OREGON’S ASTM A 1010 BRIDGES

Iowa DOT A1010 Steel Workshop: March 18, 2015. Ames, Iowa

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Steel Bridge Standards Engineer
Design and Construction

• Design Specification?
• Fabrication Specifications?
• Construction Specifications?
• Risk Management
  – Project Selection
  – Contract type
Design Specifications

– Current AASHTO LRFD Design Specifications

– Material Properties

  • Yield strength 50 ksi,
  • Tensile strength 70 ksi,
  • Elongation,
  • Modulus of elasticity 29000 ksi,
  • CVN meets A 709 Grade HPS 50W for zone 2 fracture critical bridges.
Oregon’s Single Permit Trucks

STP-4E  258k 13-axel vehicle

STP-5BW  204k 9-axel vehicle
Provide ASTM A1010 Grade 50 steel in accordance with ASTM A 1010 specifications and section 00560.22(c). Quenched and tempered process required for all plates.
Preferred Plate Dimensions

- Plate Lengths  240 to 480 inches
- Plate Widths     84 to 99    inches.
Provide stainless steel bolts in accordance with ASTM A 193 Grade B8*, Class 2.

* = A, M, MA, M2, M3, N, NA, MN, MNA
Stainless Steel Nuts

Provide stainless steel heavy hex nuts in accordance with ASTM A 194 Grade 8. Carbide solution treated and strain hardened is required.
Stainless Steel Washers

Provide stainless steel washers meeting the requirement of stainless steel AISI Type 304. Strain hardening process required for stainless steel washers.”
Dodge Creek Bridge

129'-0" ctr.- ctr. end bents
Steel plate girder with 9½" C.I.P. deck

2'-6"
12'-0"
5 spaces @ 20'-0" = 100'-0"
12'-0"
2'-6"

"C" Line
CHORD = 55°52'59"E

60°, typ.

Bent 1
Bent 2
Dodge Creek Bridge

42'-8"

1'-4" typ.

8'-0" shldr.

12'-0" lane

12'-0" lane

8'-0" shldr.

6'-8 3/4"

5'-3 1/4"

@ bents

@ bents

Slope varies 2.8% to 6.5%

9 1/2" deck

3 beam spaces @ 12'-0" = 36'-0"

Varies
Mill Creek Bridge

TYPICAL DECK SECTION

3 girder spaces at 11'-6" = 34'-6"
Special Provisions (QC)

• Check samples from both end of each
  – CVN meets A 709 HPS Grade 50W zone 2 for fracture critical bridges
  – Yield strength 50 ksi
  – Tensile strength 70 ksi
  – Procedure Qualification Record (PQR),
  – Welder…….
  – Ultrasonic inspection,
  – New tools.
Weld Consumable

- Lincoln Blue Max ER309L, 3/32” dia.
- Lincoln Blue Max 2000 Flux.

- **SMAW** 309L *Excalibur 309/309-16*
- **FCAW** 1/16” diameter Lincoln Electric Blue Max S309 L *Lincolnweld P2000 or Lincolnweld P2007*
- **SAW** 3/32” diameter Lincoln Electric Blue Max S309/309L with Blue Max 2000 Flux *Lincolnweld 309/309L*
Thermal Cut, Plasma
Mockup
Special Provisions

CVN

Plate thickness, in

ft-lb @ 10 °F

0.00 0.25 0.50 0.75 1.00 1.25 1.50 1.75

0 50 100 150 200 250 300
Observed Cracks
Charpy V-notch Test Results

Minimum required CVN for HPS Grade 50W for FCM

Energy ft-lbs 30 @ 10°F

PLATE THICKNESS INCH
Mill Creek Bridge

Charpy V-notch Test Results

Minimum required CVN for HPS Grade 50W for FCM

Plate Thickness, Inch

Energy ft-lb @ 10° F
Mill creek Bridge
Where the metal is expected to be exposed to severe corrosive influences, it shall be specially protected against corrosion or sacrificial metal thickness shall be specified.
## ESTIMATED LOSSES

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>Corrosion Loss at 118 years, microns</th>
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</thead>
<tbody>
<tr>
<td>Seradj</td>
<td>38.269</td>
<td>0.665</td>
<td>915.097</td>
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<tr>
<td>Minitab</td>
<td>38.33</td>
<td>0.6645</td>
<td>912.494</td>
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</table>
ASTM G101

PENETRATION, µm

1000

40

mils

100

4

10

0.4

EXPOSURE TIME, YRS.

100

1

S. Afr

UK

US

Fr

Swed

Japan

A588 STEEL

MARINE

Belg
Linear regression equations for thickness loss in 5% NaCl Cyclic Corrosion tests.

<table>
<thead>
<tr>
<th>Steel</th>
<th>Coefficient Mill per Cycle</th>
<th>Predicted Life VS ASTM A 588</th>
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</thead>
<tbody>
<tr>
<td>ASTM A 1010</td>
<td>0.050</td>
<td>10.40</td>
</tr>
<tr>
<td>11Cr</td>
<td>0.056</td>
<td>9.30</td>
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<tr>
<td>9Cr</td>
<td>0.147</td>
<td>3.50</td>
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<tr>
<td>9Cr2Si</td>
<td>0.197</td>
<td>2.60</td>
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<tr>
<td>7Cr2Si</td>
<td>0.304</td>
<td>1.70</td>
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<tr>
<td>7Cr2Al</td>
<td>0.152</td>
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<td>7Cr2Si2Al</td>
<td>0.275</td>
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<td>ASTM A 588</td>
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ASBURY BRIDGE

Question?