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

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Presentation Breakdown

– Manufacturer’s Perspective-Presented by Glenn Davidenko

– Installation Perspective Presented by Gedas Grazulis

– Closing-Presented by Glenn Davidenko

– Q & A-Both Presenters
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 where 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
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!
HYBRID LAP-WELDED JOINT
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
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
• Commencement of Installation
• Fitting and Welding Operations
Pre-Installation Planning

• Invert leveled with concrete

• Tunnel Rail re-installed

• Pipe elevation determined from top of rail height

• Cradle style pipe carrier design
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 happen.
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
• 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???

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