



DESIGN



INVESTIGATE



REHABILITATE



Project Results: Inspection, Testing, Analyses, and Reporting Services, Alameda Point Piers 1, 2, & 3



January - 2018

Overall Summary

- Piers 1 and 3 – Satisfactory are in Satisfactory condition and meet MARAD structural requirements
- Pier 2 – Poor
 - Primary Damage Source Identified:
 - Chemical deterioration
Widespread deterioration at end of original Pier 2
 - Damage in tidal zone and below
 - Repairable



Project Report

- Inspection
- Concrete core testing all locations
- Analysis of deck and mooring loads for all Piers
- Developed several options for repairs with costs



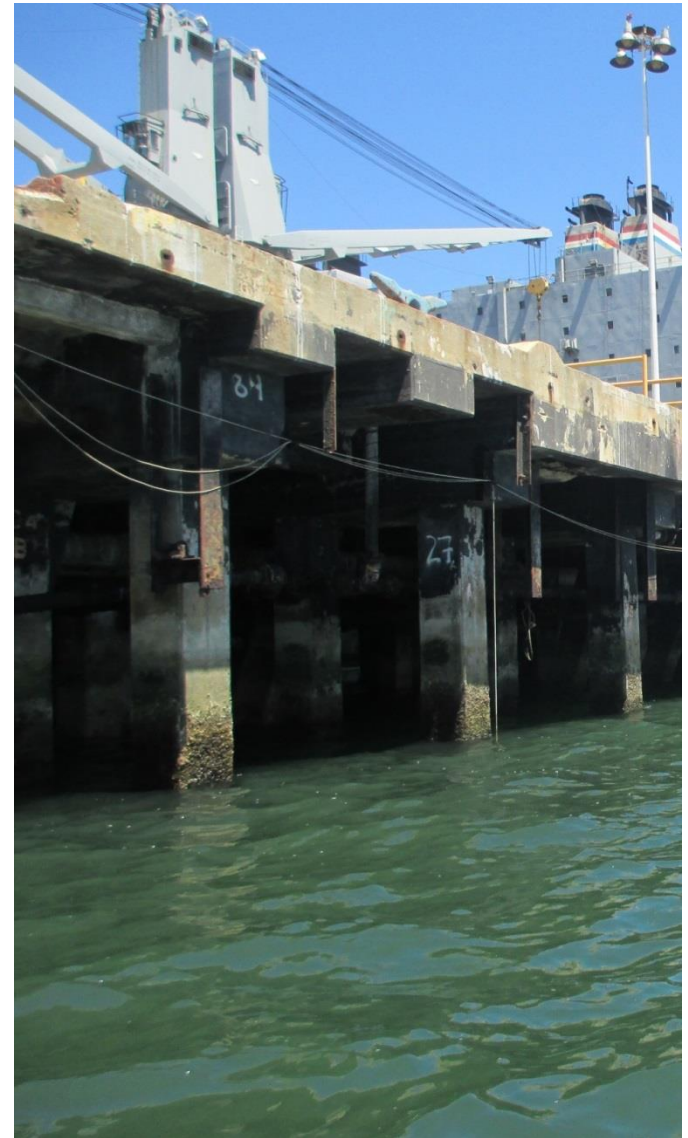
Inspection Results – Pier 1

- Pier 1 – Overall Satisfactory Condition
 - Moderate corrosion on king piles
 - Concrete panels in Fair condition
 - Sheet pile bulkhead – localized area near wharf apron in Poor condition
 - Mooring hardware and curbs in Fair Condition






Inspection Results – Pier 2

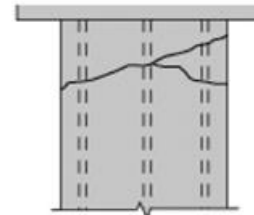
- Pier 2 – Overall Poor Condition
- 1136 piles inspected:
 - Minor/No Damage 479
 - Moderate 304
 - Major 90
 - Severe 263
- Widespread pile damage
 - Damaged concentrated at end of original pier
 - Damage in tidal zone and below



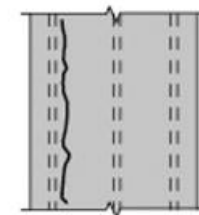
Inspection Ratings

- Moderate 
 - Rounding of corners
 - Light cracking
- Major 
 - More advanced damage
 - Spalls/Cracking
- Severe 
 - Exposed rebar
 - Significant concrete loss

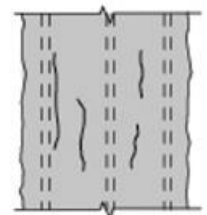
MODERATE



STRUCTURAL CRACKS
UP TO 1/16 IN.

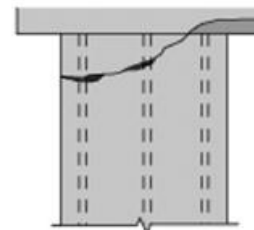


CORROSION CRACKS
UP TO 1/4 IN.

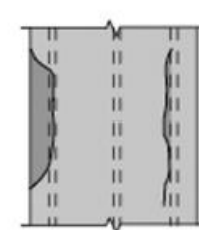


CHEMICAL DETERIORATION
CRACKS UP TO 1/16 IN;
ROUNDING OF CORNERS

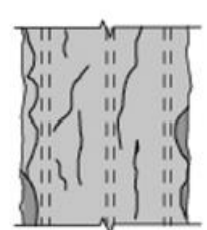
MAJOR



STRUCTURAL CRACKS
1/4 IN. AND PARTIAL
BREAKAGE

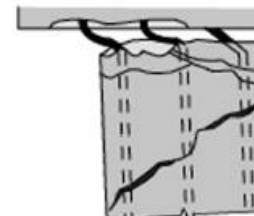


CORROSION CRACKS
WIDER THAN 1/4 IN.
AND OPEN OR CLOSED
SPALLS



MULTIPLE CRACKS AND
DISINTEGRATION DUE TO
CHEMICAL DETERIORATION

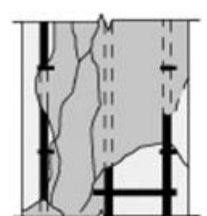
SEVERE



STRUCTURAL CRACKS
WIDER THAN 1/4 IN.
AND COMPLETE BREAKAGE



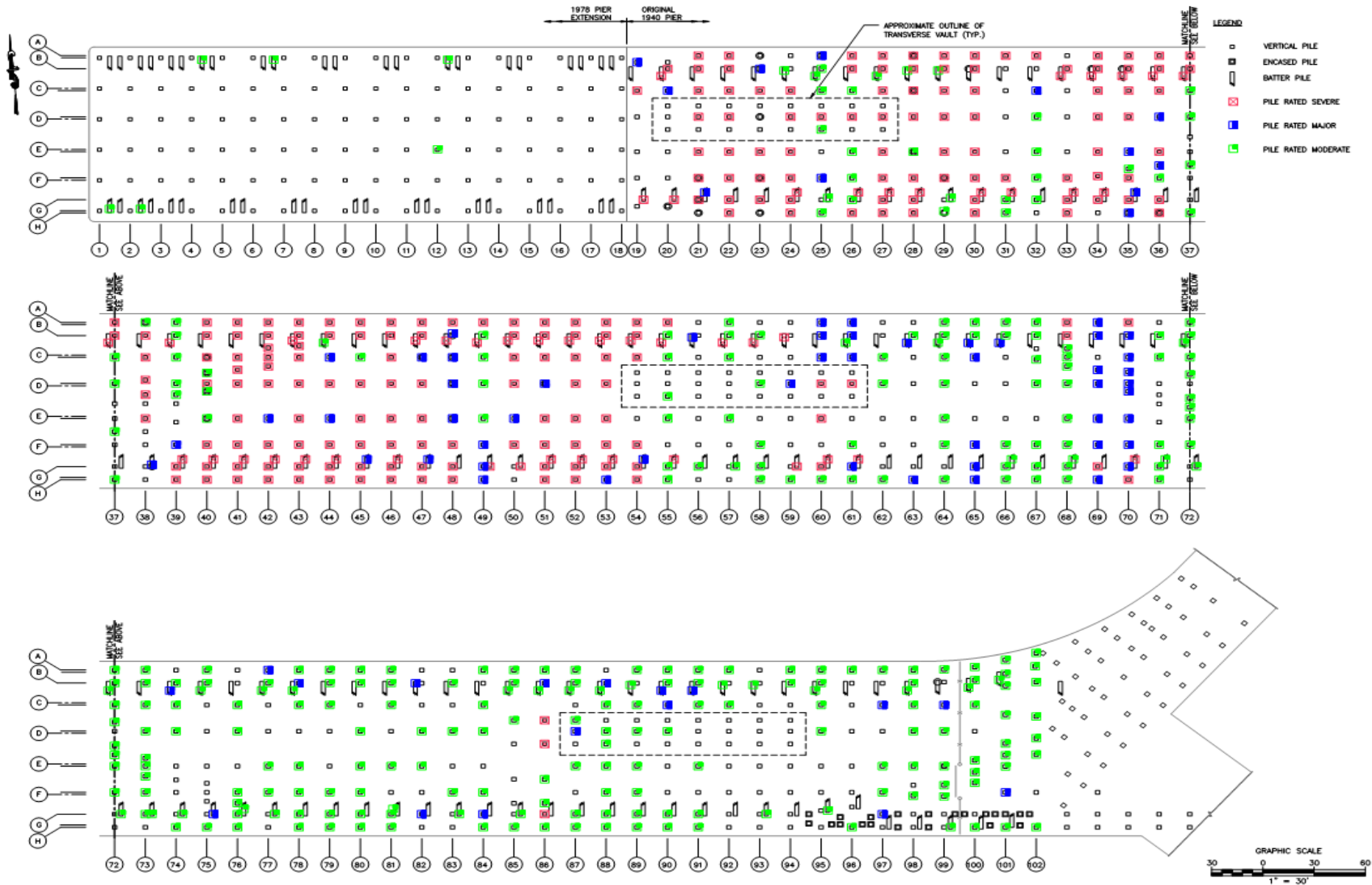
COMPLETE LOSS OF
CONCRETE COVER DUE
TO CORROSION OF
REINFORCING STEEL



LOSS OF CONCRETE COVER
(EXPOSED STEEL) DUE TO
CHEMICAL DETERIORATION

Note: Severe is a very broad category; Exposed rebar to missing pile!

Inspection Results – Pier 2



Inspection Results – Pier 3

- Pier 3 – Overall Satisfactory Condition
 - 500 piles inspected above water (Major/Severe: 29 piles)
 - Deck and soffit in Satisfactory condition
 - Some corrosion spalling at edge of deck
- Deck
 - Satisfactory condition
 - Curbs deteriorated from corrosion and impact (cosmetic)



Pier 2 Repair Strategies

- Need to stop chemical deterioration
- Need to restore strength of piles
- Investigated structural repair strategies and costs with Power Engineering
 - Repair/Restore/Rehabilitate
 - Install New
- Non-structural
 - MARAD operational limitations
 - Load restrictions on one side of pier



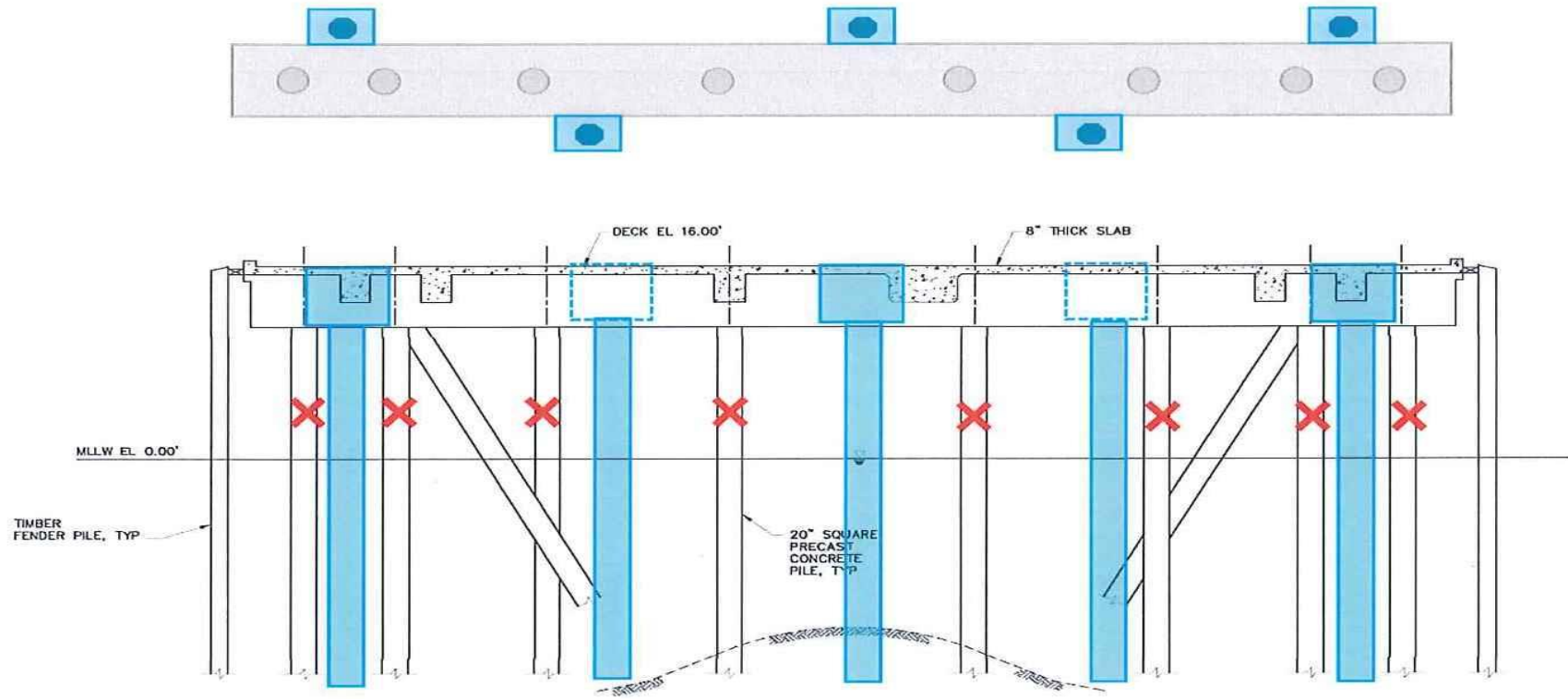
Recommended Structural Repair Option - Pile Sleeves

- Can be used for piles with various stages of damage, including large amounts of section loss
- Restores cross section
- Restores reinforcing strength
- Stops ingress of seawater and chemical deterioration
- More durable than other repairs
- Most economical repair option that works



Recommended Replacement Strategy

- Open the deck near existing pile and drive 5 new piles
- Will sustain required loads and bring the bent back to safe working capacity



Next Steps

- Identify future end users at the Piers via leasing
- Evaluate Repair Options Based on the Users of the Piers
- Piers May Not Require Extensive Work for the Less Intensive Users
- Develop a Financing Plan Based on Proposed Scope of Work for Repair or Replace

Severe Pile

- Chemical deterioration



Severe Pile

- Chemical deterioration



Severe Pile

- Impact



Severe Pile

- Exposed Rebar



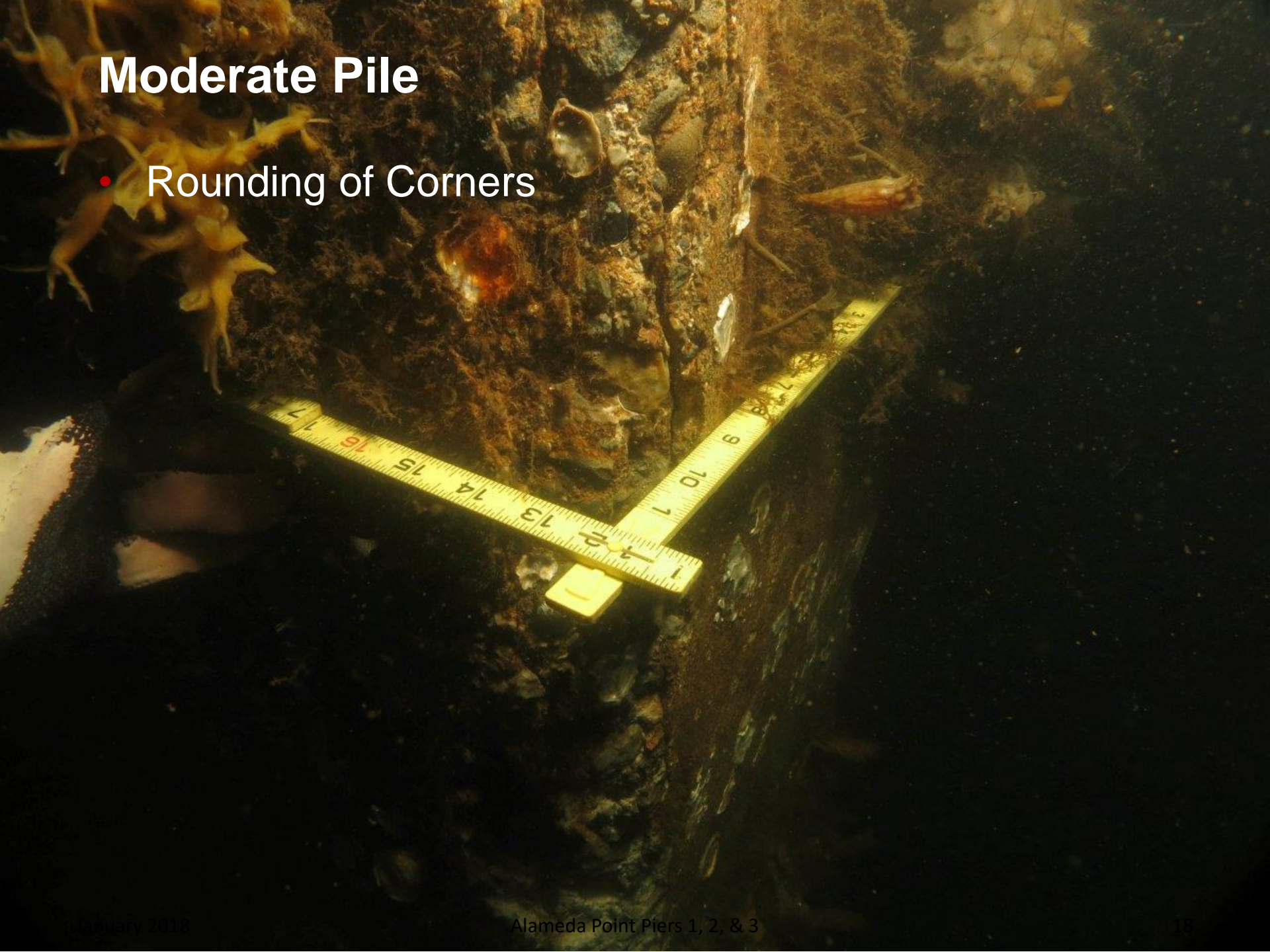
Major Pile

- No Exposed Rebar



Moderate Pile

- Rounding of Corners



Moderate Pile

- Corrosion cracking

