



# Bureau of Structures Program Updates

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Kalahari Resort, Wisconsin Dells

**January 16, 2025**

# Outline

1. Bridge Technical Committee Updates
2. Approved Product Lists
3. Construction Issues
4. Field Welding and Fabrication Updates



# Bridge Technical Committee Updates

- Past Year:
  - Maturity Method for Concrete
  - False Decking Language
- Looking Ahead:
  - Shots on girders for redecking
  - Construction project schedules



# Maturity Method for Concrete

## Std Spec 502.3.10.1.3.3

- Simplified steps
  - Mix design is batched, cylinders are made
  - Cylinders broken over time to determine maturity method curve
    - Applies to mix design and specific materials
  - Concrete is batched and placed in the field
    - Element & 3 Verification Cylinders

# Maturity Method for Concrete

- Simplified steps, cont.
  - Probes placed in field element & 1 verification cylinder
  - Verification cylinders are field cured, per WisDOT Spec
  - Use element probe to determine maturity of element, strip forms
  - Use verification cylinder probe to determine cylinder maturity, test other two cylinders to verify strength/maturity curve
  - Important! Maturity likely at different times for element & cylinder

# False Decking

## Notice to Contractor Special Provision

- Rigid containment system throughout bridge construction over live traffic lanes and pedestrian facilities
- Catch construction debris between exterior girders
- Include details of containment in falsework submittal
- Incidental to bridge construction



# False Decking

## Notice to Contractor Special Provision

- Typical use (over live traffic lanes and pedestrian facilities)

- All bridges over interstate highways
- All bridges over roadways with ADT >10,000
- Pedestrian facilities that remain open during construction
- As otherwise determined by Region



- Use Std Spec Bid Item 203.0330 Debris Containment (structure) over railroad facilities

# Survey girders for redecking

- Concern girders not rebounding as expected
- Staged construction – bigger issue!
- Consideration of solutions
  - Shots before and after deck removal?
  - Design process modifications?
  - Design contracting implications?







# Approved Product Lists

- Qualified products and fabricators
  - Must be on the list at the time of letting
- Ensure that Steel Fabricators are qualified for the work

## Product Key\*

1 - Unspliced rolled sections

2 - Field or shop spliced rolled beam bridge, straight or with radius > 500ft

Built-up I-girder with constant web depth, straight or with radius > 500ft, spliced or unspliced

Built-up I-girder with variable web depth, straight or with radius > 1000ft

Truss with length < 200ft, almost entirely preassembled at the certified facility and shipped

3 - Tub or trapezoidal box girders

Closed box girders

Truss with length > 200ft

Arches

Bascule bridges

Cable-supported bridges

Moveable bridges

Bridges with radius < 500ft

Bridges with fracture critical members

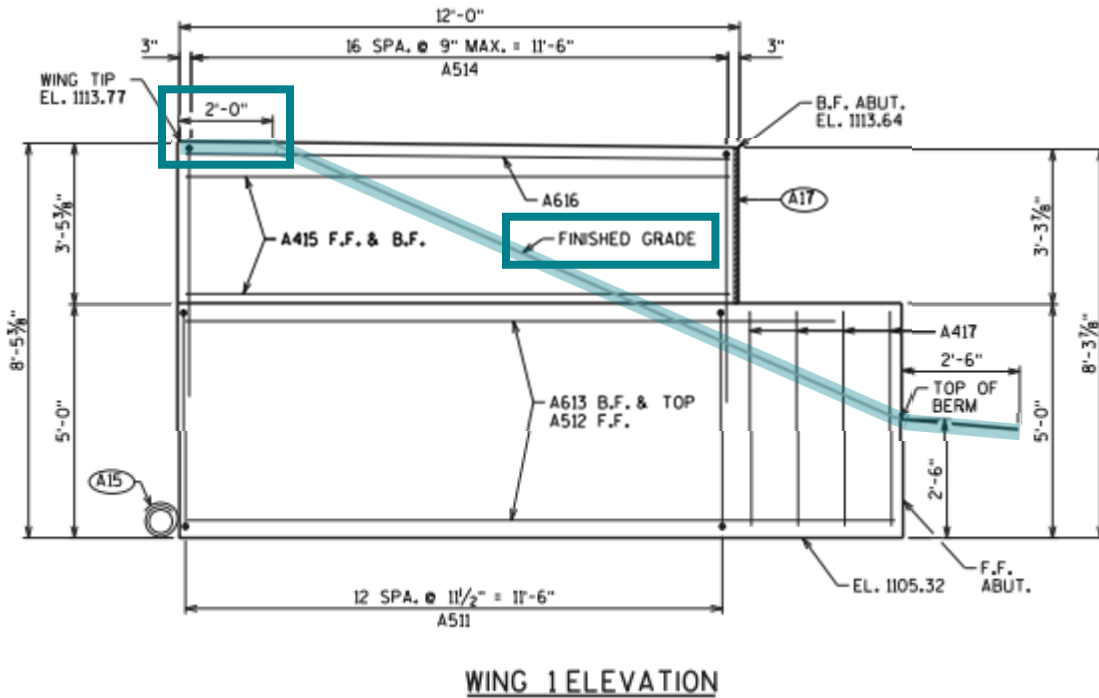
4 - Fracture Critical Members



# Construction Issues



# Wing Tip Grading



WING 1 ELEVATION

Riprap should extend to end of wing

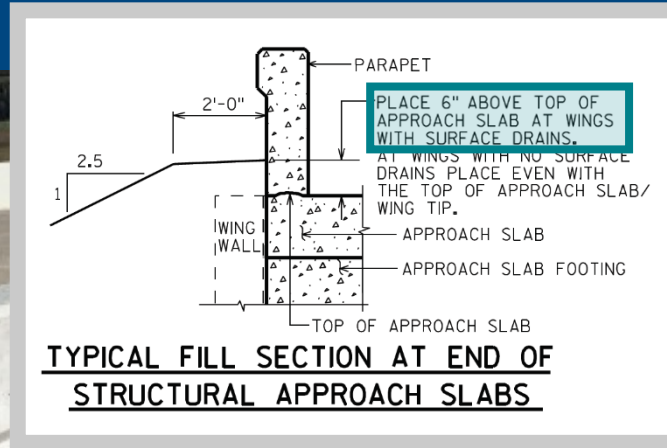


2' Level before slope

Grading on Abutment Wing Wall sheet

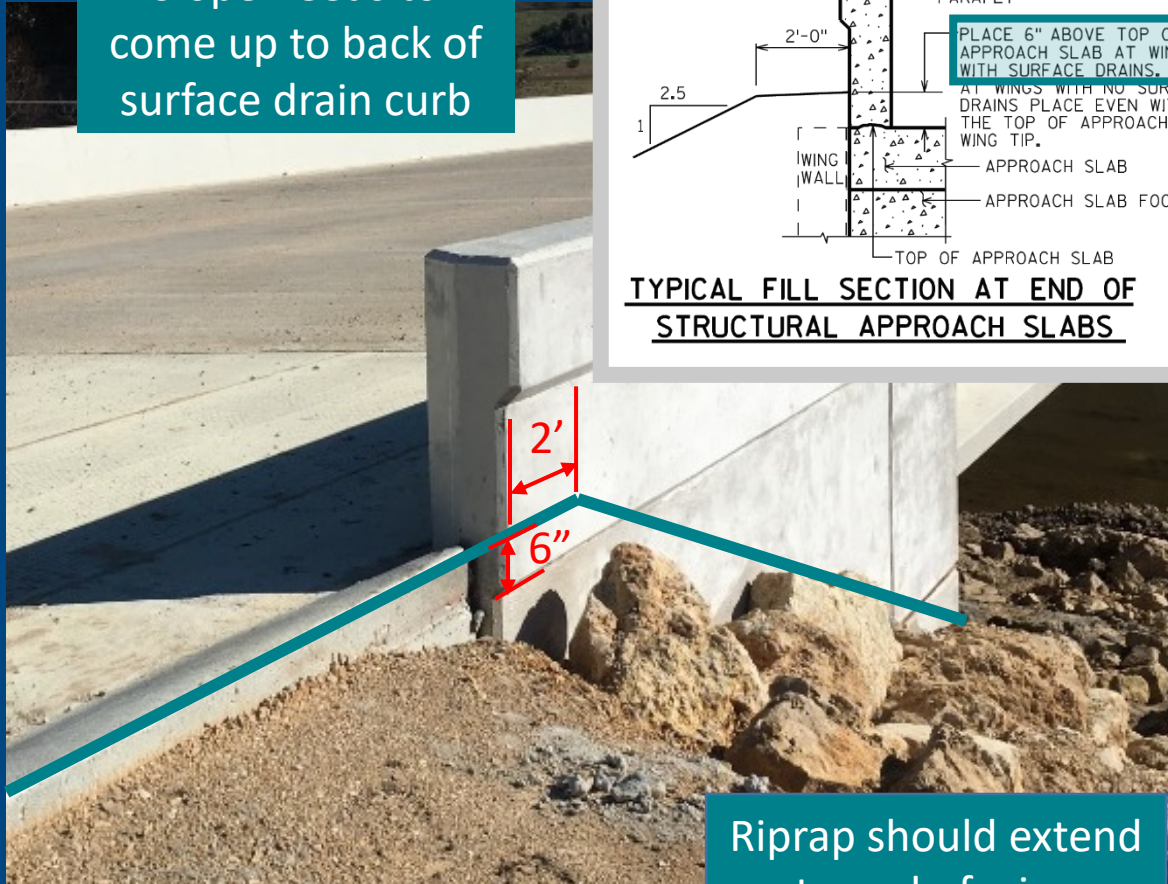
# Wing Tip Grading

Slope needs to come up to back of surface drain curb



- Check bridge plan for grading at wing walls

- Sheet 1 of Bridge Plan
- Abutment Wing Wall Sheet of Bridge Plan



Riprap should extend to end of wing

# Wing Tip Grading

Spray paint fill line!



See Bridge Plan for grading around abutments and wings

# Wing Tip Grading

- No bituminous sealant, asphalt, etc. at wings
  - Increases water speed and causes erosion issues



# Wingwall Ends - Road Side

- Wing tip elevation should match road elevation to prevent high or low top of wing



Low top of wing (covered with thin approach concrete)

High top of wing (Plow hazard)





# Drainage for Overlays

- Ensure drainage is still achieved when completing overlay projects near inlets and flumes.
  - Work with field engineer to make adjustments if necessary



# Girder Damage during Deck Removal

## Overview

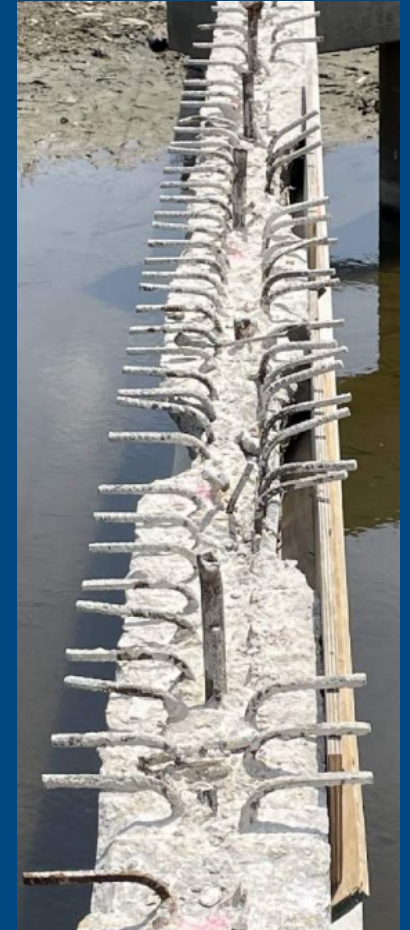
- Standard Specification 203.3.2.2.2
  - Do not damage existing bar steel reinforcement, girders, or other components that will be incorporated into new work.
  - After deck removal is complete, notify the engineer to request a damage survey. If damage is identified the department will determine if repairs or restoration will be allowed.
    - If allowed, have a Wisconsin PE analyze the damage and provide signed and sealed computations and details for restoration that restore the girders to their previous structural capacity.
  - Do not begin repairs until plan is reviewed and accepted by the department



# Girder Damage during Deck Removal

## Prestressed Girders

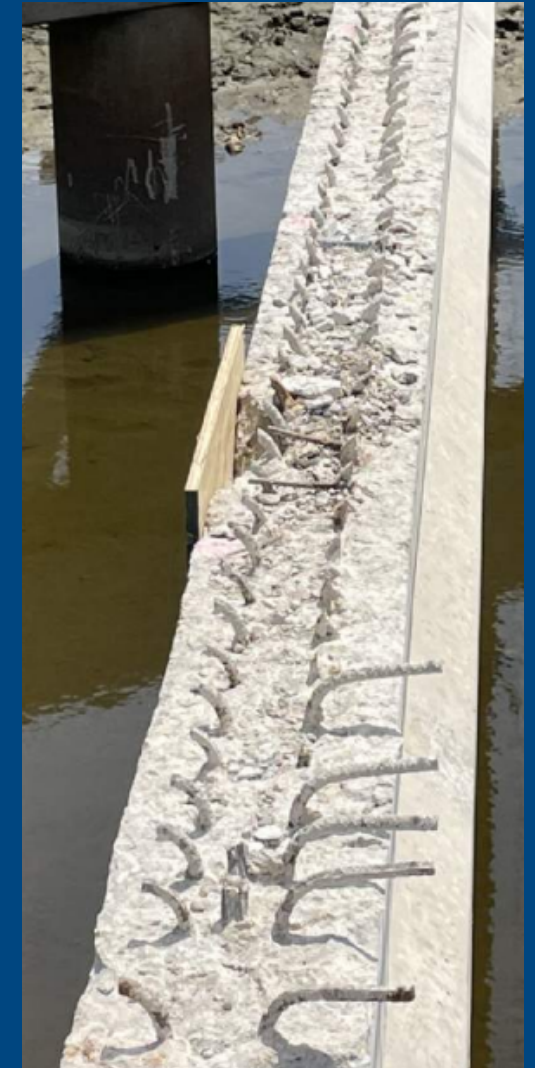
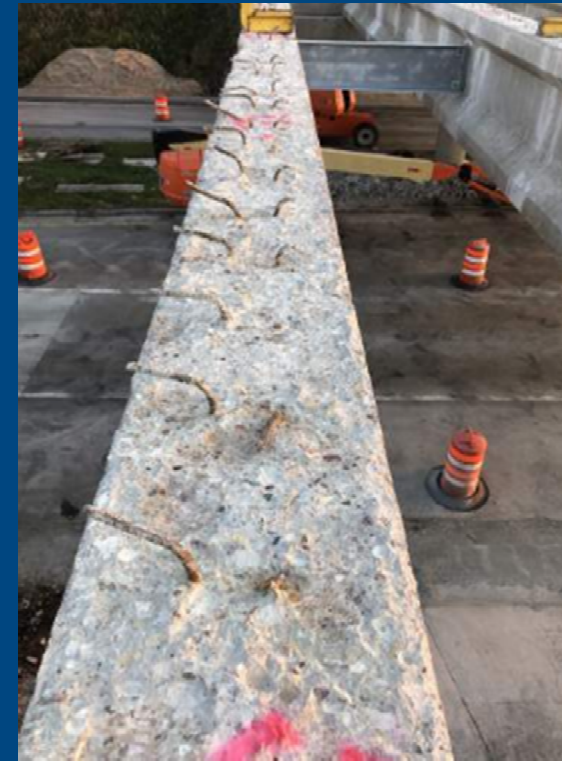
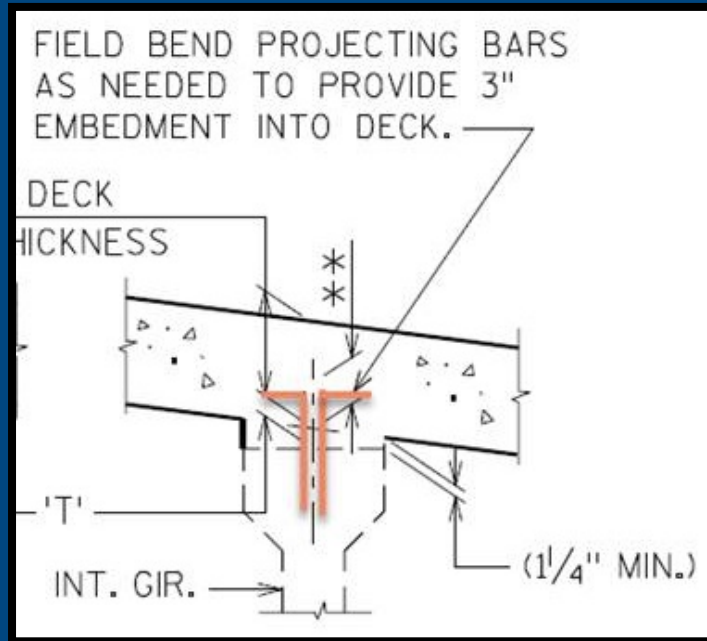
- Flange Spalling
  - limit hammer size
  - Repairs:
    - Patching with reinforcement, positive anchorage



# Girder Damage during Deck Removal

## Prestressed Girders

- Shear Stirrups Cut
  - Sawcuts to remove deck must not impact any element of existing girder
  - Repairs:
    - Adhesive anchors



# Girder Damage during Deck Removal

## Steel Girders

- Sawcut Flanges
  - Repairs:
    - Grinding
    - Bolted cover plates
- Flange deformation from hammer strike
  - Repairs:
    - Heat Straightening



# Girder Damage during Deck Removal

## Damaged Girder Report

- Any damage to girder requires Damaged Girder Report ([Link](#))
  - To be filled out by contractor
  - Must be reviewed and accepted by BOS prior to repairs
  - May require PE stamped calculations/ drawings
  - Include detailed descriptions, photos, and locations of damage and details of repair (drawing, prep, procedure, materials to be used, etc.)

**BUREAU OF STRUCTURES**

**Damaged Girder Incident Report & Proposed Response**  
(To be filled out and submitted to BOS prior to repair)

Bridge Number: \_\_\_\_\_

Project ID: \_\_\_\_\_

Date: \_\_\_\_\_

Contractor Company: \_\_\_\_\_

Contractor Contact

- Name: \_\_\_\_\_
- Email: \_\_\_\_\_
- Phone number: \_\_\_\_\_

WisDOT Project Manager

- Name: \_\_\_\_\_
- Email: \_\_\_\_\_
- Phone number: \_\_\_\_\_

WisDOT / Consultant Contact (if other than Project Manager)

- Name: \_\_\_\_\_
- Email: \_\_\_\_\_
- Phone number: \_\_\_\_\_

Deck Removal Information

- Was a sawcut used? : \_\_\_\_\_
- If so, how deep? : \_\_\_\_\_
- If so, where was sawcut(s) located? : \_\_\_\_\_
- What type(weight) of hammer was used over the girder? : \_\_\_\_\_

# Girder Damage during Deck Removal

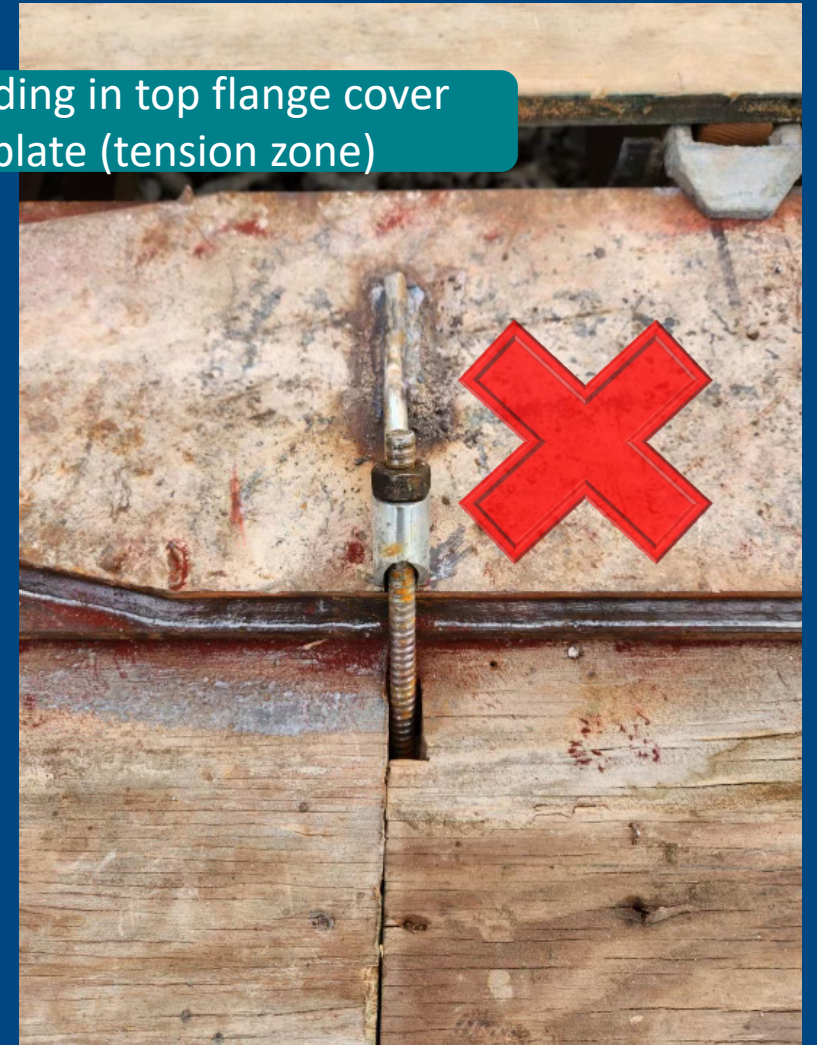
## Other States

- Michigan DOT
  - Jack hammers 60 lbs or less above the girder
- Minnesota DOT
  - Jack hammers 60 lbs or less above and within 1 foot of girder flange, operator demonstrate ability to operate hammer without damaging girder

# Field Welding Cont. Steel Girders

- Field welding in tension flanges of continuous steel girders for construction purposes (i.e. deck form attachment) is not allowed
  - Now tension zones are labeled in plan

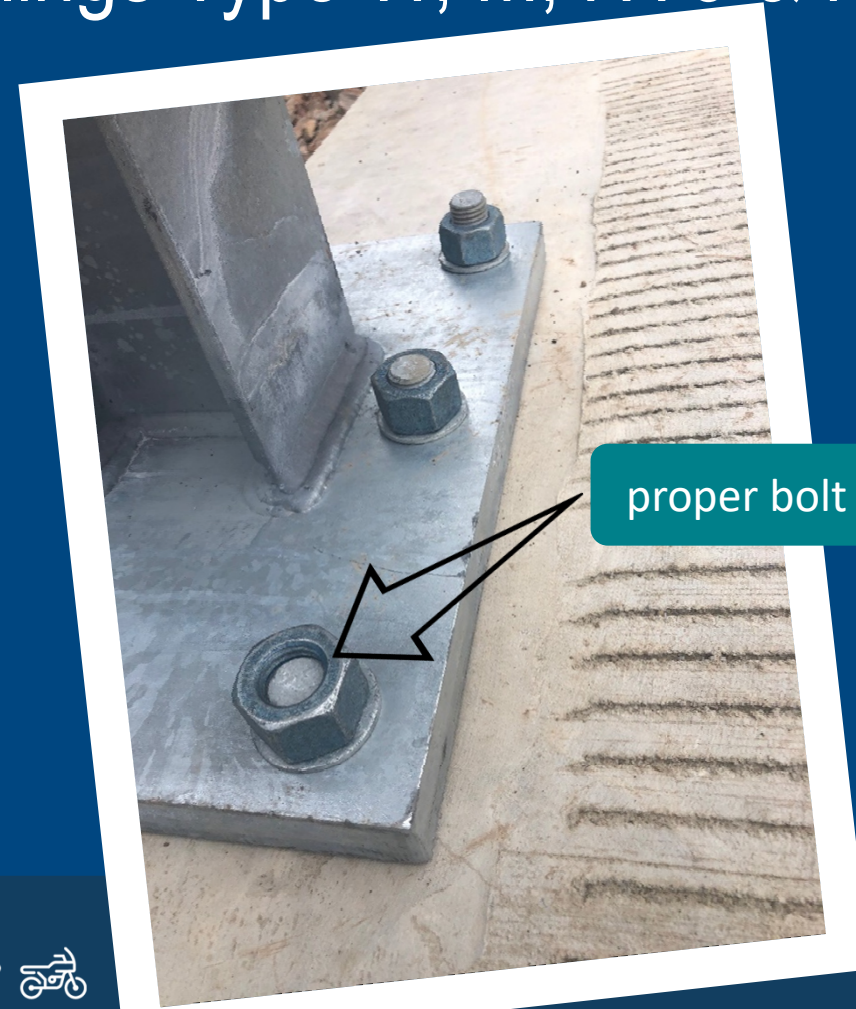
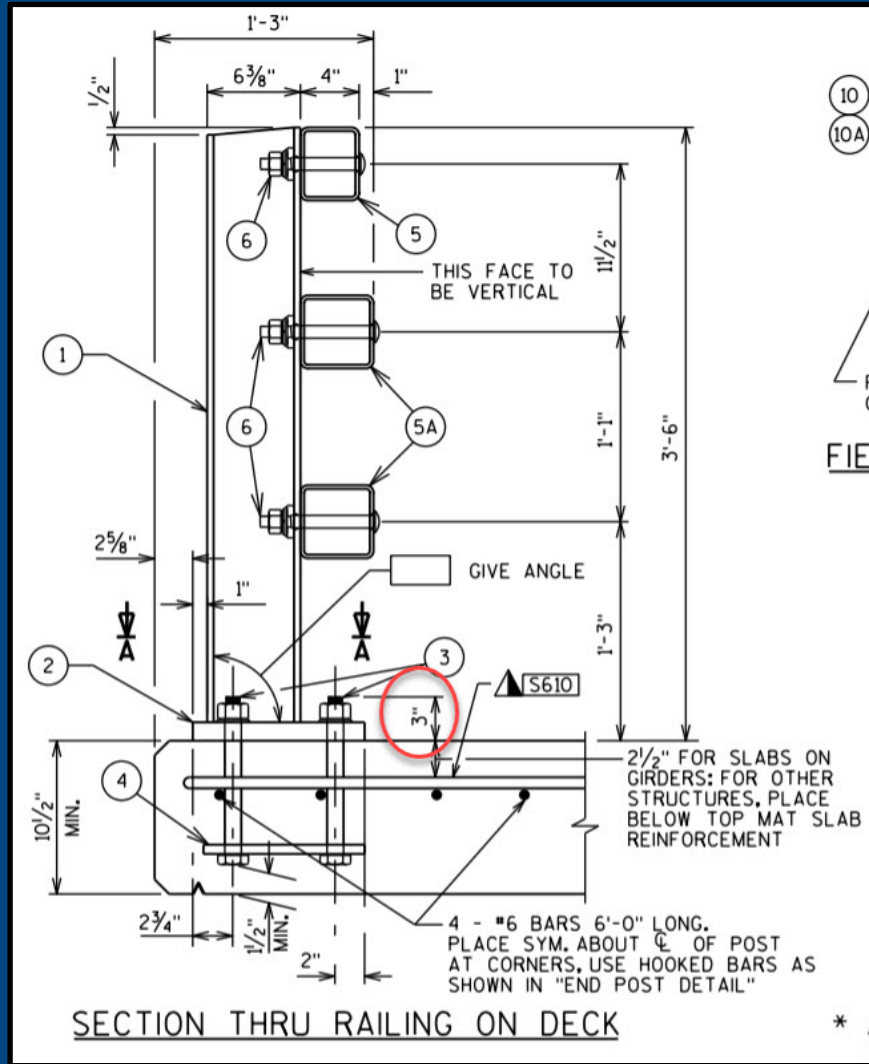
Welding in top flange cover plate (tension zone)





# Railing Anchorage

- Anchor bolt projection on traffic railings Type W, M, NY3 & NY4



# Railing Anchorage

- Check projection during dry run
- Ensure templates are adequately secured for concrete placement
- Confirm anchor length/embedment in wings and superstructure



proper bolt projection not met

# Curing Concrete Floors

## Reminders

- Bridges <100'
  - 7 days with polyethylene-coated burlap (or wetted burlap for at least 12 hours prior to applying polyethylene-coated burlap)
  - Apply as soon as concrete sets sufficiently!
- Bridges >100'
  - Fogging within 15 minutes of finishing and tining
  - Followed by burlap on wet surface
- Continuously wet throughout cure period
- Critical to prevent deck cracking



# Adhesive Anchors

## Reminders

- Standard Specification 502.3.14.1
  - Concrete must cure 21 days prior to adhesive anchor installation
  - Clean and prep drill hole prior to install per manufacturer install instructions and recommendations and follow temperature restrictions
  - Confirm length, projection above concrete



# Replacing Concrete Approaches

## Deterioration of Paving Notch

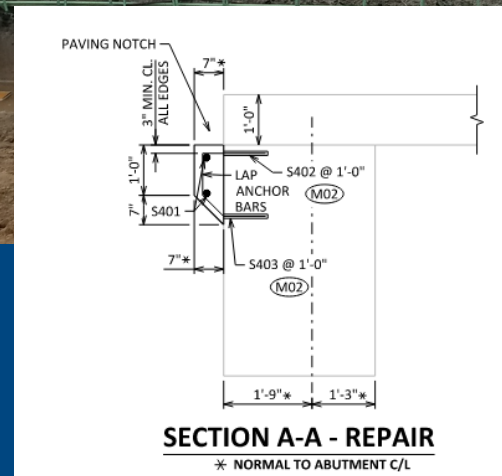


- Removal of existing concrete approach for replacement at bridge reveals significant paving notch deterioration
  - Oftentimes no work planned for the structure in the project

# Replacing Concrete Approaches

## Deterioration of Paving Notches

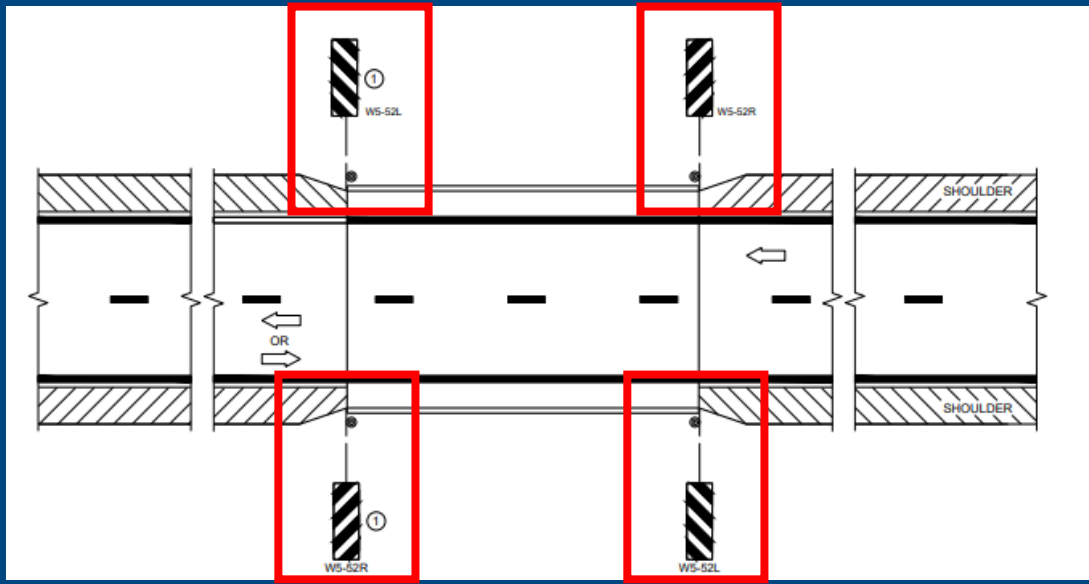
- If no paving notch or deteriorated paving notch found when approach is removed:
  - Contractor: Notify project staff
  - Project Staff: Contact BOS so repair detail can be provided



# Narrow Bridge Signage

## Placement at Bridge Ends

- Place edge of the W5-52 sign in line with face of curb or parapet (SDD 15C6)
  - Behind guardrail when present




# Field Welding and Fabrication Updates





# DT2337 - Field Welding Plan

- Must be submitted yearly before January 31<sup>st</sup>
- Must include the following:
  - Welding Procedure Specifications
  - Welder Qualifications
    - Welder Qualification Test Records (WQTR)
    - Continuity Records
  - Inspectors
  - Repairs:
    - Previously certified welder: provide copy of certification
    - Current certified welder: provide copy of certification
    - Individual who has been instructed on the visual acceptance criteria of AWS D1.1: provide proof of training

 **CONTRACTOR'S FIELD WELDING PLAN**  
Wisconsin Department of Transportation  
DT2337 1/2020

To be completed by the Contractor. The completed form and all required attachments must be emailed to the engineer by the 31<sup>st</sup> of January each year.

**1. Contact Information**

Name (First Last)  Original  Revision  Date

Title  Email

Company  Phone

**2. Scope of Field Work**

Select the type of work to be completed this year. List the corresponding WPSs next to each selected work type.

Select	AWS Code	Application	WPS Name/Number
<input type="checkbox"/>	D1.1	Steel Pile Splices – H-Pile	<input type="text"/>
<input type="checkbox"/>	D1.1	Steel Pile Splices – Pipe Pile	<input type="text"/>
<input type="checkbox"/>	D1.5	Steel Pile Splices – Exposed	<input type="text"/>
<input type="checkbox"/>	D1.1	Pile Points	<input type="text"/>
<input type="checkbox"/>	D1.1	Expansion Joint Splices	<input type="text"/>
<input type="checkbox"/>	D1.1	Steel Railing Repairs	<input type="text"/>
<input type="checkbox"/>	D1.6	Bearings – HS Steel to SS Steel	<input type="text"/>
<input type="checkbox"/>	D1.5	Bearings – HS Steel to HS Steel	<input type="text"/>
<input type="checkbox"/>	D1.5	Steel Sign Structure Repair	<input type="text"/>
<input type="checkbox"/>	D1.4	Rebar Splices	<input type="text"/>
<input type="checkbox"/>	D1.2	Aluminum Sign Structure Repair	<input type="text"/>
<input type="checkbox"/>	D1	Other – Describe in Notes	<input type="text"/>

**3. Attachments**

Welder Procedure Specifications (WPS) and Procedure Qualification Records (PQR).

Complete list of welders, welder qualifications AND continuity records. All welders must be qualified per AWS D1 codes.

Complete list of inspectors and inspector qualifications.

**4. Notes (Optional)**

Bureau of Structures (BOS) Use Only

Page 1 of 2

# Welding Procedure Specifications Requirements - Highlights

Example WPS (Single-Process)  
WELDING PROCEDURE SPECIFICATION (WPS)

RED Inc. 2010 WPS No. 0 Rev. No. 12/01/2020  
 Company Name J. Jones 12/01/2015 Date  
 Authorized by J. Jones 231 Supporting PQRI(s) No CWN Report

BASE METALS	Specification	Type or Grade	AWS Group No.	BASE METAL THICKNESS	As-Welded	With PWHT
Base Material	ASTM A131	A	I	CJP Groove Weeds	3/4-1-1/2 in	--
Welded to	ASTM A131	A	I	CJP Groove w/CVN	--	--
Backing Material	ASTM A131	A	I	PJP Groove Weeds	--	--
Other				Filler Weeds	--	--
				DIAMETER	--	--

**JOINT DETAILS**  
 Groove Type: Single V Groove Butt Joint  
 Groove Angle: 35° included  
 Root Opening: 1/16 in  
 Root Face: --  
 Backgouging: None  
 Method: --

**POSTWELD HEAT TREATMENT**  
 Temperature: None  
 Time at temperature: --  
 Other: --

**PROCEDURE**

Weld Layer(s)	All
Weld Pass(es)	All
Process	FCAW
Type (Semi-automatic, Mechanized, etc.)	Semi-auto
Position	OH
Vertical Progression	--
Filler Metal (AWS Spec.)	A5.20
AWS Classification	E71 C/C
Diameter	0.045 in
Manufacturer Trade Name	--
Shielding Gas (Composition)	100% CO <sub>2</sub>
Flow Rate	45-55 cfm
Nozzle Size	#4
Preheat Temperature	60° min
Interpass Temperature	60-350°
Electrical Characteristics	--
Current Type & Polarity	DCEP
Transfer Mode	--
Power Source Type (ac, dc, etc.)	CV
Amps	180-220
Volts	25-26
Wire Feed Speed (ft/min)	--
Travel Speed	8-12 ipm
Maximum Heat Input	--
Technique	--
Stringer or Weave	Stringer
Multi or Single Pass (per side)	Multipass
Oscillation (Mechanized Automatic)	--
Number of Electrodes	1
Contact Tube to Work Dist	1/2-1 in
Peening	None
Interpass Cleaning	Wire Brush
Other	--

Form J-2 (See <http://go.aws.org/D1forms>)

- Use prequalified WPSs when possible
- “Cast a wide net” – include several prequalified joints that can be used with the same welding process and parameters.
- Include fit-up tolerances and guidance for welders in the event tolerances cannot be met.
- List preheats by material thickness.
- List preheats by carbon equivalency for A252 Grade 3 (oil field pipe).

# Welding Procedure Specifications

## A252 Material

### What does AWS say?

#### ■ 5.3 Base Metal

- Only base metals listed in Table 5.3 may be used in prequalified WPSs.

#### ■ 6.8.3 Base Metal Qualification

- WPSs for base metals not listed in Table 5.3 or Table 6.9 shall be qualified in conformance with Clause 6.

AWSD1.1D1.1M2020 ANNEX J

**Example WPS (Single-Process)**  
**WELDING PROCEDURE SPECIFICATION (WPS)**

RED Inc. 2010 0 12/01/2020  
 Company Name WPS No. Rev. No. Date  
 J. Jones 12/01/2015 231 No  
 Authorized by Date Supporting PQRI(s) C/W Report

BASE METALS	Specification	Type or Grade	AWS Group No.	BASE METAL THICKNESS	As-Welded	With PWHT
Base Material	ASTM A131	A	I	CJP Groove Welds	3/4-1-1/2 in	--
Welded to	ASTM A131	A	I	CJP Groove w/CVN	--	--
Backing Material	ASTM A131	A	I	CJP Groove Welds	--	--
Other				Fillet Welds	--	--
				DIAMETER	--	--

JOINT DETAILS	JOINT DETAILS (Sketch)
Groove Type	Single V Groove Butt Joint
Groove Angle	35° included
Root Opening	1/8 in
Root Face	--
Backgouging	None
Method	--
POSTWELD HEAT TREATMENT	
Temperature	None
Time at temperature	--
Other	--

PROCEDURE	
Weld Layer(s)	All
Weld Pass(es)	All
Process	FCW
Type (Semi-automatic, Mechanical, etc.)	Semi-auto
Position	OH
Vertical Progression	--
Filler Metal (AWS Spec.)	A5.20
AWS Classification	E71 C/C
Diameter	0.045 in
Manufacturer/Trade Name	--
Shielding Gas (Composition)	100% C <sub>2</sub>
Flow Rate	45-55 cfm
Nozzle Size	#4
Preheat Temperature	60° min
Interpass Temperature	60-350°
Electrical Characteristics	--
Current Type & Polarity	DCEP
Transfer Mode	--
Power Source Type (ac, cv, etc.)	CV
Amps	180-220
Volts	25-26
Wire Feed Speed (ft/min)	--
Travel Speed	8-12 ipm
Maximum Heat Input	--
Technique	--
Stringer or Weave	Stringer
Multi or Single Pass (per side)	Multipass
Oscillation (Mechanized Automatic)	--
Number of Electrodes	1
Contact Tube to Work Dist	1/2-1 in
Peening	None
Interpass Cleaning	Wire Brush
Other	--

Form J-2 (See <http://go.aws.org/D1forms>)

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# Welding Procedure Specifications

## A252 Material

What does WisDOT Standard Specifications say?

- **550.3.4.1.2:** For materials not listed in table 3.1 of the AWS D1.1 code, preheat for a distance of 5 inches on both sides of the weld as follows:

- CE less than 0.35: heat to 100 F.
- CE greater than or equal to 0.35 and less than or equal to 0.45: heat to 175 F.
- CE greater than 0.45 and less than or equal to 0.50: heat to 300 F.

Example WPS (Single-Process)  
WELDING PROCEDURE SPECIFICATION (WPS)

Company Name: J. Jones  
Date: 12/01/2015  
WPS No.: 231  
Rev. No.: 0  
Date: 12/01/2020  
Authorized by: J. Jones  
Date: 12/01/2015  
Supporting PQR(s): No  
C/W Report: No

BASE METALS	Specification	Type or Grade	AWS Group No.	BASE METAL THICKNESS	As-Welded	With PWHT
Base Material	ASTM A131	A	I	CJP Groove Welds	3/4-1-1/2 in	--
Welded to	ASTM A131	A	I	CJP Groove w/CVN	--	--
Backing Material	ASTM A131	A	I	CJP Groove Welds	--	--
Other				Filler Welds	--	--
				DIAMETER	--	--

**JOINT DETAILS**

Groove Type: Single V Groove Butt Joint  
Groove Angle: 35° included  
Root Opening: 1/8 in  
Root Face: --  
Backgouging: None  
Method: --

**POSTWELD HEAT TREATMENT**

Temperature: None  
Time at temperature: --  
Other: --

**JOINT DETAILS (Sketch)**

**PROCEDURE**

Weld Layer(s)	All
Weld Pass(es)	All
Process	FCAW
Type (Semi-automatic, Mechanical, etc.)	Semi-auto
Position	OH
Vertical Progression	--
Filler Metal (AWS Spec.)	A5.20
AWS Classification	E71T1C
Diameter	0.045 in
Manufacturer/Trade Name	--
Shielding Gas (Composition)	100% CO <sub>2</sub>
Flow Rate	45-55 cfm
Nozzle Size	#4
Preheat Temperature	60° min
Interpass Temperature	60-350°
Electrical Characteristics	--
Current Type & Polarity	DCEP
Transfer Mode	--
Power Source Type (ac, cv, etc.)	CV
Amps	180-220
Volts	25-26
Wire Feed Speed (Amps)	--
Travel Speed	8-12 ipm
Maximum Heat Input	--
Technique	--
Stringer or Weave	Stringer
Multi or Single Pass (per side)	Multipass
Oscillation (Mechanized Automatic)	--
Number of Electrodes	1
Contact Tube to Work Dist	1/2-1 in
Peening	None
Interpass Cleaning	Wire Brush
Other	--

Form J-2 (See <http://go.aws.org/D1forms>)

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# Field Welding Inspection Checklist

## Reminders

**FIELD WELDING INSPECTION CHECKLIST**  
Wisconsin Department of Transportation  
DT2320 2/2018

Purpose: In compliance with field welding quality control measures, the designated contractor inspector shall fill out this form on all structures requiring field welding. For each day of field welding work, use this form to document welding activities for each weld and submit the completed form to the engineer for inclusion in the permanent record. A copy of the form should be submitted to the Sheboygan Field Welding Library by the engineer.

Structure ID: 3000000000 Project/Construction ID: 3000000000 Welded Elements: (alter site, sign structure, railing, etc.)

Date: / /

INSPECTION CHECKLIST	YES	NO
Have the inspector's qualifications been submitted to the Bureau of Structures for acceptance?		
Welder name?		
Is the welder in possession of the required WPS?		
WPS Number(s)?		
Has the WPS been accepted by the Bureau of Structures?		
Electrodes are stored in a hermetically sealed source, dry and in good condition? (SMAW Only)		
Red boxes (@250°F) are used to store opened electrode containers after no more than 4hrs of exposure (SMAW Only)?		
Are environmental conditions acceptable for welding? (no welding in water, rain or snow, high winds, or under 0° without shelter)		
Temperature at time of welding? °F Date: / /		
All metal surfaces were clean and clear of galvanizing, paint, water, rust, oil or grease, before each weld pass?		
Preheats(s) used meet the applicable code requirements and accepted WPS? *		
What instrument was used to check the preheat temperature?		
If using a calibrated temperature indicator crayon to measure preheat temperature, note the temperature tolerance.		
Can the voltage and amperage be read by the welder and inspector? ** (Calibrated gauges or calibrated clamp meter are used)		
Is the equipment calibrated?		

Preheating Parameters		Welding Parameters		
WELD NUMBER/LOCATION	TEMPERATURE (°F)	WELD NUMBER/LOCATION	VOLTADE (V)	CURRENT (AMP)

WELD NUMBER/LOCATION	OBSERVATIONS OF WELD QUALITY/CORRECTIVE ACTION

Inspector Signature: \_\_\_\_\_ Construction Project Engineer Signature: \_\_\_\_\_  
Print Name: \_\_\_\_\_ Print Name: \_\_\_\_\_  
Date: / / Date: / /

- It is not just a contract requirement.
- DT2320 is an inspection record; a quality control and quality assurance check by the Contractor and the Department, respectively.
- To be filled out daily; one form per structure
- To be filled out by the contractor's designated inspector; not the individual welding.
- The inspection form must be filled out at the time of welding.

# Field Welding Inspection Checklist

**FIELD WELDING INSPECTION CHECKLIST**  
Wisconsin Department of Transportation  
DT2320 2/2018

Purpose: In compliance with field welding quality control measures, the designated contractor inspector shall fill out this form on all structures requiring field welding. For each day of field welding work, use this form to document welding activities for each weld and submit the completed form to the engineer for inclusion in the permanent record. A copy of the form should be submitted to the SharePoint Field Welding Library by the engineer.

Structure ID: \_\_\_\_\_ Project/Construction ID: \_\_\_\_\_ Welded Elements: \_\_\_\_\_  
(Steel pile, sign structure, railing, ...)

Date: \_\_\_\_\_

INSPECTION CHECKLIST		YES	NO
Have the inspector's qualifications been submitted to the Bureau of Structures for acceptance?			
Welder name? _____			
Is the welder in possession of the required WPS?			
WPS Number(s)? _____			
Has the WPS been accepted by the Bureau of Structures?			
Electrodes are stored in a hermetically sealed source, dry and in good condition? (SMAR Only)			
Roll ovens (@250°F) are used to store opened electrode containers after no more than 4hrs of exposure (SMAR Only)?			
Are environmental conditions acceptable for welding? (No welding in water, rain or snow, high winds, or under DP without shelter)			
Temperature at time of welding? _____ °F Date? _____ / _____ / _____			
All metal surfaces were clean and clear of galvanizing, paint, water, rust, oil or grease, before each weld pass?			
Preheat(s) used meet the applicable code requirements and accepted WPS? *			
What instrument was used to check the preheat temperature? _____			
If using a calibrated temperature indicator crayon to measure preheat temperature, note the temperature tolerance: _____			
Can the voltage and amperage be read by the welder and inspector? ** (Calibrated gauges or calibrated clamp meter are used)			
Is the equipment calibrated?			

Preheating Temperatures		Welding Parameters		
WELD NUMBER/LOCATION	TEMPERATURE (F)	WELD NUMBER/LOCATION	VOLTADE (V)	CURRENT (AMP)

WELD NUMBER/LOCATION	OBSERVATION OF WELD QUALITY/CORRECTIVE ACTIONS

Inspector Signature \_\_\_\_\_ Construction Project \_\_\_\_\_  
Print Name \_\_\_\_\_ Engineer Signature \_\_\_\_\_  
Date \_\_\_\_\_ / \_\_\_\_\_ / \_\_\_\_\_ Date \_\_\_\_\_ / \_\_\_\_\_ / \_\_\_\_\_

- Record the WPS ID
- The WPS must clearly list preheat temperatures
  - By base metal thickness
  - Or carbon equivalency, when required
    - ✓ To determine preheat for A252 material, ensure the carbon equivalency (CE) of the lot is verified.
- Measure and record preheat temperatures

Please note that improper preheat can lead to delayed cracking!

# Field Welding Inspection Checklist

## SMAW Electrodes

- Electrodes must be purchased in hermetically sealed containers
- Exposure time
  - E70XX= 4 hrs
  - E70XXR= 9 hrs (moisture resistant)
- Electrodes exposed for longer than allowed must be baked before use

**Table 7.1**  
**Allowable Atmospheric Exposure of Low-Hydrogen Electrodes**  
(See 7.3.2.2 and 7.3.2.3)

Electrode	Column A (hours)	Column B (hours)
<b>A5.1</b>		
E70XX	4 max.	
E70XXR	9 max.	Over 4 to 10 max.
E70XXHZR	9 max.	
E7018M	9 max.	
<b>A5.5</b>		
E70XX-X	4 max.	Over 4 to 10 max.
E80XX-X	2 max.	Over 2 to 10 max.
E90XX-X	1 max.	Over 1 to 5 max.
E100XX-X	1/2 max.	Over 1/2 to 4 max.
E110XX-X	1/2 max.	Over 1/2 to 4 max.

Notes:  
 1. Column A: Electrodes exposed to atmosphere for longer periods than shown shall be baked before use.  
 2. Column B: Electrodes exposed to atmosphere for longer periods than those established by testing shall be baked before use.  
 3. Electrodes shall be issued and held in quivers, or other small open containers. Heated containers are not mandatory.  
 4. The optional supplemental designator, R, designates a low-hydrogen electrode which has been tested for covering moisture content after exposure to a moist environment for 9 hours and has met the maximum level allowed in AWS A5.1/A5.1M, *Specification for Carbon Steel Electrodes for Shielded Metal Arc Welding*.

AWS D1.1 (2020)

**Table 6.6**  
**Allowable Atmospheric Exposure of Low-Hydrogen SMAW Electrodes**

AWS Filler Metal Specification	Electrode	Hours*
A5.1	E70XX	4 max.
A5.5	E70XX-X	4 max.
	E80XX-X	2 max.
	E90XX-X	1 max.
	E100XX-X	1/2 max.
	E110XX-X	1/2 max.

\* See 6.5.2.3

AWS D1.5 (2020)

For additional requirements and info review:  
 AWS D1.1 (2020) Clause 7.3  
 AWS D1.5 (2020) Clause 6.5



# Field Welding Inspection Checklist

**FIELD WELDING INSPECTION CHECKLIST**  
Wisconsin Department of Transportation  
DT2320 - 2018

Purpose: In compliance with field welding quality control measures, the designated contractor inspector shall fill out this form on all structures requiring field welding. For each day of field welding work, use this form to document welding activities for each weld and submit the completed form to the engineer for inclusion in the permanent record. A copy of the form should be submitted to the SharePoint Field Welding Library by the engineer.

Structure ID: \_\_\_\_\_ Project/Construction ID: \_\_\_\_\_ Welded Elements: \_\_\_\_\_ (steel plate, sign structure, railing...)

Date: \_\_\_\_\_

INSPECTION CHECKLIST	YES	NO
Have the inspector's qualifications been submitted to the Bureau of Structures for acceptance?		
Welder name?		
Is the welder in possession of the required WPS?		
WPS Number(s)?		
Has the WPS been accepted by the Bureau of Structures?		
Electrodes are stored in a hermetically sealed source, dry and in good condition? (SMAW Only)		
Roof ovens (B250°F) are used to store opened electrode containers after no more than 4hrs of exposure (SMAW Only)?		
Are environmental conditions acceptable for welding? (No welding in water, rain or snow, high winds, or under DF without shelter)		
Temperature at time of welding? "F" Date? / /		
All metal surfaces were clean and clear of galvanizing, paint, water, rust, oil or grease, before each weld pass?		
Preheat(s) used meet the applicable code requirements and accepted WPS? *		
What instrument was used to check the preheat temperature?		
If using a calibrated temperature indicator crayon to measure preheat temperature, note the temperature tolerance.		
Can the voltage and amperage be read by the welder and inspector? ** (Calibrated gauges or calibrated clamp meter are used)		
Is the equipment calibrated?		

* Preheating Temperatures		** Welding Parameters		
WELD NUMBER/LOCATION	TEMPERATURE (F)	WELD NUMBER/LOCATION	VOLTAGE (V)	CURRENT (AMP)

Visual Inspection	OBSERVATION OF WELD QUALITY/CORRECTIVE ACTION
WELD NUMBER/LOCATION	

Inspector Signature	Construction Project Engineer Signature
Print Name	Print Name
Date / /	Date / /

- Record observations of weld quality.
- Contractor & Project Leader signatures at the bottom of the form certify that welds are visually acceptable, and welding was performed per all AWS & WisDOT requirements.
- Unacceptable welds must be corrected before piling driving can continue and before the DT2320 can be signed.



# Field Welding Inspection Checklist

## Role of Project Leaders/Managers

**FIELD WELDING INSPECTION CHECKLIST**  
Wisconsin Department of Transportation  
DT2320 2/2018

Purpose: In compliance with field welding quality control measures, the designated contractor inspector shall fill out this form on all structures requiring field welding. For each day of field welding work, use this form to document welding activities for each weld and submit the completed form to the engineer for inclusion in the permanent record. A copy of the form should be submitted to the SharePoint Field Welding Library by the engineer.

Structure ID: X001-0000X Project/Construction ID: X0001-0000X Welded Elements: (steel plate, pipe structure, railing, ...)

Date: / /

INSPECTION CHECKLIST	YES	NO
Have the inspector's qualifications been submitted to the Bureau of Structures for acceptance?		
Welder name?		
Is the welder in possession of the required WPS?		
WPS Number(s)?		
Has the WPS been accepted by the Bureau of Structures?		
Electrodes are stored in a hermetically sealed source, dry and in good condition? (SMAW Only)		
Rid ovens (2250°F) are used to store opened electrode containers after no more than 4% of exposure (SMAW Only)?		
Are environmental conditions acceptable for welding? (No welding in water, rain or snow, high winds, or under DP without shelter)		
Temperature at time of welding? °F Date? / /		
All metal surfaces were clean and clear of galvanizing, paint, water, rust, oil or grease, before each weld pass?		
Preheat(s) used meet the applicable code requirements and accepted WPS? *		
What instrument was used to check the preheat temperature?		
If using a calibrated temperature indicator crayon to measure preheat temperature, note the temperature tolerance.		
Can the voltage and amperage be read by the welder and inspector? ** (Calibrated gauges or calibrated clamp meter are used)		
Is the equipment calibrated?		

* Preheating Temperatures		** Welding Parameters		
WELD NUMBER/LOCATION	TEMPERATURE (°F)	WELD NUMBER/LOCATION	VOLTAGE (V)	CURRENT (AMP)

Visual Inspection	OBSERVATIONS OF WELD QUALITY/CORRECTIVE ACTION

Inspector Signature: \_\_\_\_\_ Construction Project Engineer Signature: \_\_\_\_\_  
 Print Name: \_\_\_\_\_ Print Name: \_\_\_\_\_  
 Date: / / Date: / /

- Verify that a contractor has an accepted field welding plan that includes the WPS needed to complete the work
- Verify welder qualifications in the contractors accepted field welding plan
- Review and verify that the information recorded on form DT2320 Field Welding Inspection Checklist is complete and accurate
- Confirm assessment of final weld quality

# Field Welding Inspection Checklist

## Role of Project Leaders/Managers & Contractors

- Contact the Structures Fabrication Unit (SFU) if
  - The procedures (WPS) required to complete the work are not listed in the field welding plan
  - The personnel present at the site are not listed in the field welding plan
  - The contractor does not have an accepted field welding plan for the current construction year
  - Visually unacceptable welds are made and not corrected.
  - Unauthorized welding has occurred

**FIELD WELDING INSPECTION CHECKLIST**  
Wisconsin Department of Transportation  
DT2320 2/2018

Purpose: In compliance with field welding quality control measures, the designated contractor inspector shall fill out this form on all structures requiring field welding. For each day of field welding work, use this form to document welding activities for each weld and submit the completed form to the engineer for inclusion in the permanent record. A copy of the form should be submitted to the SharePoint Field Welding Library by the engineer.

Structure ID: \_\_\_\_\_ Project/Construction ID: \_\_\_\_\_ Welded Elements: \_\_\_\_\_ (alter, add, sign, structure, repair, ...)

Date: \_\_\_\_\_

INSPECTION CHECKLIST		YES	NO
Have the inspector's qualifications been submitted to the Bureau of Structures for acceptance?			
Welder name? _____			
Is the welder in possession of the required WPS?			
WPS Number(s)? _____			
Has the WPS been accepted by the Bureau of Structures?			
Electrodes are stored in a hermetically sealed source, dry and in good condition? (SMAW Only)			
Rod ovens (D250°) are used to store opened electrode containers after no more than 4hrs of exposure (SMAW Only)?			
Are environmental conditions acceptable for welding? (No welding in water, rain or snow, high winds, or under DP without shelter)			
Temperature at time of welding? °F Date? / /			
All metal surfaces were clean and clear of galvanizing, paint, water, rust, oil or grease, before each weld pass?			
Preheat(s) used meet the applicable code requirements and accepted WPST *			
What instrument was used to check the preheat temperature?			
If using a calibrated temperature indicator crayon to measure preheat temperature, note the temperature tolerance.			
Can the voltage and amperage be read by the welder and inspector? ** (Calibrated gauges or calibrated clamp meter are used)			
Is the equipment calibrated?			

*Preheating Temperatures		**Welding Parameters	
WELD NUMBER/LOCATION	TEMPERATURE (F)	WELD NUMBER/LOCATION	VOLTAGE (V) CURRENT (AMP)

Visual Inspection	
WELD NUMBER/LOCATION	OBSERVATIONS OF WELD QUALITY/CORRECTIVE ACTIONS

Inspector Signature \_\_\_\_\_ Construction Project Engineer Signature \_\_\_\_\_  
Print Name \_\_\_\_\_ Print Name \_\_\_\_\_  
Date / / \_\_\_\_\_ Date / / \_\_\_\_\_



# Field Welding Inspection Checklist

## Role of Project Leaders/Managers & Contractors

**FIELD WELDING INSPECTION CHECKLIST**  
 Wisconsin Department of Transportation  
 DT2200 2/2018

Purpose: In compliance with field welding quality control measures, the designated contractor inspector shall fill out this form on all structures requiring field welding. For each day of field welding work, use this form to document welding activities for each weld and submit the completed form to the engineer for inclusion in the permanent record. A copy of the form should be submitted to the SharePoint Field Welding Library by the engineer.

Structure ID: \_\_\_\_\_ Project/Construction ID: \_\_\_\_\_ Welded Elements: \_\_\_\_\_ (steel, pipe, sign structure, railing, ...)

Date: \_\_\_\_\_

INSPECTION CHECKLIST		YES	NO
Have the inspector's qualifications been submitted to the Bureau of Structures for acceptance?			
Welder name? _____			
Is the welder in possession of the required WPS?			
WPS Number(s)? _____			
Has the WPS been accepted by the Bureau of Structures?			
Electrodes are stored in a hermetically sealed source, dry and in good condition? (SMAW Only)			
Rod covers (E7018) are used to store opened electrode containers after no more than 4hrs of exposure (SMAW Only)?			
Are environmental conditions acceptable for welding? (No welding in water, rain or snow, high winds, or under OP without shelter)			
Temperature at time of welding? °F _____ Date? ____/____/____			
All metal surfaces were clean and clear of galvanizing, paint, water, rust, oil or grease, before each weld pass?			
Preheat(s) used meet the applicable code requirements and accepted WPS? *			
What instrument was used to check the preheat temperature? _____			
* Using a calibrated temperature indicator crayon to measure preheat temperature, note the temperature tolerance.			
Can the voltage and amperage be read by the welder and inspector? ** (Calibrated gauges or calibrated clamp meter are used)			
Is the equipment calibrated?			

* Preheating Temperatures		** Welding Parameters		
WELD NUMBER/LOCATION	TEMPERATURE (°F)	WELD NUMBER/LOCATION	VOLTAGE (V)	CURRENT (AMP)

Visual Inspection	
WELD NUMBER/LOCATION	OBSERVATIONS OF WELD QUALITY/CORRECTIVE ACTION

Inspector Signature \_\_\_\_\_ Construction Project Engineer Signature \_\_\_\_\_  
 Print Name \_\_\_\_\_ Print Name \_\_\_\_\_  
 Date \_\_\_\_/\_\_\_\_/\_\_\_\_ Date \_\_\_\_/\_\_\_\_/\_\_\_\_

- Unauthorized welds are prohibited. Do not allow unauthorized welding without review by the Bureau of Structures and approval of the Engineer
- Field welds, to the structure, not noted on the contract plans or standard drawings are considered unauthorized welds



# Field Welding Inspection Checklist

## Role of Project Leaders/Managers & Contractors

- Some examples:

- Safety rails welded to flanges
- Form attachments to flange cover plates
- Welded repairs without Engineer review and approval
- Studs welded without a stud gun

**FIELD WELDING INSPECTION CHECKLIST**  
 Wisconsin Department of Transportation  
 DT2200 2/2018

Purpose: In compliance with field welding quality control measures, the designated contractor inspector shall fill out this form on all structures requiring field welding. For each day of field welding work, use this form to document welding activities for each weld and submit the completed form to the engineer for inclusion in the permanent record. A copy of the form should be submitted to the SharePoint Field Welding Library by the engineer.

Structure ID: \_\_\_\_\_ Project/Construction ID: \_\_\_\_\_ Welded Elements: \_\_\_\_\_ (steel plate, steel structure, rebar, ...)

Date: \_\_\_\_\_

INSPECTION CHECKLIST		YES	NO
Have the Inspector's qualifications been submitted to the Bureau of Structures for acceptance?			
Welder name? _____			
Is the welder in possession of the required WPS?			
WPS Number(s)? _____			
Has the WPS been accepted by the Bureau of Structures?			
Electrodes are stored in a hermetically sealed source, dry and in good condition? (SMAW Only)			
Rod covers (E7018) are used to store opened electrode containers after no more than 4hrs of exposure (SMAW Only)?			
Are environmental conditions acceptable for welding? (No welding in water, rain or snow, high winds, or under OP without shelter)			
Temperature at time of welding? _____ °F Date? _____ / _____ / _____			
All metal surfaces were clean and clear of galvanizing, paint, water, rust, oil or grease, before each weld pass?			
Preheats used meet the applicable code requirements and accepted WPS? *			
What instrument was used to check the preheat temperature? _____			
* If using a calibrated temperature indicator crayon to measure preheat temperature, note the temperature tolerance: _____			
Can the voltage and amperage be read by the welder and inspector? ** (Calibrated gauges or calibrated clamp meter are used)			
Is the equipment calibrated?			

* Preheating Temperatures			** Welding Parameters		
WELD NUMBER/LOCATION	TEMPERATURE (°F)		WELD NUMBER/LOCATION	VOLTAGE (V)	CURRENT (AMP)

Visual Inspection	
WELD NUMBER/LOCATION	OBSERVATIONS OF WELD QUALITY/CORRECTIVE ACTION

Inspector Signature _____	Construction Project Engineer Signature _____
Print Name _____	Print Name _____
Date _____ / _____ / _____	Date _____ / _____ / _____

Contacts for review and approval:  
 Aaron Bonk – BOS Design Chief  
 Carolyn Brugman – Structures Construction Program Manager

# Questions?

