

Facility Condition Surveys

.....what needs to be done?

October 21, 2021



moffatt & nichol
Brad Porter, PE

Wheel Watch

Brad Porter, Moffatt and Nichol

By Diane Isley, Emery Cove Yacht Harbor

This issue we are focusing on a Sustaining member, and since I grew up on a boat yard owned by my favorite uncle who was an engineer, I thought I'd pick on an engineer. Every time I run into Brad Porter from Moffatt and Nichol, he is coming back from or heading out to some great life adventure, or for some long bike ride with some crazy story, so I called him.

Diane: Name, rank, serial number, employer?

Brad: "Sir: Porter, Bradford A, 411-455, Seaman Recruit, Company Oscar, there are 41 rifles in the barracks....." This is the actual "sound off" that was permanently drilled into my mind during Coast Guard Boot Camp in 1974 (some foreshadowing here...). After boot camp I did a bunch of stuff and then became a Coastal Engineer with Moffatt & Nichol.



San Jose, but now I wind surf for my time on the water. I've been on or near the water for most of my life

Where did you grow up and go to school/college?

Grew up in San Jose. Went to Humboldt State for my lower division and then graduated from UC Berkeley... where my daughter now attends, also my mother graduated from UCB in 1990 after first starting in 1944, but took a leave of absence (a long one) due to a bunch of stuff: a world

Continued on Page 6

FIGURE A | RELEVANT PROJECT EXPERIENCE MAP

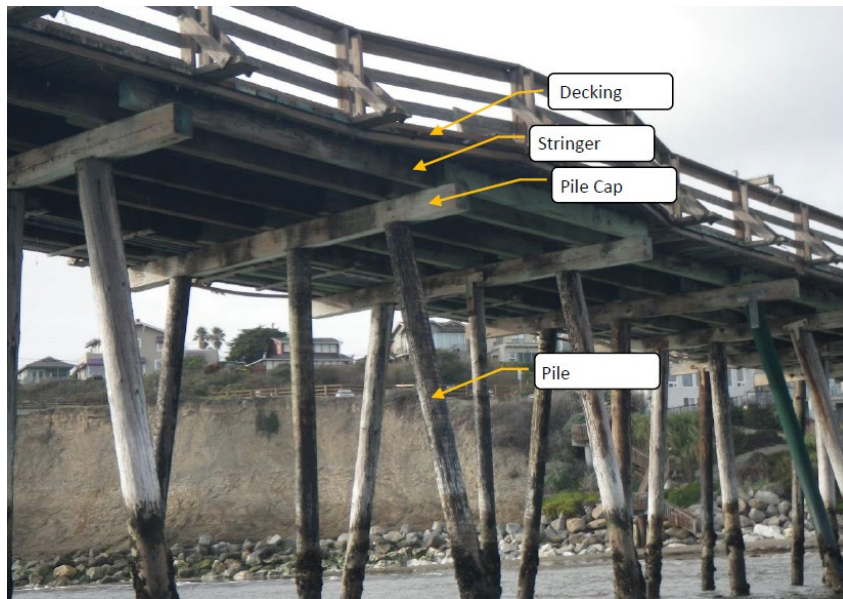
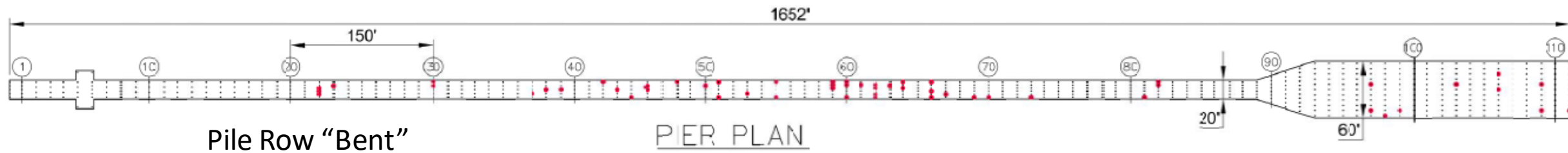


Pier References

Shore

Trestle

Head



Capitola Trestle



San Simeon



Avila Trestle

Condition Assessment/Survey/Investigation

1. Condition: Deterioration?
Establish % Missing



2. Analysis (?).....maybe

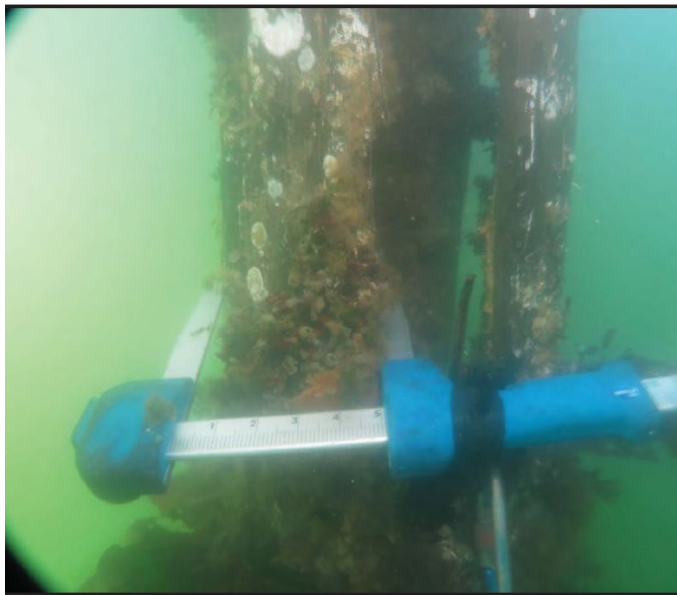
Demand Summary:							
Case	Corrosion	Moment DCR			Shear DCR		
		1.4D	1.2D+1.0E	0.9D+1.0E	1.4D	1.2D+1.0E	0.9D+1.0E
Case 1	0"	0.99	1.08	0.87	0.32	0.34	0.28
Case 2	0.07"	1.16	1.27	1.02	0.38	0.41	0.33
Case 3	0.12"	1.31	1.43	1.15	0.45	0.48	0.39

Geometry:

3. What to do? Repair? Replace? Do nothing?

Condition Assessment/Survey/Investigation

1. Deterioration-% Missing
Observation
Sounding
Measurement (?)
Testing (?)



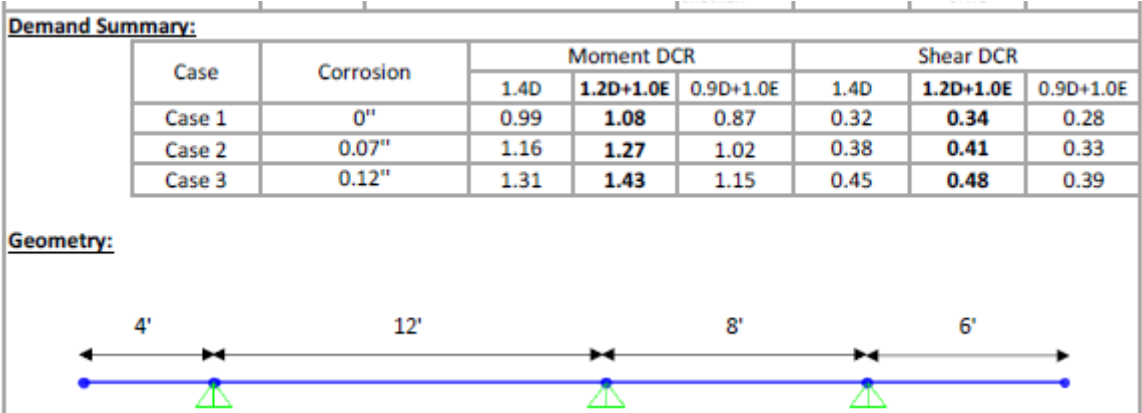
hoto 3: Pile 48-E, pile with severe section loss - approximately 95% (0033)



Condition Assessment/Survey/Investigation

2. Analysis (?)

Function of Structure
Vertical
Horizontal
Changed ?



Load to Support (“Demand”)---	200 lbs	200 lbs
Strength (“Capacity”)	400 lbs	100 lbs
Demand/Capacity:	0.5 Good !	2.0 Bad!

Condition Assessment/Survey/Investigation

3. What to do? Risk vs. Cost

- Restore original (100%) capacity
Safe, Conservative. Cost \$\$\$\$?
- Analyze, repair as needed
Safe by the numbers ($DCR < 1$) Cost: \$\$
- Wait and see-deflection
Risky Cost: 0



Case Study: Avila Pier

2017—Closed.

Replace for \$ 18 million

2018-Start Design New Pier

.....or.....



Prior to 2018

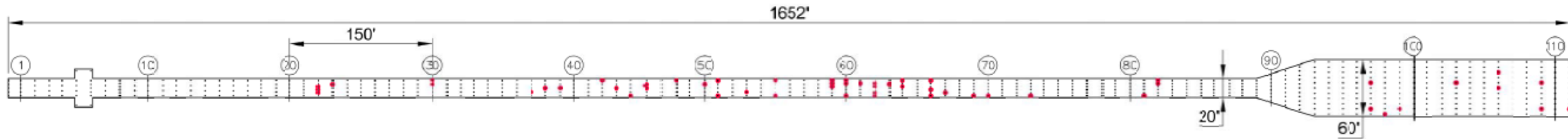


Table 1 –

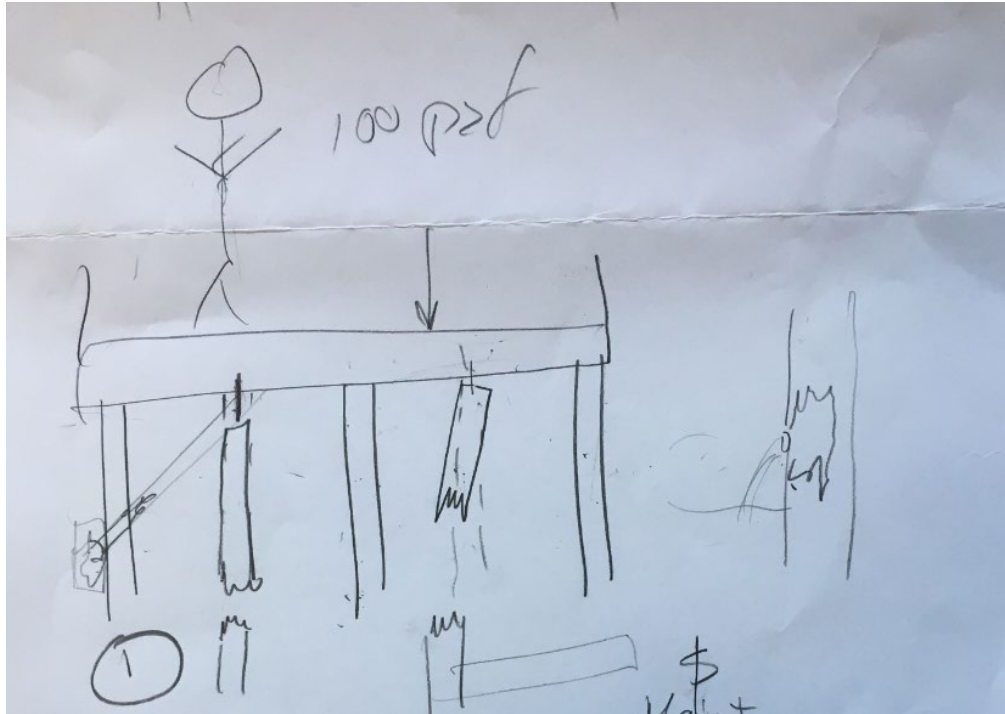
%
9
18
34
39

No. of Piles	Rating	Observations
64	SV	Severe damage or missir
126	MJ	Major damage. Advance
239	MD	Moderate damage. Adv capacity of the element.
271	MN	Minor damage. Minor to
0	ND	No damage noted.
0	NI	Not inspected.

700 Piles

Damage level? 100% some.....27% Major or Severe.....of what is there.

Damaged vs. Needed



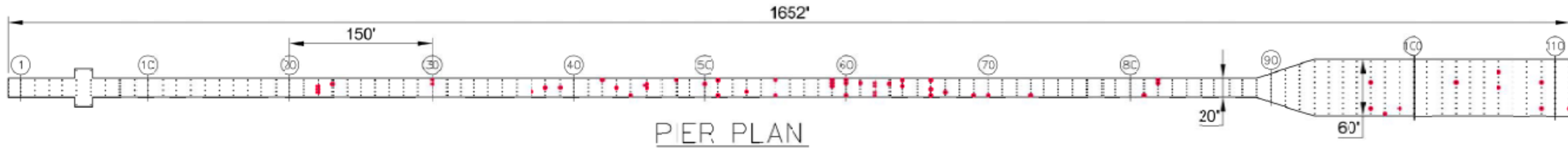
Basis:

Damaged? 2 of 5 so 40%

Needed? Only 3, so 0%



Repair? Replace?



Needed?

Pier load: 46,000 sf at 100 lb/sf = 4,600,000 lb (2,300 tons)

Pile Capacity, nominal: = 25 tons

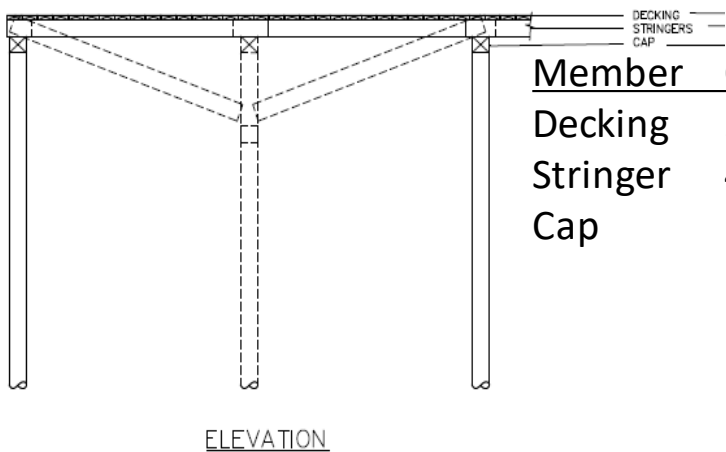
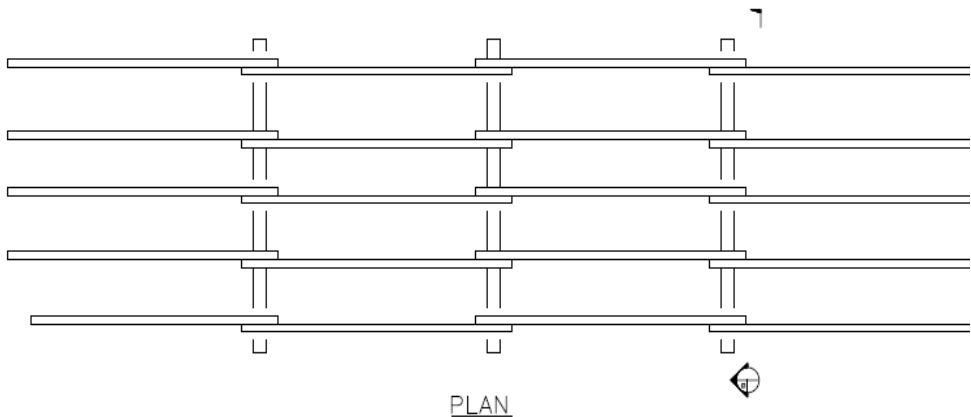
Piles "required", theoretically = 92 Piles

Required/Existing 92/700 = 0.13

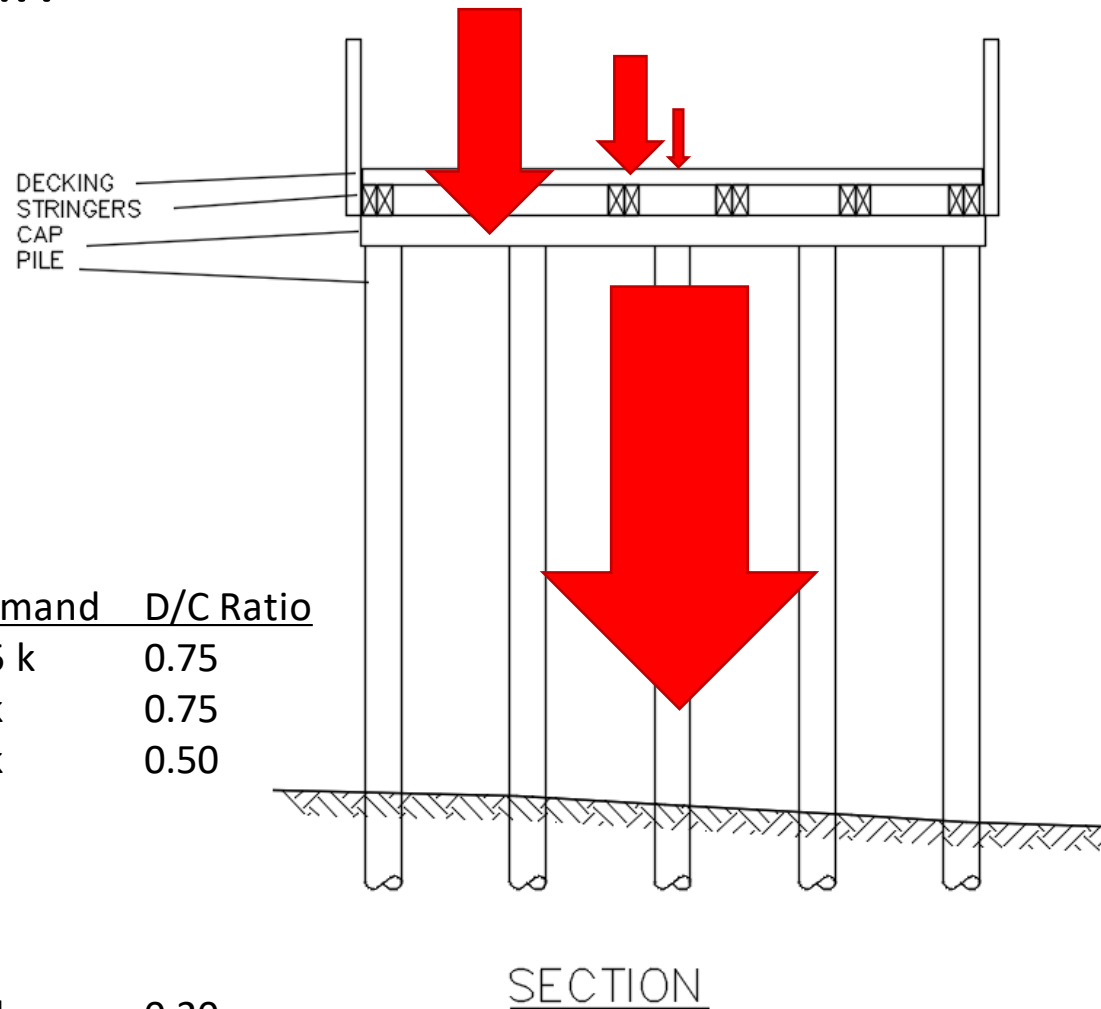
If load can get there.....deck?

Structure Support (load path)

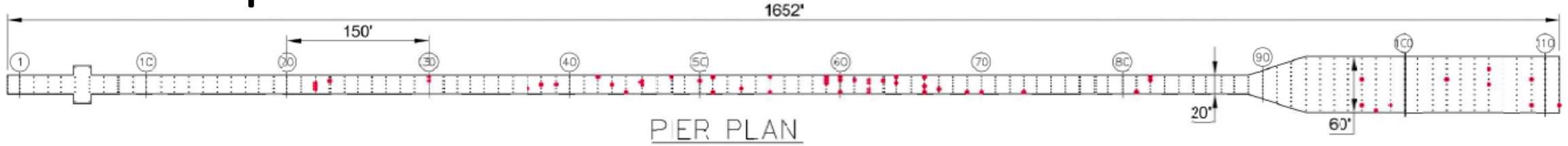
Supports Member Above--Span



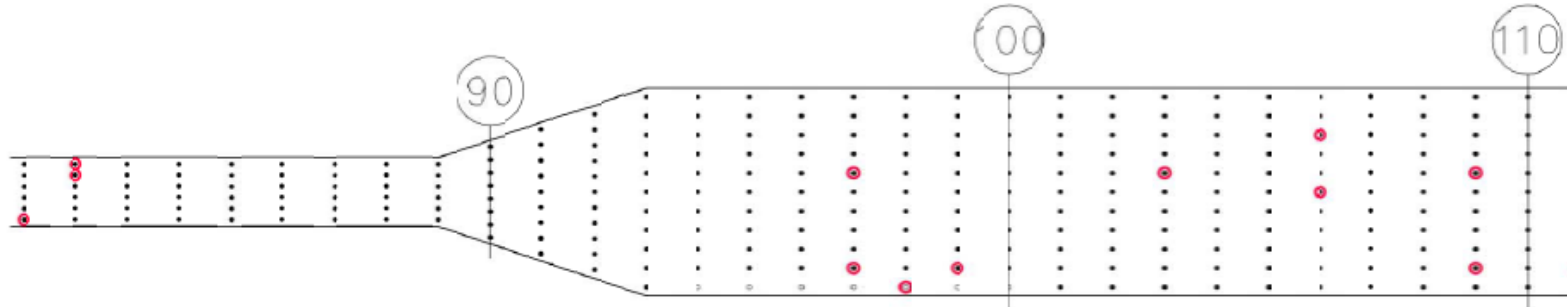
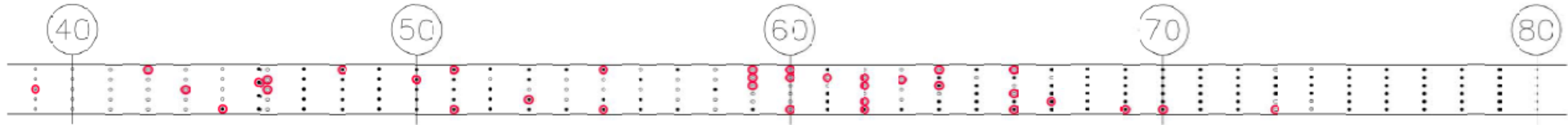
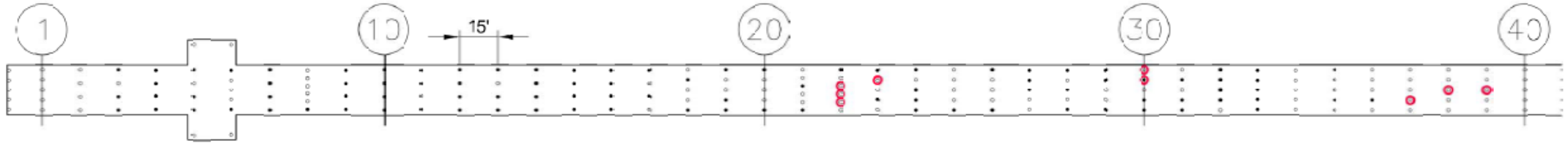
Member	Capacity	Demand	D/C Ratio
Decking	2 k	1.5 k	0.75
Stringer	4 k	3 k	0.75
Cap	10k	5 k	0.50
Pile	50k	10k	0.20



Piles to Replace? $DCR=.2.....$ All? Moderate? Critical?



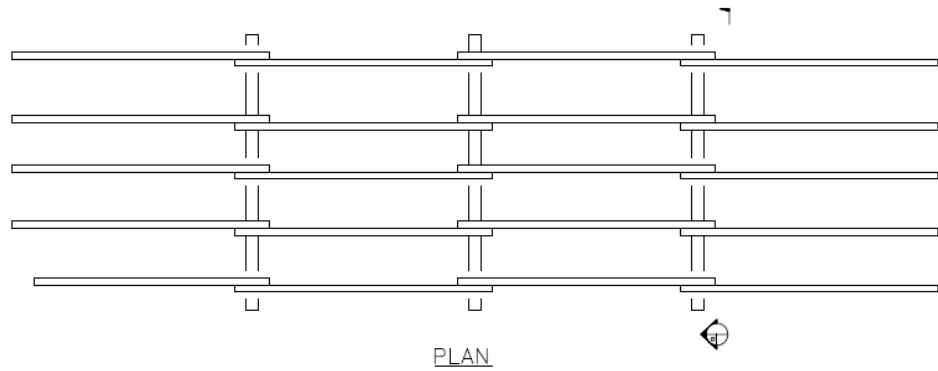
64 Severe
...or....30?



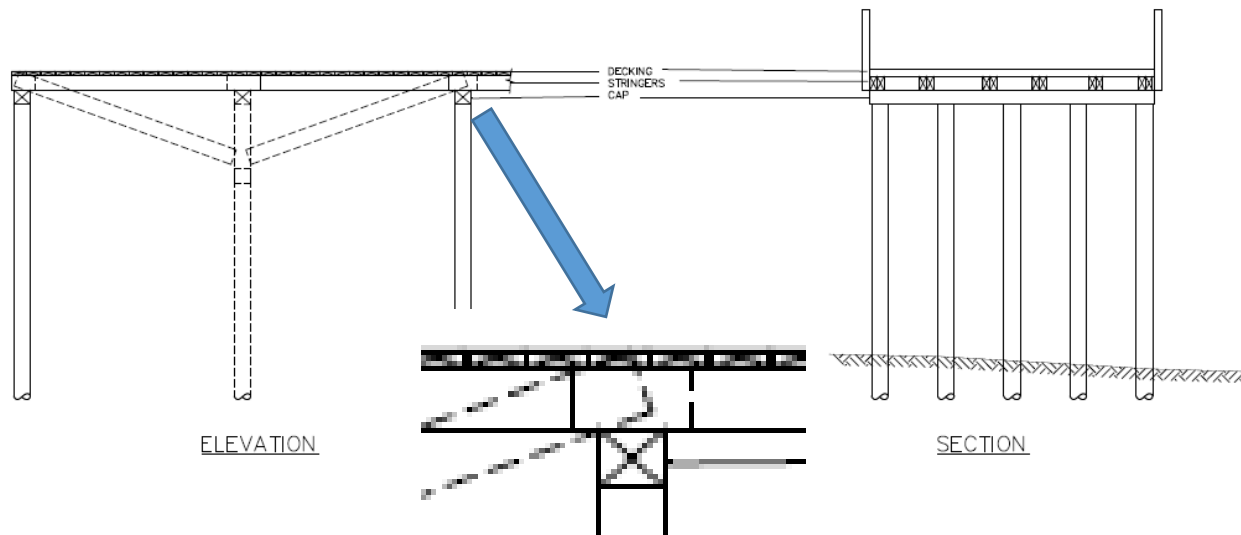
- ORIGINAL PILE?
- PILE REPLACED 1987
- PILE BAD 2015

Structure Redundancy

Simple support....and....



Decking.....cap straps.....continuous edge stringer

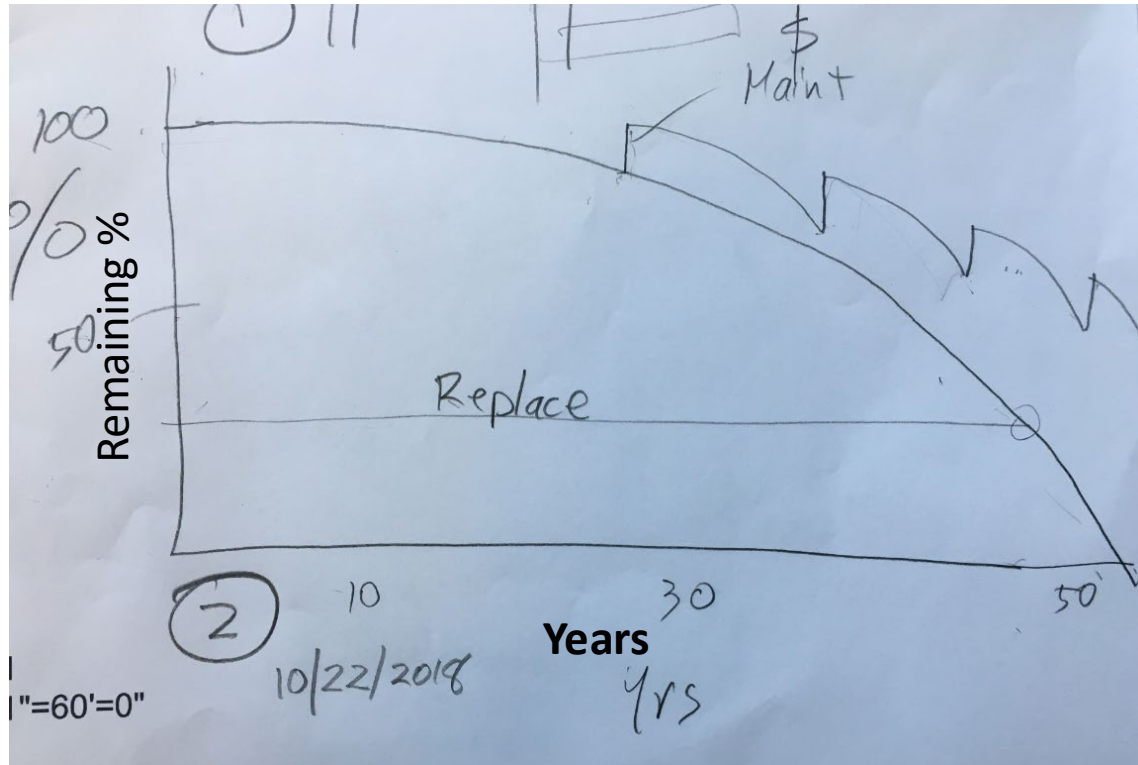


Photograph 10-All Piles Broken at Bent 12 (2002)

What to do?

Repair?

Replace?



40 Years at \$1 mil every 5-10 years? (maint)

60 Years at \$15-20 mil now? (replace)

Initial Observations
Analysis

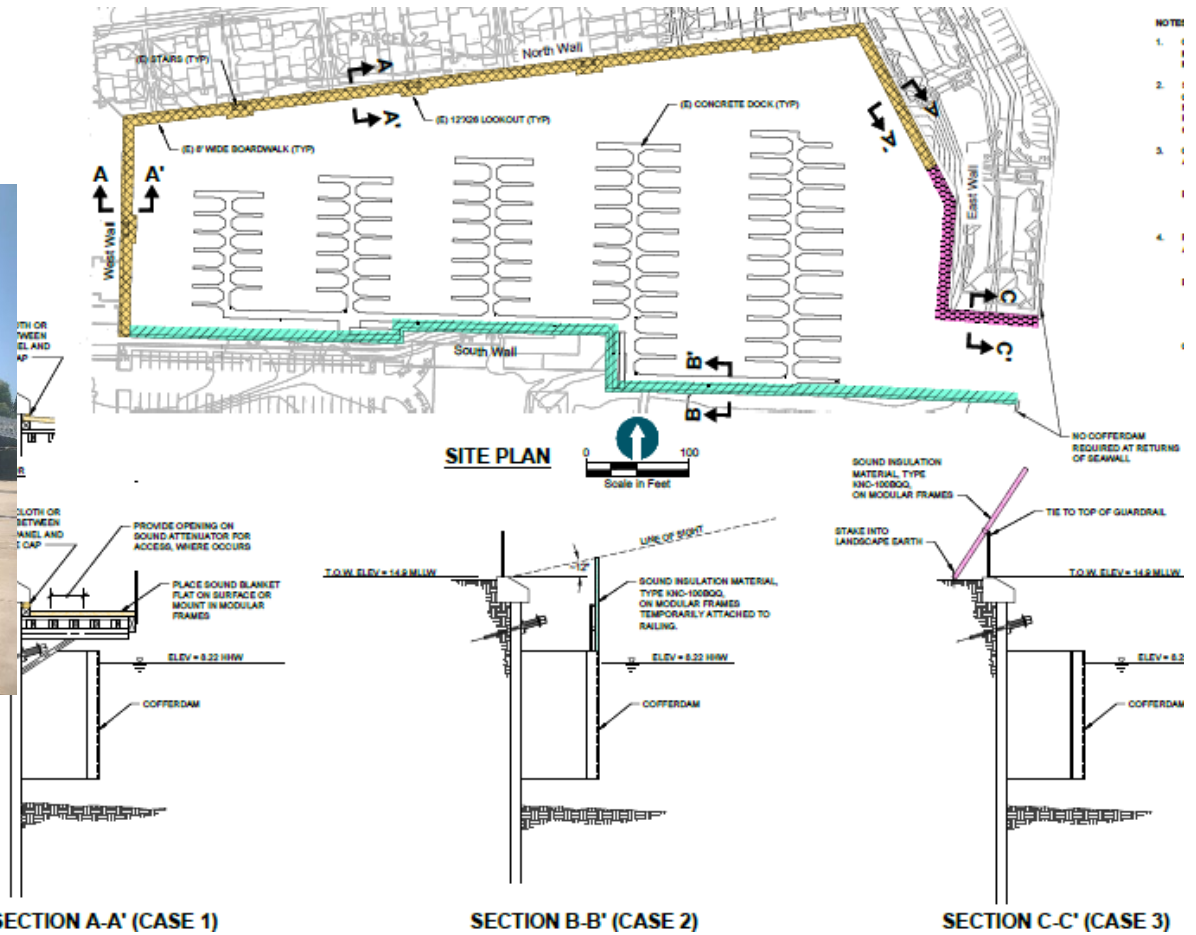
Life cycle, Costs and Maintenance Timber Pier

Case Study: Silicon Valley Marina

2019—Assessment of Steel Bulkhead Wall

Repairs: Encase Waler and Sheets \$15-20 million

2020 -- Peer Review of Repair Plan



Case Study: Silicon Valley Marina

Peer Review

1. Condition--Site visit Observed Measured



Figure 3. Cleaning Channel Sections for UT Measurements (Left), Cleaned Section (Right)

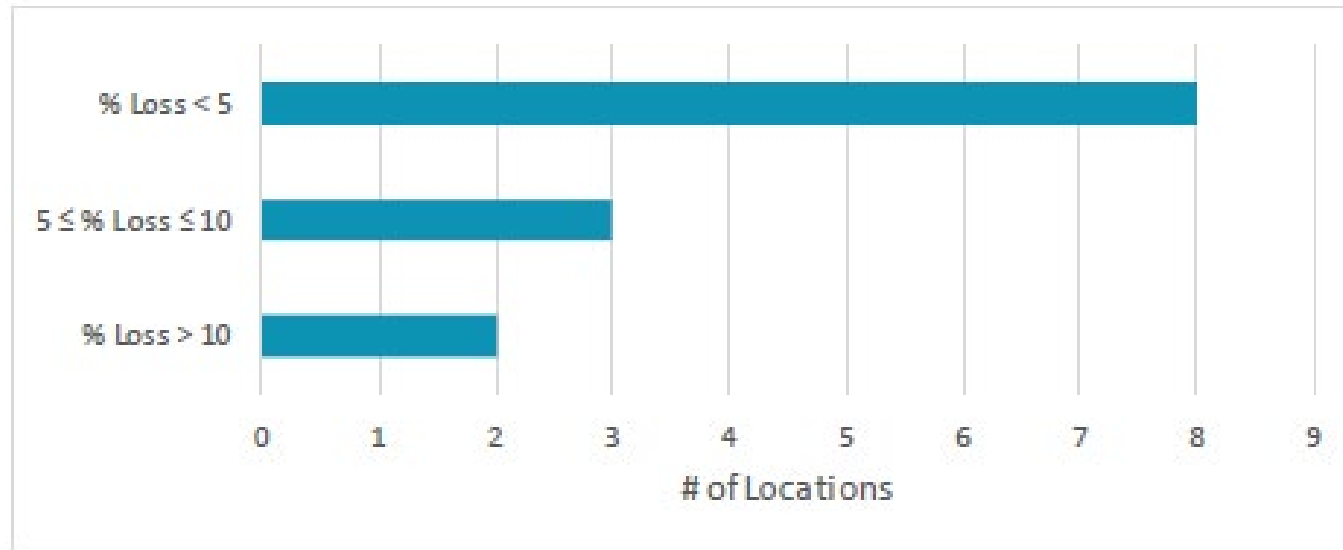


Figure 10. Summary of Observed Sheet Pile Corrosion



Case Study: Silicon Valley Marina

Peer Review

1. Condition--Site visit

Observed

Measured

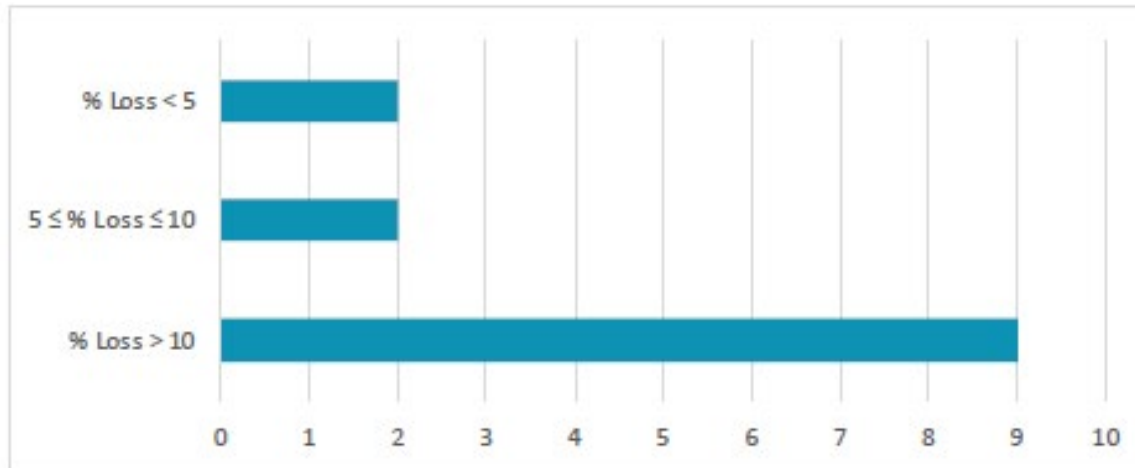


Figure 13. Summary of Observed Water Corrosion

Case Study: Silicon Valley Marina

Peer Review

2. Analyzed

Table 3. Sheet Pile Evaluation Summary

Case	Corrosion	Moment DCR			Shear DCR		
		1.4D	1.2D+1.0E	0.9D+1.0E	1.4D	1.2D+1.0E	0.9D+1.0E
Case 1	0"	0.58	0.53	0.40	0.09	0.10	0.08
Case 2	0.015"	0.60	0.55	0.42	0.10	0.11	0.09
Case 3	0.065"	0.71	0.65	0.50	0.12	0.13	0.10

Good

Table 4. Waler Evaluation Summary

Case	Corrosion	Moment DCR			Shear DCR		
		1.4D	1.2D+1.0E	0.9D+1.0E	1.4D	1.2D+1.0E	0.9D+1.0E
Case 1	0"	0.99	1.08	0.89	0.32	0.34	0.28
Case 2	0.07"	1.16	1.27	1.02	0.38	0.41	0.33
Case 3	0.12"	1.31	1.43	1.15	0.45	0.48	0.39

Bad

Case Study: Silicon Valley Marina

Peer Review

3. What needs to be done?

Encase waler,

Do nothing to sheets

Cost: \$4 mil



Case Study: Silicon Valley Marina

Peer Review

3. What needs to be done?

Encase waler,

Do nothing to sheets

Cost: \$4 mil



Case Study: Johnson Pier

2021—Assessment cited overstress evidenced by cracks



Case Study: Johnson Pier

2021—Assessment cited overstress evidenced by cracks

"Support Piles and Pile Bents (more properly Pile Caps or Beams)— The majority of piles and pile bents are in "good" condition; some of the reinforced concrete beams (or bents) supporting portions of the deck at the end of the pier were noted to be in "poor" condition and in need of repair in the next 5 to 10 years due to overstressing by excessive loading, and one pile under Fish Buyer Building noted to also be in "poor" condition and in need of repair in the next 5 to 10 years."

Case Study: Johnson Pier

1. Site Investigation



Case Study: Johnson Pier

1. Site Investigation --cracks

What am I seeing?

What does it mean?

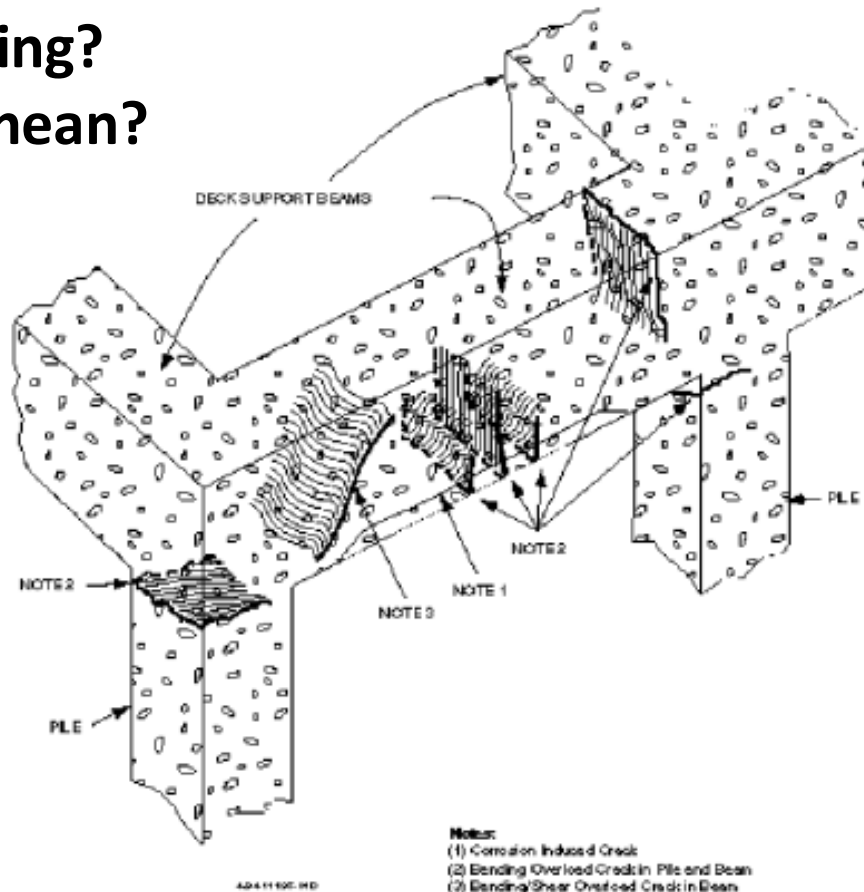


Figure 4-Concrete Crack Indications of Cause (from MOTEMS Audit Manual 2017)