AMI

Consulting Engineers P.A.

June 4, 2026

Michelle Wetmore-Shrider
City of Bayfield Harbor Commission
125 South First Street
Bayfield, WI 54814

Re: Bayfield Marina – Existing Finger Piers
AMI Project # 241026

Ms. Wetmore-Shrider:

The Bayfield Habor Commission requested that AMI Consulting Engineers, PA (AMI) provide a structural evaluation and recommendations for the existing Finger Piers at the Bayfield Marina located in Bayfield, WI.

Methodology

AMI completed this inspection accordance with American Society of Civil Engineers (ASCE) Manual of Practice (MOP) 130 entitled Waterfront Facilities Inspection and Assessment. Each individual element of each structure was inspected and assigned a damage rating. Once each element has a damage rating, a Condition Assessment Rating can be applied to the entire structure. The Condition Assessment Ratings are based on the element damage ratings and consider ancillary information including but not limited to:

- Scope of Damage
- Severity of Damage
- Distribution of Damage
- Types of Components Affected
- Location of Defect on Components
- Serviceability

The overall condition of each structure and the condition of the individual structural components composing the structures were evaluated and assigned a condition rating using an industry-accepted rating system developed by the ASCE. These ratings were used to describe the existing in-place structure relative to its new condition.

91 MAIN STREET
SUPERIOR, WI 54880
PH: (715) 718-2193
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Site Conditions

A total of six finger piers are located on the south side of the City Pier (See attached plan for location). The fingers piers are constructed of a lightweight steel crib structure, commonly referred to as Steel Bin Wall, which are filled with material to function as ballast. Steel cribs are a gravity type structure that primarily utilizes its self-weight to resist lateral forces exerted on it from wave, ice, berthing, and mooring forces.

AMI performed a visual inspection of the finger piers from the deck of the marina and documented several large voids in the sides of the crib near the waterline. The large voids have allowed for the fill material within the crib to fall out. Due to the amount of steel loss from corrosion, the steel is in ***Severe Condition*** according to ASCE MOP 130. See Figure 1 for the typical condition of the six finger piers.

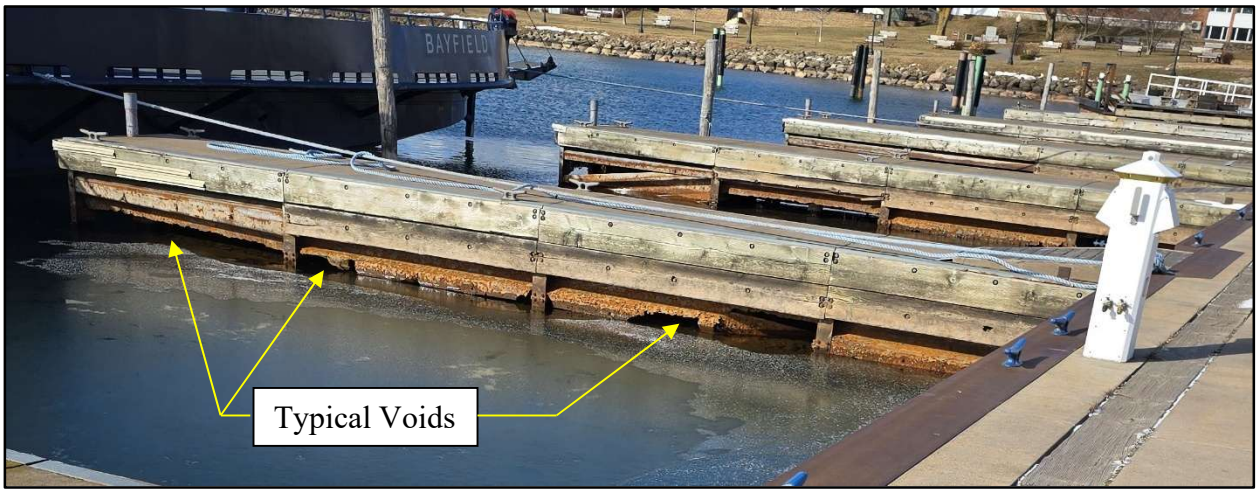


Figure 1: Typical Finger Pier Condition

Due to the void and the loss of fill material, the cribs have lost a substantial amount of ballast or resistance to lateral loads. In addition to the loss of ballast, the concrete slab on top of the cribs is severely undermined and unsupported for large spans. Due to this loss of support, the concrete slab is in ***Severe Condition*** according to ASCE MOP 130.

Recommendations

The finger piers are currently in ***Critical Condition*** due to the amount of steel loss and resulting loss of ballast. The finger piers are unstable and are at risk of collapse since they are no longer able to resist wave, ice, berthing, and mooring forces. The concrete slab on top of the cribs is also at a high risk of collapse due to the loss of support. AMI recommends that access and use of the finger piers cease ***immediately*** due to the high risk of collapse and high risk to public safety. Permanent barricades and signage shall also be installed at each access point and ends of each finger pier to prevent the public from using them.

We appreciate the opportunity to be of service to you on this project. If you have any questions or comments regarding this report or find any information listed above to be in error, please do not hesitate to contact me at (715) 718-2193 ext. 17 or chase.dewhirst@amiengineers.com.

Respectfully Submitted,

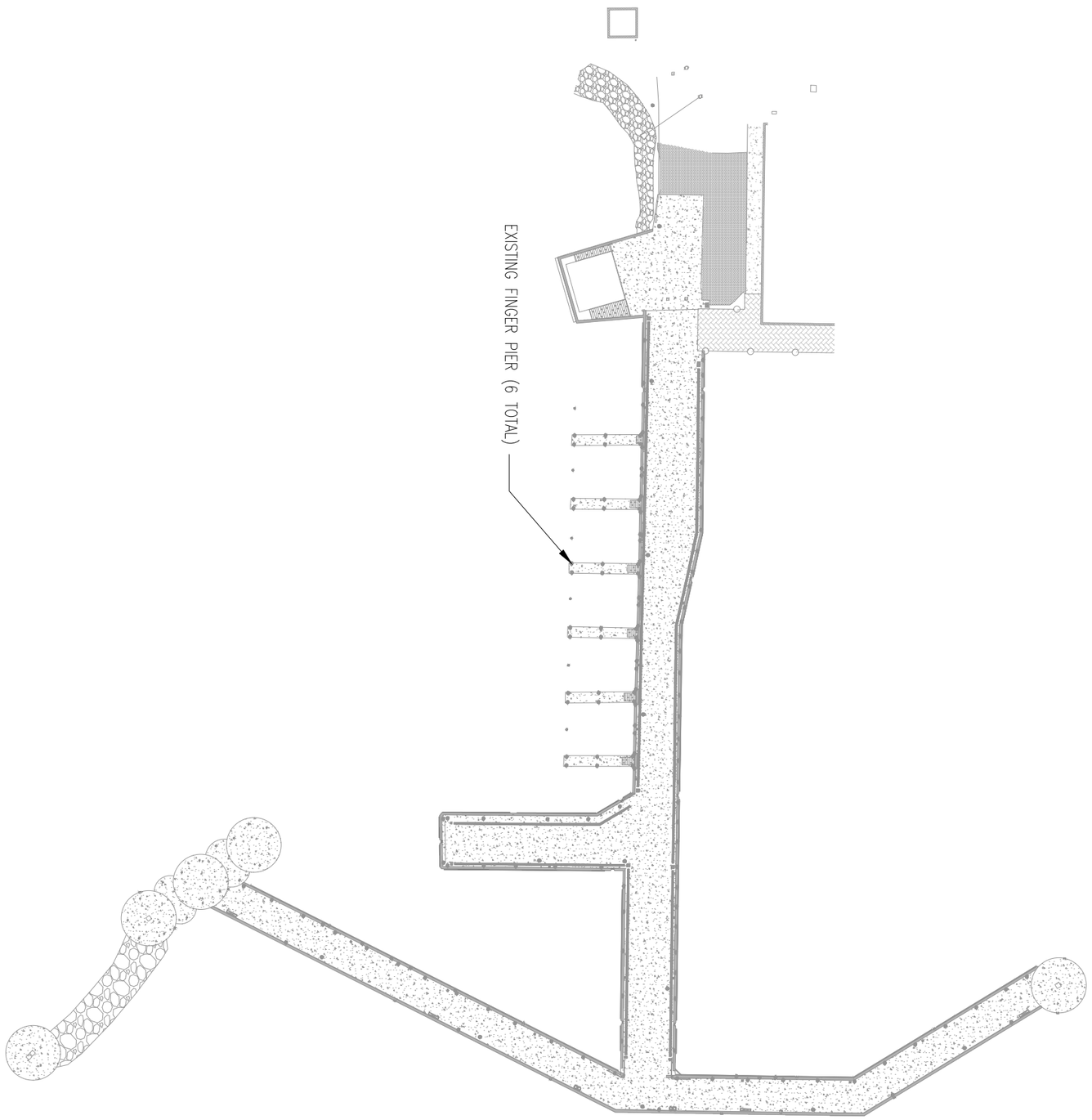
Chase Dewhirst, PE (MN)
Marine Civil Engineering Manager

Reviewed By,

Zac Morris, PE (WI)
Principal

Enc.:

- Bayfield Marina Existing Site Plan
- Steel Element Damage Ratings
- Reinforced Concrete Element Damage Ratings
- Condition Assessment Ratings



N

0
70
140
FEET

PRELIMINARY
NOT FOR CONSTRUCTION

SHEET: EX1

JOB No: 241026
DATE:
DRAWN BY: SAJ
DESIGNED BY: CAD

BAYFIELD FINGER PIER REHABILITATION

RITTENHOUSE AVE
BAYFIELD, WI 54814

EXISTING SITE PLAN

DATE:	REV:	DESCRIPTION	BY:

AMI
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91 Main Street SUPERIOR, WI
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TWIN CITIES - IRON RANGE

Steel Elements

ASCE Waterfront Facilities Inspection and Assessment Damage Ratings for Steel Elements

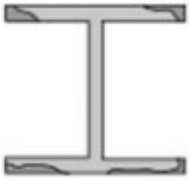
DAMAGE RATING	EXISTING DAMAGE*	EXCLUSIONS [defects requiring elevation to the next higher damage rating(s)]
NOT INSPECTED (NI)	• Not inspected, inaccessible, or passed by**	
NO DEFECTS (ND)	• Protective coating or wrap intact • Light surface rust • No apparent loss of material	
MINOR (MN)	• Protective coating or wrap damaged and loss of thickness by up to 15% of nominal at any location • Less than 50% of perimeter or circumference affected by corrosion at any elevation or cross section • Loss of thickness up to 15% of nominal at any location	Minor damage not appropriate if: • Changes in straight line configuration or local buckling • Corrosion loss exceeding fabrication tolerances (at any location)
MODERATE (MD)	• Protective coating or wrap damaged and loss of thickness 15 to 30% of nominal at any location • More than 50% of perimeter or circumference affected by corrosion at any elevation or cross section • Loss of thickness 15 to 30% of nominal at any location	Moderate damage not appropriate if: • Changes in straight line configuration or local buckling • Loss of thickness exceeding 30% of nominal at any location
MAJOR (MJ)	• Protective coating or wrap damaged and loss of nominal thickness 30 to 50% at any location • Partial loss of flange edges or visible reduction of wall thickness on pipe piles • Loss of nominal thickness 30 to 50% at any location	Major damage not appropriate if: • Changes in straight line configuration or local buckling • Perforations or loss of wall thickness exceeding 50% of nominal
SEVERE (SV)	• Protective coating or wrap damaged and loss of wall thickness exceeding 50% of nominal at any location • Structural bends or buckling, breakage and displacement at supports, loose or lost connections • Loss of wall thickness exceeding 50% of nominal at any location	

*Any defect listed is sufficient to identify relevant damage grade.

**If not inspected due to inaccessibility or passed by, note as such.

Source: ASCE Standard of Practice No. 130 "Waterfront Facilities Inspection and Assessment"

Damage Ratings for Steel Elements

MINOR		LESS THAN 50 PERCENT OF CIRCUMFERENCE AFFECTED BY CORROSION		LOSS OF THICKNESS UP TO 15 PERCENT AT ANY LOCATION
MODERATE		OVER 50 PERCENT OF CIRCUMFERENCE AFFECTED BY CORROSION		LOSS OF THICKNESS UP TO 30 PERCENT AT ANY LOCATION
MAJOR		VISIBLE REDUCTION OF WALL THICKNESS		LOSS OF THICKNESS 30 TO 50 PERCENT AT ANY LOCATION. PARTIAL LOSS OF FLANGES
SEVERE		STRUCTURAL BENDS OR BLUCKING; LOOSE OR LOST CONNECTIONS		PERFORATIONS AND LOSS OF THICKNESS EXEEDING 50 PERCENT AT ANY LOCAITON

Source: ASCE Standard of Practice No. 130 "Waterfront Facilities Inspection and Assessment"

Appendix B

Waterfront Facilities Inspection and Assessment Damage Ratings for Reinforced Concrete Elements

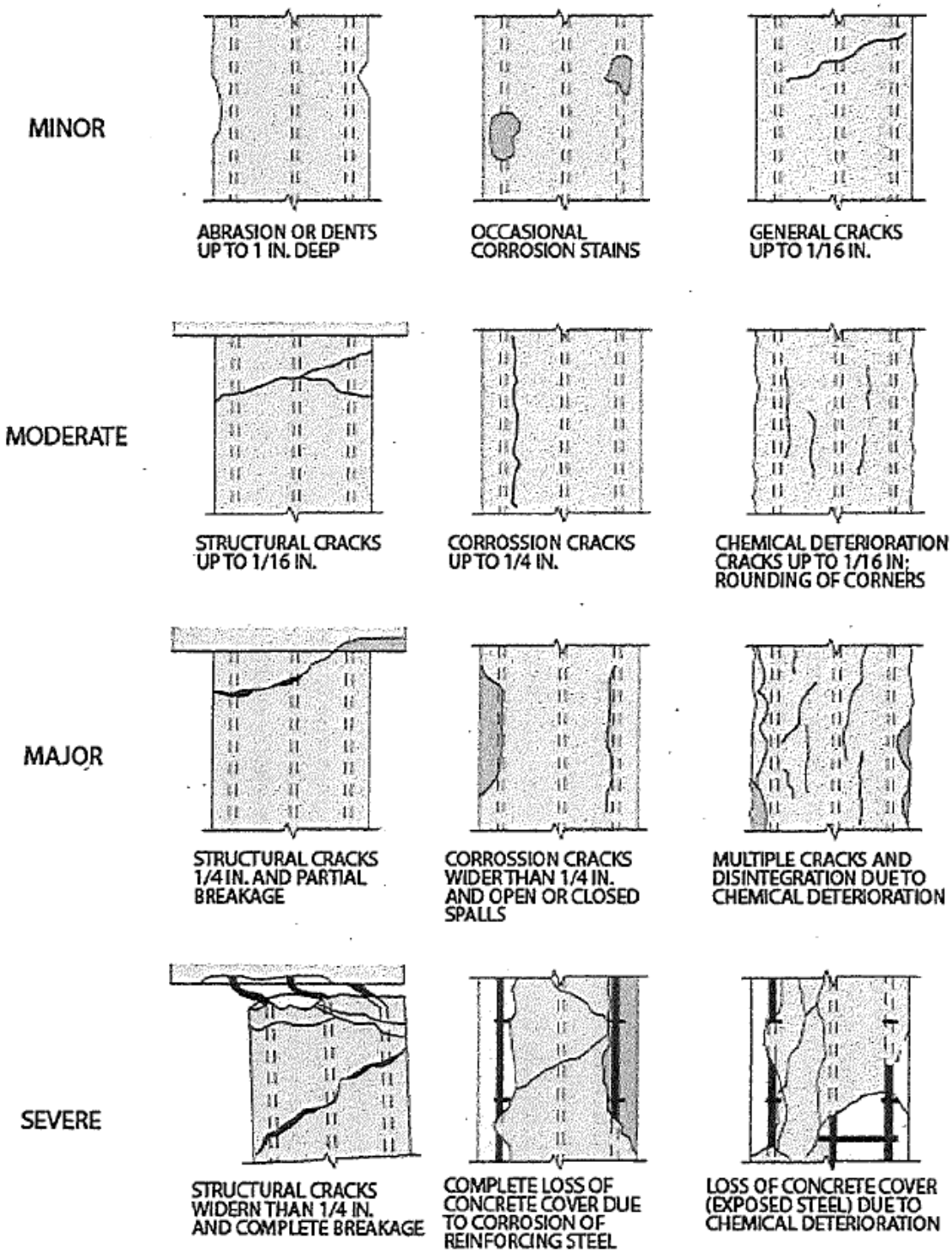
DAMAGE RATING	EXISTING DAMAGE*	EXCLUSIONS [defects requiring elevation to the next higher damage rating(s)]
NOT INSPECTED (NI)	• Not inspected, inaccessible, or passed by**	
NO DEFECTS (ND)	• Good hard surface, hard material, sound	
MINOR (MN)	• Mechanical abrasion or impact spalls up to 1 in. in depth • Occasional corrosion stains or small pop-out corrosion spalls • General cracks up to 1/16 in. in width	Minor damage not appropriate if: • Structural damage • Corrosion cracks • Chemical deterioration***
MODERATE (MD)	• Structural cracks up to 1/16 in. in width • Corrosion cracks up to ¼ in. in width • Chemical deterioration: Random cracks up to 1/16 in. in width; "soft" concrete and/or rounding of corners up to 1 in. deep • Mechanical abrasion or impact spalls greater than 1 in. in depth	Moderate damage not appropriate if: • Structural breakage and/or spalls • Exposed reinforcement • Loss of cross section due to chemical deterioration beyond rounding of corner edges
MAJOR (MJ)	• Structural cracks 1/16 in. to ¼ in. in width and partial breakage (through section cracking with structural spalls) • Corrosion cracks wider than ¼ in. and open or closed corrosion spalls (excluding pop-outs) • Multiple cracks and disintegration of surface layer due to chemical deterioration	Major damage not appropriate if: • Loss of cross section exceeding 30% due to any cause
SEVERE (SV)	• Structural cracks wider than ¼ in. or complete breakage • Complete loss of concrete cover due to corrosion of reinforcing steel with more than 30% of diameter loss for any main reinforcing bar • Loss of bearing and displacement at connections • Loss of concrete cover (exposed steel) due to chemical deterioration • Loss of more than 30% of cross section due to any cause	

*Any defect listed is sufficient to identify relevant damage grade.

**If not inspected due to inaccessibility or passed by, note as such.

***Chemical deterioration: sulfate attack, alkali-silica reaction, alkali-aggregate reaction, alkali-carbonate reaction ettringite distress, or other chemical/concrete deterioration.

Damage Ratings for Reinforced Concrete Elements



Source: ASCE Standard of Practice No. 130 "Waterfront Facilities Inspection and Assessment"

Condition Assessment Ratings

RATING		DESCRIPTION
6	**GOOD**	No visible damage or only minor damage noted. Structural elements may show very minor deterioration, but no overstressing observed. No repairs are required.
5	**SATISFACTORY**	Limited minor to moderate defects or deterioration observed but no overstressing observed. No repairs are required.
4	**FAIR**	All primary structural elements are sound but minor to moderate defects or deterioration observed. Localized areas of moderate to advanced deterioration may be present but do not significantly reduce the load-bearing capacity of the structure. Repairs are recommended, but the priority of the recommended repairs is low.
3	**POOR**	Advanced deterioration or overstressing observed on widespread portions of the structure but does not significantly reduce the load-bearing capacity of the structure. Repairs may need to be carried out with moderate urgency.
2	**SERIOUS**	Advanced deterioration, overstressing, or breakage may have significantly affected the load-bearing capacity of primary structural components. Local failures are possible and loading restrictions may be necessary. Repairs may need to be carried out on a high-priority basis with urgency.
1	**CRITICAL**	Very advanced deterioration, overstressing, or breakage has resulted in localized failure(s) of primary structural components. More widespread failures are possible or likely to occur, and load restrictions should be implemented as necessary. Repairs may need to be carried out on a very high-priority basis with strong urgency.

Source: ASCE Standard of Practice No. 130 "Waterfront Facilities Inspection and Assessment"