

# ASHE / PennDOT District 9

## Bridge Topics

**Ralph J. DeStefano, PE**

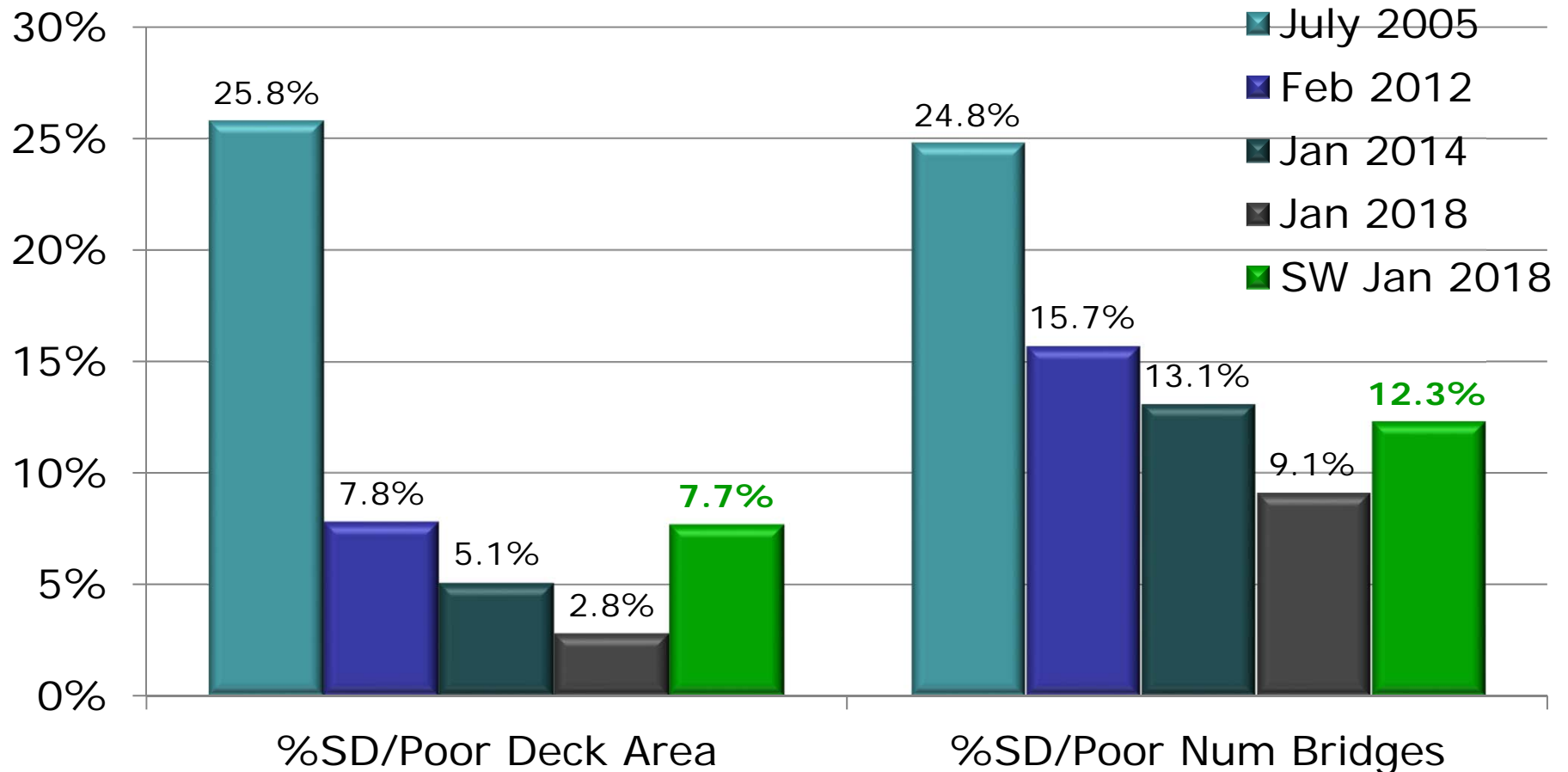
District Bridge Engineer

April 17, 2018

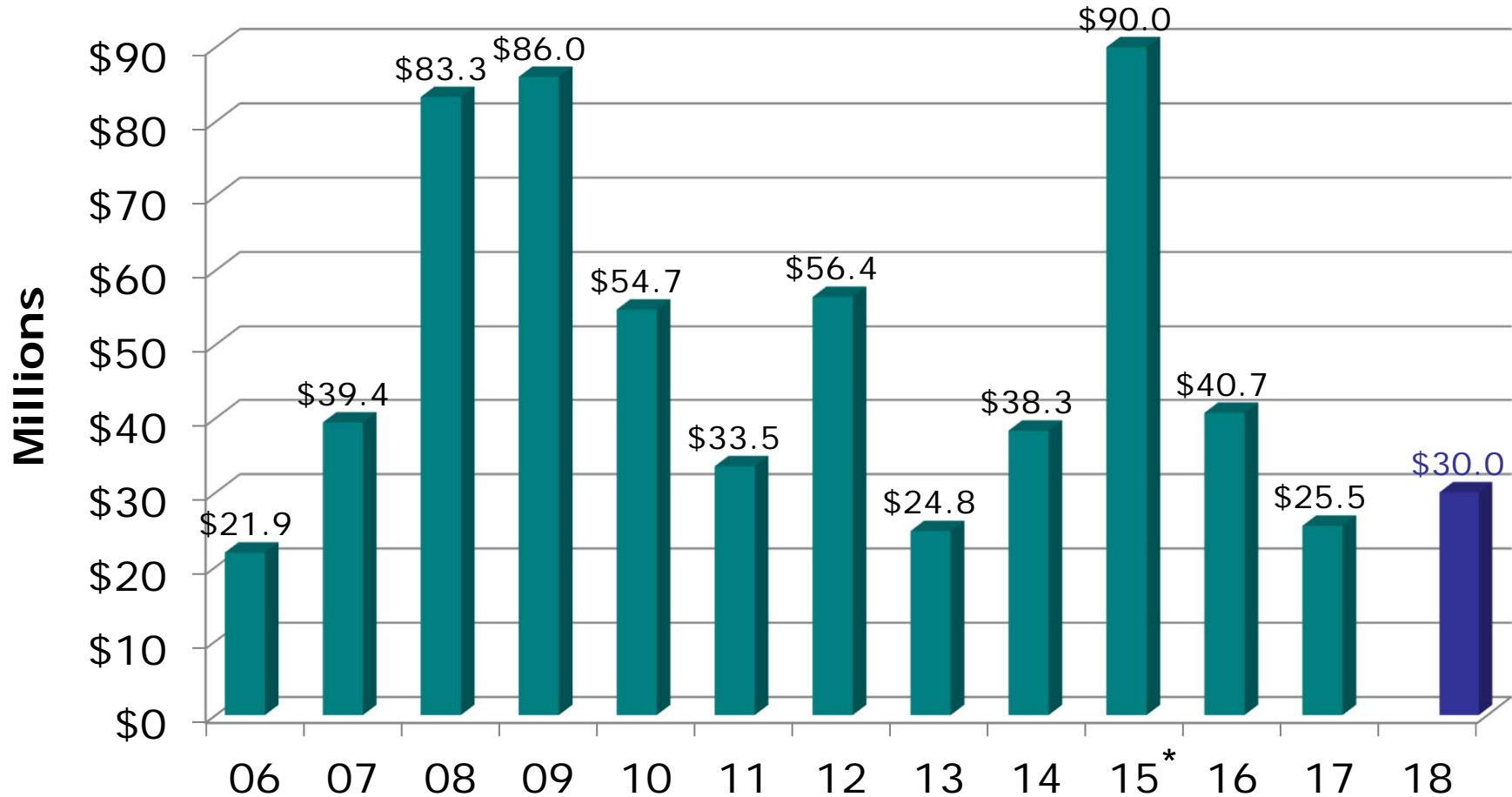
# TOPICS OVERVIEW

- **SD/Poor Bridge Trends**
- **ASTM A 1035 Grade 100 Corrosion Resistant Rebar vs. Conventional Epoxy Coated**
- **Inverted T-Wall**
- **MSE Wall Panel Distress**

# SD/POOR STATE BRIDGE STATISTICS

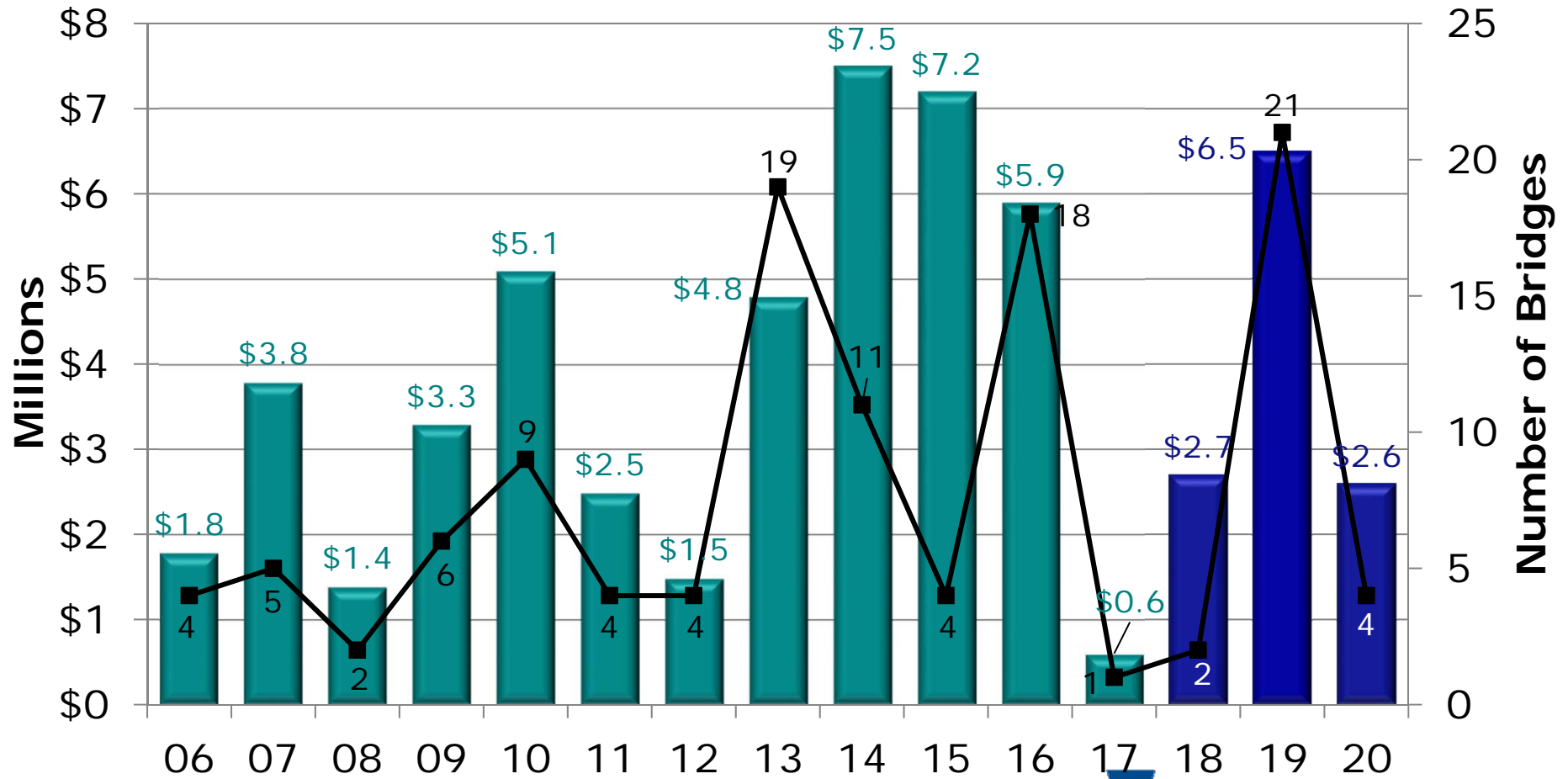


# STATE BRIDGE CONSTRUCTION SPENDING

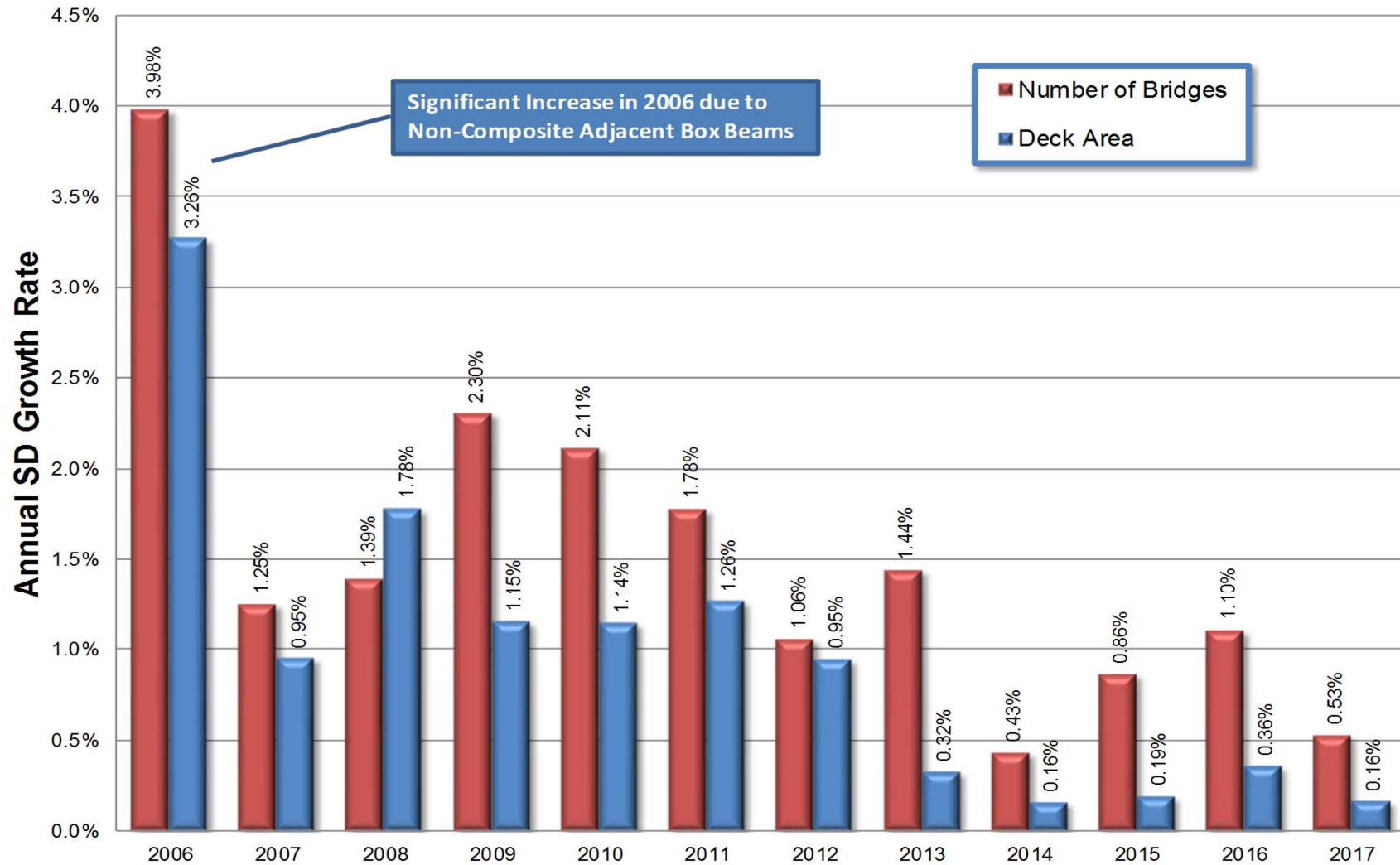


\* Includes approx. \$58 million for P3 Bridges

# LOCAL BRIDGE CONSTRUCTION SPENDING



# STATE BRIDGE SD/POOR ANNUAL GROWTH RATES



# A 1035 Corrosion Resistant vs Epoxy Coated Rebar

- ASTM-A 1035 suppliers (i.e., MMFX) claim to be competitive if higher strength is utilized to reduce quantity
- Central Office solicited Districts to develop dual designs for direct comparison bidding
- Central Office Bridge would provide revised deck reinforcement design taking advantage of A 1035 100 ksi yield strength
- District 9 agreed to participate

# A 1035 Corrosion Resistant vs Epoxy Coated Rebar

- ECMS 21425 "Chalybeate Dunning Creek Rehab"
- As-designed plans included designs for both A 1035 and conventional epoxy coated
- Total quantity of steel reinforcement
  - 82,265 lbs conventional epoxy coated
  - 51,993 lbs A 1035
    - 37% less steel reinforcement for A 1035 alternate taking advantage of 100 ksi strength



# A 1035 Corrosion Resistant vs Epoxy Coated Rebar

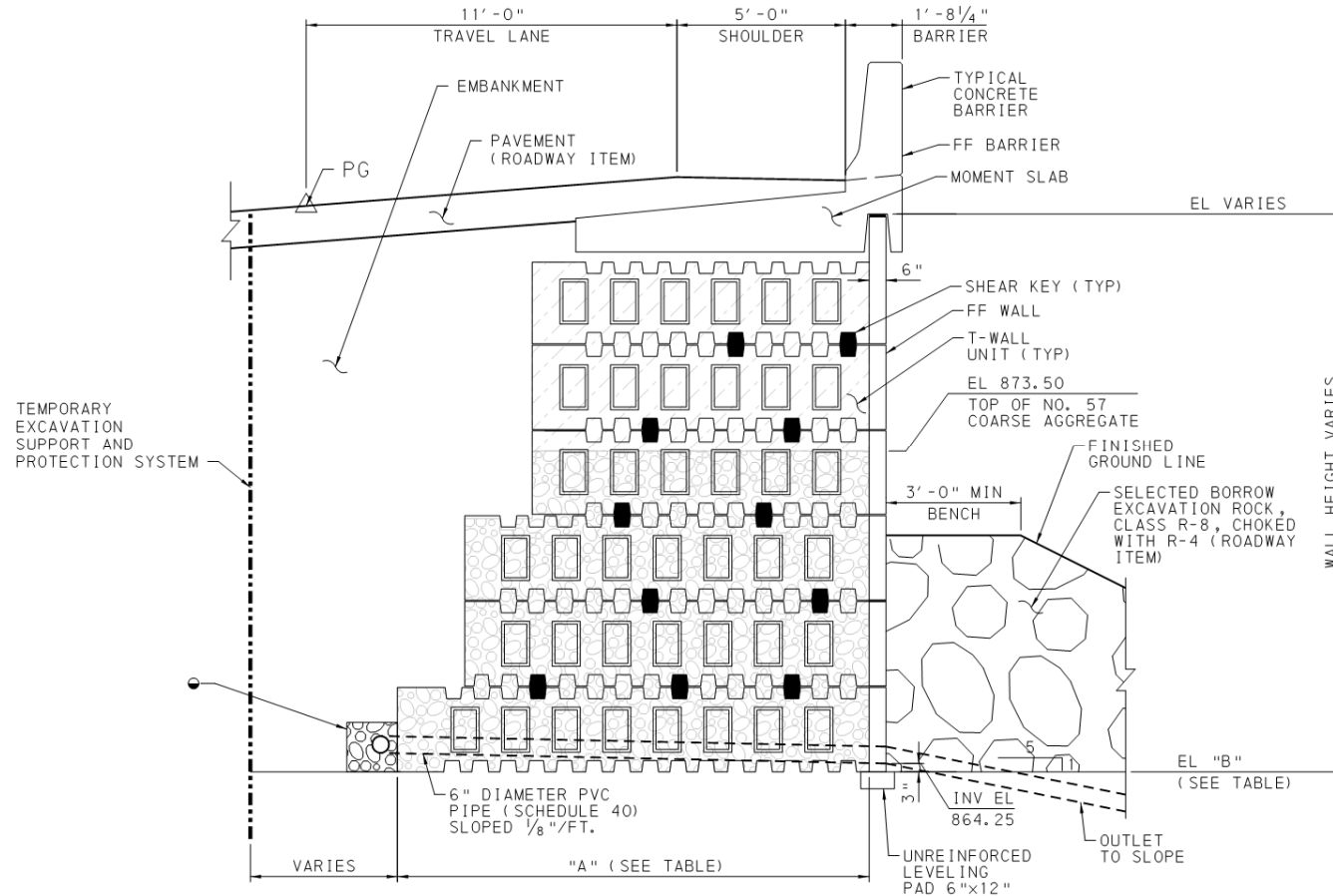
- Contract was bid on 2/15/2018
- None of the 3 low bidders bid the A 1035 alternate
- In-place bid price of epoxy coated rebar was \$1.51, \$1.30 & \$1.58 per lb for the 3 lowest bidders, respectively
- A contractor shared his material pricing info:
  - \$0.585 / lb epoxy
  - \$1.32 / lb A 1035
- Resulting total material cost
  - \$48,125.03 epoxy
  - \$68,630.76 A 1035

# Inverted T-Wall<sup>®</sup>

## HOPEWELL BRIDGE

- Reinforced Earth Co acquired The Neel Company
- Contemplating VE Proposal
- 5,640 sf of as-designed T-wall<sup>®</sup>
- Potential advantages of Inverted T-wall<sup>®</sup>
  - Reduce/eliminate temporary shoring
  - Reduce select backfill quantity
- Inverted T-wall<sup>®</sup> results in higher bearing pressure compared to conventional T-wall<sup>®</sup> designs

# Inverted T-Wall



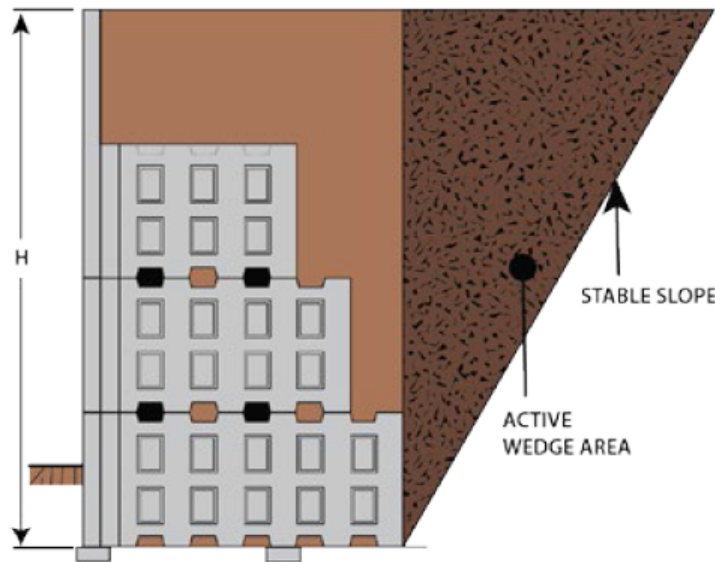
SECTION	STATION LIMITS	A	B
1	STA 2198+80 TO STA 2201+26	14'-0" MIN	864.00
2	STA 2201+26 TO STA 2202+29	20'-0" MIN	858.92

TYPICAL SECTION - T-WALL

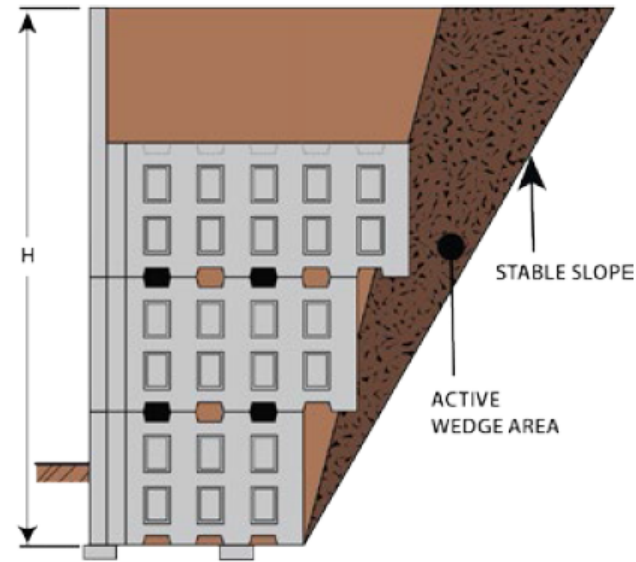
# Inverted T-Wall

## **Inverted T-WALL**®

*A New Solution from The Neel Company*



Conventional T-WALL



Inverted T-WALL

***The NEEL Company - June 2017 NEWSLETTER***

# Inverted T-Wall

## NEW Inverted T-WALL Advantages



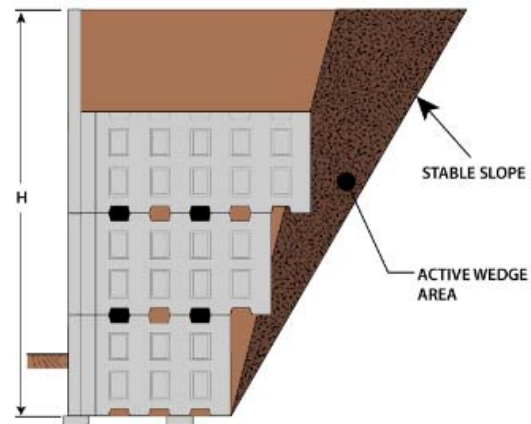
### Benefits for Rail & Highway

- Add Lanes, Add Tracks
- Keep Trains Moving *Safely*
- Eliminate/Minimize Zone A Encroachment
- Maintain Existing Right-of-Ways
- Further Reduce/Eliminate Shoring
- Even Less Granular Fill
- Even Less Excavation
- Even Less Material Hauling



Inverted T-WALL combines all the benefits of standard T-WALL with minimal or no need for shoring and excavation. Optimal for rail and highway expansion in areas with extremely limited right-of-way, Inverted T-WALL keeps existing lanes or tracks open while adding new.

Learn more about the structural details of standard and Inverted T-WALL [here](#).



# Inverted T-Wall<sup>®</sup>

## District 4 Harrison Ave Bridge (ECMS 7838)

- Bid September 2014
- Conceptual proposal submitted within past several months to use Inverted T-wall<sup>®</sup>
- Central Office Geotech had numerous review comments regarding analysis assumptions and theoretical approach as part of new product evaluation

# MSE Wall Panel Distress

- To date, two bridges on I-99 affected:
  - I-99 over T-349 Mountain Rd
  - I-99 over PA 164 & South Dry Run
- Abutments constructed using Reinforced Earth MSE wall panels
- Built in 1988 prior to requirement to support stub abutments on steel piles
- Compression dams original deck joints
- Replaced with strip seals in 2011
- 3 strike-off letters issued in late 1980's, earlier 1990's dealing with 1988 MSE wall failure in District 4

# MSE Wall Panel Distress

- Reasons Cited for District 4 VSL MSE Wall Failure
  - Lack of drainage through wall joints
  - Low drainability of backfill material
  - Frost action
  - Button head connection detail
- Reinforced Earth Contacted for Assistance
  - No experience with this kind of distress
  - Suggested forensic investigation because every situation is different
  - Does have a panel replacement procedure, but is complex



# MSE Wall Panel Distress

## ECMS 91533 (MPMS 106066)

- Contract let 5/18/2017
- 128 total number of panels with visible cracks
- 21 panels visibly “bulging” and identified in contract for removal and replacement
- \$10,000 per panel replacement cost

# MSE Wall Panel Distress

**BMS ID 07 0099 0205 0290**

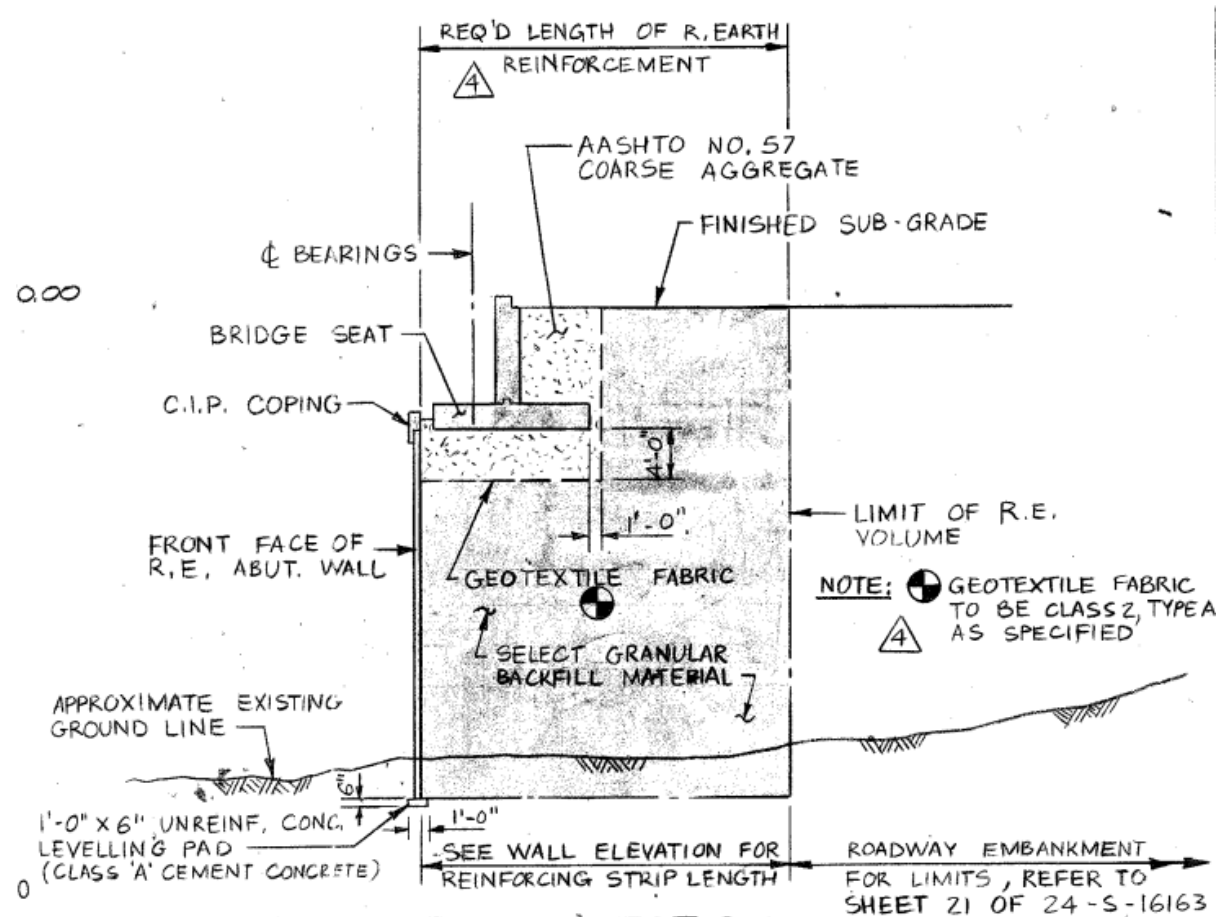


**I-99 over T-349 Mountain Rd**

**11/17/2015**

**Looking Right to Left**

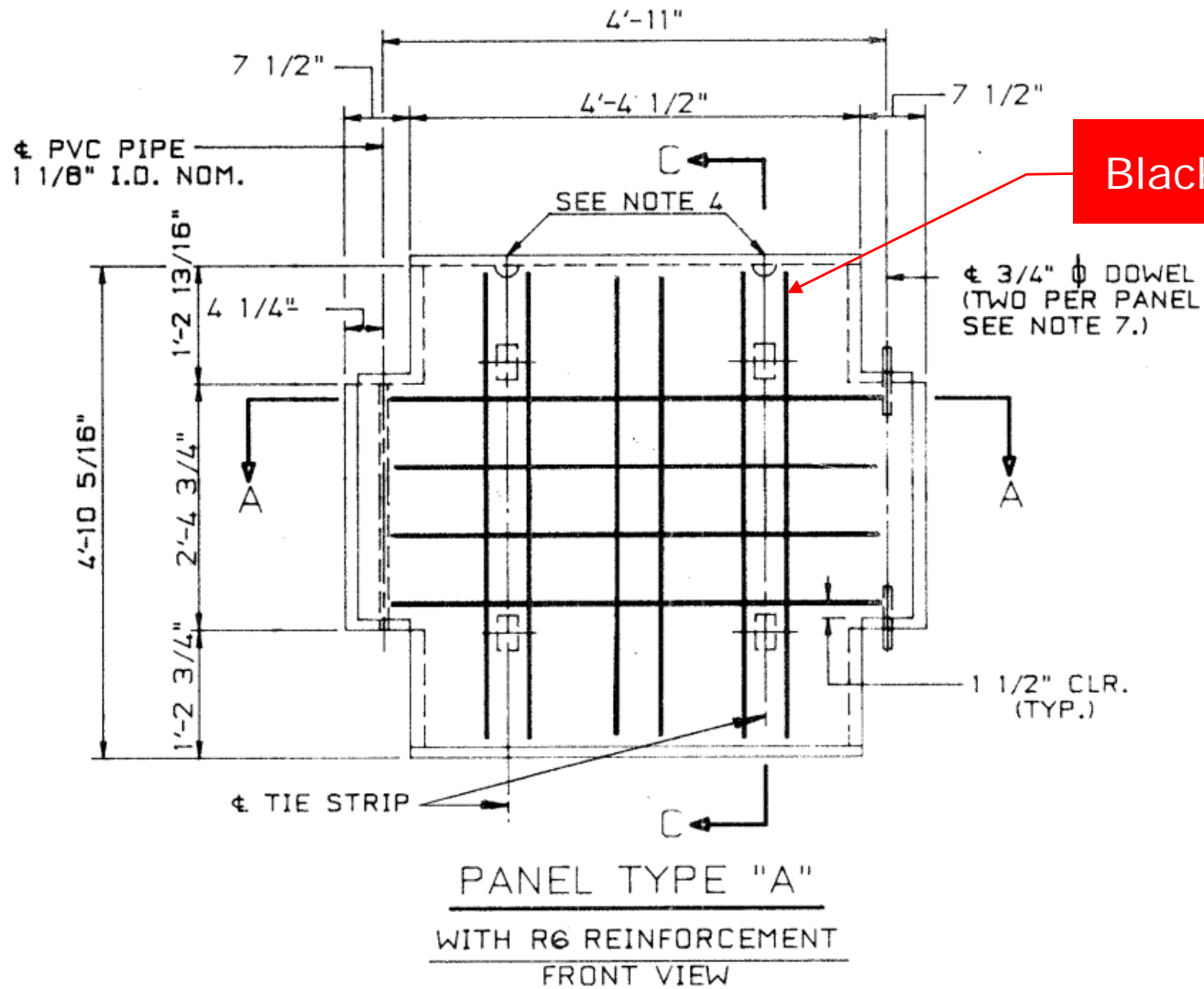
# MSE Wall Panel Distress



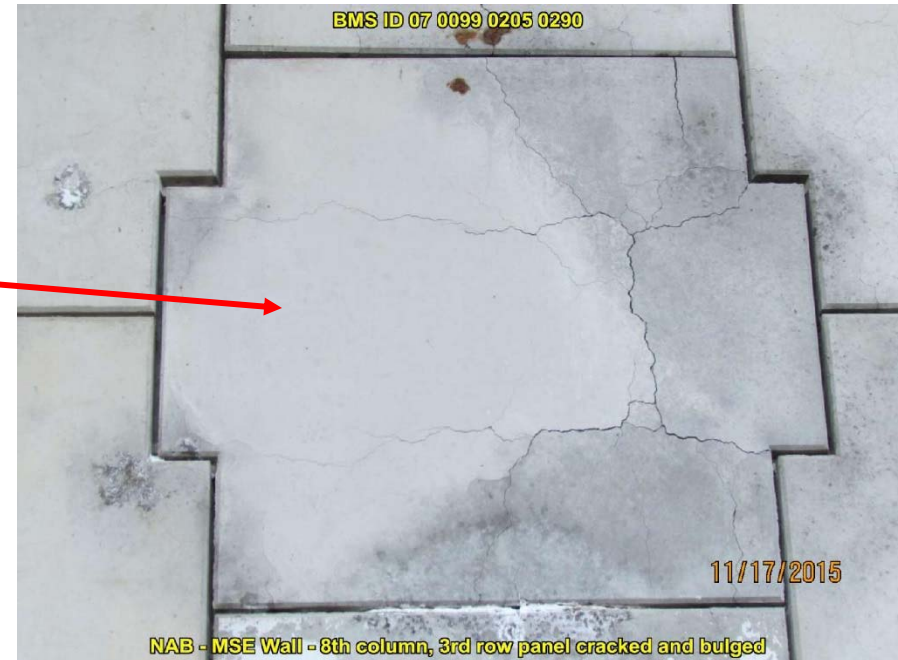
TYPICAL SECTION  
THROUGH R.E.<sup>®</sup> ABUTMENT

**I-99 over T-349 Mountain Rd**

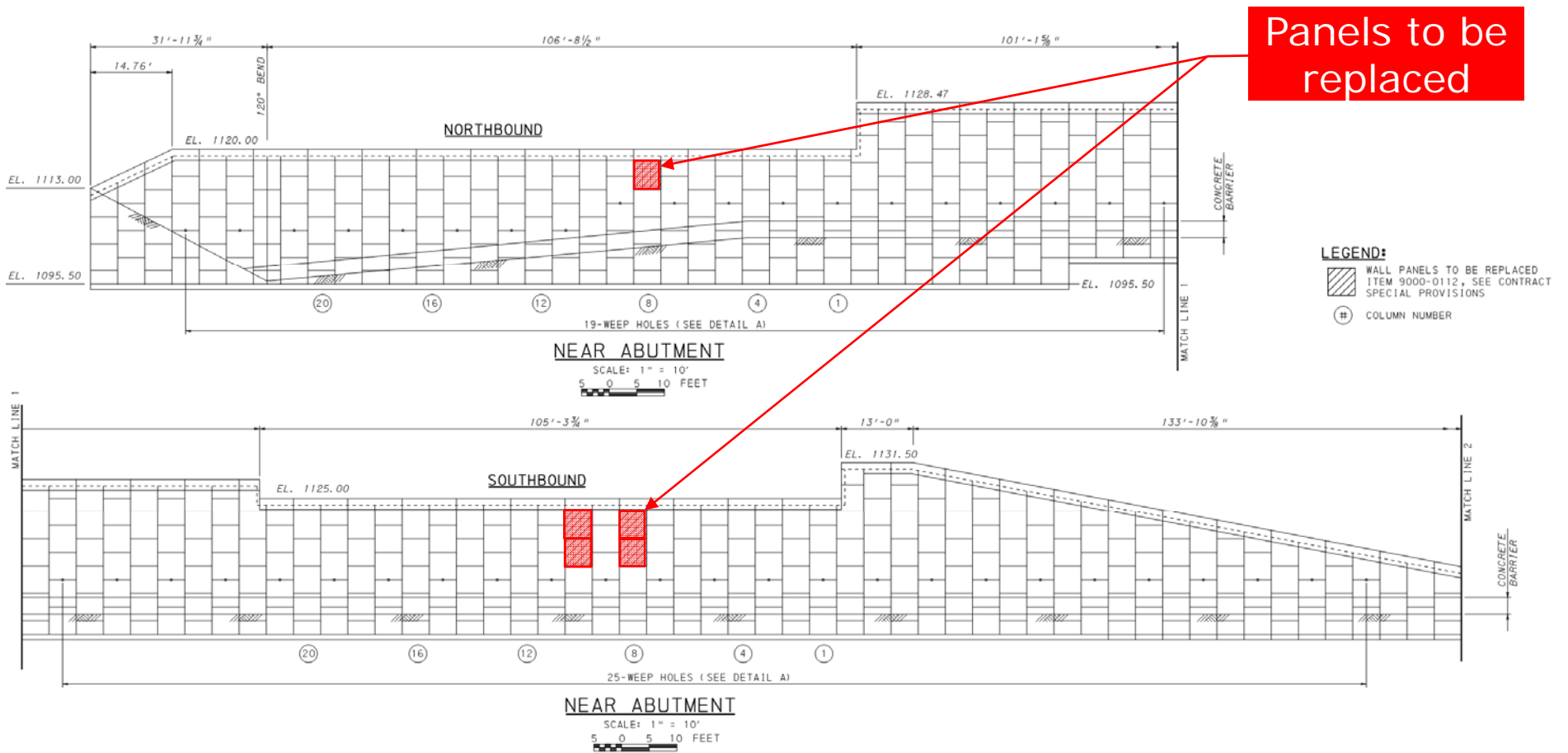
# MSE Wall Panel Distress



# MSE Wall Panel Distress

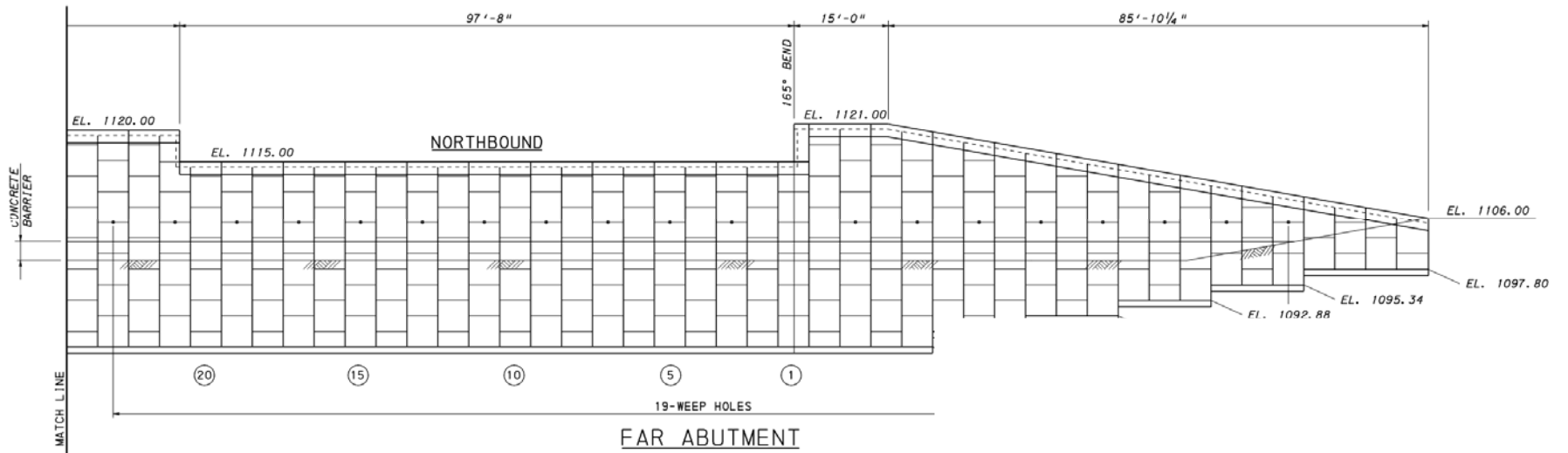
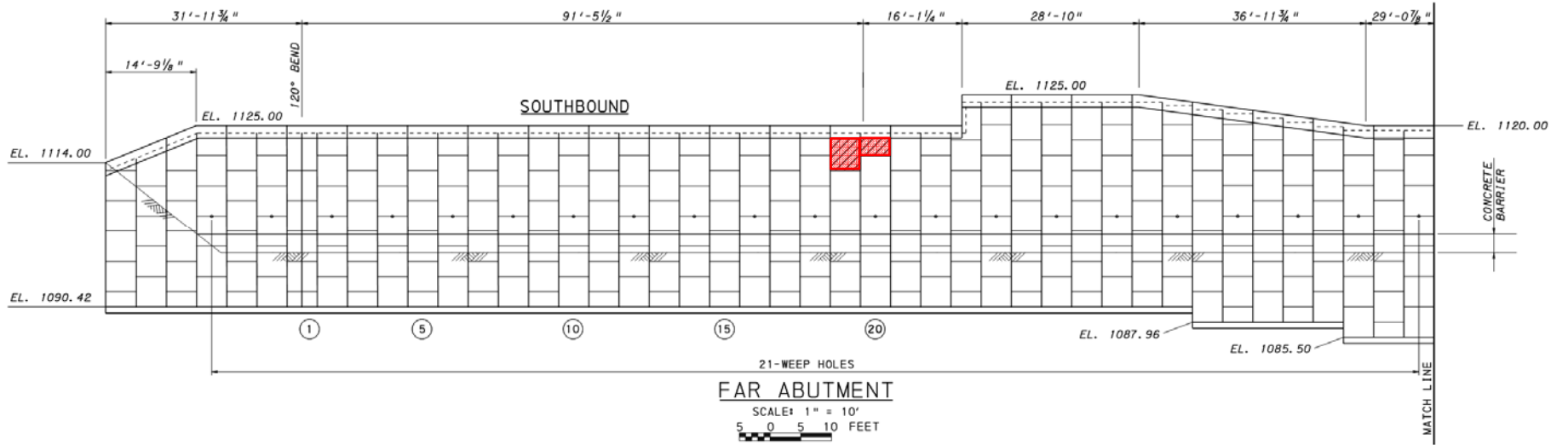


# MSE Wall Panel Distress



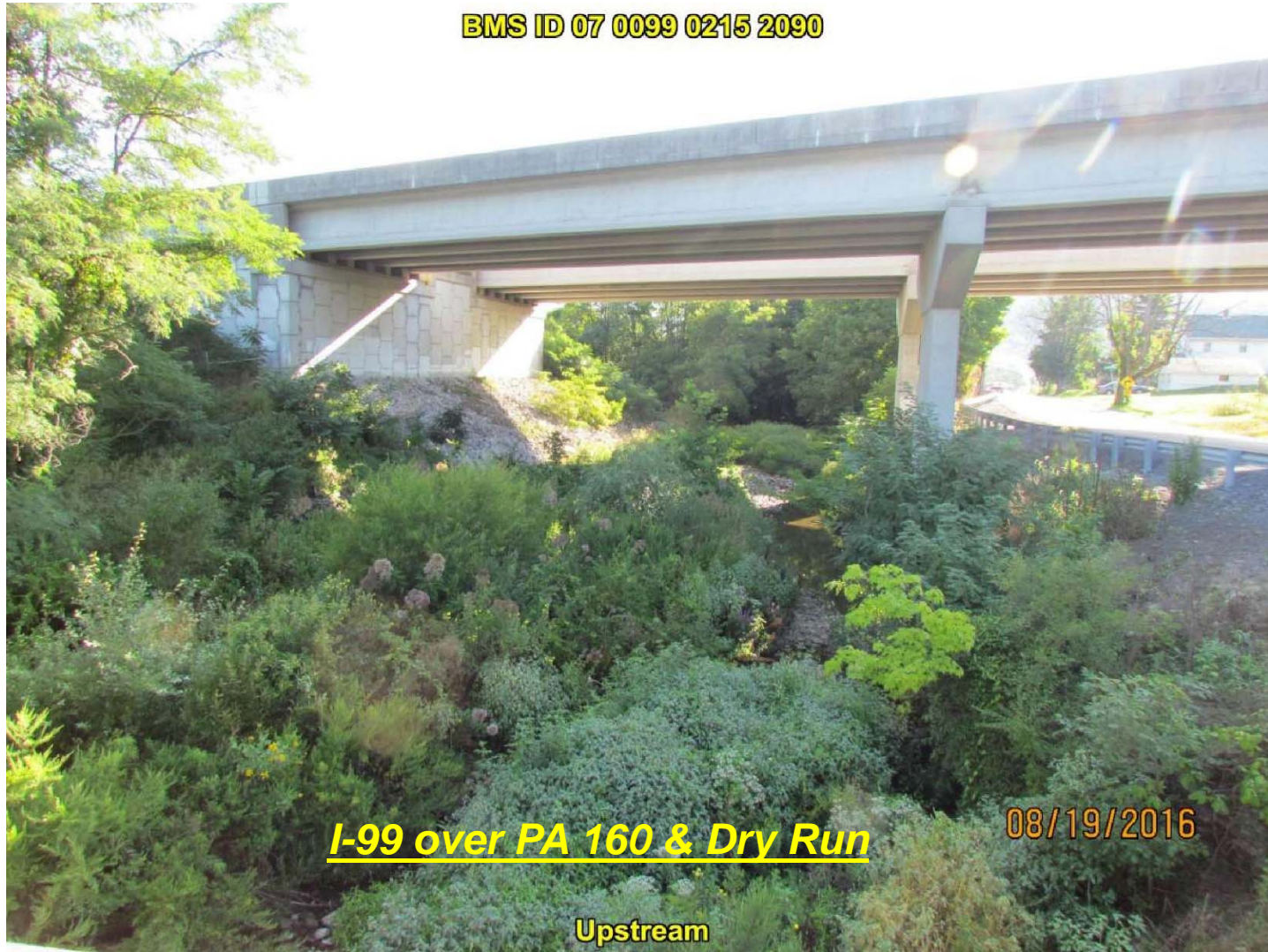
**I-99 NB & SB over T-349 Mountain Rd (SOUTH ABUTMENT)**

# MSE Wall Panel Distress



**I-99 NB & SB over T-349 Mountain Rd (NORTH ABUTMENT)**

# MSE Wall Panel Distress



**BMS ID 07 0099 0215 2090**

**I-99 over PA 160 & Dry Run**

**08/19/2016**

**Upstream**



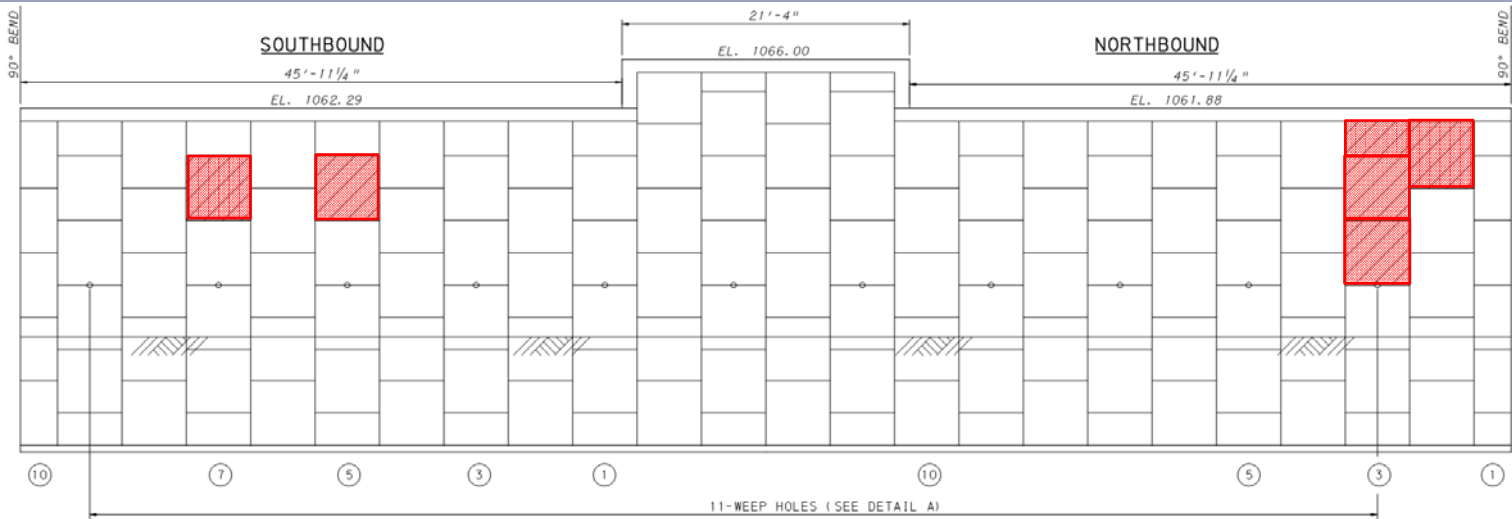
# MSE Wall Panel Distress



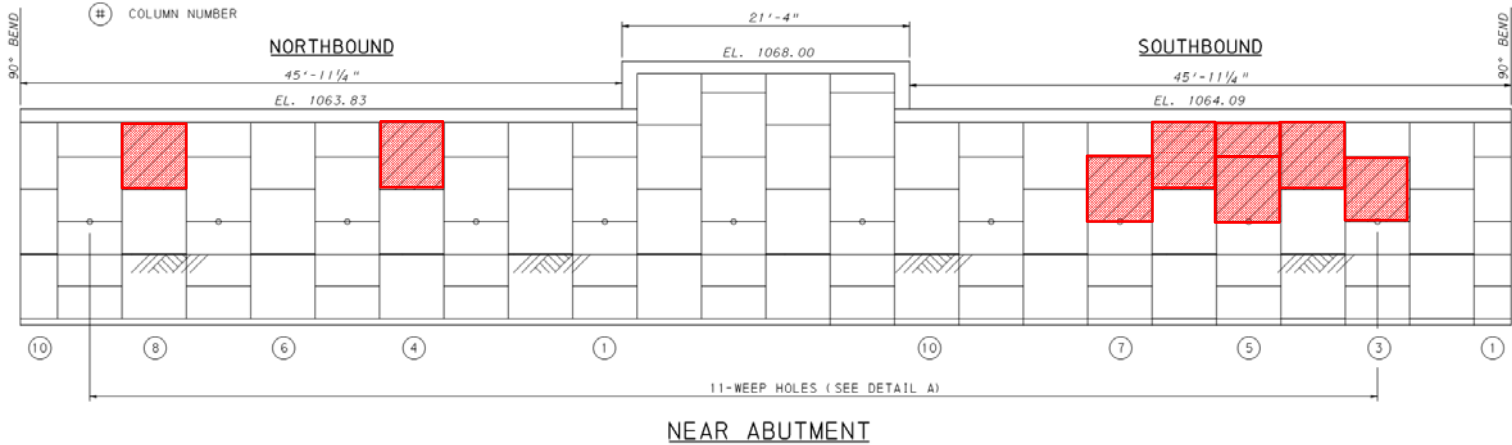
# MSE Wall Panel Distress



# MSE Wall Panel Distress



## **I-99 NB & SB over PA 164 & Dry Run Creek**



# MSE Wall Panel Distress

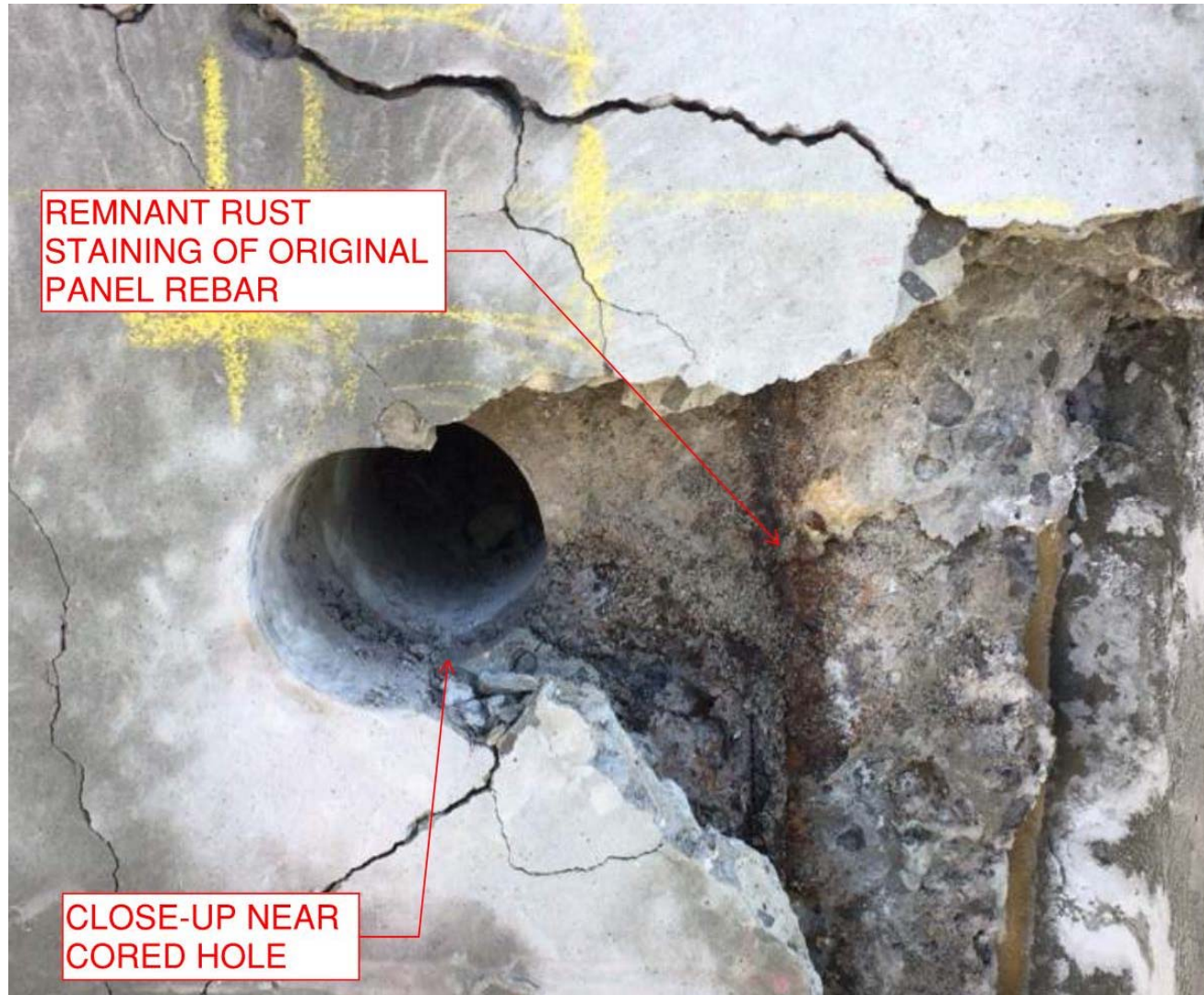


**I-99 SB over T-349 Mountain Rd**

# MSE Wall Panel Distress



# MSE Wall Panel Distress



# MSE Wall Panel Distress



# MSE Wall Panel Distress





# MSE Wall Panel Distress



# MSE Wall Panel Distress



CONDITION OF AREA AT  
TIME OF JANUARY 2006  
INSPECTION

2006 1 12

# MSE Wall Panel Distress

## Chloride Ion Content Analysis Performed on Core Samples

- 3.45 lb/cy – core from T-349 overpass bridge
- 5.16 lb/cy – core from PA 164 overpass bridge
- > 2 lbs/cy considered sufficient to initiate corrosion

# MSE Wall Panel Distress

**19 Step Panel  
Replacement  
Procedure Provided  
by Reinforced Earth**

**Panel Appears to be In  
Much Better Condition than  
District 9 I-99 MSE Walls**



# MSE Wall Panel Distress



**Drill Holes & Inject Grout in Panel to be Replaced & Adjacent Panels**

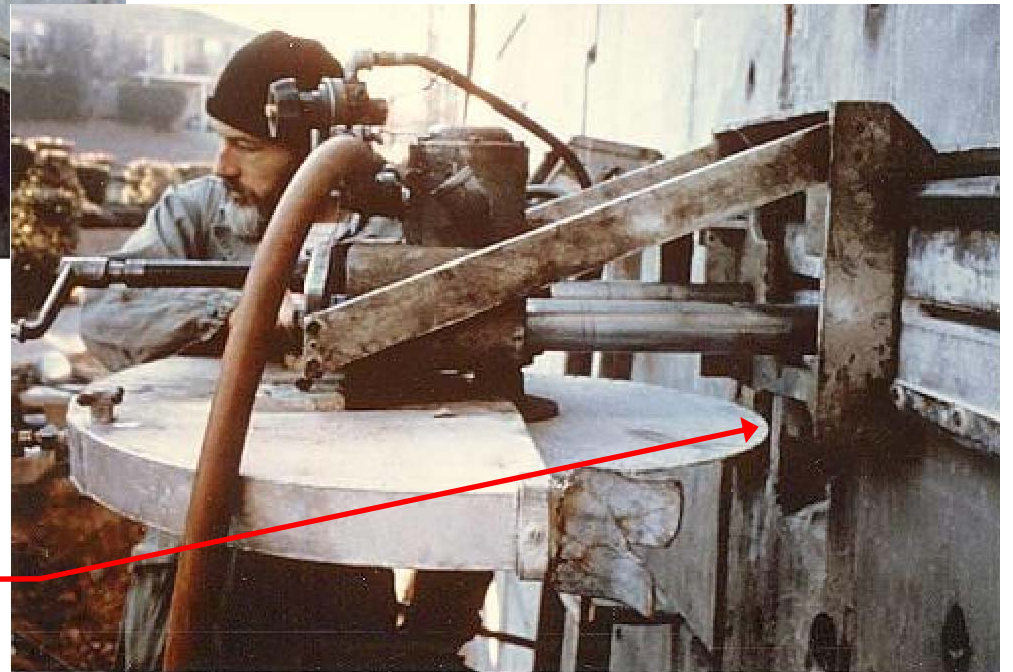


**Core Access Hole in Panel Above**

# MSE Wall Panel Distress

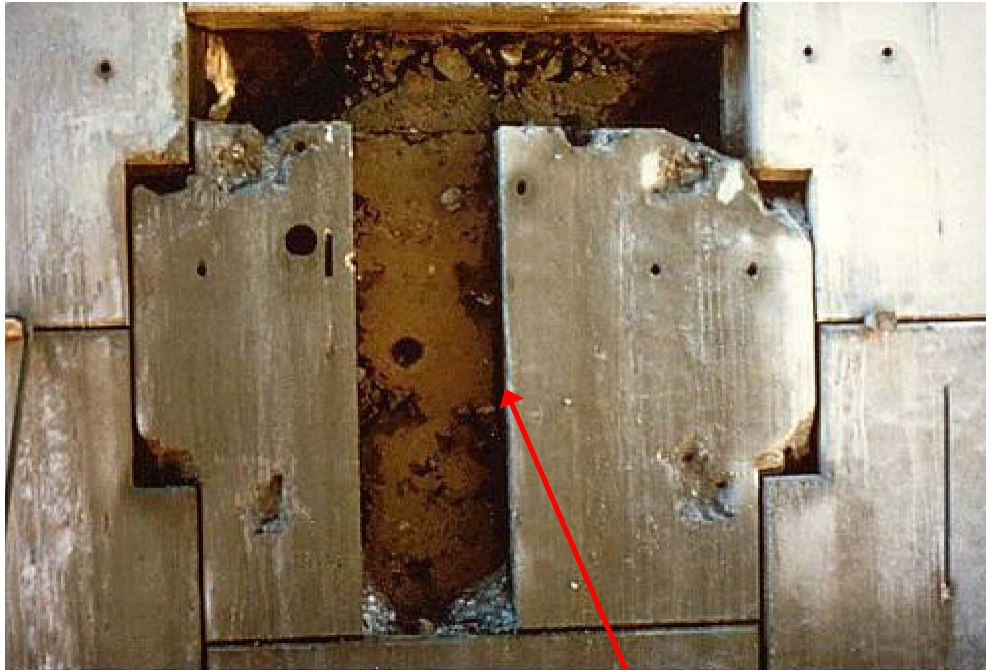


Cut Tie Straps



Horizontal Saw Cut & Remove  
Above Top Tie Straps

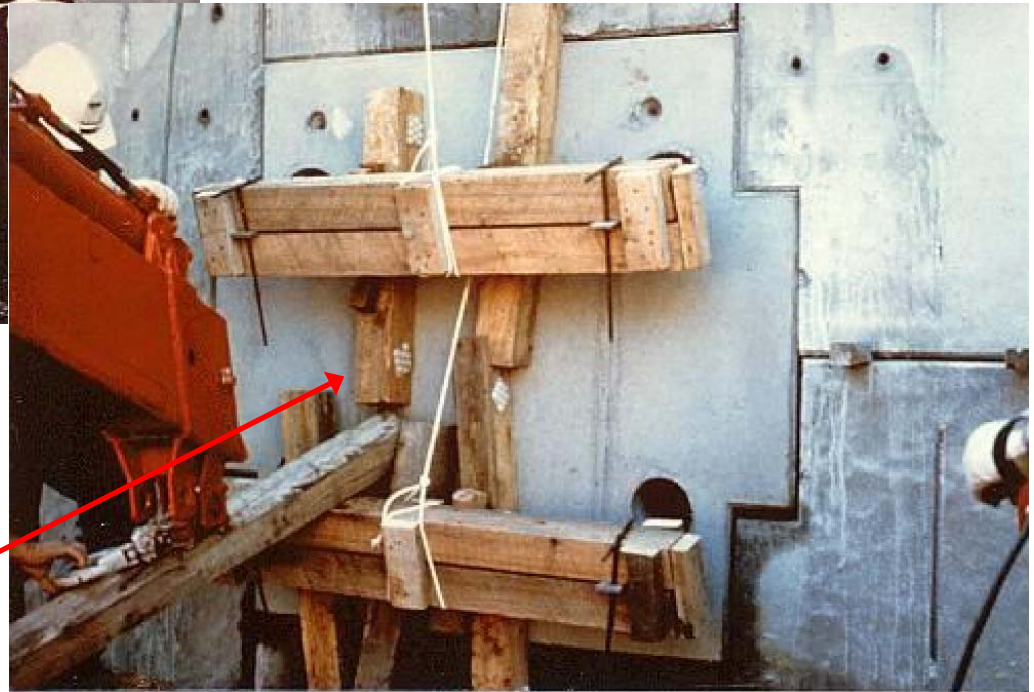
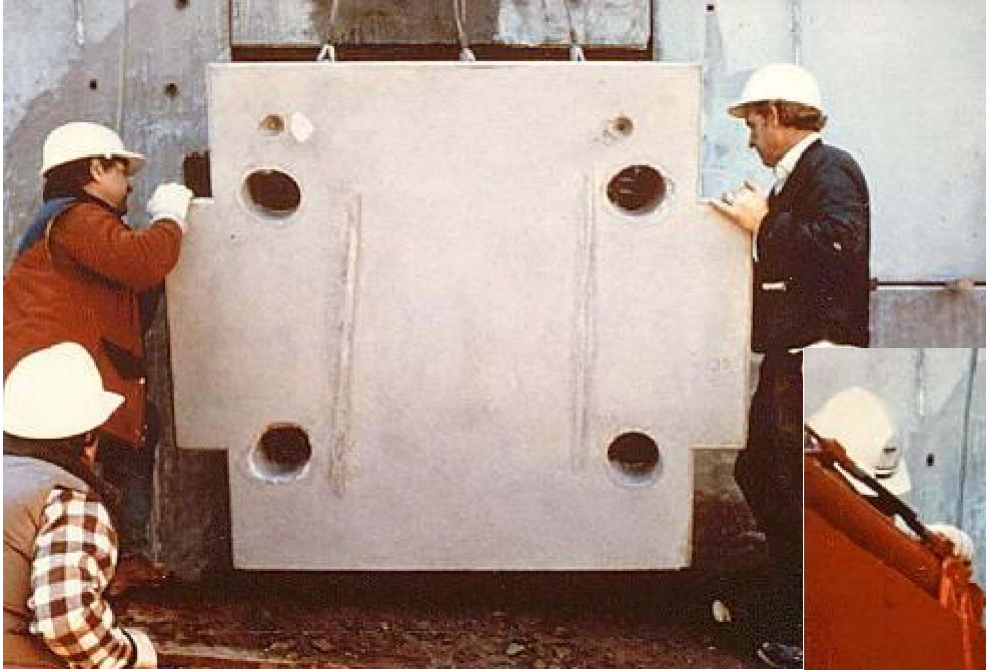
# MSE Wall Panel Distress



**Vertical Saw Cuts To  
Remove Remaining  
Portions**



# MSE Wall Panel Distress



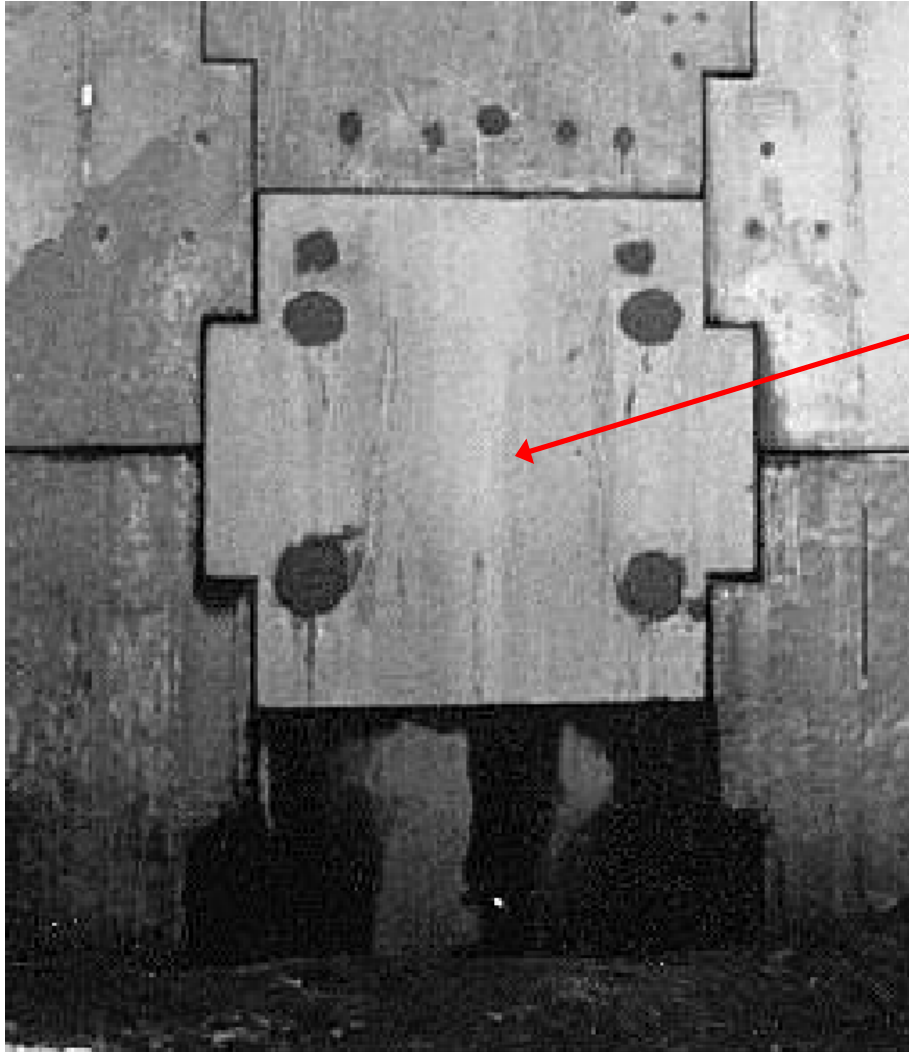
**Brace Replacement Panel**



# MSE Wall Panel Distress



# MSE Wall Panel Distress



**Finished Product**