

Herron Island Mainland Ferry Terminal

ROUTINE STRUCTURE INSPECTION – 2012



For: HMC Management
Inspection By: Sargent Engineers, Inc.
A.L.Packard, P.E.
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Inspection Date: March 16, 2012



SARGENT



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April 9, 2012

Ms. Claudia Ellsworth
HMC Management
P.O. Box 119
Lakebay, WA 98349

RE: Ferry Terminal Observation
Project No.: A12108.00

Dear Ms. Ellsworth:

INTRODUCTION

BRIDGE DESCRIPTION

The Herron Island Ferry terminals service a single ferry that is the only means for vehicular traffic to and from Herron Island and the mainland. The terminals carry a single lane of traffic that is controlled by signs, lights and ferry crew members. The approach spans leading to the draw span terminals consist of a cast in place reinforced concrete slab superstructure, supported by concrete abutments and reinforced concrete piles. The lift span superstructure consists of a timber plank deck, two painted steel girders, and a painted steel stringer and floor beam system. The lift span superstructure is supported by a concrete cap and concrete piles at one end and steel lift towers on battered concrete pile at the other end. The bridge is equipped with steel bridge rails with concrete and steel curbs. The bridge is not currently posted for vehicular loads, but the Heron Island Terminal Access Policy limits vehicle weight to 40,000 pounds. The length wise numbering orientation for both terminals is from the land end to the terminal end, and for side to side it is left to right.

TIME AND SCOPE OF INSPECTION

This inspection was performed on March 16, 2012. The inspection covered all of the structural elements of the mainland terminal that were above the water line at the time of the inspection. Areas inspected included the concrete approach spans, steel lift spans, and the steel counterweight towers. The inspection also covered the mechanical elements of the mechanical lifting system for the mainland and island terminals. The mechanical components inspected include the concrete counterweight towers, the lifting cables, cable anchors, and sheaves.

VISUAL INSPECTION

MAINLAND REINFORCED CONCRETE APPROACH SPANS

The reinforced concrete approach slabs are integral with the bent caps and piles:

Roadway Approach:

- Good condition, no deficiencies observed.

Reinforced Concrete Slabs:

- Good condition, no deficiencies observed.

Reinforced Concrete Bent Caps:

- Good condition, no deficiencies observed.

Reinforced or Prestressed Concrete Piles:

- Good condition, no deficiencies observed.

Reinforced Concrete Abutment:

- Good condition, no deficiencies observed.

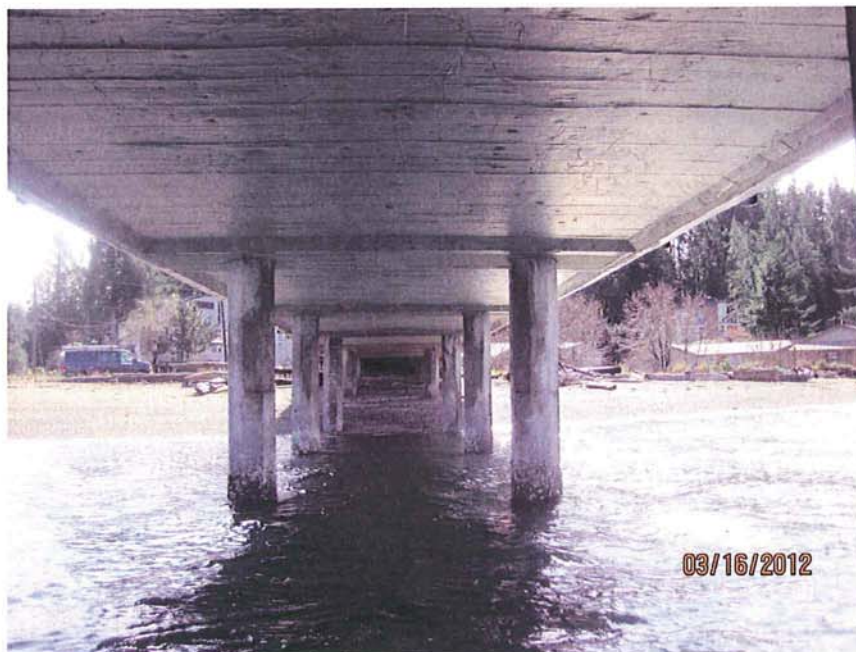


Image 1: Reinforced concrete approach spans.

MAINLAND BUILT-UP WELDED STEEL LIFT SPAN

Rail and Curb System:

- Good condition, no deficiencies observed.

Timber Deck:

- Generally, the deck planks are becoming worn and are in the later stages of their service life. The surface of the planks is wearing and rutting in the traffic wheel lines and there are checks and splits in many of the planks. Counting from the mainland end, planks three and 26 are heavily split and decayed and should be replaced soon. Planks 17, 22, 24, 31, 33, 43, 46, 47, 50, 60, 67, 87, and 90 were found to have advanced splitting and wear and should be monitored for further deterioration. The deck attachment clips to the stringers are in good condition.



Image 2: Note splits in the timber deck near the top of the Image.

Painted Steel Stringers:

- The stringers are in fair condition. There are rust stains washing down from the interface between the stringers and the deck. Vehicle traffic is most likely causing the deck planks to wear against the tops of the stringers, causing the paint to wear. Several stringers have dark rust stains along their welded connections to the floor beams. No significant corrosion was observed in these joints or on the stringers. There are many local paint failures throughout the stringers, which promote surface corrosion.



Image 3: Note surface rusting on the steel stringer.

Painted Steel Floor beams:

- The painted steel floor beams are in a similar condition as the stringers. The floor beam connection to the main girder is welded. The welds are such that they intersect the welds of adjacent lateral bracing gusset plates. When welds like these intersect, they cause a stress concentration. This area can be susceptible to cracking. No cracking was observed in these welds at the time of this inspection. However, this is a location that should be closely looked at during each inspection.



Image 4: Typical of the floor beam connection to the girder.



Image 5: Typical of rust staining washing down the stringers and floor beams.

Painted Steel Girders:

- The steel girders are in fair condition. There are two main girders in this span, which are considered fracture critical because they are steel and there is no load path redundancy. I.E., if one girder were to fail the entire span would fail. The steel girders appear to receive more salt spray than the stringers and floor beams, as a result there are several areas of blistering paint and surface corrosion. Most blistering is along the bottom flange of the girders. Several strengthening details have intersecting welds similar to those of the floor beams. No cracking in the girders or welds were observed at the time of this inspection. No deficiencies were noted in the lifting outriggers located near the end of the lift span.



Image 6: Typical condition of the exterior face of the steel girders.



Image 7: Localized corrosion on the exterior face of a steel girder, along the bottom edge.



Image 8: Interior face of a steel girder: Typical of the corrosion around the connections of other members to the interior side of the girders.

Painted Steel Bearings:

- The bearings are in fair condition. The movable painted steel bearing at bent 9 appears to be free and in good service condition. There is some paint deterioration and corrosion along the edges of the bearing.



Image 9: Typical of the corrosion around the girder bearing.

Galvanized Steel Lifting Tower:

- Good condition, no deficiencies observed in the galvanized steel tower.
- Debris and muck is accumulating in the cavity on top of the reinforced concrete counterweight. The debris and muck should be cleaned out periodically.



Image 10: Typical of the steel lifting towers.

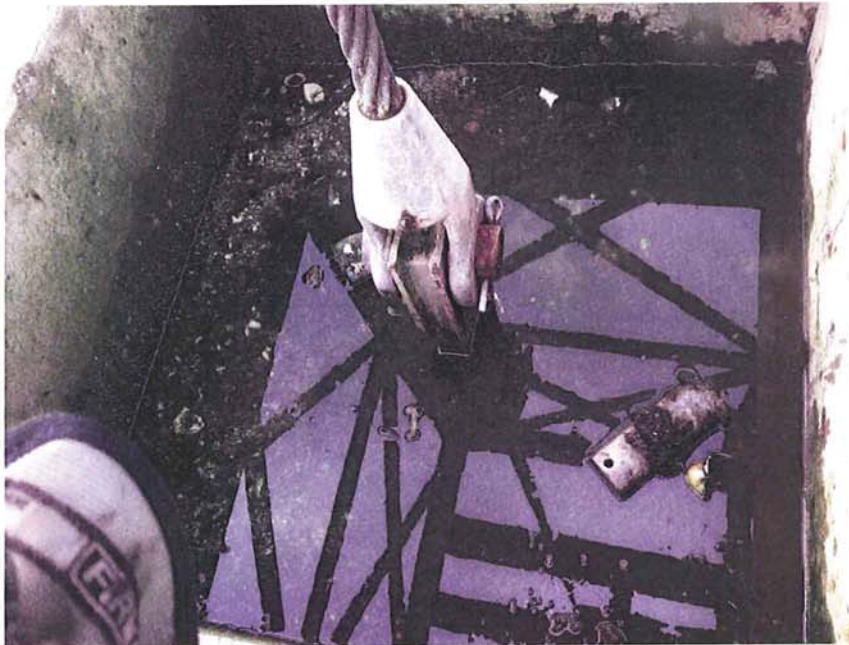


Image 11: Typical of debris and muck build-up in the cavity on top of the counterweights.

Concrete Pier and Piles at Bent 10:

- Good condition, no deficiencies observed.



Image 12: Pier 10.

MAINLAND MECHANICAL LIFTING SYSTEM

Steel Wire Cables

- The left side lifting cable is in good condition. The right side lifting cable is in poor condition. Both cables are well greased. The right side cable is not properly winding onto the winch spool. The cable is not winding in uniform and even layers, rather it is somewhat arbitrarily winding on to the spool. The tension in the cable is causing the cable to drag and twang into place, which is causing it to wear on itself. This wear has caused several of the strands within the cable to fray and sever. The cable should be replaced as soon as possible. Until the cable is replaced it should be re-spoiled correctly and monitored for further wear. If it becomes noticeable that more strands are breaking, the cable should be immediately removed from service. The left side lifting cable appears to be winding correctly.

Large 1.25" diameter
counterweight cables

Smaller diameter lifting
cables



Image 13: Mechanical cable lifting system.



Image 14: Correctly spooled lifting cables. Note uniform and even wrap.



Image 15: Incorrectly spooled lifting cable, note gaps and lack of uniformity.



Image 16: Damaged and broken strands in the lifting cable.

- The counterweight cables are well greased and in satisfactory condition. There is some minor wear in the strands along the bottom side of the cable that passes over the two larger 24 inch diameter sheaves on top of the lifting tower.



Image 17: Shiny flat spots in the counterweight cable near the upper sheaves.

Cable Anchors:

- The counterweight cable anchors are in good condition. Debris and muck is building up in the cavity on top of the counterweight. The debris is clogging the drain holes and causing standing water around the connection of the cable to the weight. The cable anchor plate paint is wearing thin and the plates have some surface corrosion.
- The lifting cable anchors are in good condition.

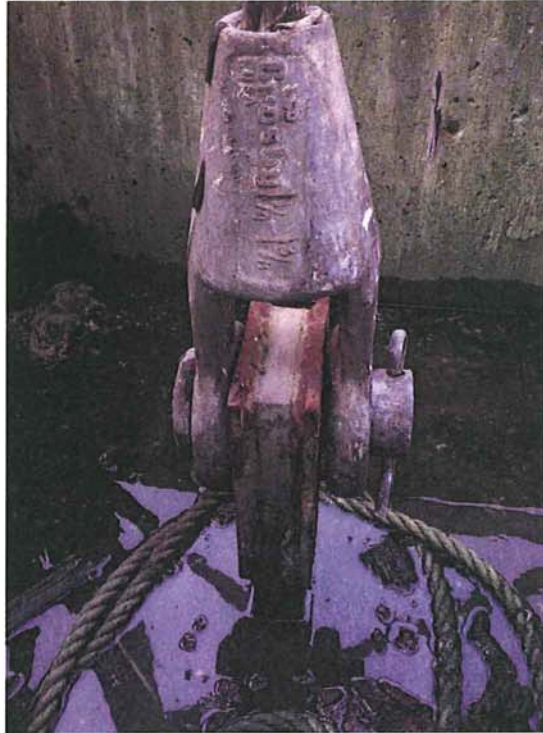


Image 18: Typical counter weight cable anchor. Also note the surface corrosion on the connection plate.



Image 19: Typical lifting cable anchor. Also note the surface corrosion on the outrigger connection plate.

Pulleys and Clevis Connections:

- The pulleys within the cable lifting system are in good condition.
- The clevis connections in the counterweight and lifting system are in good condition. There are several clevis connections without cotter pins. There is no indication that any of the bolts in the clevises are loose or that the lack of a cotter pin is a problem.

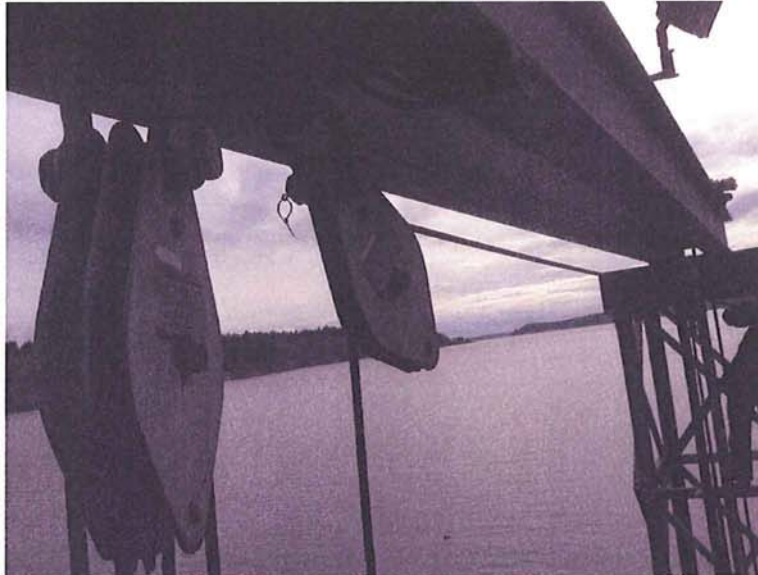


Image 19: Lifting pulleys.



Image 20: Typical clevis connecting a lifting cable to a pulley. Note the lack of a cotter pin in the clevis bolt.

Sheaves:

- The 20 inch diameter sheaves in the lifting cable system and the 24 inch diameter sheaves in the counterweight system are in good condition. All of the sheaves are well greased and appear to be running smoothly.



Image 21: Typical well-greased counterweight sheave.

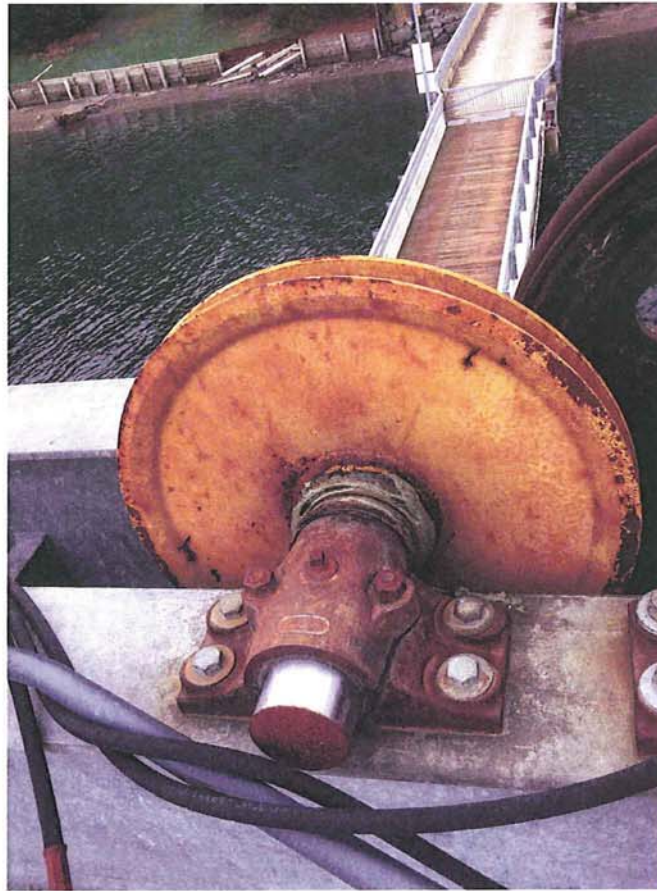


Image 22: Typical well-greased lifting cable sheave.

HERON ISLAND MECHANICAL LIFTING SYSTEM

Steel Wire Cables:

- The left and right side lifting cables are in good condition. Each cable appears to be winding correctly and is well greased.
- The counterweight cables are well greased and in satisfactory condition. There is some minor and normal wear in the strands along the bottom side of the length of cable that passes over the two larger 24 inch diameter sheaves at the top of the lifting tower.

Cable Anchors:

- The counterweight cable anchors are in good condition. Debris and muck is building up in the cavity on top of the counterweight. The debris is clogging the drain holes and causing

standing water around the connection of the cable to the weight. The cable anchor plate paint is wearing thin and the plates have some surface corrosion

- The lifting cable anchors are in good condition.

Pulleys and Clevis Connections:

- The pulleys within the cable lifting system are in good condition.
- The clevis connections in the counterweight and lifting system are in good condition. There are several clevis connections without cotter pins. There is no indication that any of the bolts in the clevises are loose or that the lack of a cotter pin is a problem.

Sheaves

- The 20 inch diameter sheaves in the lifting cable system and the 24 inch diameter sheaves in the counterweight system are in good condition. All of the sheaves are well greased and appear to be running smoothly.

RECOMMENDED MAINTENANCE AND REPAIRS

The following are maintenance and minor repair recommendations that should be performed to keep the bridge elements functioning properly and extend the life of the bridge.

Mainland Ferry Terminal

1. Blast clean and spot paint the steel girders in the lift spans.
2. Monitor lift spans paint systems, schedule complete paint system as necessary.
3. Monitor intersecting welds on floor beams and main girders during subsequent inspections.
4. Replace deck planks three and 26, monitor and replace remaining planks as necessary.
5. Periodically clean out the cavity on the top side of the reinforced concrete counter weights.

Mechanical Lifting System for the Mainland and Heron Island Terminals

6. Continue cable and grease maintenance schedule.
7. Replace the right side mainland terminal lifting cable as soon as possible.

8. Re-spool and monitor the existing right side mainland lifting cable until it can be replaced.
9. Consider replacing the existing clevis bolts without cotter pins, for longer ones with cotter pins.

SUMMARY

The concrete approach spans appear to be in good structural condition with no significant deficiencies noted. The timber deck planks are in the later stages of their service life. It should be expected that many of the planks will begin to split and require replacement over the next few years. Salt spray is a continual problem for painted steel structures, and the main span lift terminals are no exception. The paint system on the girders is failing and blistering in several locations. A good spot paint and paint maintenance schedule is a necessary effort to control corrosion, and will extend the service life of the steel members for many years. Though no significant surface section loss from corrosion was observed, spot painting should take place fairly soon to ensure it does not start. With the exception of one lifting cable at the mainland terminal, the cable and mechanical lift systems appear to be well maintained and in good condition.

If you should have any questions, please call.

Respectfully,
Sargent Engineers, Inc.



Andrew L. Packard
Project Engineer

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APPENDIX

DRAWINGS AND PHOTOGRAPHS



Image 23: Typical of approach span construction.



Image 24: Typical of lift span construction.