

AUTOMATION OF MOVABLE BRIDGES

Presented at AREMA
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CONRAIL The logo graphic for CONRAIL, featuring a stylized bridge structure with a large circular element on the right side, rendered in a light blue color.

Office of Vice President/Chief Engineer

Conrail's operation in New Jersey requires manning of movable bridges to comply with various marine regulations

- 1/3 of former Conrail's movable bridges were located in the Shared Assets allocated territory
- 10 were in the New Jersey area
 - 6 bridges service pleasure craft only
 - 4 bridges service commercial shipping
 - 6 bridges utilized BMW E craft (15 positions)
 - 3 bridges utilized TCU craft (13 positions)

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Conrail's operation in New Jersey requires manning of movable bridges to comply with various marine regulations

- Code of Federal Regulations mandated specific operations for all movable bridges
 - Hours of operation based upon those requirements
- Coast Guard monitors bridge activity and Conrail's compliance with regulations
- Increasing marine activity coupled with bridge operator attrition presented an opportunity to get serious about automation of movable bridges at Conrail

4 movable bridge candidates were identified in 2000 for automation that appeared to have the greatest potential for success

- Secondary and industrial tracks
- Marine activity was limited
 - CFR did not require 24/7 operator presence
 - Pleasure craft only
 - Bridges closed to marine traffic during winter months
- Increasing complaints from boating public caused the Coast Guard to consider expanding hours of operation
 - Increasing overtime requirement to meet demand
 - Accelerating need to hire and train new bridge operators
- Successful automation would be a win-win for all parties concerned

Between 2000-2003, new technology interfaced with old infrastructure to allow for the automation of movable bridges on Conrail

- Each bridge had unique challenges to solve
- Each automation solution was tailored to the specific marine and train operation at that location
- Electrical, mechanical, and signal modifications were necessary to support bridge automation
- Automation plans were submitted to the Coast Guard for their review and approval for each bridge
- Concurrently, Conrail finalized design and requested authorization for capital expenditures

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Between 2000-2003, new technology interfaced with old infrastructure to allow for the automation of movable bridges on Conrail

- In the end, 3 different applications were chosen for bridge control:
 - Microwave link path between one bridge and another 24/7 manned bridge
 - DTMF radio control allows train crews to operate three bridges
 - Remote control by Mt. Laurel Train Dispatch Center was the best solution for another location
- Upon completion, the automated bridges were bulletined in service and the Code of Federal Regulation for operation at each location was modified

Darby Creek Bridge



Darby Creek Bridge

Description

Bridge No. B -1.67 – Chester Industrial Track

Thru-Girder, Open Deck, Bascule Draw

Located in Eddystone, Pennsylvania

Waterway – Darby Creek

Built in 1923

Railroad Operation

Number of Tracks – 2

Track Speed – 10 MPH

Train Movements Per Day - 6

Marine Operation

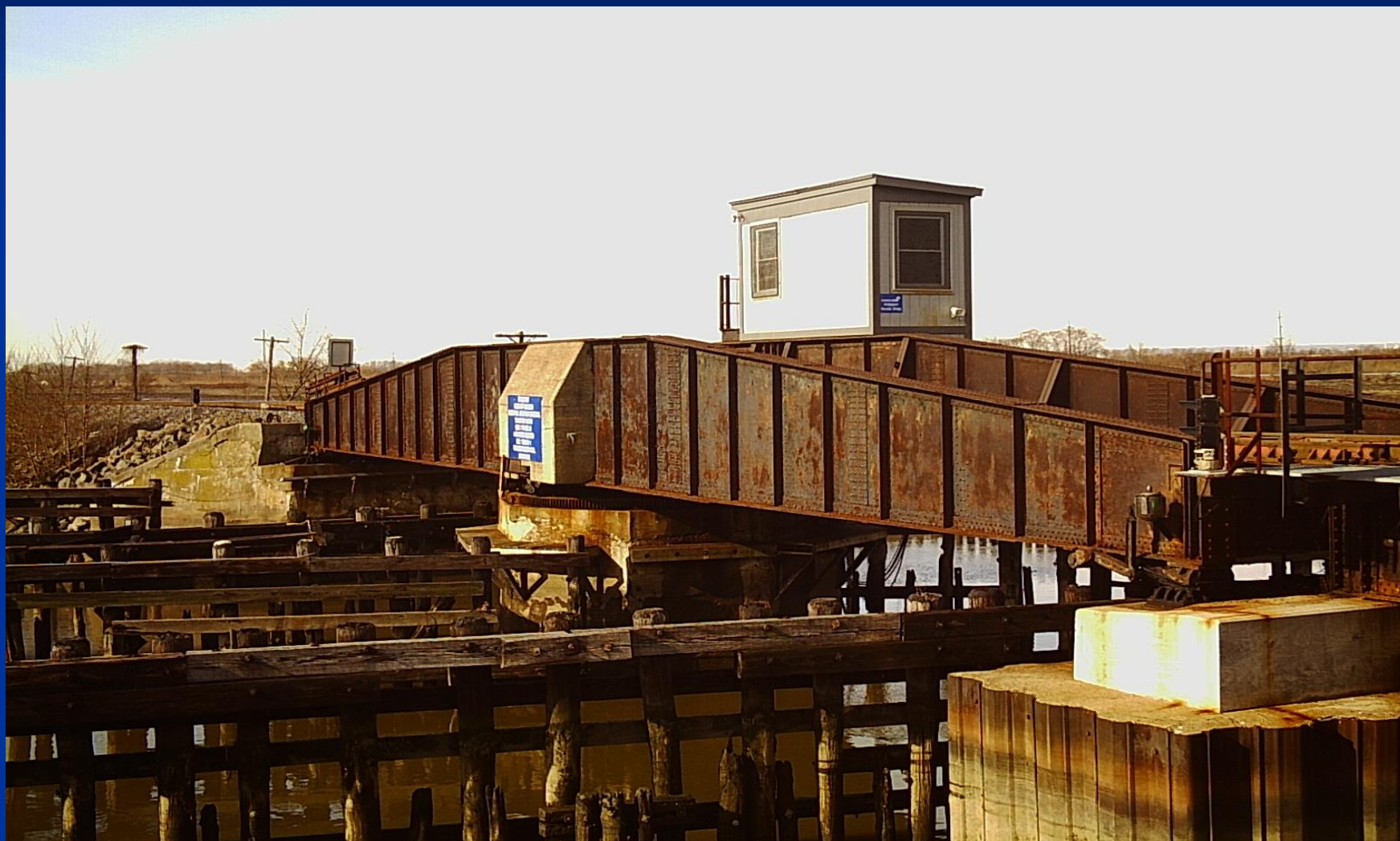
Marine Traffic – Pleasure Craft

CFR Regulation – Open April 1st
thru October 31st

Open with 24 hour notice

November 1st thru March 31st

Bridgeport Movable Bridge



Bridgeport Movable Bridge

Description

Bridge No. D - 20.79 – Penns Grove Secondary

Thru-Girder, Open Deck, Swing Span

Located in Bridgeport, New Jersey

Waterway – Raccoon Creek

Built in 1919

Railroad Operation

Number of Tracks – 1

Track Speed – 10 MPH

Train Movements Per Day - 6

Marine Operation

Marine Traffic – Pleasure Craft

CFR Regulation – Open March 1st
thru November 30th

Open with 4 hour notice
December 1st thru February 28th

Paulsboro Bridge



Paulsboro Bridge

Description

Bridge No. D -13.70 – Penns Grove Secondary

Deck Girder, Open Deck, A-Frame Swing

Located in Paulsboro, New Jersey

Waterway – Mantua Creek

Built in 1917

Railroad Operation

Number of Tracks – 1

Track Speed – 10 MPH

Train Movements Per Day – 10

Marine Operation

Marine Traffic – Pleasure Craft

CFR Regulation – Open March 1st
thru November 30th

Open with 4 hour notice

December 1st thru February 28th

Rahway River Bridge



Rahway River Bridge

Description

Bridge No. B -14.49 – Chemical Coast Secondary

Thru-Girder, Open Deck, Bascule Draw

Located in West Carteret, New Jersey

Waterway – Rahway River

Built in 1921

Railroad Operation

Number of Tracks – 2 (1 active)

Track Speed – 20 MPH

Train Movements Per Day – 12

Marine Operation

Marine Traffic – Pleasure Craft

CFR Regulation – Closes only for passage of trains

Darby Creek Bridge



Darby Creek Bridge Operation

AUTOMATION
REQUIREMENT:

Bridge is left in the open position

TECHNOLOGY:

Train crew operates bridge using DTMF radio with keypad in engine or on portable radio

CLOSING BRIDGE:

With approach track circuit occupied, crew member enters access code on keypad

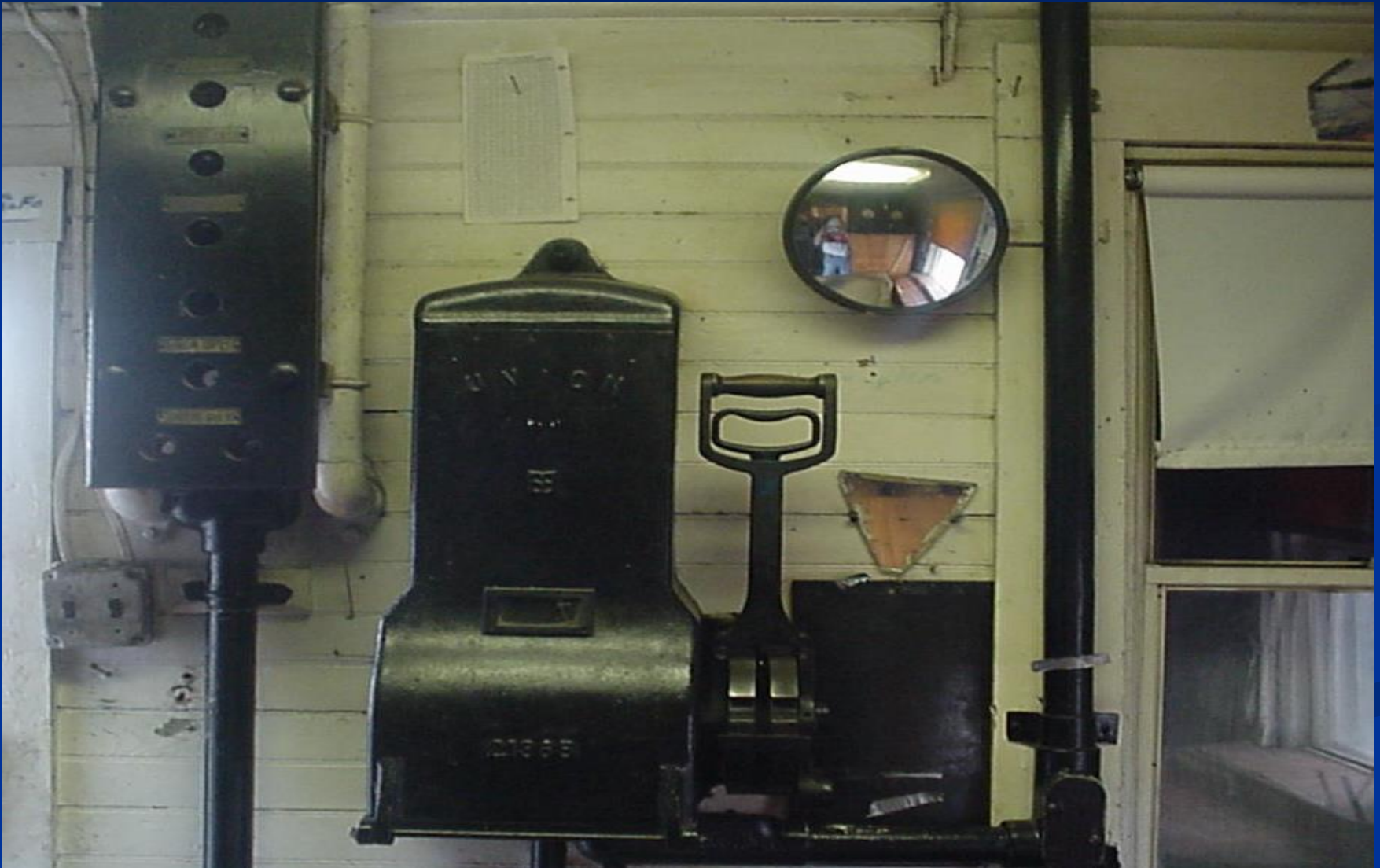
EMERGENCY STOP:

Enter access code and # key

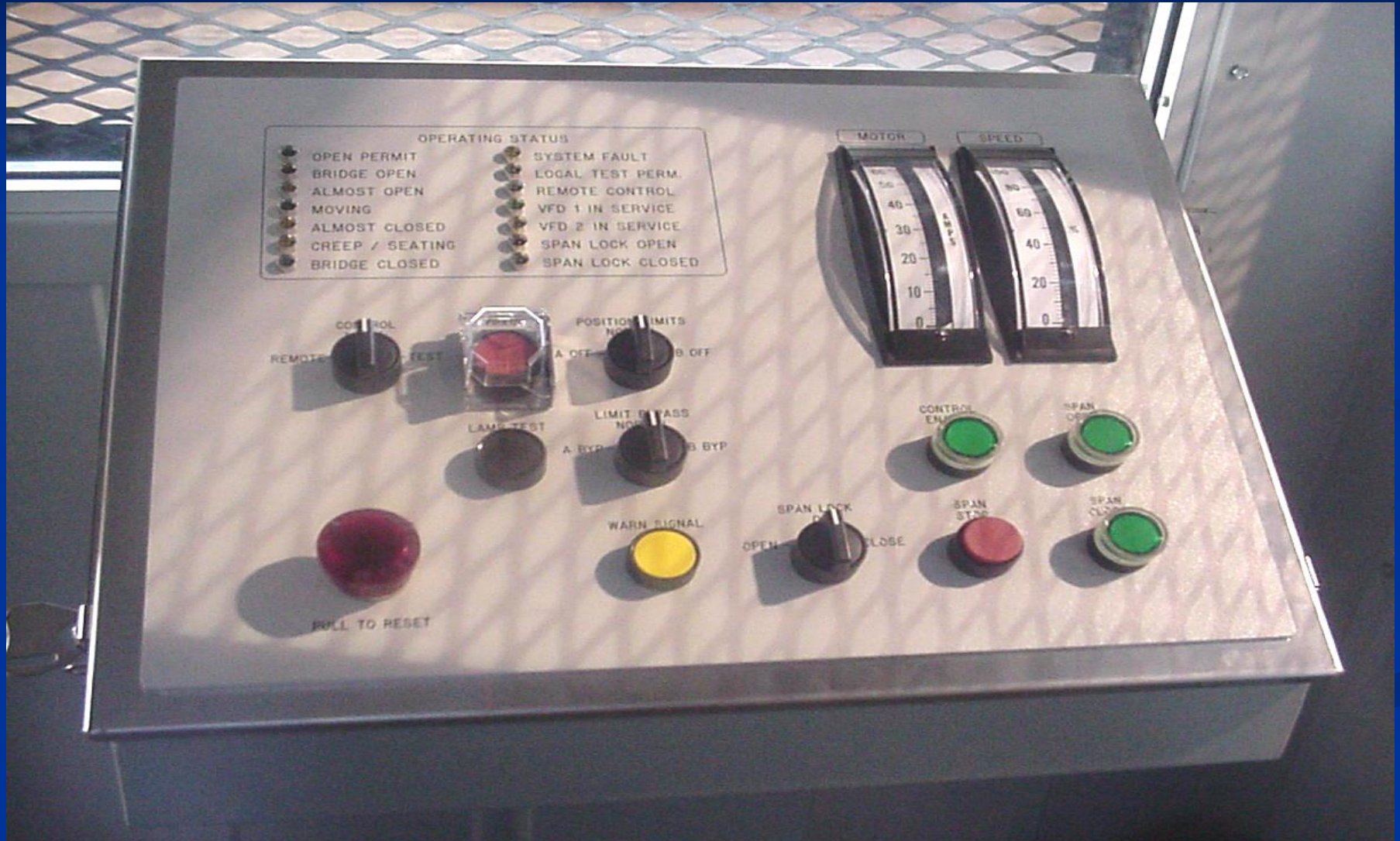
OPEN BRIDGE:

Bridge will open automatically when track circuits are clear

Darby Creek Bridge Operation (before)



Darby Creek Bridge Operation (after)



Darby Creek Bridge



Paulsboro Bridge Operation (before)



Paulsboro Bridge (after)



Bridgeport Movable Bridge



Paulsboro and Bridgeport Bridge Operation

AUTOMATION
REQUIREMENT:

Bridge is left in the open position

TECHNOLOGY:

Train crew operates bridge using DTMF radio with keypad in engine or on portable radio

CLOSING BRIDGE:

With approach track circuit occupied, crew member enters access code on keypad

EMERGENCY STOP:

Enter access code and # key

OPEN BRIDGE:

Bridge will open automatically when track circuits are clear

Paulsboro Bridge Operation



Paulsboro Bridge Operation



Paulsboro Bridge Operation



Radio Failure Control



M&W Control Buttons



Rahway River Bridge



Rahway River Bridge Operation

AUTOMATION
REQUIREMENT:

Bridge is left in the open position

TECHNOLOGY:

Vital Processor linked to Mt. Laurel
Dispatch Office

CLOSING BRIDGE:

Prior to train arrival, the dispatcher operates
the bridge remotely from his work station

OPEN BRIDGE:

With track circuits cleared, train dispatcher
can open the bridge

Rahway River Bridge



Conrail enjoys the on-going benefits and efficiencies of movable bridge automation and continues to explore future opportunities

- Each bridge automation projects produced a significant ROI
- Re-deployment of the existing bridge operators and reduction in future hiring requirements
- Elimination of train delays due to operator availability
- Reduction in complaints from boat owners regarding bridge openings
- Improved relationship with the Coast Guard

(continued)

Conrail enjoys the on-going benefits and efficiencies of movable bridge automation and continues to explore future opportunities

- Building on these successes, Conrail is reviewing the cost and benefits of our remaining, more challenging future automation projects
 - Delair Bridge
 - Upper Bay Bridge
 - Hack Bridge

Update on future opportunities

- Delair Bridge – Project is underway to remote the bridge from Mt. Laurel
- Upper Bay Bridge – Operator now controls Hack Bridge and AK Bridge

Delair Bridge



Upper Bay Bridge



Hack Bridge



AK Bridge



The success of each of the projects was primarily due to the interaction and cooperation of many agencies and organizations

- Conrail's Communication & Signal and Bridges & Building Departments
- Conrail's Labor Relations Department
- CSXT and NSC for their support of these capital projects
- Hans J. Heidenreich, Heidenreich Associates, Inc.
- North American Signal, Inc.
- United States Coast Guard
- Various marina owners

Questions and Answers

CONRAIL