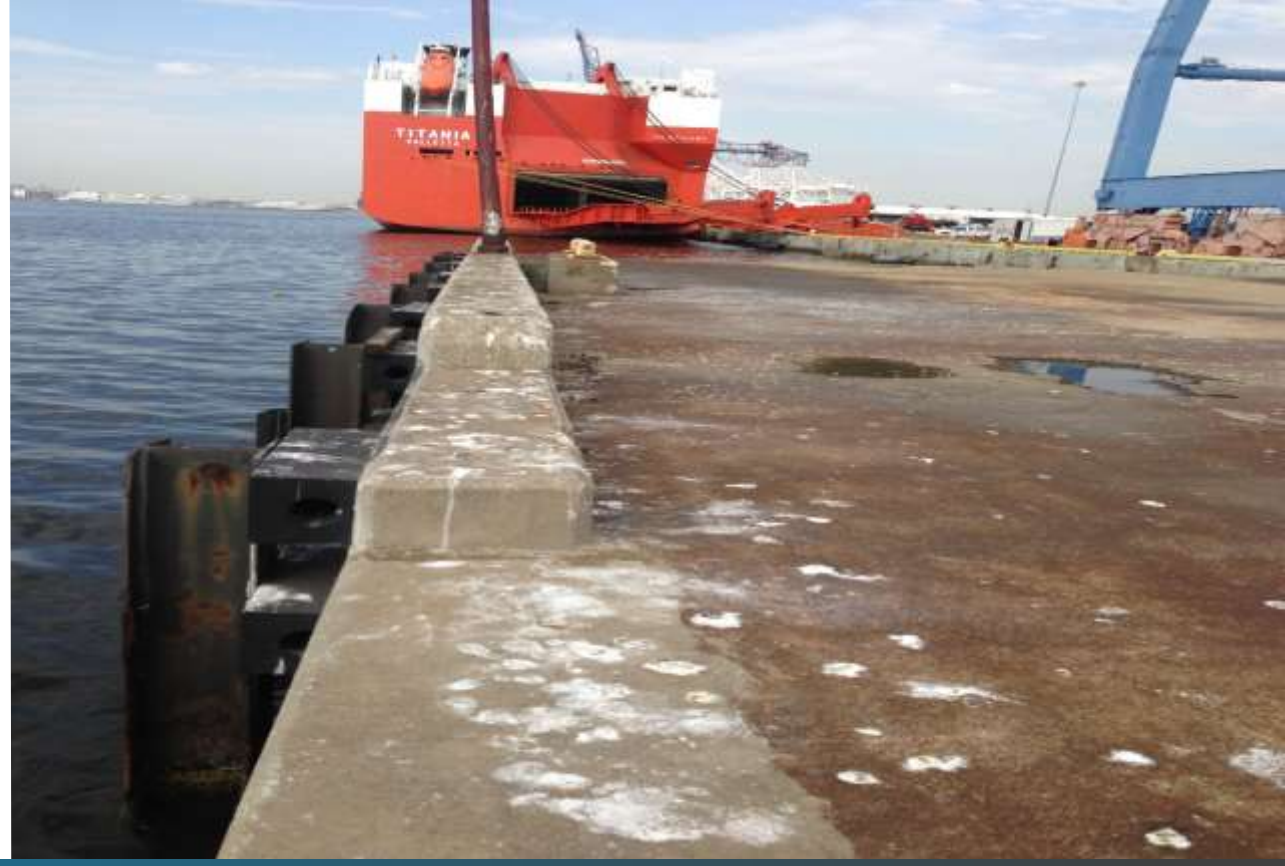


Dundalk Marine Terminal (DMT) RoRo Demolition and Bulkhead Rehabilitation

Port of Baltimore, Maryland Port Administration

Presented by:
Jeffrey Cerquetti, MCE, PE
Vice President, Facilities Structures and Coastal Engineering

March 23, 2016

Introduction

MPA Baltimore
A Diversified Facility

At the top of one of the main branches of the Chesapeake Bay into the Baltimore Harbor

Special thanks to Ms. Patricia Gaynor, PE from Maryland Port Administration for her assistance with this project and presentation.

Overview

Port Location

Terminal History

Structural Assessment

Design Phase

Rehabilitation Construction

Location

Port of Baltimore

- 7 MPA Terminals
- Over 1,250 acres of Port Facilities
- 7 Private Terminals
- Average Depths Ranging 23’ to over 50’

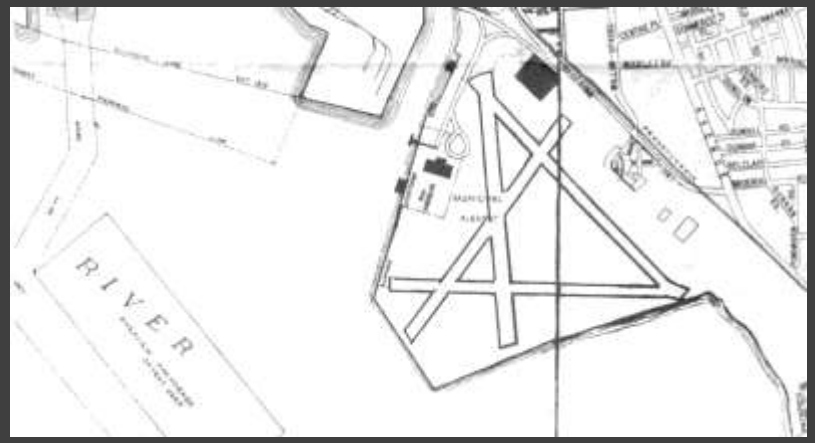

Oriole Park at Camden Yards
M&T Bank Stadium
SOUTH BALTIMORE
FELLS POINT
NORTHWEST HARBOR
NORTH LOCUST POINT MARINE TERMINAL
SOUTH LOCUST POINT MARINE TERMINAL
Fort McHenry
MIDDLE BRANCH
MASONVILLE MARINE TERMINAL
FAIRFIELD AUTO TERMINAL
FAIRFIELD
HARBOR TUNNEL
CANTON
HIGHLANDTOWN
Clinton Street MPA Terminal
PATAPSCO RIVER
BALTIMORE PORT TRUCK PLAZA
CANTON PENN MARY
CSX ICTF
SEAGIRT MARINE TERMINAL
EASTPOINT
DUNDALK
DUNDALK MARINE TERMINAL
395
95
895

Terminal History

Terminal History

Baltimore Municipal Airport

- Originally a seaplane facility in the 1930's
- 1946 saw the return to civil airline service, although only for smaller planes once BWI opened in 1950.
- 1960 the airport was closed and purchased by the Maryland Port Administration for conversion to a marine terminal.



1941 Improvements to Baltimore Municipal Airport including a concrete driveway under construction.

Terminal History

Baltimore Municipal Airport

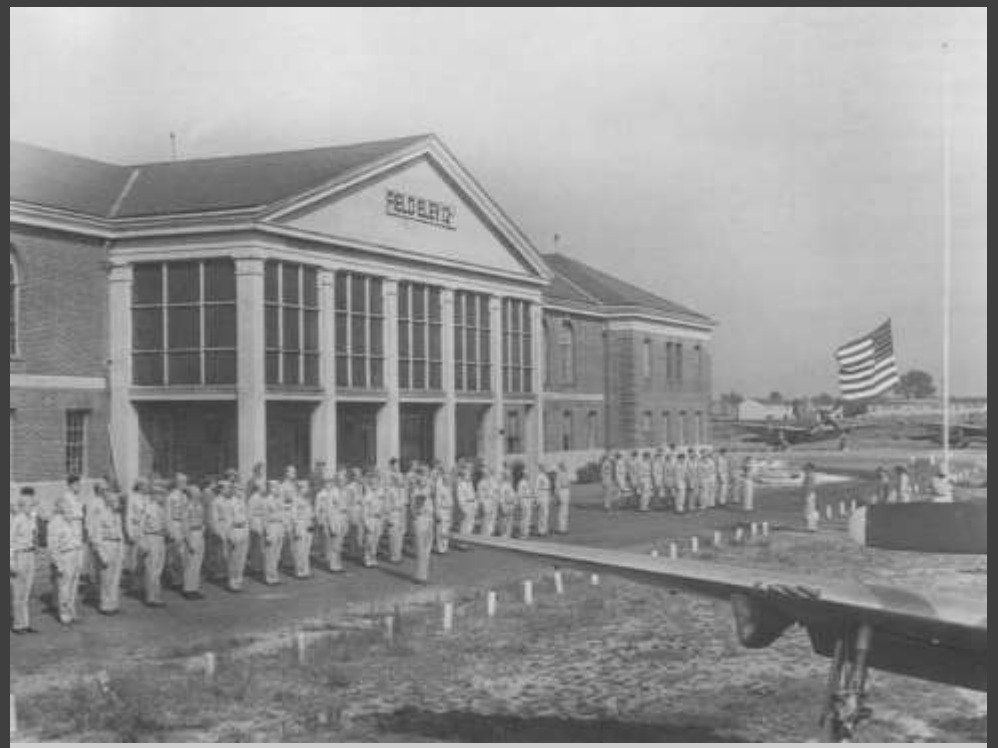
- Originally a seaplane facility in the 1930's
- 1946 saw the return to civil airline service, although only for smaller planes once BWI opened in 1950.
- 1960 the airport was closed and purchased by the Maryland Port Administration for conversion to a marine terminal.

1939 Boeing 314 "Yankee Clipper" landing at Baltimore Municipal Airport's Flying boat facility.

Terminal History

Civil Air Service

- Utilized as a military Operating Base during WWII and the Maryland Air National Guard Fighter Squadron.
- Operated until the mid 1950's



1947 Maryland Air National Guard's 104th Fighter Squadron conducting a retreat ceremony in from of the Air Guard Hangar at Baltimore Municipal Airport.

Terminal History

Airport Decommissioning

- 1960 the airport was closed and purchased by the Maryland Port Administration for conversion to a marine terminal.
- Dundalk Marine Terminal was added to in Acreage to extend the wharf edges in the 1960's.

1957 Aerial view of Harbor Field still operating, although runways appear in extremely rough condition prior to purchase by MPA.

Terminal History

1961 Aerial of Dundalk Marine Terminal after airport decommissioning

2001 Aerial of Dundalk Marine Terminal

DMT RoRo Platform

DMT RoRo Platform

Dundalk Marine Terminal

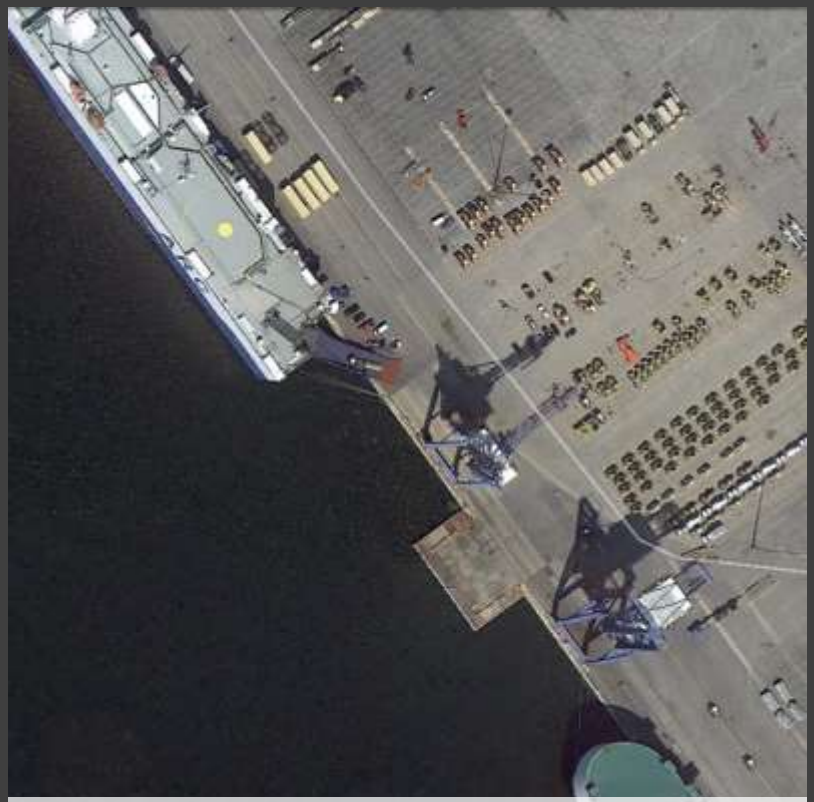
- The DMT was originally an integral part of the automobile industry in Baltimore. The croming processes for certain auto parts were done throughout the terminal.
- Issues with Hexavalent Chromate later

Caption

DMT RoRo Platform

Dundalk Marine Terminal

- The marginal wharf was added to seaward over time
- Built with wooden piles and grade beams to match original form.
- Traffic at DMT is generally from stackable sea container vessels or from vehicle transport.



Berth 8 with the Ro-Ro Platform Location next to the Panamax STS Cranes.

DMT RoRo Platform

Dundalk Marine Terminal

- STS cranes were added for unloading ship cargo. Required additional structural capacity.
- High mast light poles can be seen for ISO container stacking illumination.

Side View of Roll On – Roll Off Typical Platform

Ship Side Ramp used into Modern Times of the Port

DMT RoRo Platform

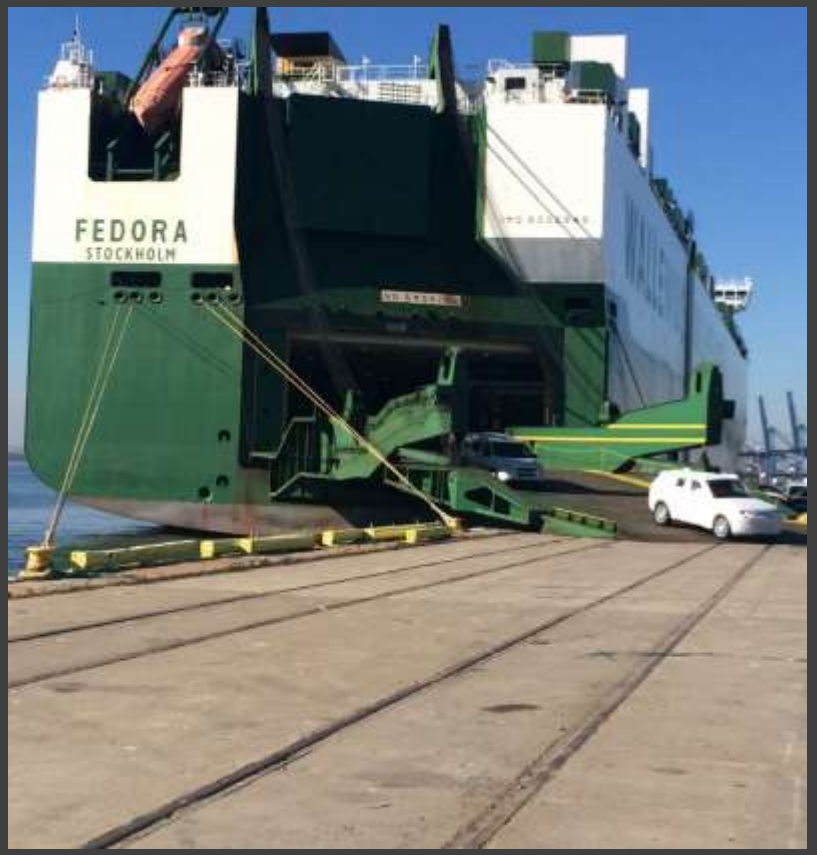
Dundalk Marine Terminal

- Roll-On Roll-Off Platforms were originally utilized to unload vessels by rear cargo ramps
- As modern times came, side ramps were more widely utilized

DMT RoRo Platform

Dundalk Marine Terminal

- Heavier mooring loads gave way to larger bollard capacities.
- Rail cars were used less frequently

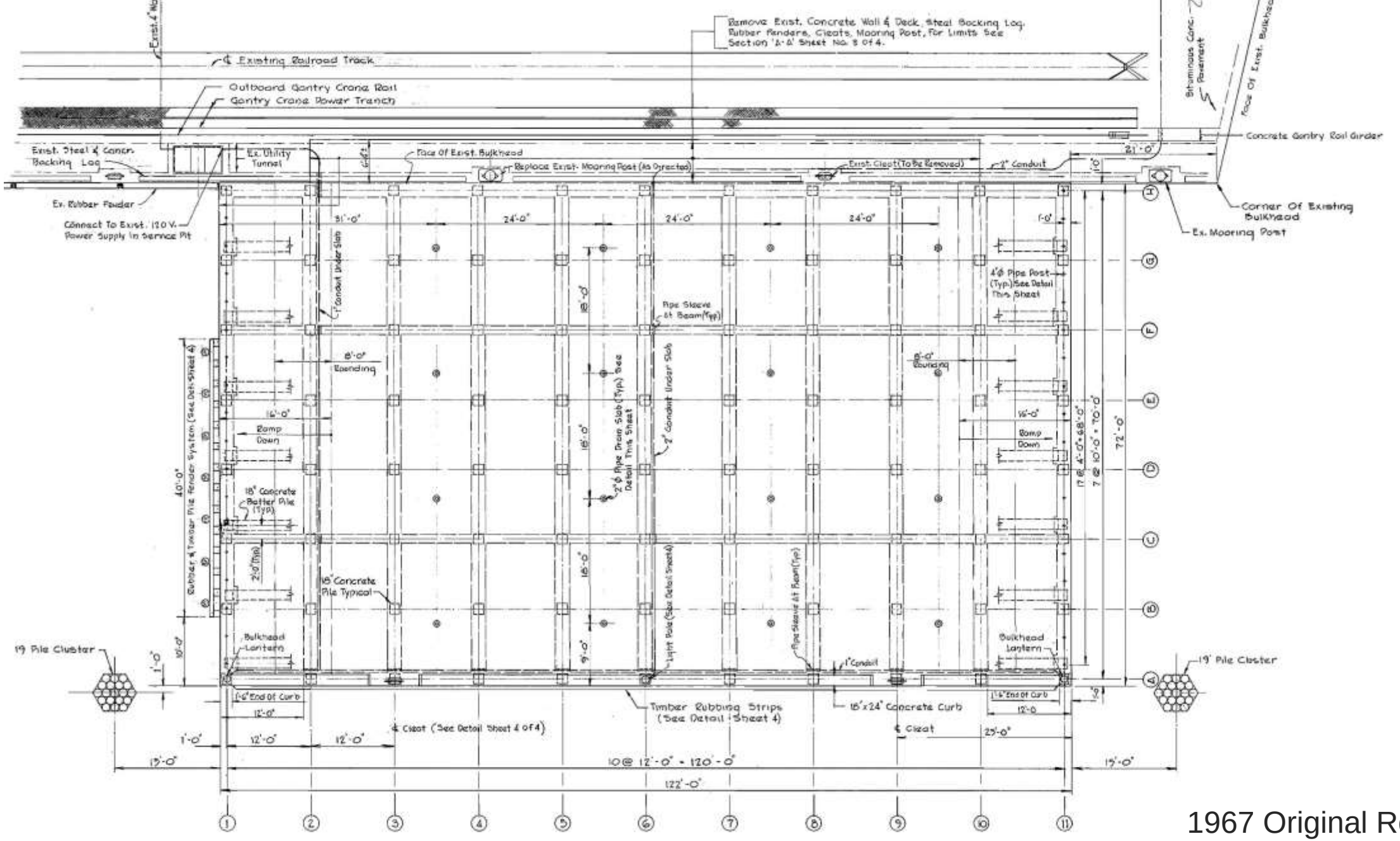


Structural Assessment

Structural Assessment

Historical Plans Review

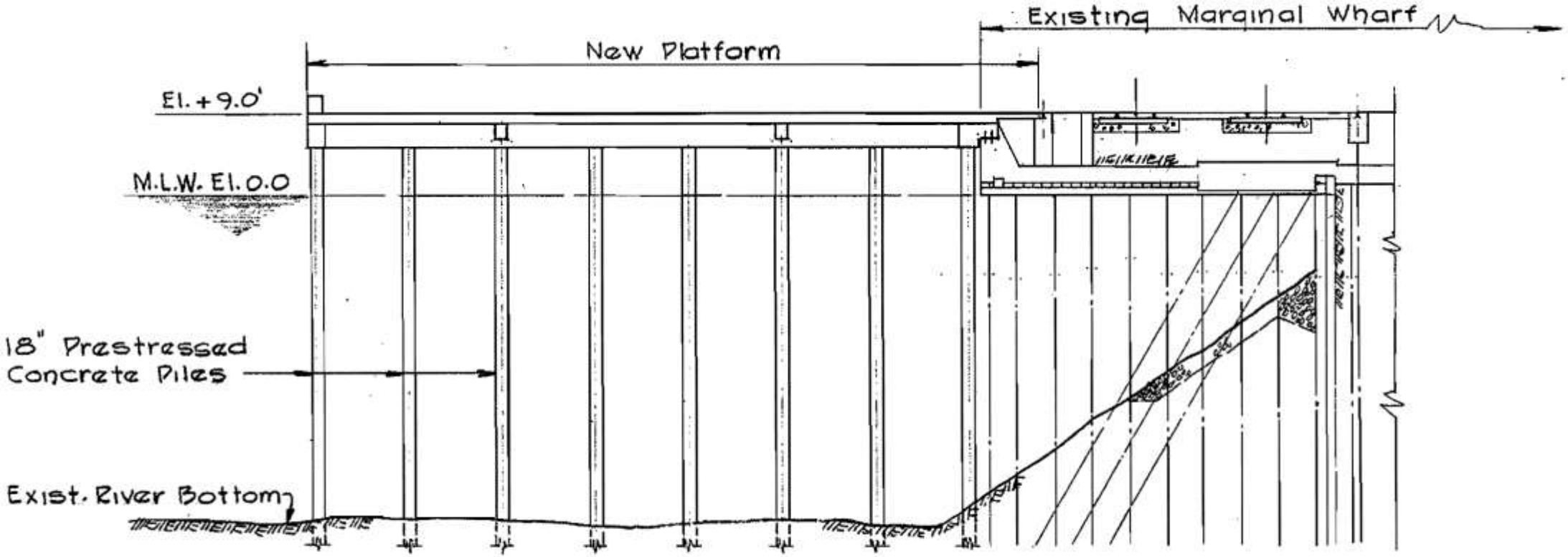
- 1964 Marginal Wharf Plans
- 1967 Original Ro-Ro Platform Design Plans
- 1973 Bearing Piles & Fender Repairs
- 1975 Rehab Rails, Paving & Related Work
- 1980 SubStructure & Deck Repair
- 1981 Bollard Replacement, Railroad Track & Crane Rail Rehabilitation
- 1994 New Fendering System & Bulkhead Repairs
- 2011 Wharf Upgrades & Repairs



PLATFORM DECK PLAN

SCALE: 1/8" = 1'-0"

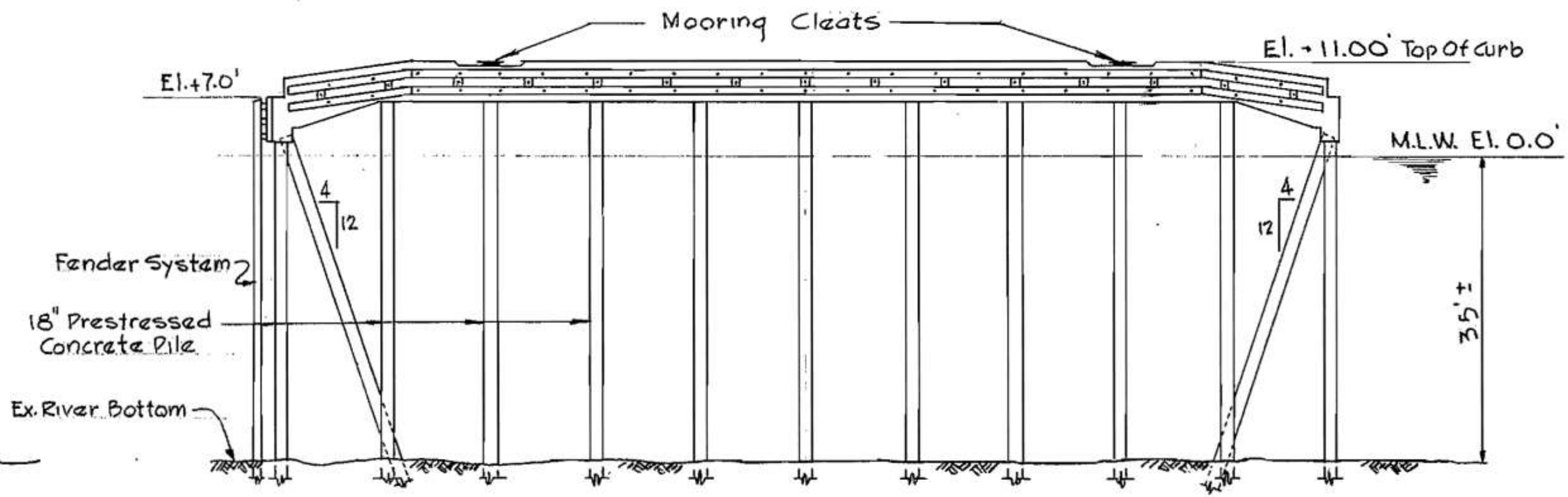
1967 Original RoRo Platform Plans



TYPICAL SECTION 'B-B'

SCALE: 1/16" = 1'-0"

1967 Original RoRo Platform Plans

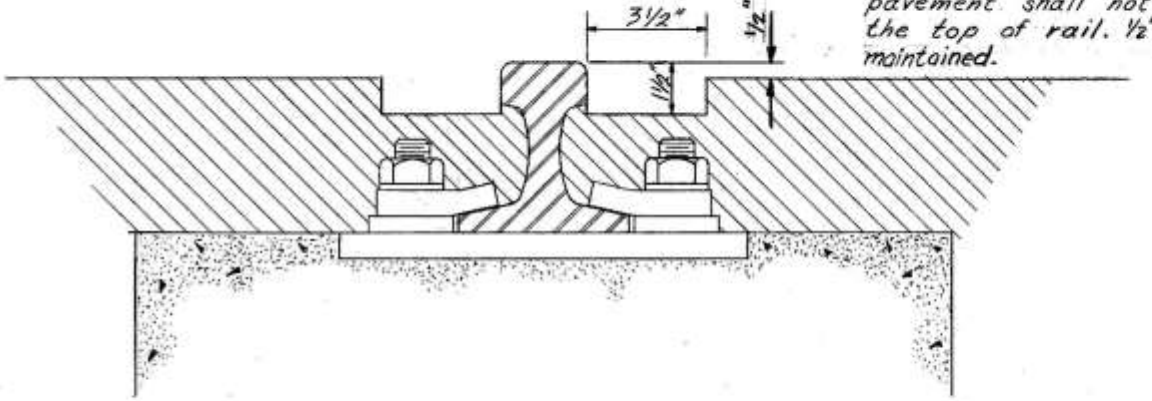


ELEVATION LOOKING NORTH

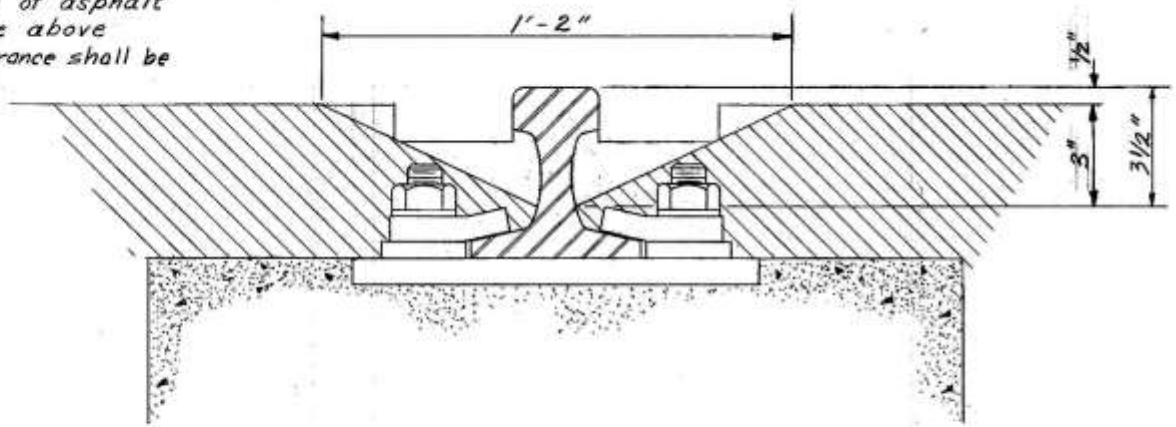
SCALE: 1/6"=1-0"

1967 Original RoRo Platform Plans

NOTE:
The elevation or grade of asphalt pavement shall not rise above the top of rail. ½" clearance shall be maintained.



DETAIL OF CRANE WHEEL SLOTS
BERTH 6
Scale: 3" = 1'-0"

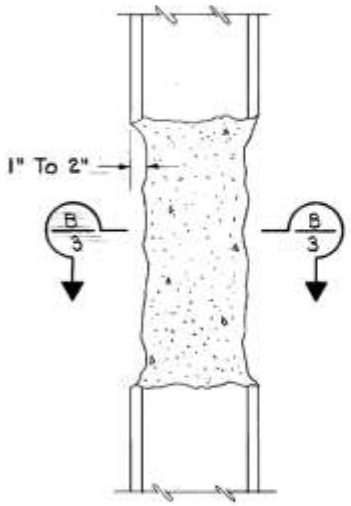


DETAIL OF CRANE TIE-DOWN LOCATIONS
BERTH 6
Scale: 3" = 1'-0"

1975 Rehab Rails, Paving & Related Work Plans

SECTION B-B

SECTION C-C

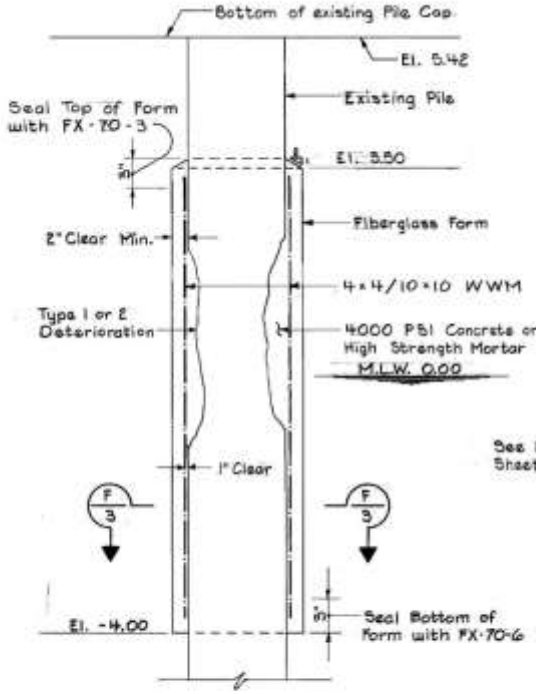


TYPE 1

TYPE 2

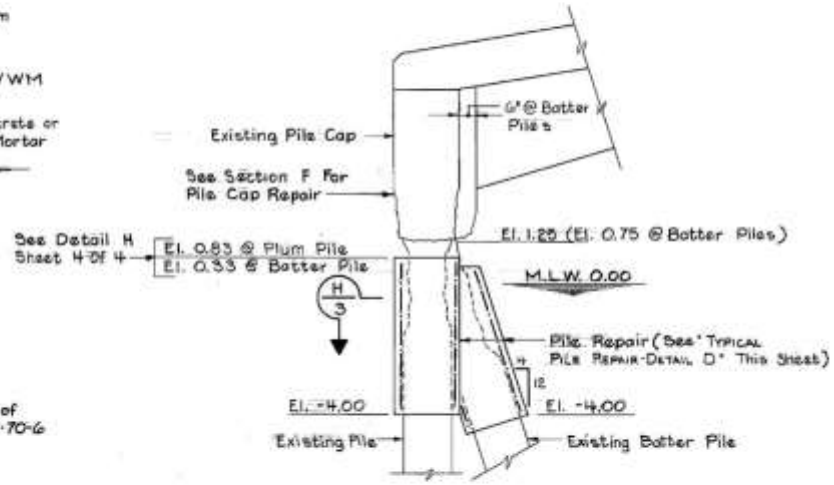
EXISTING PILE DETERIORATION

N.T.S.



TYPICAL PILE REPAIR - DETAIL D

Scale: 1½" = 1'-0"



SECTION E

N.T.S.

1980 Sub-Structure and Deck Repair Plans

Above & Below Board Structural Assessment

Underwater and Site Investigation

- Trained divers from M&N Engineering and Diving Services, Inc. surveyed and documented the condition of the piles, substructure and inventoried any debris along the bottom that would influence dredging operations.

Engineering Divers conducting an underwater structural assessment.

View Looking Toward the Francis Scott Key Bridge

Waterline Fenders and Piles

Above & Below Board Structural Assessment

Underwater and Site Investigation

- Condition of piles restricted pulling during demolition
- Timber and concrete pile section obstructions on the channel bottom
- Underside of concrete deck and deck beams spalled fully exposing reinforcing bars
- Prestressed concrete piles broken and defective with exposed strands

Typical spalls in underside of platform

Spalled underside of Platform Deck Beam

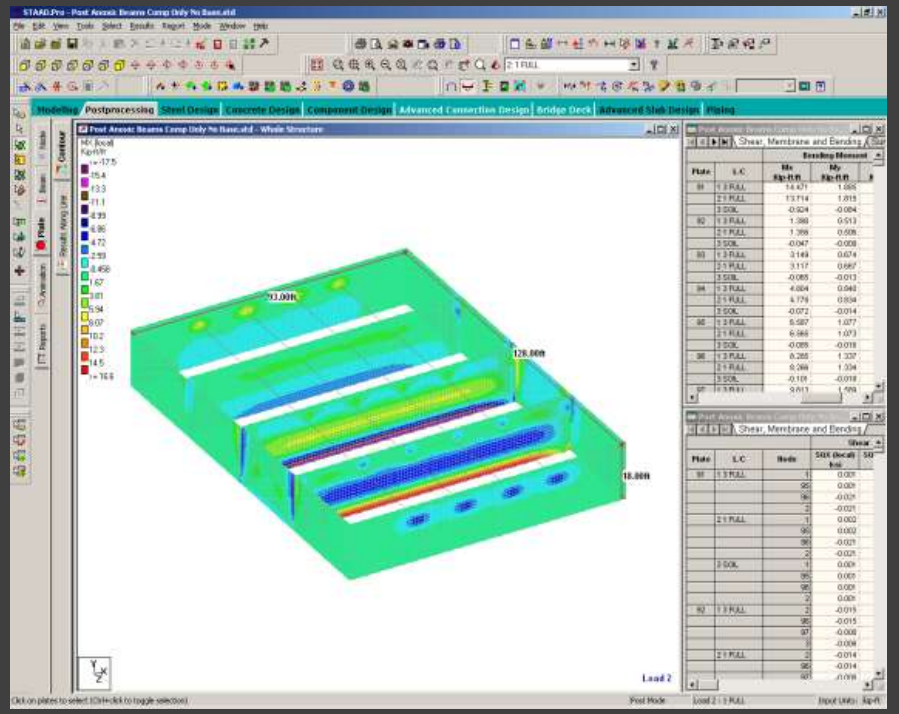
Fully Exposed Reinforcing Bars on Fascia Deck Beams

Bent 10, Pile A – Exposed and Severed Strands

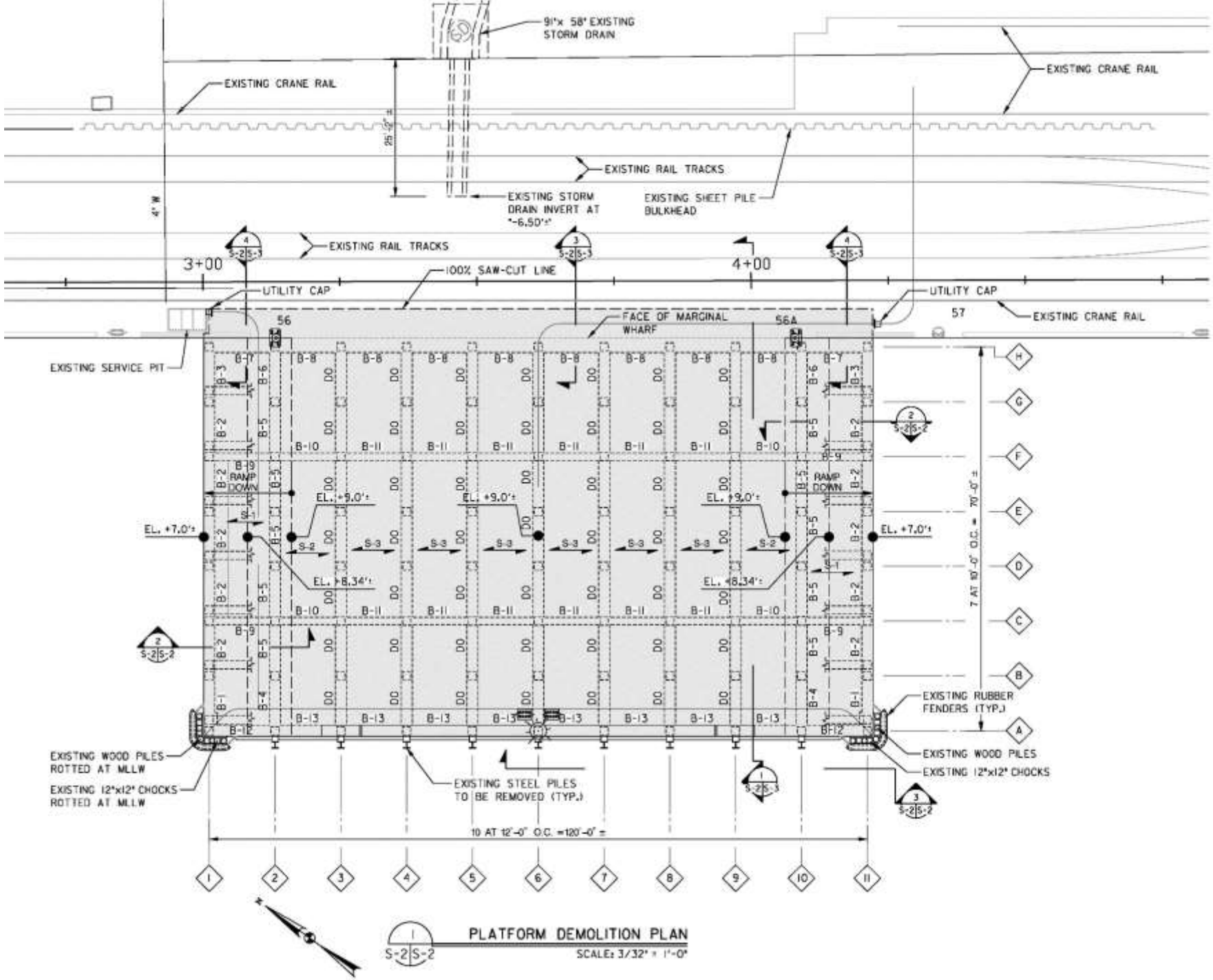
Design Phase

RoRo Platform Demolition

- Use of FEA for marginal wharf capacities
- Load acquisition for pile pulling requirements
- Existing platform piles checked for unbalanced loads



FEA Concrete Analysis



PLATFORM DEMOLITION PLAN

SCALE: 3/32" = 1'-0"

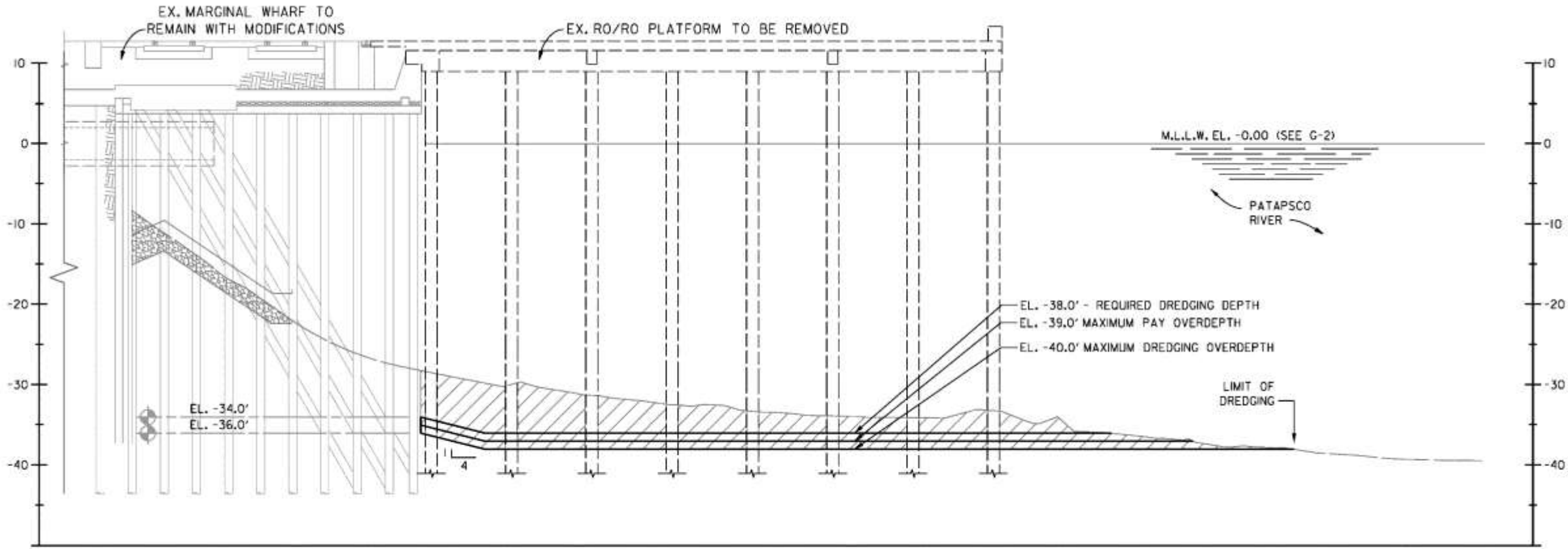
Design Phase

Dredging Design

- Bottom contours under Ro-Ro Platform to be dredged
- All spoils taken to DMCF specifically built at MPA
- Final contours checked with Lidar

Dredging Under Removed Ro-Ro Platform

Dredged Material transported to DMCF



1
C-1 | C-2

DREDGING CONTROL TYPICAL SECTION

SCALE: 1/8" = 1'-0"

Design Phase

New Bollard Design & Wharf Rehabilitation

- Original classification 60 -80 T capacity
- Larger 150 – 200 T capacity with recessed arrangements

1981 Era Bollard

Larger Capacity Bollards

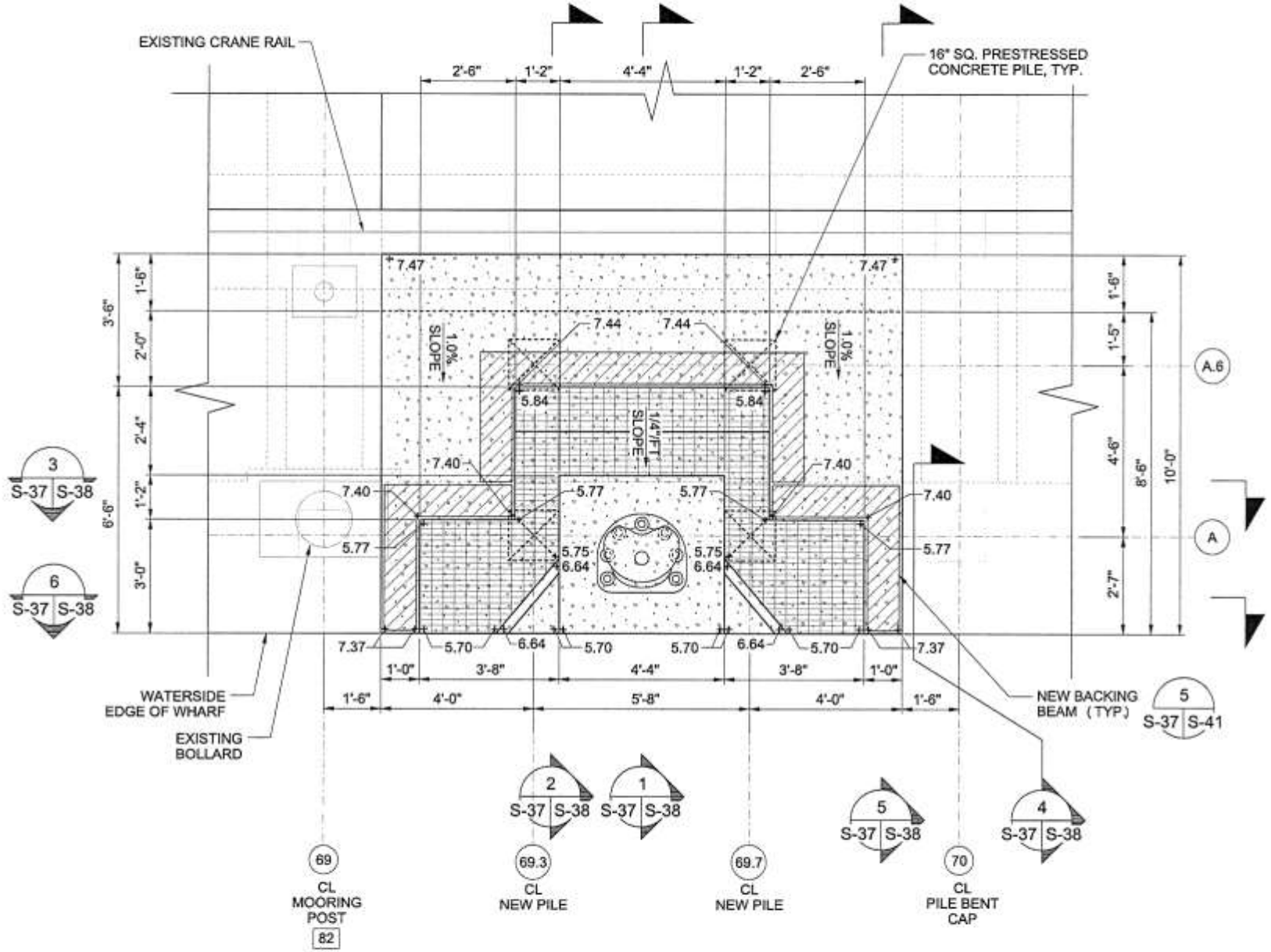
Rehabilitation Construction

New Bollard Arrangement

- Using independent piles and pile cap.
- Breakaway theory from marginal wharf
- Recessed for unencumbered ship mooring access
- Positive drainage
- Step grating for man access

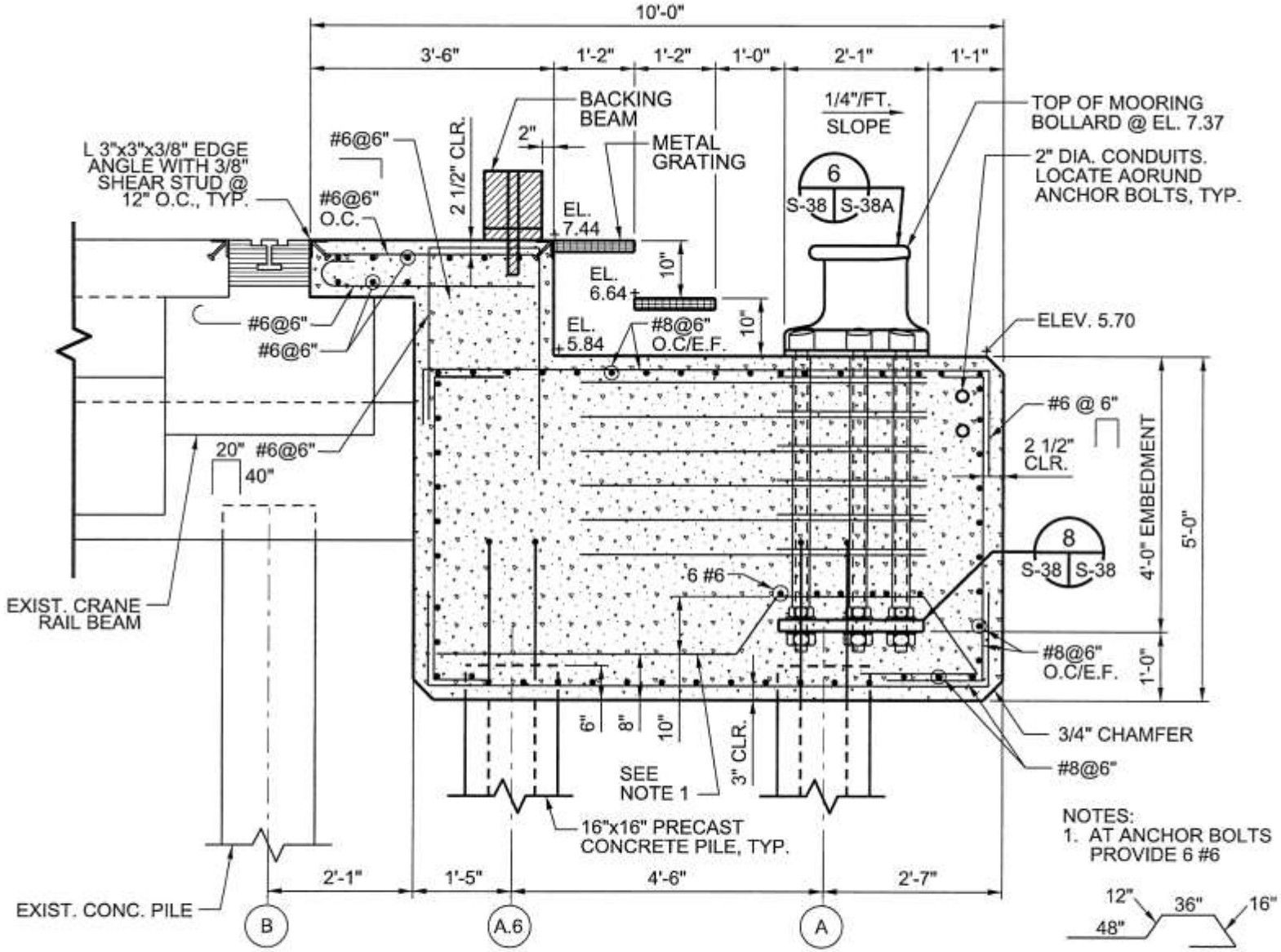
Recessed Type Larger Capacity Bollard

Step Grating Access Stairs



1 S-12,S-16 S-37 PLAN - 125 TON MOORING BOLLARD AND FOUNDATION (PHASE 1)

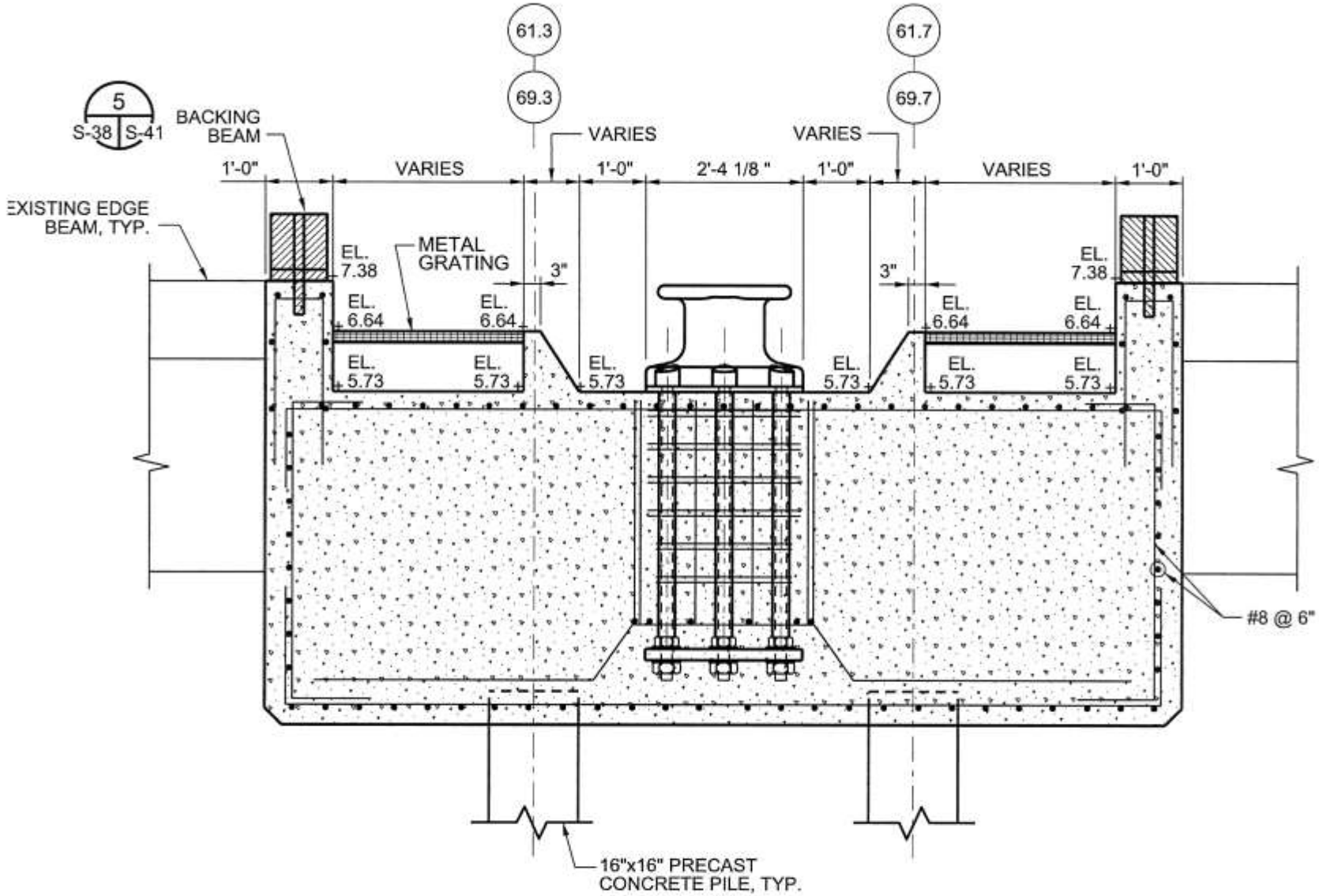
SCALE: 3/8"=1'-0"



1 SECTION - BOLLARD FOUNDATION

S-37 | S-38

SCALE: ½"=1'-0"



6 SECTION - BOLLARD FOUNDATION

S-37 | S-38

SCALE: ½"=1'-0"

Construction Observation

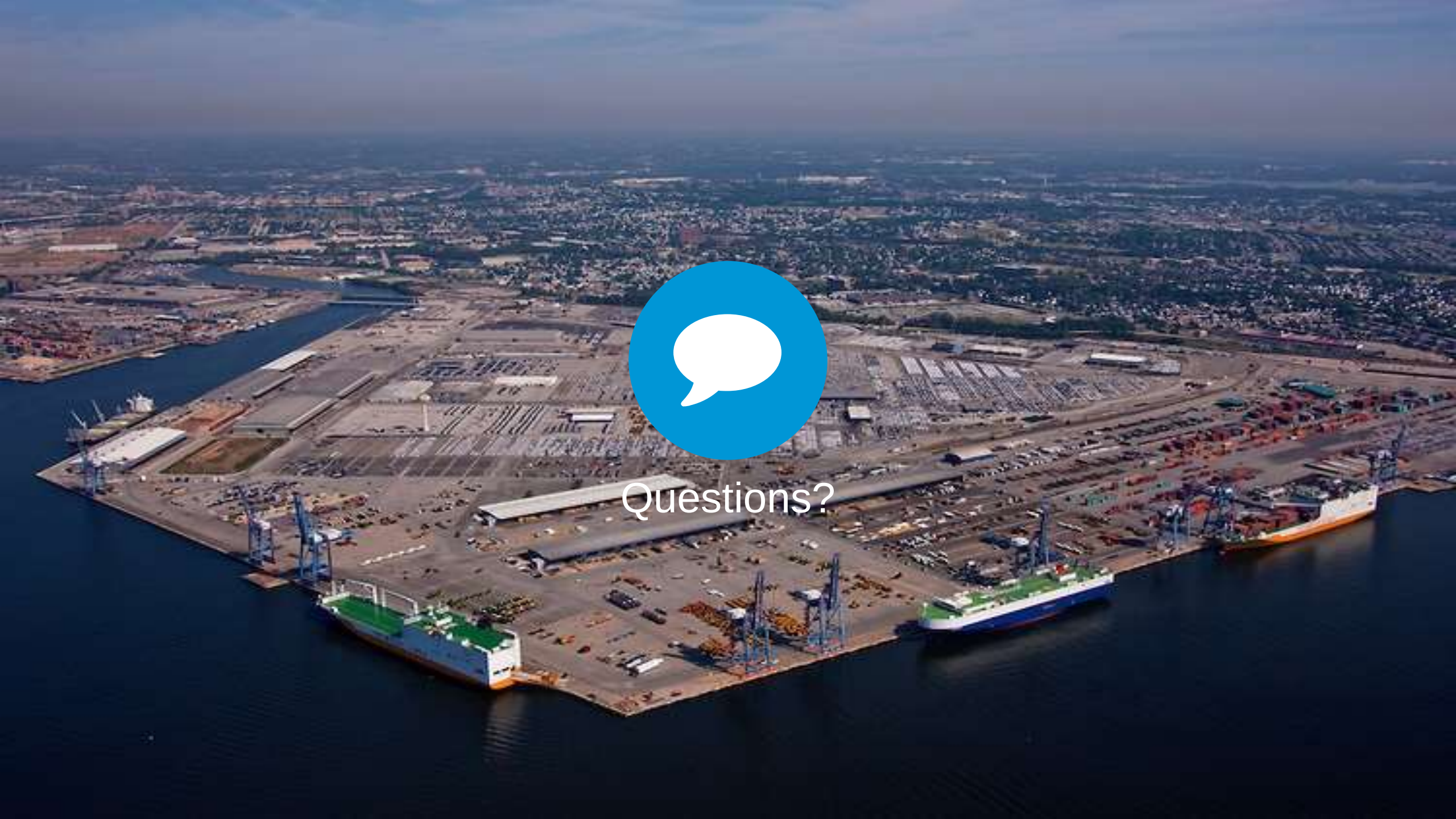
Rehabilitation Construction

Construction Observation

- Face repairs from rusted connections
- Piles under Ro-Ro Platform sawcut and pulled
- Repairs done to wharf sides and face and integrated with new pile supported bollards

DMT Wharf Face

Removal Equipment – Pulled PC Piles


Questions?