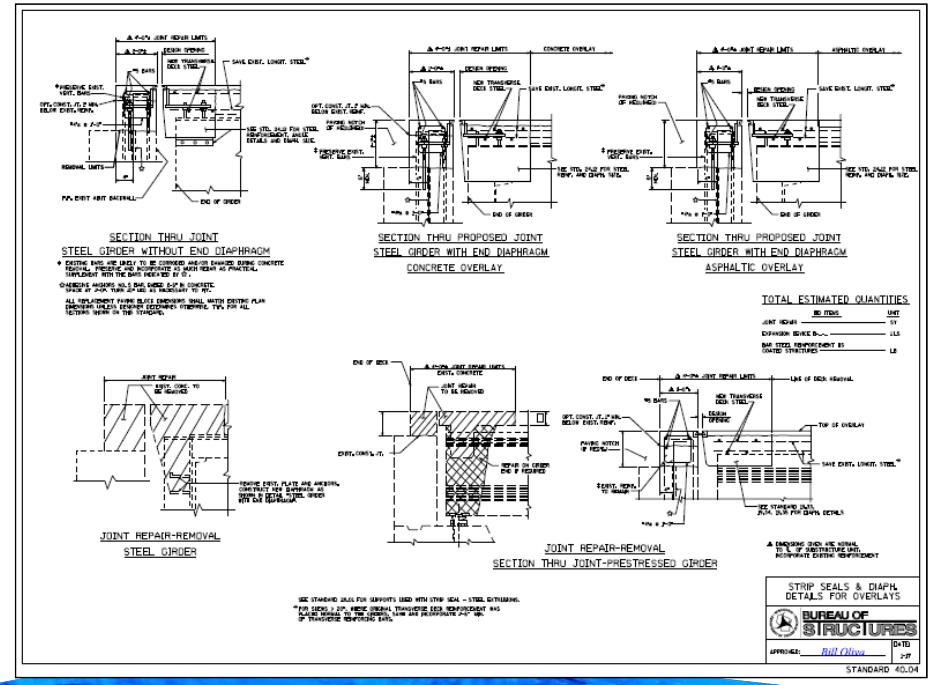
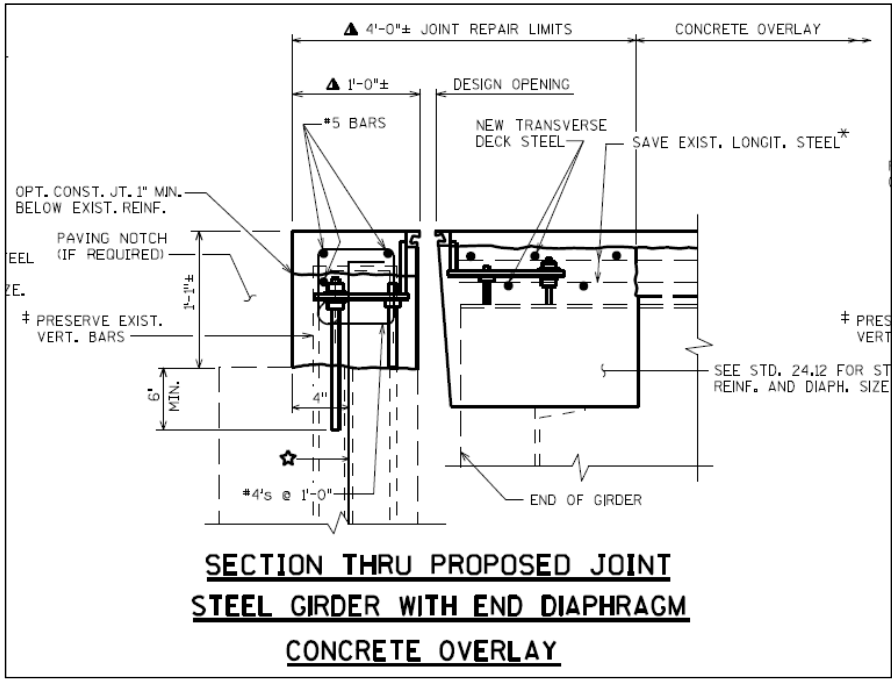
Joint Replacement Issues

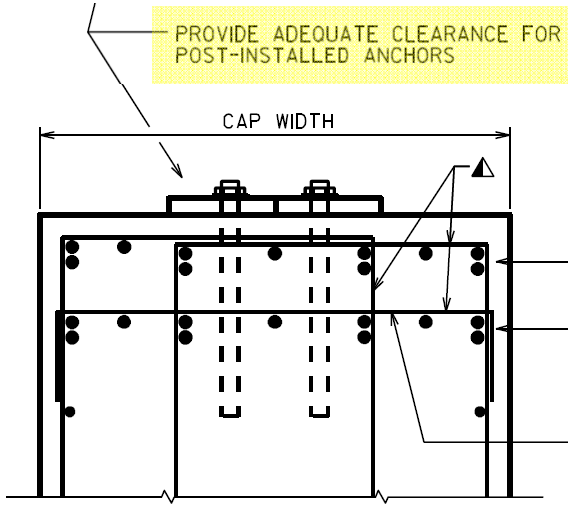
- New Issue Discovered in the Past Year
  - New Standard Detail Created (Won't be on Plans this Construction Season but detail can be used as a field adjustment)





Bearing Anchor Bolts

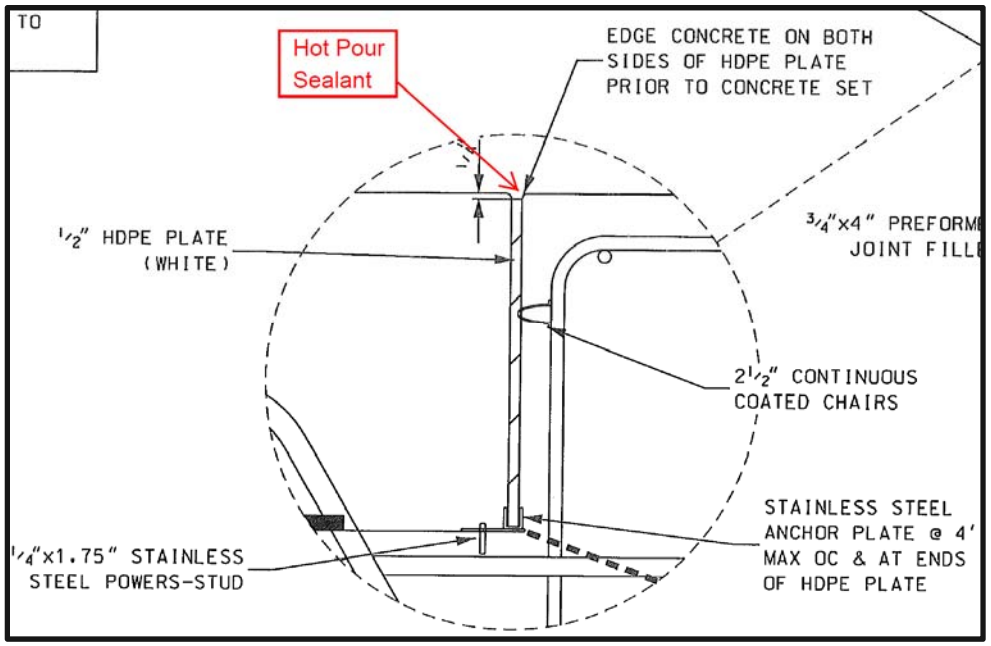
- Know the contractor's plan for Anchor Bolts
  - Cast-in vs Post-installed (grouted or epoxied)
- If Post-installed, check to ensure bar steel does not conflict
- Bar steel can, and should, be adjusted before pouring concrete if conflicts are found



SECTION THRU PIER CAP

Structural Approach Slabs

- Some contractors have requested to pour the structural approach slabs in conjunction with the bridge deck



- Potential benefits:
  - Schedule
  - Ride
  - Durability

- If you get this request, contact BOS to see if it is right for your situation

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Ancillary (Wind Loaded) Structures

- Standard Spec updates
  - 636: Concrete Sign Supports
    - Construction joint is not allowed on footing, or drilled shaft without engineer's written approval
    - Remove disposable casing before backfilling

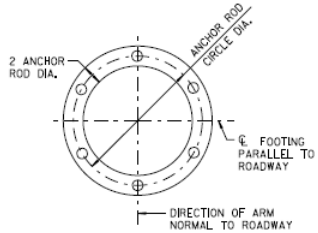
  - 641: Sign Bridges and Overhead Sign Supports
    - Removal of aluminum sign bridges, and reformat the section to cover aluminum components (sign supports & catwalk) only
    - Re-arrange the steel sign bridge section for better clarity
    - Design overhead sign support per plan specification, currently design with ASD and LFD methods
    - Welding aluminum members in the field is not allowed

Ancillary (Wind Loaded) Structures

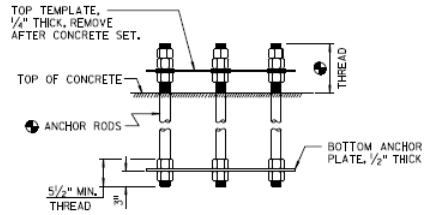
- Standard Spec updates (continue)
  - 657: Poles, Arms, Standards, and Bases
    - Contractor furnish all H.S. bolts, nuts, flat washers and DTI's
    - All standard poles are designed under AASHTO legacy standards until LRFD specifications are implemented
    - Misprinted section 657.2.2.1.4. It is a repeat of 657.2.2.1
  - 660: High Mast Lighting
    - Design high mast lighting structure per 6th edition of AASHTO design standards

Ancillary (Wind Loaded) Structures

- Standard Drawings
  - Updated standard drawings for Chapter 39 of the WisDOT Bridge Manual
  - All new sign bridge standard insert sheets
  - Updated SDD's for type 10 & 13 concrete base
  - Updated SDD's for all overhead sign support concrete bases
    – new details for anchor rod assembly, top template and bottom anchor plates as shown



TOP TEMPLATE AND BOTTOM ANCHOR PLATE



ANCHOR ROD ASSEMBLY DETAILS

MINIMUM OF 6 ANCHOR RODS, EXACT NUMBER, SIZE, DIMENSION AND ORIENTATION AS SHOWN ON FABRICATION DRAWING.

Ancillary (Wind Loaded) Structures

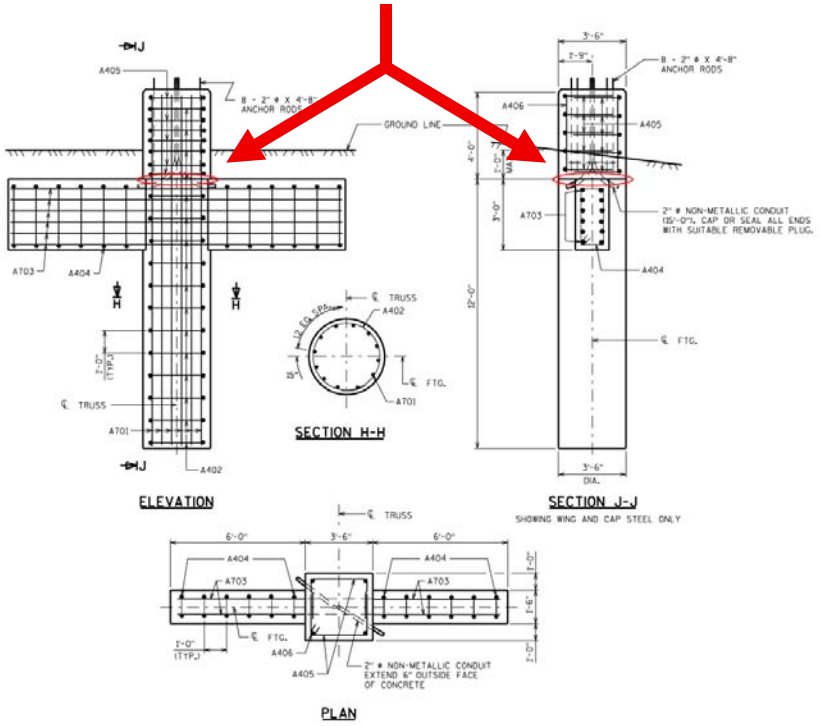
- Footing construction issues
  - No horizontal construction joint on cantilever structure footings

ACCEPTABLE
(single pour)

separate pours

NOT ALLOWED

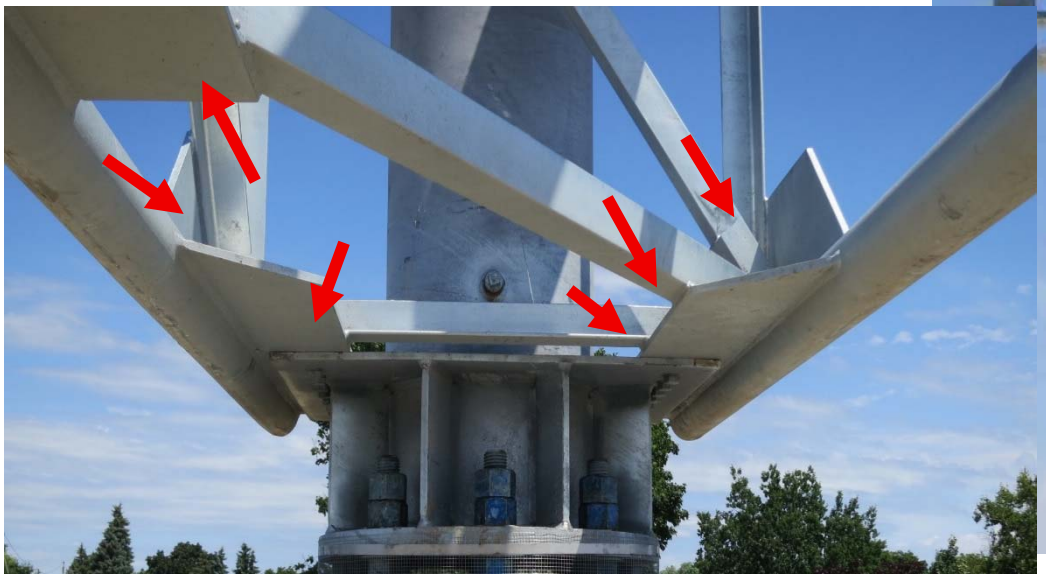
NOT a construction joint



CANTILEVER TRUSS FOOTING

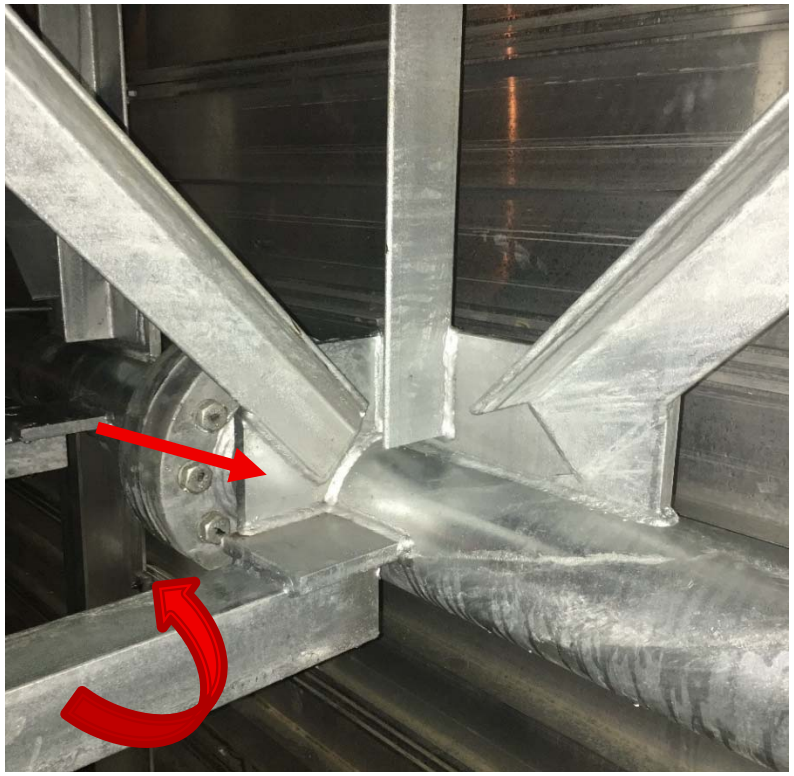
Ancillary (Wind Loaded) Structures

- Recent Findings – Cantilever Truss
  - End of truss connections to be bolted.



Ancillary (Wind Loaded) Structures

- Recent Findings - Full span truss
  - Transverse plate should be parallel to chord.
  - Bottom web should be facing up



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- Recent Findings – Cantilever Truss
  - End of truss connections to be bolted.

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Ancillary (Wind Loaded) Structures

- Recent Findings –
  - Coordination in Staged projects, ensuring anchor templates are consistent with plans.

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Steel Expansion Bearings Issues

- Issues to watch for with Steel Expansion Bearings
  - Girders coming off of their bearings
  - Teflon squeezing out of the bearing assembly
  - Improper Teflon thickness (should be 1/16”)
  - Improper bond of Teflon to steel plate B. See standard specification for proper bond procedure

Steel Expansion Bearings Issues

- Issues to watch for with Steel Expansion Bearings
  - Girder anchor plate not centered on plate B at the time of girder erection
  - Unclean bearing surfaces (proper storage is key!)
  - Improper surface finish on anchor plate (ANSI 8 -mirror finish)

Steel Expansion Bearings Issues

Conclusion

- Call us!
- BOS looks forward to another successful construction season – THANK YOU!

WISCONSIN DEPARTMENT OF TRANSPORTATION

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