



**BARNHART**

**Minds Over Matter**

# Lock Gate Replacement System

National Defense Industrial Association  
2005 Conference  
St Louis, MO  
August 2-5



The logo for Barnhart, featuring the word "BARNHART" in white, bold, sans-serif capital letters on a red rectangular background. The letter "A" is stylized with a white diagonal line through it.

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## **Presenters**

### **Shaun A. Sipe**

Project Engineering and Operations Manager  
Barnhart  
Project Services Group

### **Will Smith**

Project Sales Representative  
Barnhart  
Civil Market





## **The Scope**

Provide a suitable Lifting Device to Remove and Replace both Lower Pool Lock Gates. These Lock Gates shall be completely assembled for both removal and installation with the following dimensions:

- 85' Tall
- 65' Wide
- 7' Thick
- 360 Tons / Each

## **Additional Scope Requirements**

The successful solution will provide a way to handle complete installation of the Gates within 30 Days. (Extending work beyond the scheduled outage would have severe economic effects on the region).

## Competitive Advantage

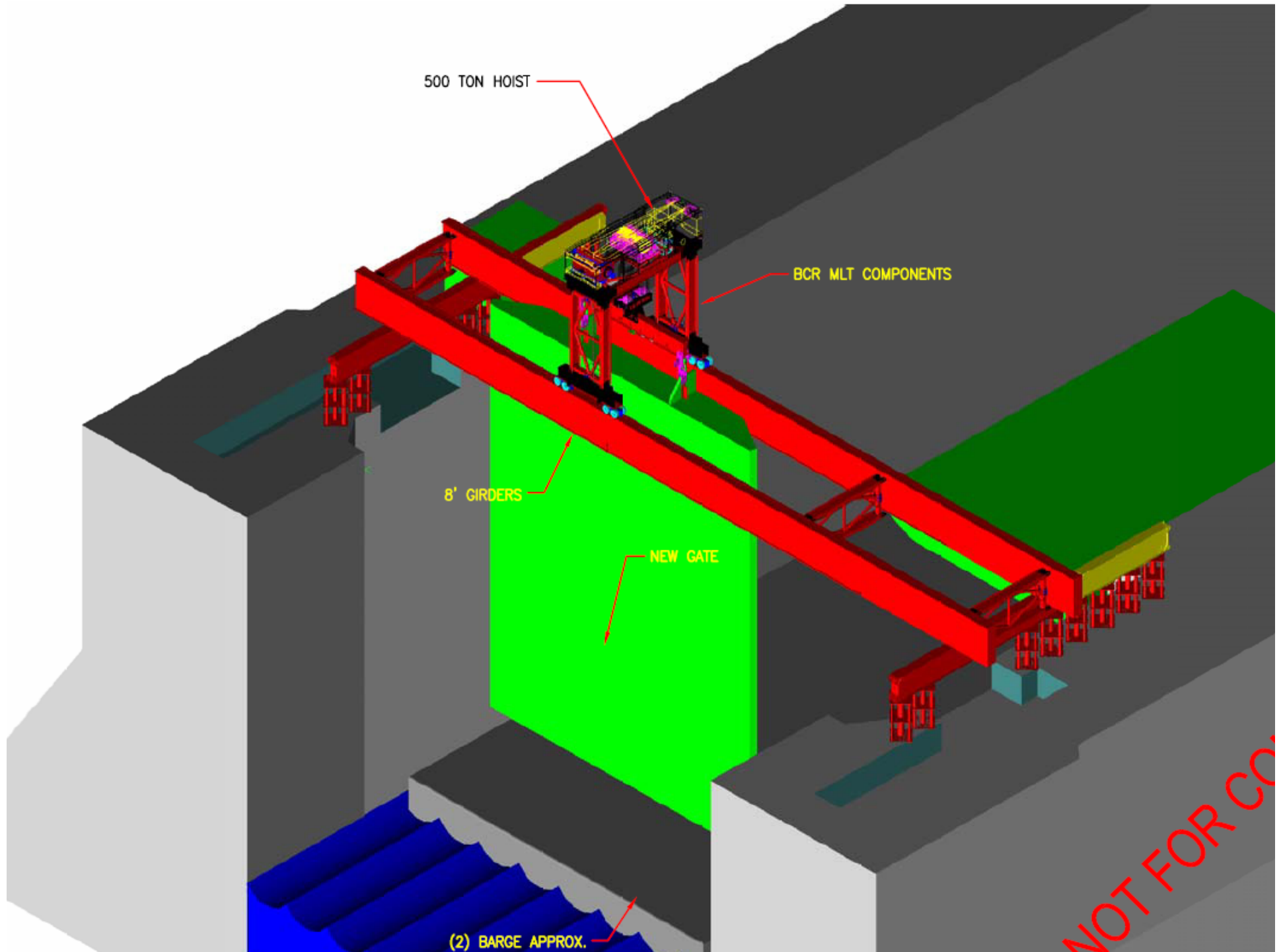
The ability to perform the work of replacing the gates “in the dry” would provide a higher degree of safety and allow the Corps of Engineers to perform functions that had not been done in decades.

## The Solution

A portable, high capacity bridge crane that would span the Lock and replace the gates, and do so “in the dry.”

Barnhart was awarded the Project with approximately 3 weeks to prepare.







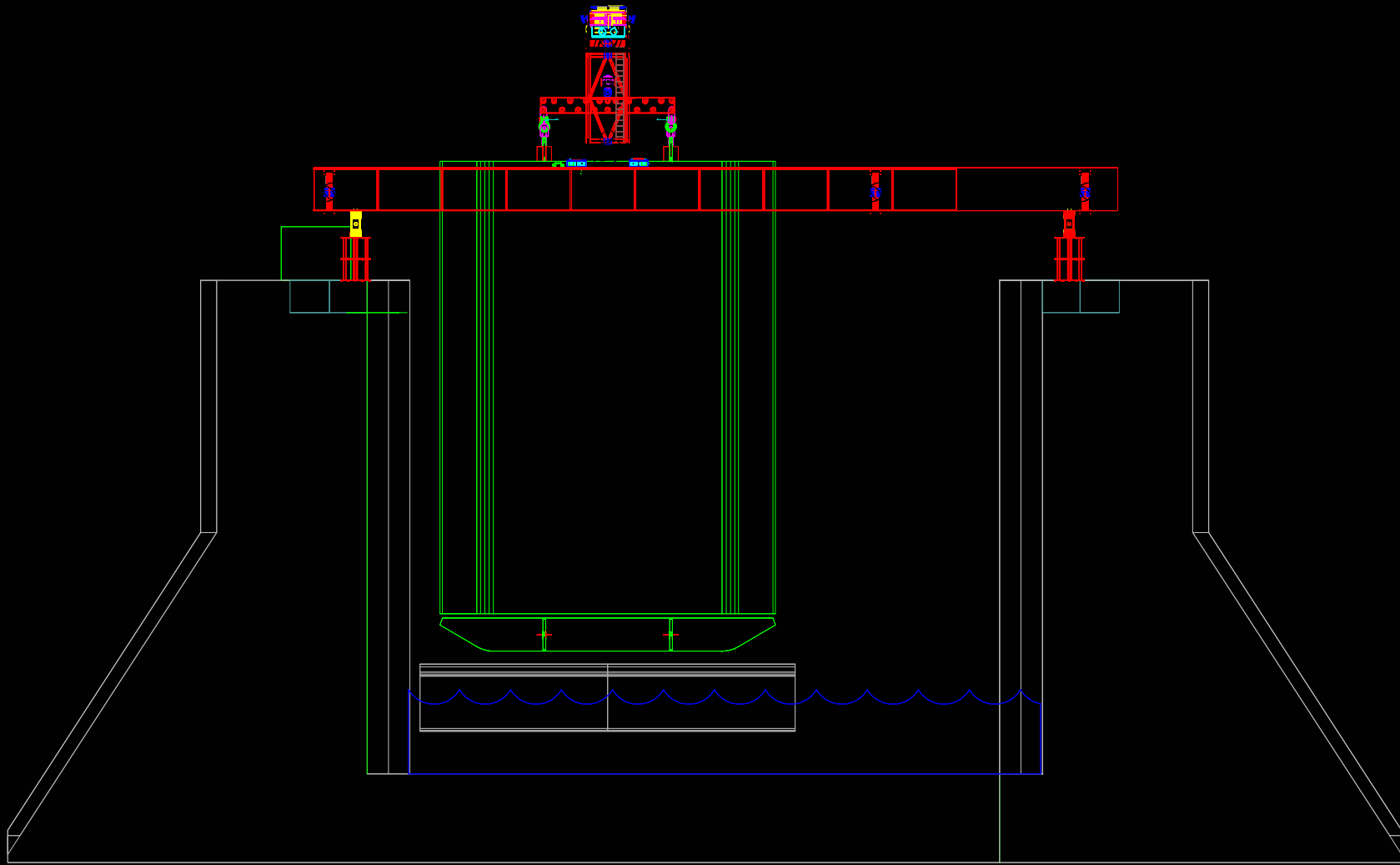
## ENGINEERING AND PLANNING

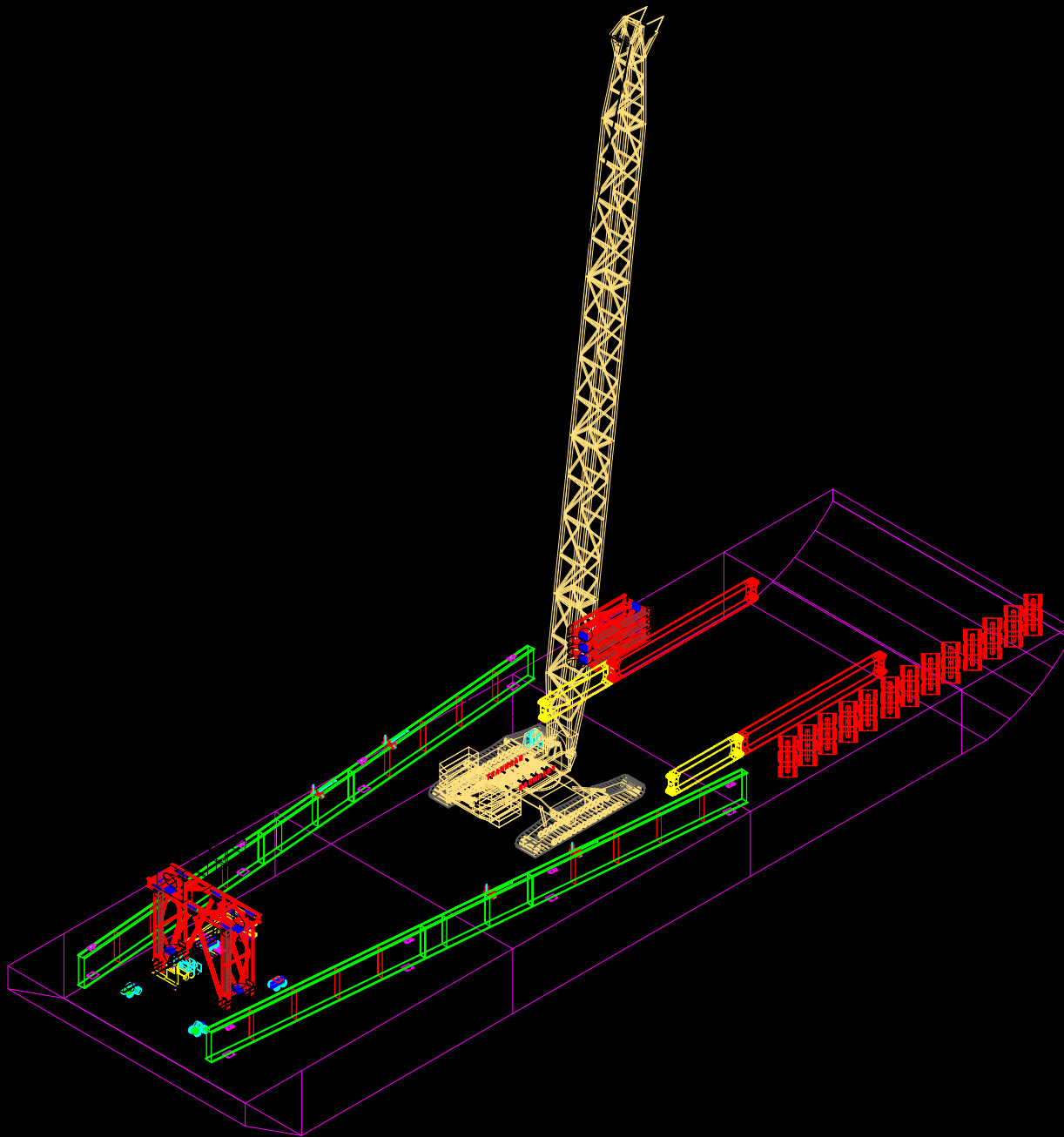
- Challenges
  - The Span
  - The Weight (360 Tons Each)
  - The Obstructions
    - The Operations Room and the Maintenance Room
    - The “Voids” in the Lock Wall surface for mechanical access
  - Tailing the Load
  - Securing the Gates for Dewatering
  - The Weather (Hurricane Ivan)
  - The Schedule (30 Days)

## The Planning Phase

- Design and Fabrication (3 Weeks!)
- Two Important Load Tests
  - One in Memphis for Full Functionality
  - One in Alabama using the 330 Ton Crawler as the Test Load
- Component Load Out for Rapid Assembly
- Safety At Every Step















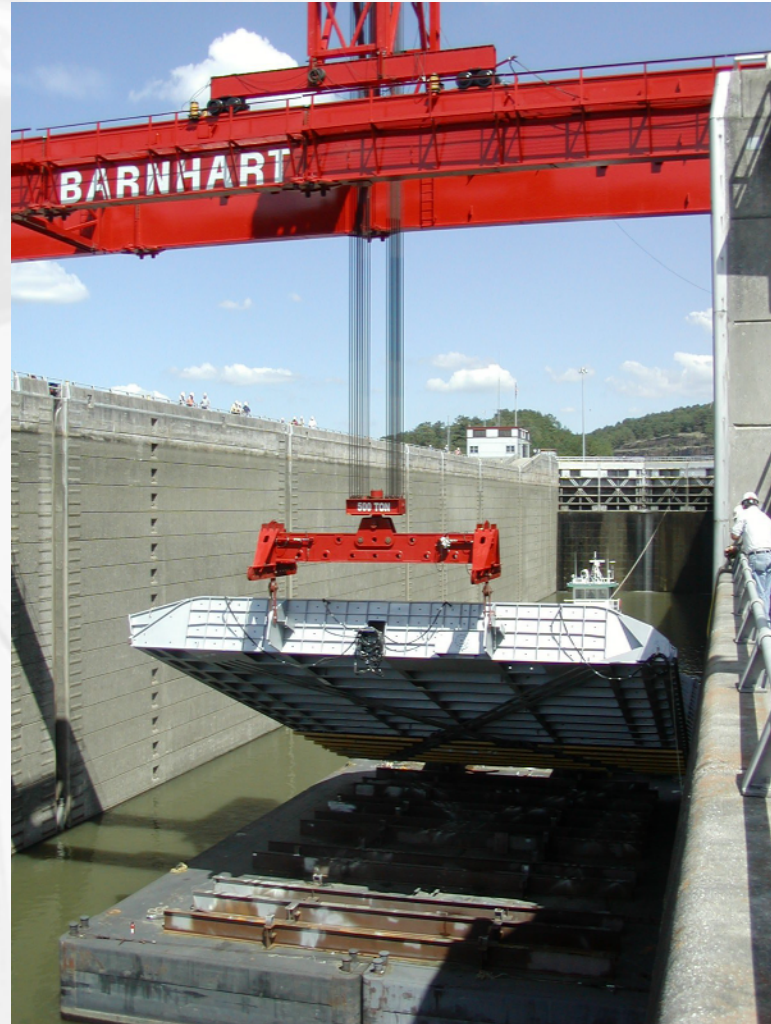






## Project Execution

Removal and  
Replacement  
Procedure





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Each leaf was removed by rotating it out of its “hinges”, lifting it between the 8’ Deep Trolley Girders, and lowering it onto a barge using the barge as the tailing device.











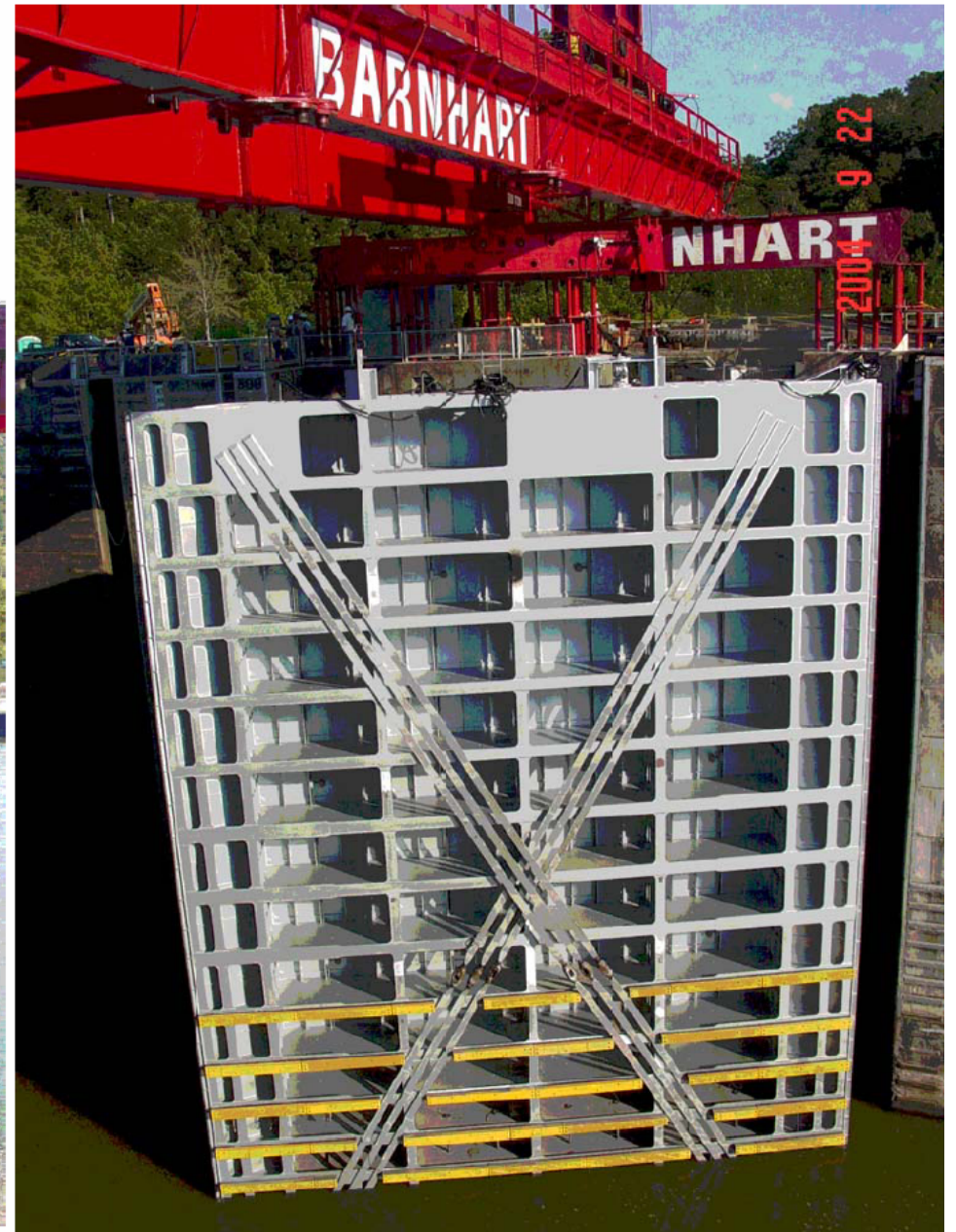
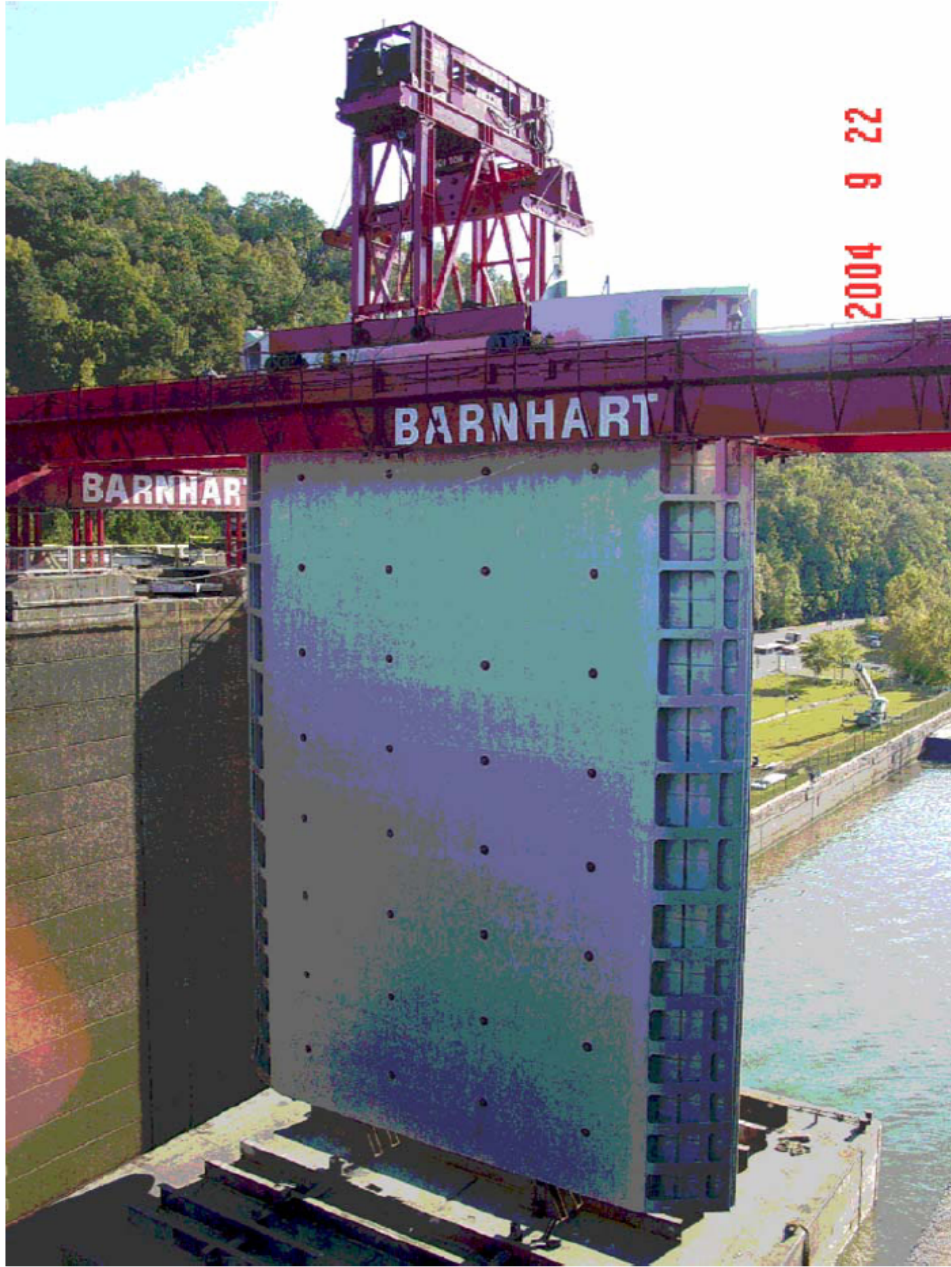
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## Installation and Dewatering

After the New Gates were removed from the delivery barge and temporarily installed, the Lock would be dewatered for final installation and inspection procedures.







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## INNOVATION AND INGENUITY

- Newly Designed Equipment
  - Trolley Gantry utilizing the BCR Containerized 500 Ton Hoist
  - BCR Gripper System w/ Wheel Mounted End Trucks
- Modification of Existing Equipment
  - 150' Long, 8' Deep Box Girders were developed using existing 60' Long Girders. (60', 90', 120', 150' Lengths)

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A grayscale background image showing a large, complex steel truss structure, likely a bridge or industrial framework. The structure consists of numerous vertical and diagonal members connected by girders. The word "BARNHART" is visible on several horizontal beams of the structure.

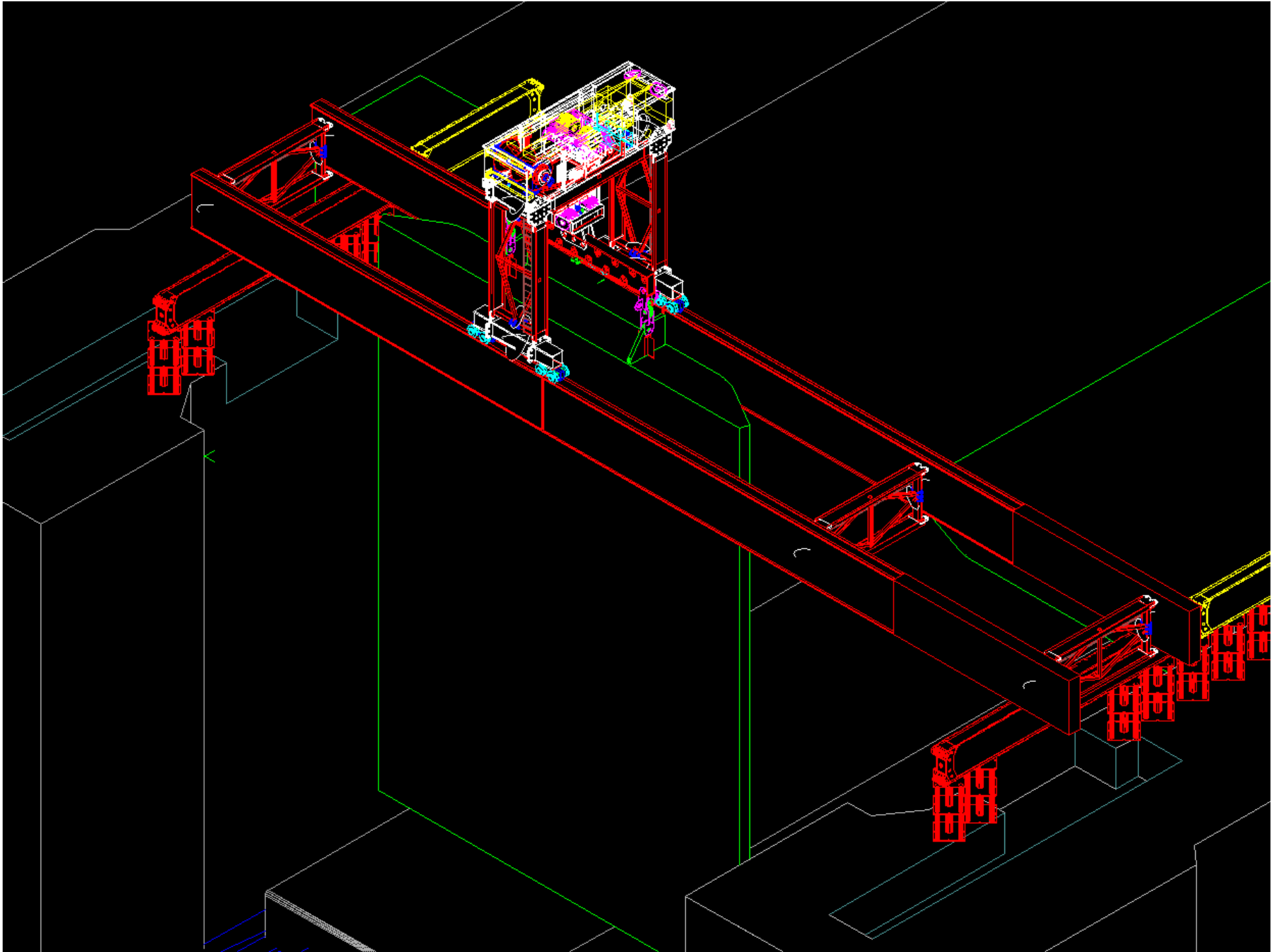
**BCR 8' DEEP, 150' LONG BOX  
GIRDERS**

**LATERAL TORSIONAL BUCKLING**











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# **MLT TROLLEY W/ 500 TON HOIST**







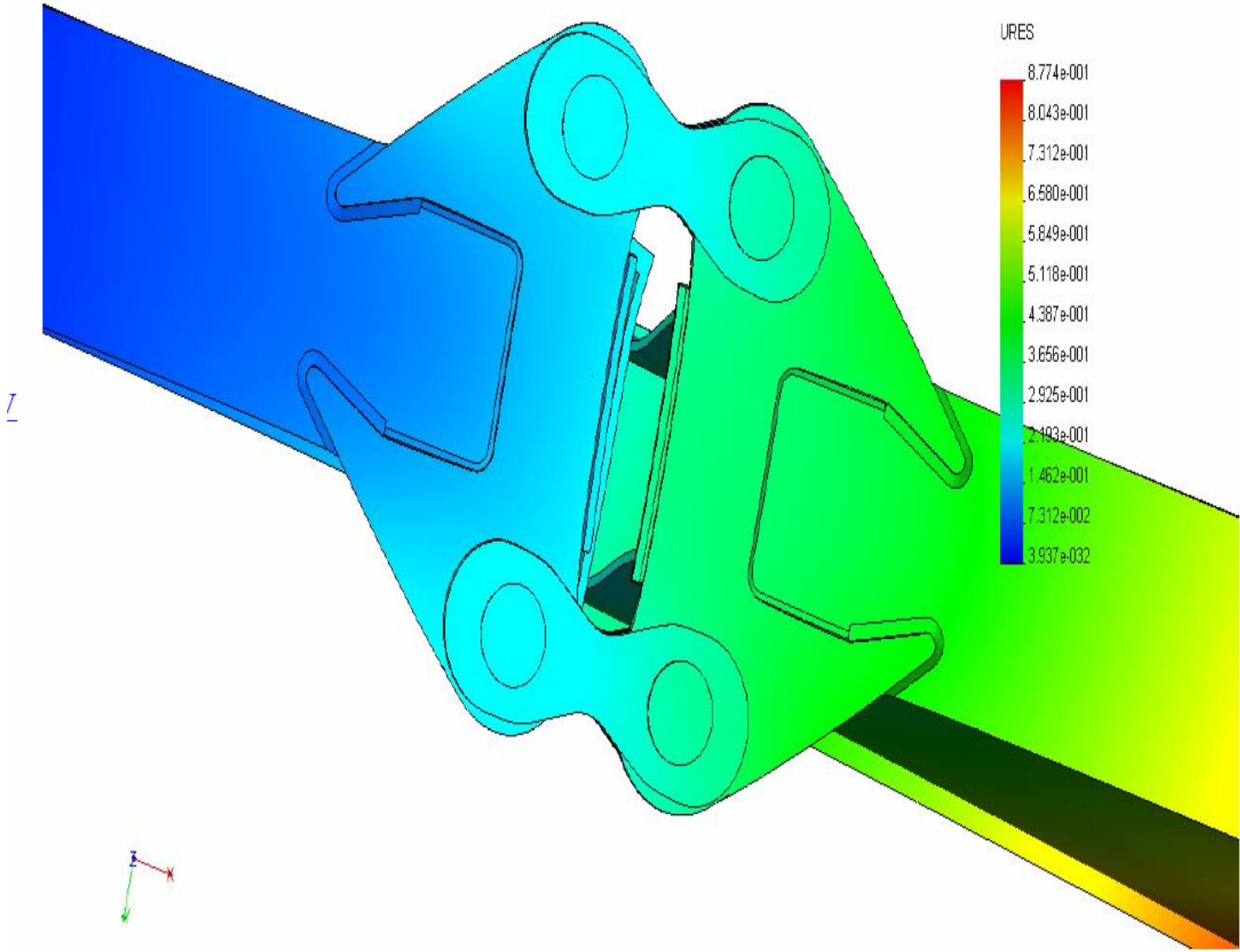
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## FINITE ELEMENT ANALYSIS



B foot Girder Splice COSMOS-S1 :: Static Displacement  
Units : in Deformation Scale 1 : 27.4315









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## BCR WHEELED GRIPPER SYSTEM







## COMMERCIAL LIMITATIONS

This Project was a **Fixed, Lump Sum** Proposal with an agreement to accept **liquidated damages** for exceeding scheduled outage days.

Barnhart completed assembly, removal, replacement, dewatering procedure and permanent installation lifting within **15 days**.



## SAFETY OVERVIEW

- No OSHA Recordables
- No First Aids (Includes Load Test, Load Out, Erection, and Execution)
- Daily Safety Meetings with Corps
- Pre-Lift Meetings with Job Assignments for the Crew
- 100% Remote Operations
- Met or exceeded Army Corps of Engineers Safety Manual Requirements
- Awarded Army Corps of Engineers Annual Safety Award





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## Barnhart's Key to Fit Any Lock

Thank You



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## Presenters Contact Info

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