Welding Complex Structures with Clear Understanding of Options

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Weld Engineer prepares, reviews, and assures **high-caliber instructions** for the production of welded joints.

This is usually done in accordance with standard; CSA W59, AWS D 1.1, etc and complex instructions historically rely on the past experience.

**In the modern age, Welding Engineers routinely face challenges that are not directly addressed by standards nor previous experience.**
CSA W59 Clause 5.6 Control of Distortion and Shrinkage Stresses

AWS D1.1 Clause 5.20 Control of Distortion and Shrinkage

- Distortion shall be minimized
- Welding heat shall be balanced
- Program of distortion control shall be developed
- Weld shall be made in sequence such as will minimize distortion
- Restrained shall be minimized

**HOW?**
Weld Distortion Engineering Approaches:
1) I’ve done the best practice
2) There is always a better way
Optimal Distortion Mitigation Plan

Flange

Stiffener

web
Optimal Distortion Mitigation Plan

GTSM, Fill to flush, & Cap beads

Fill the prep to flush
Pre-Bending of Flange

Pre bending = 0 mm

Pre bending = 2 mm

Pre bending = 4 mm

Pre bending = 6 mm
Adding Angle Bars

Fill the prep to flush

GTSM, Fill to flush, & Cap beads

Questions:
• Release the angle bar when flipping or keep it?
• Release the angle bar before final cool down or keep it until ambient?
• Attach the angle bar in the welding side or on the opposite side
• Connect it to the web, positioner or the stiffener?
• …
Tacking and Fixturing
Back Stepping Pattern

X10
Assessment of Retrofit Options
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Weld modeling and simulation tools are now mature for enabling our weld engineers for being innovative in developing solution to challenging problems. That includes pre-weld engineering when preparing instruction for welding complex structures. Post-weld engineering if we need to find a solution to an initial poor welding design. And when a reasonable and defendable ground of making decision is required to settle-down a dispute.
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