# Des Moines Marina Boat Launch
# Technical Memorandum

May 18, 2022

Prepared for

City of Des Moines

**Exeltech Consulting, Inc.**
8729 Commerce Place Drive NE
Lacey, Washington 98516

# Technical Memorandum

## Introduction

The City of Des Moines (City) Marina Boat Launch has creosote treated timber pilings which are showing signs of deterioration. The City requested that Exeltech Consulting, Inc. conduct an evaluation of the structure. The structure was designed in 1968 and installed during the construction of the Small Boat Marina. It is understood to have operated continuously since construction with minimal maintenance.

Exeltech Consulting, Inc. performed an on-site inspection of the structure on May 16, 2022. The structure was not in use at the time of the inspection. The posted load signs attached to the structure state "6-ton maximum boat load, or 5 tons with a trailer". The total operating capacity is 12,000 pounds associated with one 6-ton boats, based on the posted load signs. It is assumed that the posting sign only refers to the pier structure. The north hoist has a 1.5-ton maximum boat load labeled on the hoist. See the boat launch Site Photographs in Attachment 1.

The following references and assumptions were used in the on-site inspection and this technical memorandum.

- References:
  - Available construction plans (constructed in 1968 by the City)
  - Previous inspection documents
  - Historic beach grade in the project area
- Assumptions:
  - The inspection will be a visual inspection and observation of the boat launch
  - No destructive testing will be conducted during the inspection.

## Immediate Recommendation

Based on our on-site structural inspection performed on May 16, 2022 and our subsequent review of available information, our recommendation is to completely close operation of the hoist structure and associated pier structure.

## On-Site Inspection

### Structure Description

The City's Small Boat Marina Boat Launch was built in 1968 and has been operating continuously since that time with minimal maintenance other than replacing deck boards and other superstructure members as needed, as well as a new attachment to the seawall constructed in 2009.

The structure is composed of two basic independent systems - the hoist structure and the pier structure. The hoist structure comprises four piers, labeled Pier 1 to Pier 4, from the shoreline. Each pier has between two and five round creosote treated timber piles. The structure is approximately 24 feet (ft) wide by 70 ft long with a maximum height of approximately 49 ft above the dredged surface of the marina basin. The hoist is attached to a steel traveler rail which is supported by square timber cap beams which in turn bear upon the pile bents. Longitudinal timbers connect each pier with steel rods acting as "X-bracing" in the top plain of the structure. Two hoists run the length of this structure. The hoist does not share loading with the pier yet it has vertical and battered piles which pass through the plane of the pier.

The pier structure (where the boats on trailers travel) comprises five 12x12 timber cap beams, which run longitudinally and bear upon a concrete corbel at the new sea wall directly on to three timber piles each. There are 4x12 timber stringers, between 17 and 20 depending on the bay, that run transversely over the timber cap beams with the furthest stringer from shore being 12x12 timber. The deck comprises 4x12 timber members laid flat, which run longitudinally. The structure is approximately 30 ft by 40 ft in plan dimension with a maximum height to the dredged surface of the marina basin of approximately 30 ft.

The railings are composed of steel posts and longitudinal members with a timber handrail. There is a fish cleaning station and a small shed on the pier portion of the structure.

The nomenclature used herein for the hoist structure is Pier 1 to Pier 4 with Piles A to E (Pile A being the northernmost vertical pile moving south). For the pier structure, the longitudinal timbers are referred to as Girder 1 to Girder 5 with three lines of piles referred to as Bent A to Bent C. This creates the nomenclature for the pier piles of Bent C Pile A being the northwesternmost pile and Bent A Pile E being the southeasternmost pile. The transverse 4x12 timbers are referred to as Joist 1 through Joist 20 beginning at the shoreline. Deck boards running longitudinal are numbered 1 to 40 from the north. See the Pile Inspection Layout Diagram in Attachment 2.

## On-Site Observation

On Monday, May 16, 2022, Exeltech engineer inspectors, Ron Smith, PE, and Philip Wong, PE, performed an in-service inspection of the Boat Launch structure with a focus upon noted deterioration to the timber pile elements. The structure was operational during the inspection. A diver from Dave's Dive Services contracted with the City, provided hands-on access to the submerged piles at low tide. The inspection was conducted from foot.

All inspections employed visual, tactile, and non-destructive inspection techniques. Ladder was used to climb down near the loading deck area to reach the piles underneath for inspection. No drilling was utilized during this inspection.

The pile assessment was conducted through sounding (acoustic information obtained by hitting piles with a hammer), tactile (touching and scraping away debris), and visual techniques. The known areas of deterioration (holes through piles, missing segments of piles, visually identifiable defects) were used as a calibration for the acoustic sounding.

Estimation of remaining sections were recorded given the visual defects combined with the results of the sounding and non-destructive inspection techniques. All remaining section values taken in the field and included herein are estimations informed by visual, tactile, and sounding techniques except for the few locations where a partial remaining shell could be measured explicitly (very bad piles).

A general assessment of the superstructure was conducted with some issues noted including damaged deck boards, railing defects, and other minor or localized issues. The girders are remaining in fair condition with the most noteworthy defects occurring at the ends of the members. Approximately 20% of the deck boards are rotten. The railing in the southwest corner is more deteriorated than the rest with a connection that is mostly decayed. Overall, the superstructure is in poor condition.

See the boat launch Site Photographs in Attachment 1 and Pile Inspection Layout Diagram in Attachment 2.

The piles exhibit numerous defects including decay, checks, shakes, splits, surface defects, and a partially missing section. The piles supporting the pier structure (loading deck area) vary in condition from good to failed, with pile Bent B Pile A and C being failed with zero remaining capacity and pile Bent B Pile E being very poor with remaining area below 50 percent. Bent B Pile A exhibits void, 24" high x width of pile x 4" deep starting at ground line. Bent B Pile C exhibits rot through entire pile, 4ft high starting at ground. Bent B Pile E exhibits splits with rot, 24" high x 6" wide x 4" deep starting at ground. The other remaining piles have at least 50 percent area remaining. Overall, the pier structure is in very poor condition with two failed piles and one reduced capacity pile with below 50 percent area remaining.

The piles supporting the hoist structure (launching area) are in very poor condition and exhibit very large unbraced lengths. Five piles, Pier 4 Pile B and C, Pier 3 Pile A, Pier 2 Pile B, and Pier 1 Pile B exhibit the most severe defects with very low capacity remaining. There are three reduced capacity piles, Pier 4 Pile A, Pier 3 Pile B, and Pier 2 Pile C with remaining area below 50 percent.

Based upon the diving inspection, Pier 4 Pile C exhibits hollow sounding and punky material for 8 ft of the pile above the ground line. Pier 4 Pile B, batter pile, exhibits void, 14" high x 3" wide x 1" deep starting from the ground line. Pier 3 Pile A exhibits areas of missing section, approximately 5 ft high x width of pile x 8" deep for the bottom 8 ft of the pile above the ground line. Pier 2 Pile B, batter pile, exhibits void, 12" high x 8" wide x 6" deep starting from the ground line. Pier 1 Pile B exhibits void, 16" high x width of pile x 6" deep, starting from the ground line. Pier 4 Pile A, exhibits split, 6" from

the ground line x 1" deep. Pier 3 Pile B exhibits soft spot with 1 ½-inch penetration to probing with screwdriver, 2ft from the ground line. Pier 2 Pile C, batter pile, exhibits soft spot, 3" high with 4" deep, starting from the ground line.

Due to very poor condition of the piles, Exeltech Consulting, Inc didn't perform an inspection of the upper framing hoist structure.

## Recommendations

Based on our on-site structural inspection performed on May 16, 2022 and our subsequent review of available information, our recommendation is to completely close operation of the hoist structure and associated pier structure.

Attachments: Attachment 1: Site Photographs
Attachment 2: Pile Inspection Layout

# Attachment 1

Site Photographs


1. General view looking southwest.


2. Load Posting Sign


3. Typical rotten deck boards.


4. Loading deck area looking south.


5. Void 16” high x width of pile x 6” deep starting from the ground line, Pier 1 Pile B.


6. Void 12” high x 8” wide x 6” deep starting from the ground line, Pier 2 Pile B (Batter Pile).


7. Void 24” high x width of pile x 4” deep starting at ground line, Bent B Pile A.

8. Rot through entire pile, 4’ high starting at ground line, Bent B Pile C.


9. Splits wit rot 24” high x 6” wide x 4” deep starting at ground line, Bent B Pile E.

# Attachment 2

Pile Inspection Layout Diagram

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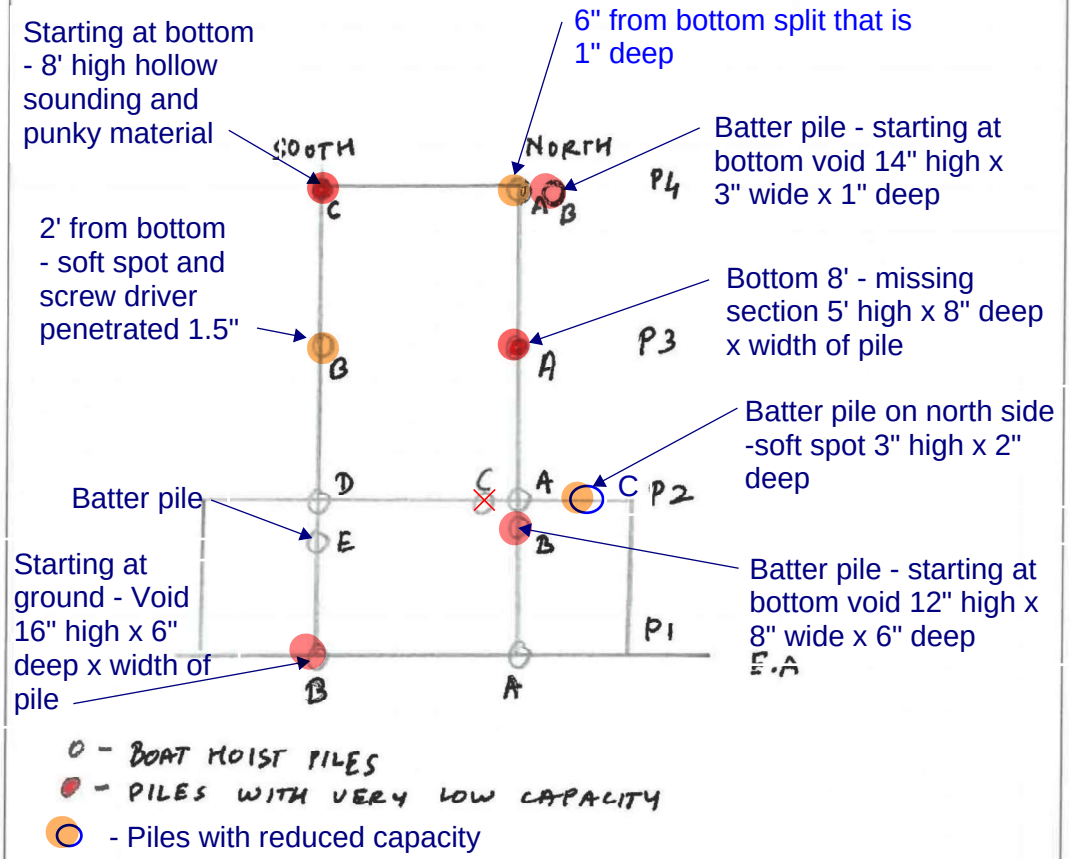
| Project | Engineer: DAS | Project # |
|---|---|---|
| DES MOINES MARINA | Date: 8/16/2019 | 1927 |
| Subject | Checked | Page |
| BOAT LAUNCH PILE LAYOUT | Date: | |




Notes from 5-16-2022 Inspection

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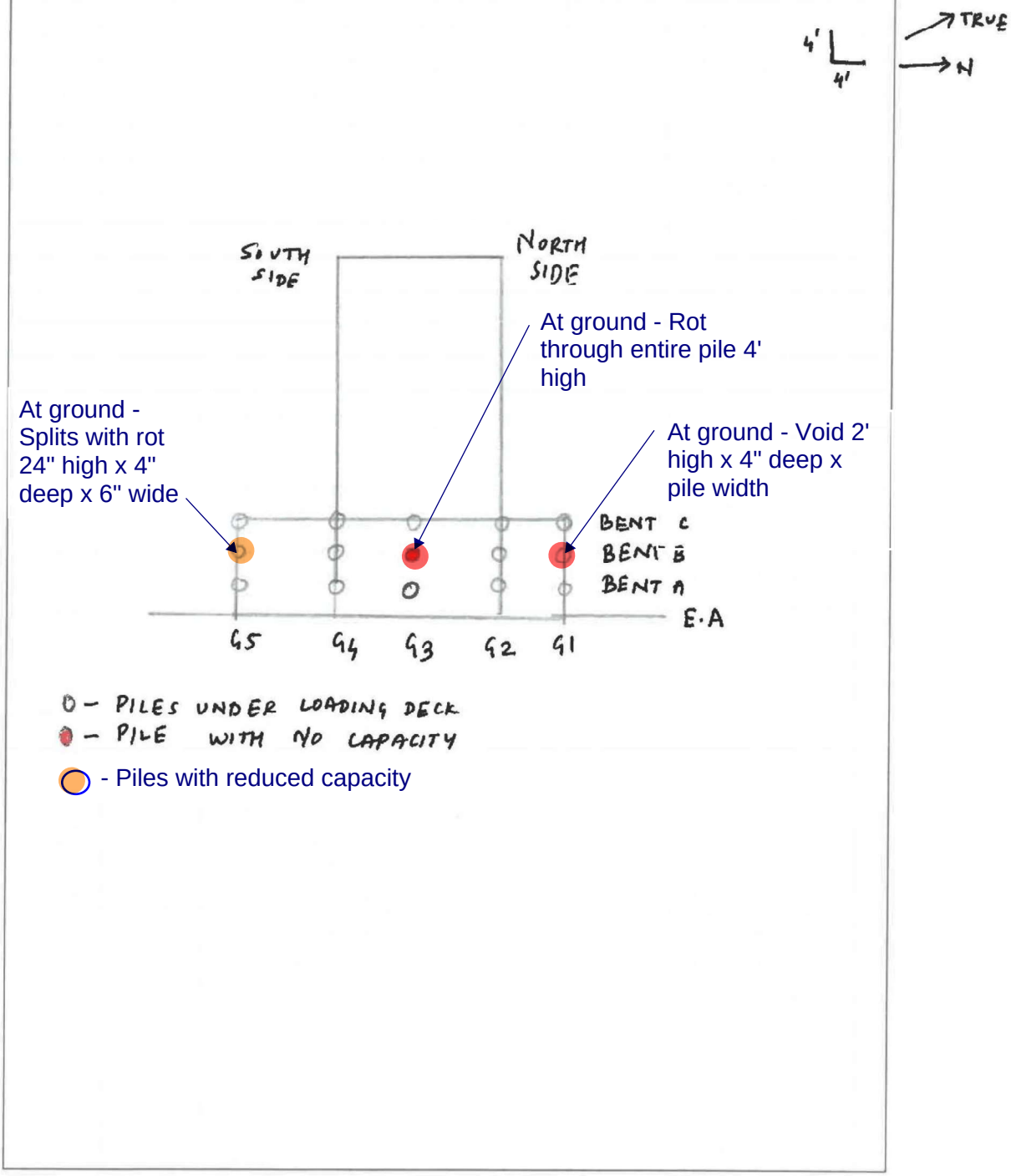
| Project | Engineer: DAS | Project # |
|---|---|---|
| DES MOINES MARINA | Date: 5/16/2019 | 1927 |
| Subject | Checker: | Page |
| BOAT LOADING AREA PILE LAYOUT | Date: | |




Notes from 5-16-2022 Inspection