I-29 SALIX INTERCHANGE

Woodbury County Design # 715

BRFIMX-29-6(246)134- -14-97
PROJECT BACKGROUND

- Poor soils
- Structure length/approach embankment length
- Steel superstructure to control weight
- Initially rolled beams, changed to CWPG per DOT request
INITIAL GIRDER DESIGN / ANALYSIS

- Maintain same girder depth
- Assume unstiffened web
- Minimize required plate thicknesses
- Analysis based on strength / fatigue values for A709 Grade 50
- Maximize yield from standard plate widths / lengths
INITIAL GIRDER DESIGN / ANALYSIS
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1" x 84" R WITH 12" R WIDTH
(NEED 12 - R 12" X 1" X 53'-0" (SPAN 1))
(NEED 12 - R 12" X 1" X 53'-0" (SPAN 4))
INITIAL GIRDER DESIGN / ANALYSIS

6 14" + 5 8" = 7'-6.5"

1" x 96" 14" WITH 14" WIDTH
(NEED 12 - 14" x 1" x 61'-9" (SPAN 2))
(NEED 12 - 14" x 1" x 61'-9" (SPAN 3))
INITIAL GIRDER DESIGN / ANALYSIS

$4 \text{ @ 17"} + 3 \text{ cuts @ 8"} = 5' - 8\frac{3}{8}$

$1\frac{3}{16} \times 72" \text{ WITH 17" WIDTH}$

NEED 12 - $17" \times 1\frac{1}{2}" \times 54'-0"$ (PIER 1)

NEED 12 - $17" \times 1\frac{1}{2}" \times 54'-0"$ (PIER 3)
INITIAL GIRDER DESIGN / ANALYSIS

2" x 60" R WITH 17" R WIDTH
(NEED 12 - R 17" X 2" X 65'-6" (PIER 2))
**PRELIMINARY GIRDER DESIGN / ANALYSIS**

<table>
<thead>
<tr>
<th></th>
<th>SPAN 1</th>
<th>PIER 1</th>
<th>SPAN 2</th>
<th>PIER 2</th>
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</thead>
<tbody>
<tr>
<td><strong>FLANGE PLATE</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>top</td>
<td>12 X 1</td>
<td>17 X 1 1/2</td>
<td>14 X 1</td>
<td>17 X 2</td>
</tr>
<tr>
<td>bott</td>
<td>12 X 1</td>
<td>17 X 1 1/2</td>
<td>14 X 1</td>
<td>17 X 2</td>
</tr>
<tr>
<td><strong>CONSTRUCTIBILITY PERFORMANCE RATIO</strong></td>
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<tr>
<td>top</td>
<td>0.81</td>
<td>NA</td>
<td>0.87</td>
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<td>NA</td>
<td>0.72</td>
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<td>0.72</td>
<td>0.99</td>
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<td><strong>SERVICE PERFORMANCE RATIO</strong></td>
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<tr>
<td>top</td>
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<tr>
<td><strong>FATIGUE II RATIO (at diaphragm stiffener)</strong></td>
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<tr>
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<td>0.55</td>
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</table>
DISCUSSION ITEMS FOR DESIGN COMPLETION

- Strength design values
  + Confirm same allowable values as A709 Grade 50
DISCUSSION ITEMS FOR DESIGN COMPLETION

- Fatigue design values
  - Confirm same allowable values as A709 Grade 50
- Welded connections
  - Web/flange connection – Category B – 16 ksi
  - Bolted connections (splices) – Category B – 16 ksi
  - Diaphragm stiffener locations – Category C’ – 12 ksi
  - Shear studs – Category C – 10 ksi
DISCUSSION ITEMS FOR DESIGN COMPLETION

- Bolted splice connections
  - Galvanic corrosion between A325 bolts/A1010 Grade 50 plate
  - Slip critical connections (slip coefficient values?)
    - Not currently covered by AASHTO/AISC Specifications
DISCUSSION ITEMS FOR DESIGN COMPLETION

- Headed studs/welded connection for composite action
  - Strength value
  - Fatigue value
  - Per Nelson Stud Welding, testing should be conducted with A1010 plates:
    - Mild steel studs
    - Stainless steel studs
DISCUSSION ITEMS FOR DESIGN COMPLETION

- Material for diaphragm stiffener connection plates
- Material for sole plates welded to bottom flanges
- Diaphragm material and bolts (match standards?)
DISCUSSION ITEMS FOR DESIGN COMPLETION

- Developmental specifications?
  - Material handling requirements
  - Welding procedures/specifications?
  - Material or weld testing requirements
QUESTIONS?