Update on FHWA Welding and Fabrication Related Research

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Electroslag Welding (ESW)

• A very efficient welding process with potential reduced fabrication cost.
  – Application limited by AASHTO/AWS D1.5
  – Three full-scale beams with HPS/HPS and HPS/50W flange butt welds
SFOBB ESW Weld

1 inch dia. pilot holes (4)

Section A

31.63

3.94

12.81

3.15

3.15
Tower weld was welded diagonally into large tensile coupon to induce maximum shear in weld.
SFOBB ESW Weld

Axial Stress on Specimen (ksi)

Approximate Axial Load (kips)
SFOBB ESW Weld
2947 kips
(78 ksi)

SAW

ESW
SFOBB ESW Weld
“Development of Innovative Welding for High Performance Bridge Steel”

• Small Business Innovative Research (SBIR) grant
• Metric to develop process(s) demonstrated faster than SAW for a hypothetical 3” x 30” CJP butt weld
• Two vendors in Phase 2 contracts
  – Hybrid Laser Arc Welding (HLAW)
  – Resistance welding with a Homopolar Generator (HPG)
“Development of Innovative Welding for High Performance Bridge Steel”

- Hybrid Laser Arc Welding

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“Development of Innovative Welding for High Performance Bridge Steel”

- Homopolar Generator (HPG)

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Leading a task group within AISI Welding Advisory Group:

- Guidance document for how to work with material
- Represents the knowledge based on the five bridges built to date.
- Learned a lot from the VDOT Waynesboro bridge
Plasma Cut Holes

Tested the fatigue and static resistance of plasma cut holes.

- Would have to use “high-definition” plasma to attain necessary hole quality.
- Open hole would be a Category E’ detail, worst than punched holes.
- Saw some brittle fractures at specification min. CVN, would recommend prohibiting on FCMs, possibly from primary members too.
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