Innovative Joint Designed for 84-Inch Raw Water Tunnel Carrier Pipe

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NATIONAL WELDING CORP.

Presentation Breakdown

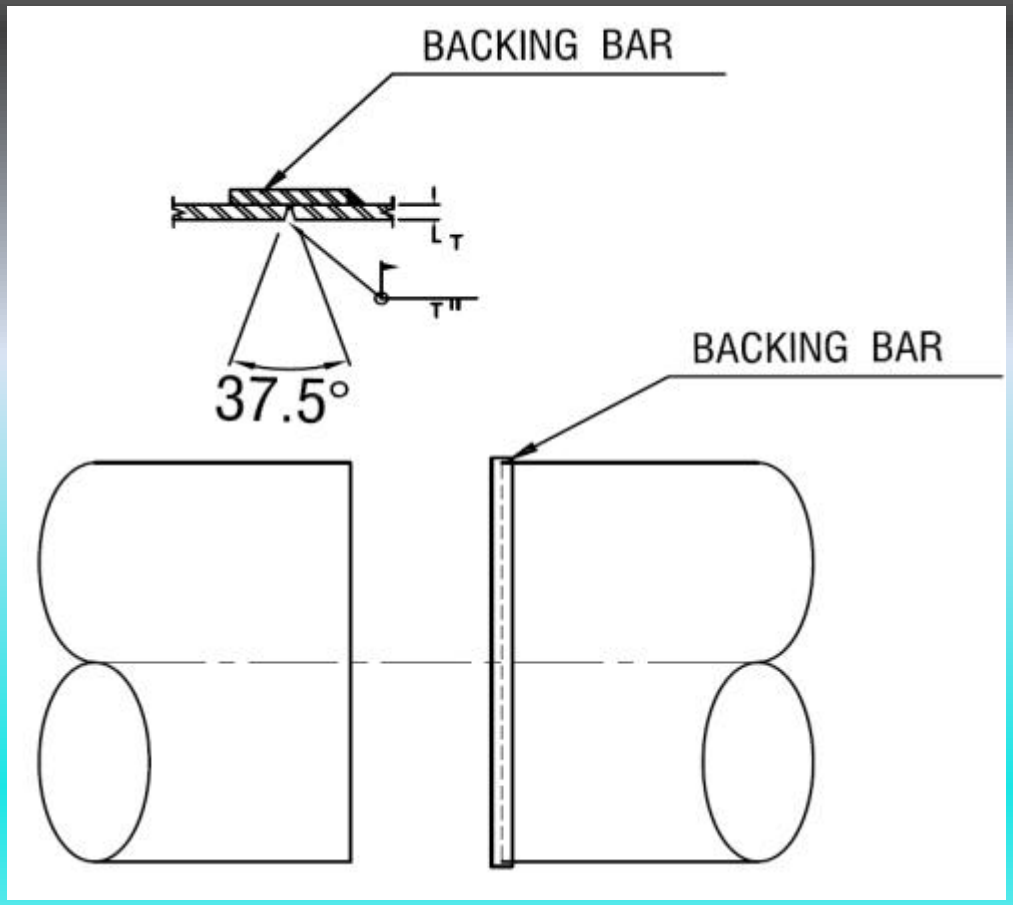
- Manufacturer's Perspective-Presented by Glenn Davidenko
- Installation Perspective Presented by Gedas Grazulis
- Closing-Presented by Glenn Davidenko
- Q & A-Both Presenters

Manufacturer's Perspective

Project Details-84" Carrier Pipe in 96" Casing

- ~3,900 LF – 84" Steel Pipe
- ½" Wall Thickness
- Bare ID-Cement-Lined In-Place
- Polyurethane-Coating
- Working Pressure is Approximately 190' of Head (~83 psi)
- Butt-Welded Joint was specified
- Horizontal Routing – Mostly Horizontal Curves with Radii down to 800'

Manufacturer's Perspective



BUTT-WELDED JOINT PER CONTRACT

Manufacturer's Perspective

Project Issue Developed

- Tunnel Survey indicated Alignment issues at several locations (Tunnel was not were it's supposed to be!)
- Installation Contractor was concerned about placing a 50-foot long pipe in a horizontal curve
- Installation Contractor was concerned about being able to weld the butt-welded joints throughout the tunnel
- Installation Contractor requested a meeting of all parties to discuss.
- Pipe Manufacturer previously received approval to start making 50-Foot Joints and any Change was Cost Prohibitive

Manufacturer's Perspective

Key Decision Makers at Project Meeting

- Attendees were Project Manager, AECOM, from China
- Contractor Project Manager, Obayoshi, from Japan
- Installation Sub-Contractor, National Welding, from Lithuania
- Pipe Manufacturer, Northwest Pipe Company, from India

Manufacturer's Perspective

Outcome from Project Meeting

- Pipe Manufacturer was directed to work with the Installation Sub-Contractor and propose a solution to this issue.
- REPEATING!!
- Pipe Manufacturer WAS directed to work with the Installation Sub-Contractor and propose a solution to this issue.

Manufacturer's Perspective

Pros for Butt-Welded Joints

- Provide one the strongest joint types
- Resists Higher Pressures
- Single Complete Joint Penetration (CJP)Field-Weld

Cons for Butt-Welded Joints

- Higher Cost to Manufacture
- Limited Installation Flexibility
- Single Inside Fillet Weld

Manufacturer's Perspective

Additional Limits By Installation

Sub-Contractor

- Installation Method is Bell Over Spigot
- Maximum Rise in Pipe When Placing Weld Bell Over Spigot is on around 2"
- Clearance between Faying Surfaces of the Assembled Lap-Joint Cannot Exceed 3/16", per AWWA C206
- The Minimum Overlap of the Assembled Lap-Joint is 1", or 3 Times Wall Thickness, or 1-1/2", whichever is greater, per AWWA C206

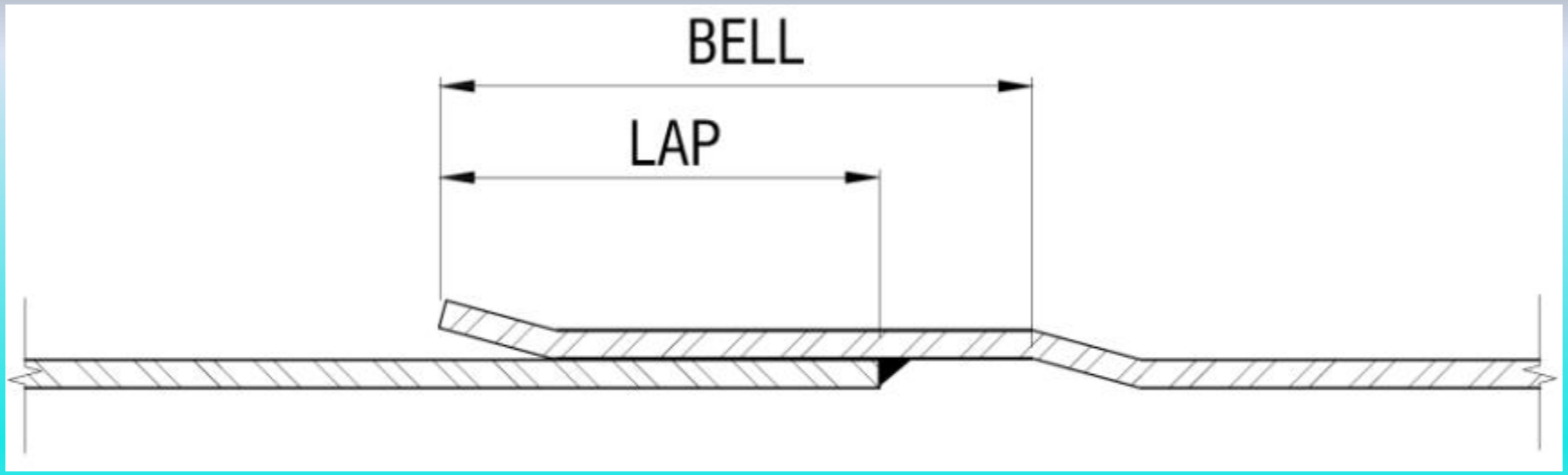
Manufacturer's Perspective

Next Step for Pipe Manufacturer

Draw on 50+ years of experience in making Integral Joints Using the following Criteria

- Develop a Joint that meets the project requirements (i.e. Pressure, Installation, Flexibility, etc.)
- Develop a Joint that can be consistently manufactured
- Develop a Joint that can be field welded
- Develop a Joint Using Existing Manufacturing Techniques
- **THE SOLUTION!**

Manufacturer’s Perspective



HYBRID LAP-WELDED JOINT

Manufacturer's Perspective

Key Points of the Hybrid-Weld Bell Joint

- This Joint allows Joints to be supplied with Built-In Miters plus the joint can be pulled as necessary while utilizing the Installation Sub-Contractors Techniques
- All Bell Joints were consistently manufactured
- Field Welding occurs at a Single Location

Manufacturer's Perspective

Conclusions

About Hybrid Lap-Welded Joint

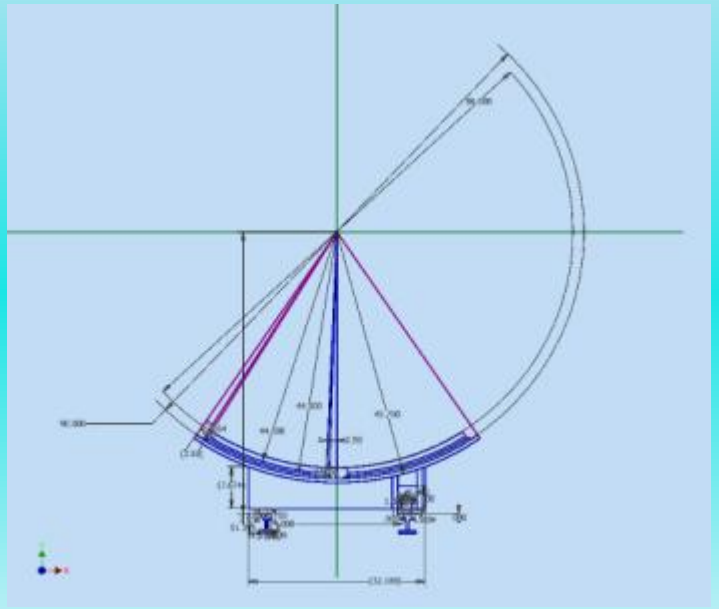
- Met all Design Requirements from the Engineer, Contractor, Installation Sub-Contractor and Pipe Manufacturer
- Joints Handled all Horizontal Curved Area with no Additional Fit-Up
- Since all Required Joint Deflections were Cut Into Bell Joints Exactly, very little Joint Pulling Was Reported
- The Hybrid-Lap Welded Joint Provided a Winning Solution for This Installation

Gedas Grazulis

National Welding Corporation-Installation Perspective

Pre-Installation Planning

- Pipe elevation determined from top of rail height
- Cradle style pipe carrier design



- Invert leveled with concrete
- Tunnel Rail re-installed

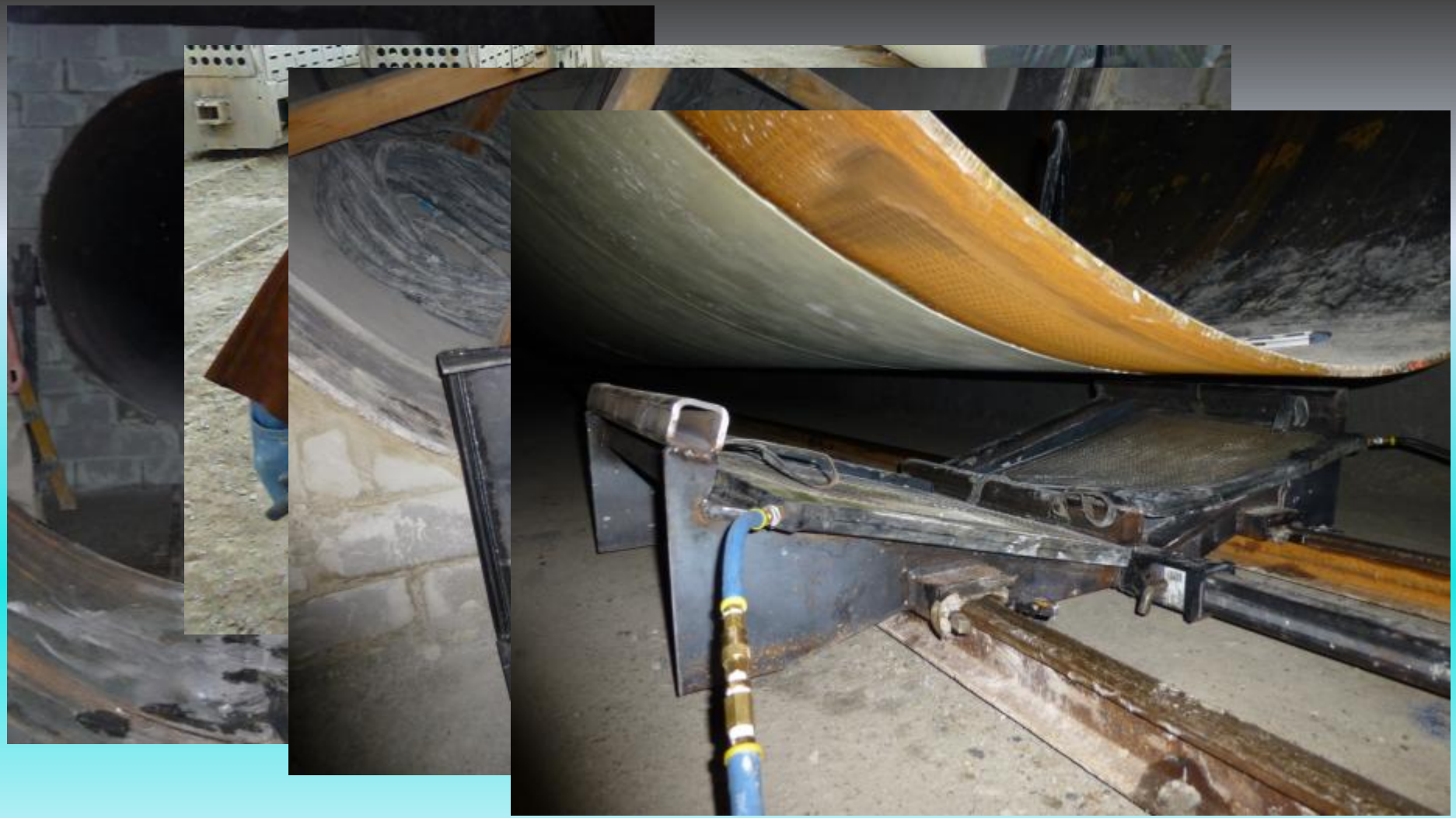
Pipe Carrier Requirements

- Transportation of pipe through tunnel
- Pipe Clocking
- Lifting and side shift of pipe
- Protecting pipe coating from damage

Transportation

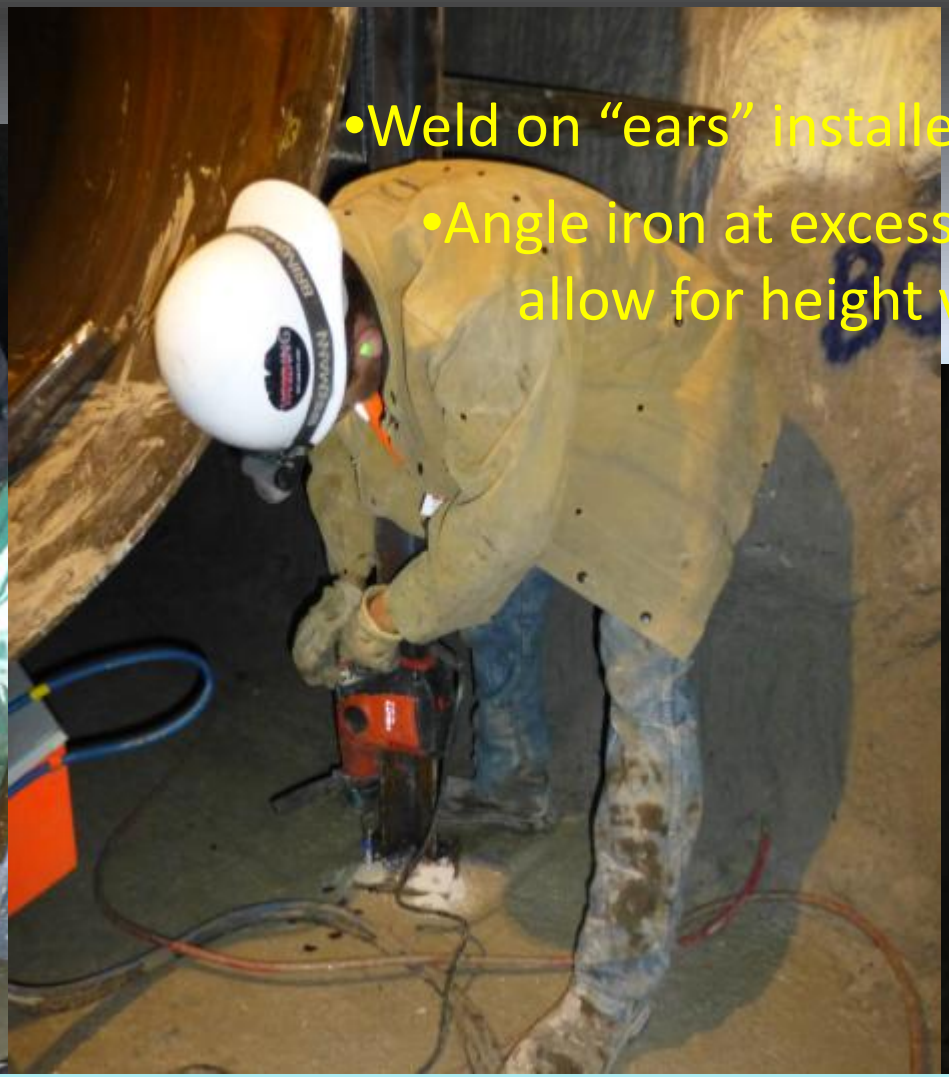
Problems:

It’s not a matter of if there will be, but of when they will they occur??



Installation Tools

Pipe Bracing



- Weld on “ears” installed at location
- Angle iron at excessive length to allow for height variation

Welding Operations

- FCAW Flux Cored Arc Welding
- Inverter style welding machines

CLOSING

- OWNER and ENGINEER turned over the solution to the Subject Matter Experts (SME) in Their Fields to Work Out the Solution to this Issue. We the Engineer, Contractor, Installation Sub-Contractor and Pipe Manufacturer.
- THE SOLUTION ULTIMATELY WAS THE ENGINEERS AND OWNERS TO ACCEPT, WHICH THEY DID.
- The Team-Approach Solved the Issue and the Team-Approach worked on other Project Issues that Developed.

QUESTIONS???

Glenn A. Davidenko, P.E.

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