

CLEARWOOD COMMUNITY
BRIDGE & DOCK INSPECTION REPORTS
FOR
CLEARWOOD COMMUNITY ASSOCIATION
PROJECT #2020-0272

BY

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INTRODUCTION

The bridges inspected in the following report are all pedestrian bridges in Yelm, Washington located around Clear Lake, Blue Lake, and the surrounding waterways. Each of the docks are located on Clear Lake.

The Clearwood Community Association has informed us that the bridges and docks were likely constructed in the 1970's and the timber likely shares similar strength values to today's standards. However, the design requirements have changed in that time.

One bridge, the "Bear Island" bridge is designed for pedestrian loading and will need to be improved for a small excavator loading (Approximately 4000 lbs per wheel line). This loading is much greater than the pedestrian design loads of 100 psf.

A detail inspection report for each bridge is given below.

Clearwood Community Bridges & Docks

Otter Beach Docks

Inspection Date: July 24, 2020

Inspected by: Jacob Gustafson, EIT & James K. Farley, PE, SE

STRUCTURE DESCRIPTION

The Otter Beach Docks are broken up into two floating structures which run north to south and are separated by an approximate 8' gap between the ends. The docks enclose a small cove with the only opening being between the two docks. Each dock is laterally supported by a concrete footing at the shore and two piles at the opposite end. The docks are both decked with 2x timber decking and vertically supported with rubber tire floating supports.

The north dock is 66' in length and is composed of three sections. The shore end is composed of a 20' by 14' platform which is connected to an angled section by two driven piles. The 8' wide by 20' long angled section turns to the 32' straightaway section which leads to the two 12" diameter end piles. The piles are attached with U-shaped pile hoops bolted to the deck framing.

The south dock is two sections, the first being a 7' by 8' ramp area which rests on a slab footing at the shore. This leads to an 8' by 22' walkway section which connects to two 12" diameter piles with U-shaped pile hoops bolted to dock framing.

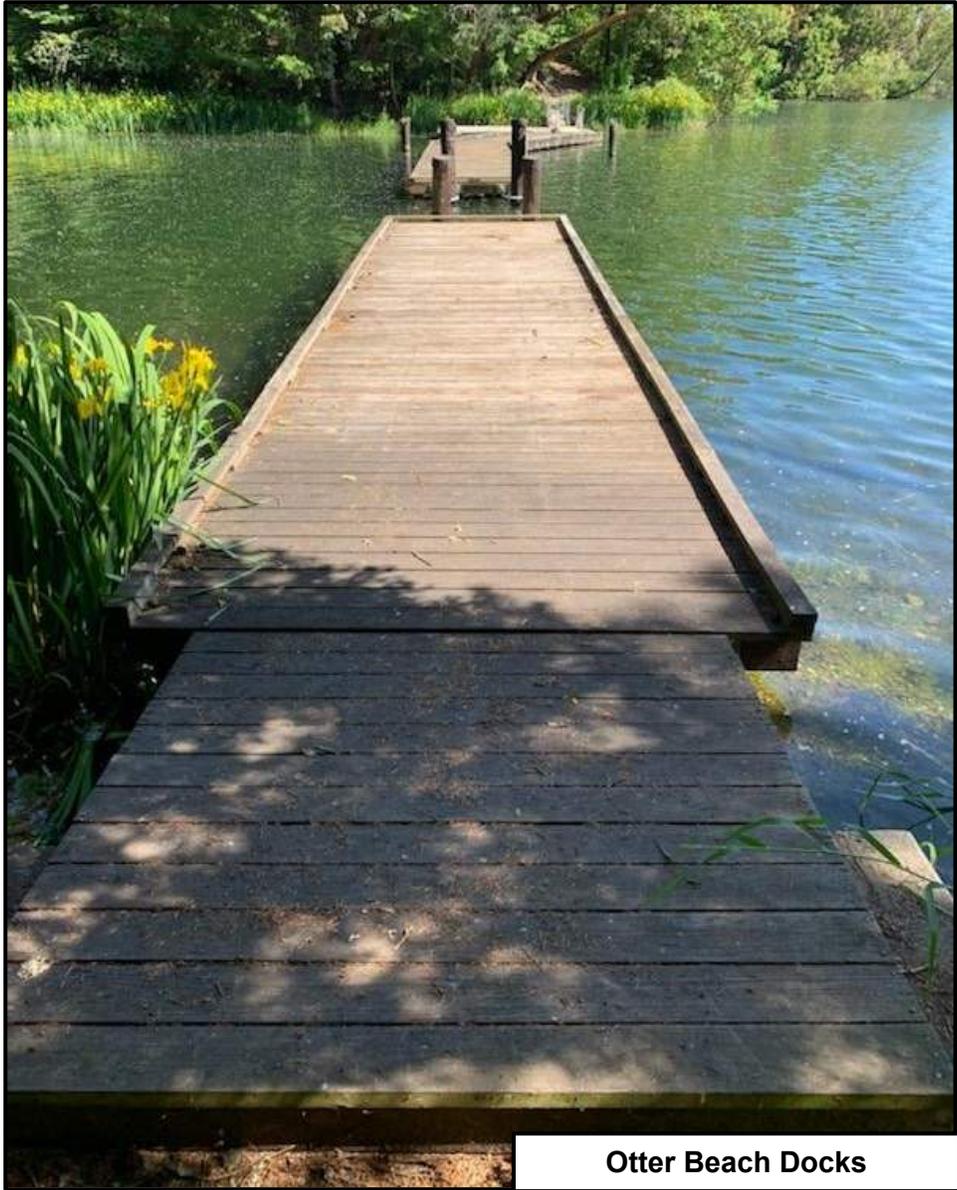
INSPECTION SUMMARY

The docks are framed with pressure-treated 2x8 stringers at 30" on center and supported by tire floats at approximately 4' on center. The outside stringers are lapped with a second 2x8. The decking consists of non-pressure treated 2x's which are supported by the stringers. A 2x4 bull rail is framed around the perimeter of both docks which is broken at some locations. Boats are tied onto the bull rail and steel cleats should be installed to the tops of the rails with additional blocking.

The pressure-treated framing is not experiencing significant rot or water damage, but up to 1/2" knife penetration was observed at some rim joist locations. This amount of penetration suggests that they may need to be replaced in the near future. Timber decking is experiencing surface weathering and is warped and lifting at some edges. The primary decking damage is located at the 20' by 14' section and is in need of replacement at the northern dock (Figure 1).

An aluminum ramp is located between the 20' and 14' platform and the angled section which is holding the two ends of the docks together using a 4' wide hinge. The pin in the hinge is damaged and should be replaced (Figure 2). The concrete slabs at the shore sides of both docks are both undermined. The slab at the south dock is undermined up to 9" in both directions at the shore side and must be filled in (Figure 3). The slab at the north end is undermined beneath the middle and is spanning about 1' and will break eventually if not filled in and supported (Figure 4).

The pile at the northeastern corner of the south dock is rubbing against and wearing away a 16" section of the end rim joist and may be a concern in the future (Figure 5). At the end of the north dock, the end tire supports is completely submerged under water with the weight of two people at the end of the dock. The tire floats may need to be replaced to provide sufficient support.



Otter Beach Docks

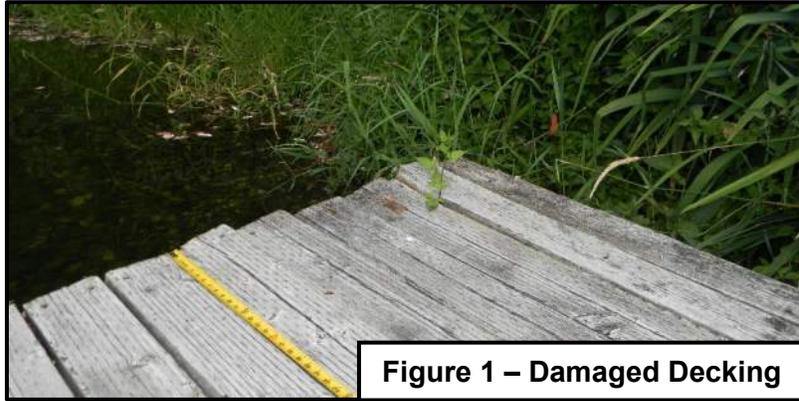


Figure 1 – Damaged Decking

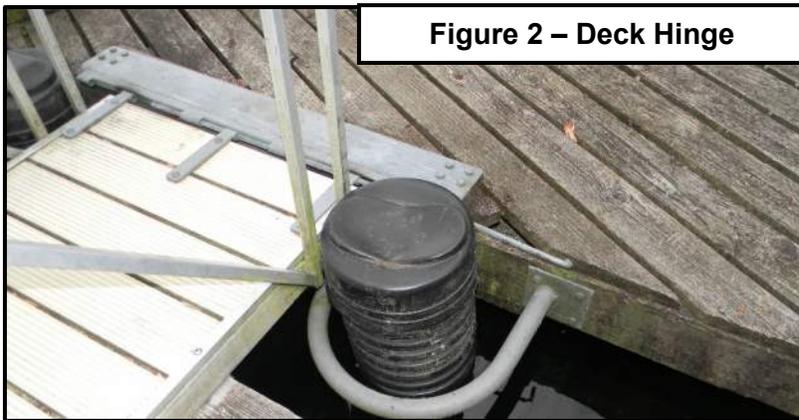


Figure 2 – Deck Hinge

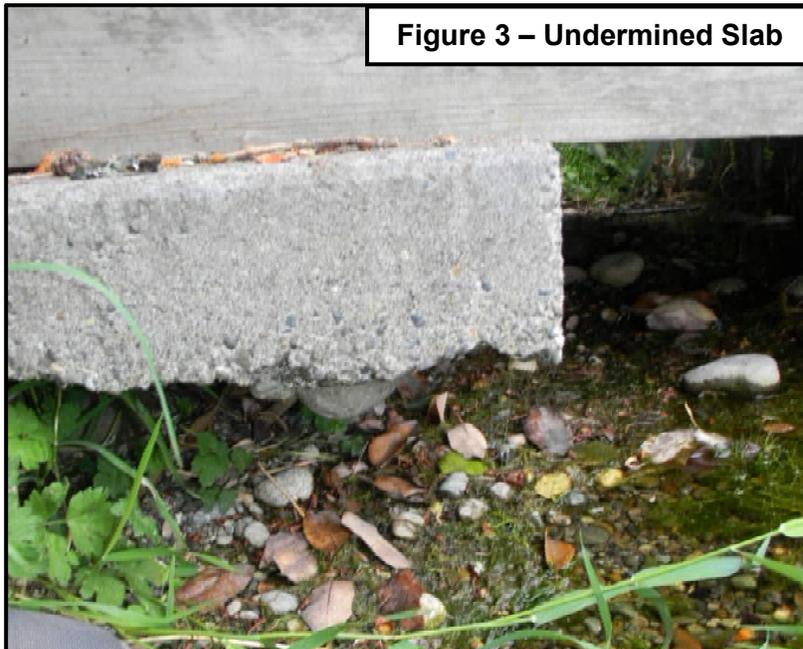


Figure 3 – Undermined Slab



Figure 4 – Undermined Slab

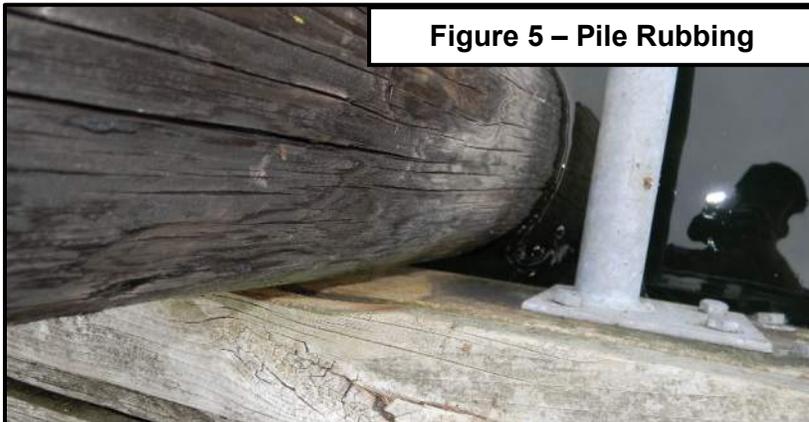


Figure 5 – Pile Rubbing

Clearwood Community Bridges & Docks
Horseshoe Dock
Inspection Date: July 24, 2020
Inspected by: Jacob Gustafson, EIT & James K. Farley, PE, SE

STRUCTURE DESCRIPTION

The dock is 10' wide, 30' long, and runs east to west and is located on Horseshoe Lake. The deck supported by four 12" piles which break up the dock into three spans. The first span is approximately 17' between the shore and the first pile cap. The second span is approximately 9' in length to the next pile cap and then cantilevers 4' at the third span. Pressure treated 4x4 guardrail posts are located at 6' on center around the perimeter of the dock, attached to 2x rim joists.

INSPECTION SUMMARY

The dock is constructed with pressure treated 2x decking over pressure treated 4x stringers at 4' on center. Two of the three beam lines align directly with the piles and the middle beam line lands on the pile caps of the same size which span approximately 7' between piles.

The rim joists are warping around the perimeter and are separating from the decking, causing nails to be exposed (Figure 6). The decking displays significant sagging and rot, which will require replacement throughout. Additional stringers are suggested to reduce this problem in the future.

All guard rail posts have been notched at the base and visibly sag outward (Figure 7). The posts are also easily moved by hand. Many of the handrail sections are significantly damaged as well. The guard rails must be replaced with 4x4 or 4x6 posts without notching the bottoms and the handrails should be replaced as well.

The piles below do not show any significant damage, although are showing early signs of rot. This is not a current problem but may require repair in the near future.



Horseshoe Dock

Figure 6 – Decking Separation



Figure 7 – Notched Posts



Clearwood Community Bridges & Docks
Upper Spillway Bridge
Inspection Date: July 24, 2020
Inspected by: Jacob Gustafson, EIT & James K. Farley, PE, SE

STRUCTURE DESCRIPTION

The Upper Spillway Bridge is a single span timber bridge that runs east to west. The bridge spans over a man-made asphalt spillway which flows from Blue Lake, toward Clear Lake. The bridge is approximately 7' wide and has a total length of 42'. At the east and west ends of the main span there are 16" wide concrete strip footings and 6x6 bearing blocks. The main span of the bridge is approximately 30' long and is supported with four 6x8 beams, with an angled ramp at the western approach. The bridge is decked with timber 2x decking which spans a foot past the guard rail.

INSPECTION SUMMARY

The 30' span of the bridge is constructed of four pressure treated 6x8's spaced at 24" on center and are unsupported over the full span. The bridge does not show any significant sagging, although it visibly deflects with one person walking across the deck. The stringers should be strengthened by adding additional beams or steel channels.

The guard rail posts are fully intact at the base and are attached to the exterior stringers with two 1/2" diameter bolts, spaced 6" apart. The posts are spaced at 6' on center and do not display significant deflection. While they do not meet current code, the posts are not a current concern.

The decking is weathered but does not show any significant signs of damage or rot. The stringers below are not damaged despite the deflection concerns and the pressure treatment is fully intact.

Upper Spillway Bridge



Clearwood Community Bridges & Docks
Bear Island Bridge
Inspection Date: July 24, 2020
Inspected by: Jacob Gustafson, EIT & James K. Farley, PE, SE

STRUCTURE DESCRIPTION

The Bear Island Bridge is a single span timber bridge that runs northwest to southeast. The bridge spans to Bear Island over a small offshoot of Blue Lake between the Upper and Lower spillways. The bridge is approximately 7' wide and has a total length of 24'. At the east and west ends of the main span there are 12" wide concrete strip footings. The span of the bridge is approximately 22' long and supported by four 6x8 beams. The bridge is decked with timber 2x decking which spans past the guard rail.

INSPECTION SUMMARY

The 22' span of the bridge is constructed of four pressure treated 6x8's spaced at 24" on center and are unsupported over the full span. The bridge does not show any significant sagging, although it will not be able to support an ATV or excavator load without strengthening.

The guard rail posts are fully intact at the base and are attached to the exterior stringers with two 1/2" diameter bolts, spaced 6" apart. The posts are spaced at 6' on center and are deflecting when pushed on. Some of the guard rail posts are splitting or showing rot and should be replaced (Figure 8).

The decking is weathered but with minor warping at the ends of the 2x's. The stringers below are not damaged despite the deflection concerns and are not showing any significant weathering.

Bear Island Bridge



Figure 8 – Damaged Posts



Clearwood Community Bridges & Docks
Lower Spillway Bridge
Inspection Date: July 24, 2020
Inspected by: Jacob Gustafson, EIT & James K. Farley, PE, SE

STRUCTURE DESCRIPTION

The Lower Spillway Bridge is a single span timber bridge that runs east to west. The bridge spans over a man-made asphalt spillway which flows from Blue Lake, toward Clear Lake. The bridge is approximately 7' wide and has a total length of 38'. At the east and west ends of the main span there are 16" wide concrete strip footings with ramps above and a platform at the east end. The span of the bridge is approximately 24' long and supported with three 6x10 beams. The bridge is decked with timber 2x decking which spans past the guard rail.

INSPECTION SUMMARY

The 24' span of the bridge is constructed of three pressure treated 6x10 stringers spaced at 36" on center. The bridge does not show any significant sagging, although the stringers are visibly weathered which will begin to rot.

The guard rail posts are fully intact at the base and are attached to the exterior stringers with two 1/2" diameter bolts, spaced 6" apart. The posts are spaced at 6' on center and do not display significant deflection. While they do not meet current code, the posts are not a current concern.

The decking is weathered but does not show any significant signs of damage or rot. The 36" span between the beams may eventually be a concern for the decking, but it is currently safe.

Lower Spillway Bridge



Clearwood Community Bridges & Docks
Rampart Bridge
Inspection Date: July 24, 2020
Inspected by: Jacob Gustafson, EIT & James K. Farley, PE, SE

STRUCTURE DESCRIPTION

Rampart Bridge is a 6-span bridge located at the eastern end of Blue Lake and runs north to south. The bridge is approximately 7' wide at the ends and widens to 8'-6" at the middle two spans with a total length of approximately 105'. The south shore approach is approximately 13' long, which leads up to a ramped portion spanning 18'. The middle spans are each 18' in length and compose a platform with six benches at the sides. The following span ramps down for an 18' distance and then the final section spans 20' to the opposite shore. The bridge is supported by a total of 10 piles which are embedded into the bottom of the lake.

INSPECTION SUMMARY

The north and south end spans are supported by two pressure treated 6x10 stringers spaced approximately 6' apart with 2x10 rim joists. At the South end, the stringers are resting directly above the piles on 6x6 pile caps which span approximately 6'. The pile caps at the North end consist of two stacked flat 6x8's. These piles are unbraced and have been painted with a protective coating in the past. The piles reach a height of approximately 4' above the water and is in good condition with minor weathering and minimal rot. The decking is deflecting at this location and will likely require replacement.

The sloped spans and the middle spans are supported by pressure treated 6x10's also spaced at 6' on center and is additionally supported by a double 2x8 center stinger. The stringers rest on 4x10 pile caps, which are skewed to the direction of the dock at the top of the ramps. The three sets of piles between these spans reach a height of approximately 8' above the water and are braced with diagonal 2x cross bracing. The decking is also deflecting at this location, although less significantly. There is also a high likelihood that the deflection at this location is due to the double 2x8 which is overstressed.

All guard rail posts are attached to the rim joist/fascia, have been notched at the base, and are visibly sagging outward (Figure 9). The posts are also easily moved by hand. Many of the handrail sections are significantly damaged as well. The guard rails must be replaced with 4x6 or 4x4 posts without notching the bottoms of the posts and the handrails should be replaced.



Rampart Bridge



Figure 9 – Damaged Posts

Clearwood Community Bridges & Docks

Inflow Bridge

Inspection Date: July 24, 2020

Inspected by: Jacob Gustafson, EIT & James K. Farley, PE, SE

STRUCTURE DESCRIPTION

The Inflow Bridge is a single span timber bridge that runs east to west with ramps at each side. The bridge is approximately 7' wide and has a total length of 35'. The east and west ramps are each 10' in length and the middle of the bridge is spanning 15' over a small creek. The bridge is supported by 4x12 stringers and has flat 6x6 timber abutments at either end of the center span. The bridge is decked with timber 2x decking which spans past the guard rail.

INSPECTION SUMMARY

The 15' span of the bridge is constructed of four pressure treated 4x12 stringers spaced at 24" on center and is unsupported over the full span. This span reaches a maximum height above the water of approximately 18". The bridge does not show any significant sagging, although the stringers are visibly weathered.

The guard rail posts are fully intact at the base and are attached to the exterior stringers with two 1/2" diameter bolts, spaced 6" apart. The posts are spaced at 5' on center and do not display significant damage or deflection. While they do not meet current code, the posts are not a current concern.

The decking is weathered but does not show any significant signs of damage or rot. There is also a bench at the south side at the middle side which hangs off two of the guardrail posts. This design will not meet code requirements but is sufficient for now.

Inflow Bridge



Clearwood Community Bridges & Docks
Brookside Bridge
Inspection Date: July 24, 2020
Inspected by: Jacob Gustafson, EIT & James K. Farley, PE, SE

STRUCTURE DESCRIPTION

The Brookside Bridge is a single span timber bridge that runs east to west. The bridge spans over a small creek which flows toward Blue Lake. The bridge is approximately 8' wide and has a total length of 20'. At the ends of the main span there are 6x timber abutments. The bridge spans the full 20' distance and is supported with 6x6 beams. The bridge is decked with timber 2x decking which spans a few inches past the guard rail.

INSPECTION SUMMARY

The 20' span of the bridge is constructed of three pressure treated 6x6's spaced at 42" on center. The bridge does not show any sagging, although it significantly deflects with one person walking across the deck.

The guard rail posts are notched at the base and are attached to the exterior stringers with two ½" diameter bolts, which are spaced 2" apart (Figure 10). The posts are spaced at 7' on center and visibly deflect when pushed on.

The decking is weathered but does not show any significant signs of damage or rot. The stringers below are not damaged despite the deflection concerns and are not showing any significant weathering.

This bridge falls short of code requirements at almost every structural component of the bridge and should be replaced. The bridge currently will not fall down with one or two people on it, but it is still a safety concern.



Clearwood Community Bridges & Docks

Arch Bridge

Inspection Date: July 24, 2020

Inspected by: Jacob Gustafson, EIT & James K. Farley, PE, SE

STRUCTURE DESCRIPTION

The Arch Bridge is a 3-span bridge which runs northwest to southeast over a narrow part of Blue Lake. The bridge is approximately 6'-6" wide and has a total length of 55'. The outside spans at each shore side ramp upward and span 20' with 6x10 stringers. The center span of the bridge is approximately 15' long and constructed of 4x10 stringers on four 12" diameter piles at each side. The bridge is decked with timber 2x decking which are attached to 2x10 rim joists.

INSPECTION SUMMARY

The sloped end spans are supported by two pressure treated 6x10 stringers spaced approximately 4' apart with pressure treated 2x10 rim joists. The middle span is supported with two pressure treated 4x10's along with the continued 2x10 rim joists. The pile caps consist of 4x10's which are skewed from the angle of the decking. The piles are unbraced and have been painted with a protective coating in the past. The piles reach a height of approximately 8' above the water and are in good condition with minimal weathering and rot.

The guard rail posts are notched at the base and is attached to the rim joists with multiple nails and two 1/2" diameter bolts, spaced 6" apart (Figure 11). The bays beside the posts have 4x blocking between the rim joist and stringers. The posts are spaced at 4' on center and slightly deflect when pushed on. The guard rail post spacing meets code requirements, but the notched 4x4's do not and replacement would be recommended.

The decking is weathered but does not show any significant signs of damage or rot. The 48" span between the beams may eventually be a concern for the decking, but it is currently safe.



Clearwood Community Bridges & Docks

Reichel Bridge

Inspection Date: July 24, 2020

Inspected by: Jacob Gustafson, EIT & James K. Farley, PE, SE

STRUCTURE DESCRIPTION

The Reichel Bridge is a 3-span timber and steel bridge at the northernmost end of Clear Lake that spans north to south over a small inlet connected to the lake. The bridge is approximately 7' wide and has a total length of approximately 36'. The center span of the bridge is 20' in length and cantilevers 8' at each end which bears on 12" diameter wood piles. The bridge is decked with timber 2x decking and has guardrail posts consisting of double 2x4's. There are steps with concrete pads at both ends, and the pads are not attached to the bridge.

INSPECTION SUMMARY

The bridge is constructed with four pressure treated timber 4x4 stringers at 24" on center and span 5' to pressure treated 4x8 cross beams. The 4x8's rest on paint coated C10x15.3 steel channels which are bolted to the timber piles. In addition to the bolted connection, the C-channels are also resting on pressure treated 4x6's which have been bolted to the piles as well. The channels cantilever out 8' to the steps at either end. The timber piles reach a maximum height of approximately 10' and are cross-braced by steel rod diagonal braces in two directions. The piles have been painted and do not show any signs of damage or rot.

The steel channels are to be free of rust and the exterior paint coat is undamaged. The 4x8 beams supporting the stringers are also supporting the guard rails at their ends and extend out up to 2' at some locations. The extended ends are deteriorated at some locations and should be cut off and sealed with a cap (Figure 12).

The guard rail posts are fully intact at the base and are attached to the exterior steel channels and 4x8's with bolts in multiple directions. The posts are spaced at 5' on center and do not display significant deflection. While they do not meet current code, the posts do not present a safety concern.

The timber girders, timber pile caps, and timber piles are in good condition and do not require any repairs or strengthening at this time.



Reichel Bridge



Figure 12 - Beam End Damage

Clearwood Community Bridges & Docks
Longmire Bridge
Inspection Date: July 24, 2020
Inspected by: Jacob Gustafson, EIT & James K. Farley, PE, SE

STRUCTURE DESCRIPTION

Longmire Bridge is a 9-span bridge at the northwestern end of Clear Lake which runs east to west. The bridge is approximately 7' wide at most locations and has a total length of 70'. The bridge is composed of seven individual platforms of different heights, with six of the platforms being 7'x10' and stepping up to a middle 17'x10' platform. The entirety of the bridge is supported by a total of 18 individual driven piles with concrete pier footings at each shoreline. The bridge is decked with timber 2x decking which extends a few inches past the guard rail.

INSPECTION SUMMARY

Each of the smaller platforms is centrally supported at the side by two timber piles with a pressure treated timber 4x8 pile cap. The pile caps are attached to the piles with bolted steel plate hangers at each side. Pressure treated 2x6 joists are spaced at 24" on center and span 5' in both directions to the ends of each platform. The 2x6's are attached to 4x rim joists at their ends which hang off the next platform above. This attachment consists of thick-gauge straps which are bolted to the upper and lower rim joists at each end. A 2x kick-board is attached to the upper rim joists in order to hide the heads of the bolts.

The tallest platform located at the middle is constructed of more pressure treated 2x6 joists which are spanning approximately 8 feet between the 4x8 pile caps. The pile caps span up to 7' and are also attached to the piles with steel plate hangers.

The 4x4 guard rails are attached to the inside of the exterior 4x rim joists with bolts spaced 4" to 5" apart. The guard rails are spaced at 5' on center and are to be in very good condition.

The timber joists, timber pile caps, and timber piles are in good condition and do not require any repairs or strengthening at this time.

Longmire Bridge

