Gambier Harbour, Gambier Island
Ports Condition Assessment

DRAFT FOR CLIENT REVIEW
2023.03.30

February 28, 2023

Prepared for:

Sunshine Coast Regional District
1975 Field Road
Sechelt, BC
V0N 3A1

Attention: Kelly Koper, Capital Projects Coordinator
[Ports]

Prepared by:

Herold Engineering Limited
Unit 7, 1920 Lyche Road
Ucluelet, BC
V0R 3A0

HEROLD ENGINEERING

www.heroldengineering.com

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Herold Engineering Limited
Unit 7, 1920 Lyche Road
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Submittal Date: February 28, 2023

Herold Project No.: 4551-012

Prepared by:

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Project Engineer

Reviewed by:

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Craig Work, P. Eng., FEC
Principal

Executive Summary

The scope of the assignment includes above and below water assessment of the Gambier Harbour port facility followed by preparation of a site-specific condition assessment report. The report includes health and safety considerations and load rated capacities for the overall structure, as well as residual life estimates for individual members. A brief gap analysis between the existing structure and locally accepted Best Management Practices for marine facilities was completed using cited reference material (see Section 1.3). The Best Management Practices utilized for the analysis were generated and apply to Howe Sound, Pender Island, and the Sunshine Coast region.

The assessment was conducted on November 28 and 29, 2022. The purpose of the assessment was to document the overall physical condition of the facility through review of provided reference material (previous reports/drawings) and visual and tactile assessment of accessible elements from above and below water. The above water assessment was conducted by Herold Engineering and the underwater portion of the work was completed by Westcoast Diving Contractors Limited under direct audio and visual communication with Herold Engineering.

The port facility is in overall serviceable condition. Assessment results indicate that minor remedial work the structures is required.

There are some items identified as recommended to be repaired/replaced within the next year as follows:

- Eight sections of timber guard to be replaced on the approach
- All timber guarding on the wharfhead to be replaced
- One post is to be replaced
- Nine concrete footings are to be re-cast
- One bearing pile is to be patched
- Seventeen cross braces and one wale timber to be replaced
- Four brace/wale connections are to be re-secured
- One fender chock to be replaced
- Signage at safety ladders to be installed
- Field coating touchups to steel bull rails is recommended

The gap analysis identified minor items which could be completed at the facility to bring it closer to adherence with BMPs. The following could be considered during the next maintenance cycle/upgrade:

- Consideration should be given to prohibiting vessel moorage in the winter season.

The following recommendations pertain to Health and Safety at the facility:

- Safety ladder spacing and signage does not conform to WorkSafe BC regulations.
- Handrails do not conform to OH&S standards.

The load rating was established using The Canadian Highway Bridge Code (CAN/CSA S16-19), and assumes that all repairs identified to qualify the rating have been completed. The fixed structure(s) has been rated for a CL2-W design vehicle only with a maximum GVW of 8,250kg. The float is in serviceable condition and is rated to a maximum occupancy load of 1.3kPa. The gangway has been rated to a maximum area load of 1.5kPa. Load limit signage is to be installed once repairs are completed to qualify the rating.

GAMBIER HARBOUR, GAMBIER ISLAND
PORTS CONDITION ASSESSMENT
Table of Contents

TO BE REVISED IN FINAL ISSUE

1.0 INTRODUCTION

Facility: Gambier, Gambier Island

Assessment by: Shannon Summersides, P. Eng. (Herold Engineering Ltd.)
Westcoast Diving Contractors Ltd. (3 man crew)

Date: November 29, 2022

1.1 Purpose of Assignment

The assessment was conducted to identify members either requiring repairs or showing signs of deterioration. The following report will provide information regarding maintenance, repair, replacement and health and safety on a 10 year forecasted time period, allowing for a prioritized repair and maintenance program to be implemented. Other items noticed during the assessment will be reported only in terms of general overall condition.

The assessment included detailed above water visual / tactile assessment of the following facility components:

- Abutment headwall
- Handrails
- Vehicle Guard
- Cleats
- Safety Ladders
- Deck Planks
- Stringers
- Pile Caps
- Cross Bracing
- Piles

Items assessed specific to floats:

- Gangways and connections
- Bull rails
- Rub boards
- Decking
- Floatation
- Mooring system (piles, anchor chains)

The facility was previously reviewed from above water by Herold Engineering in November 2018, and below water in 2015 by Pelagic Technologies Inc. (Pelagic). Reference drawings indicating noted bearing pile condition, as well as the chain and anchor mooring layout were provided to Herold Engineering. It is assumed that this reporting was conducted via underwater assessment.

1.2 Scope of Work

The assessment of the facility components was completed to the standards set out below. The work included facility components noted in Section 1.1.

The condition assessment and residual life estimates were based on previous experience, as well as the reference material noted below.

The load rating and capacity calculations were executed following the recommendations in the reference material noted below and best engineering practice.

All recommendations related to occupational health and safety were provided based upon current WorkSafe BC regulations, as well as our experience with facilities similar in form and function.

A gap analysis was conducted for the facility to evaluate compliance with several best management practices documents. The documents were prepared by municipalities and First Nations groups along the coast of Vancouver Island and the Coastal Mainland for the maintenance and construction of marine infrastructure. All documents were provided by The Sunshine Coast Regional District and are reference in Section 1.3 below.

1.3 Reference Material

- Procedures for Inspection and Assessment of Fixed Timber Docks – 1994 September – 4th Edition by R.G. Sexsmith Ltd.
- Standard Practice Manual for Underwater Investigations by the American Society of Civil Engineers, Ports and Harbors Committee, May 2000.
- Canadian Highway Bridge Design Code CAN/CSA S6-19.
- WorkSafeBC Occupation Health and Safety Regulations for Wharves, Docks and Mooring Floats
- Pender Harbour Dock Management Plan. Ministry of Forests, Lands, Natural Resource Operations and Rural Development. March 2021.
- Shisha'lh Nation Best Management Practices for Marine Docks. Version 20180605.
- Atl'ka7tsem/Howe Sound Biosphere Region Best Management Practices for Marine Docks. Draft 10. June 13, 2021.
- Canadian Navigable Waters Act. R.S.C, 1985, c.N-22. Canadian Minister of Justice. December 12, 2022.

1.4 Methodology

The facility was reviewed from above water by Herold Engineering Limited (Herold Engineering) and below water by Westcoast Diving Contractors Ltd (WDC) under direct audio and visual supervision of Herold Engineering.

The assessment involved a visual and tactile assessment of the structural elements, and select hammer soundings of timber elements. Refer to Section 5 for assessment results, as well as Appendix D for detailed remediation recommendations. Although these assessments are able to verify much of the visible and tactile damage, they are somewhat limited in assessing the severity and extent of internal damage, especially damage as a result of marine borer activity.

Load capacity calculations were completed using CAN/CSA S6-19. Residual life estimates for various elements were completed using guidelines provided in the reference material noted in Section 1.3. The findings are based on “as found” conditions at the time of the assessment.

2.0 DESCRIPTION

2.1 Location

Gambier Harbour Port Facility is located on the southern tip of Gambier Island, approximately 30 kilometers northwest of Vancouver, B.C in Howe Sound. Refer to the following aerial figure (Figure 2.1) for port location.

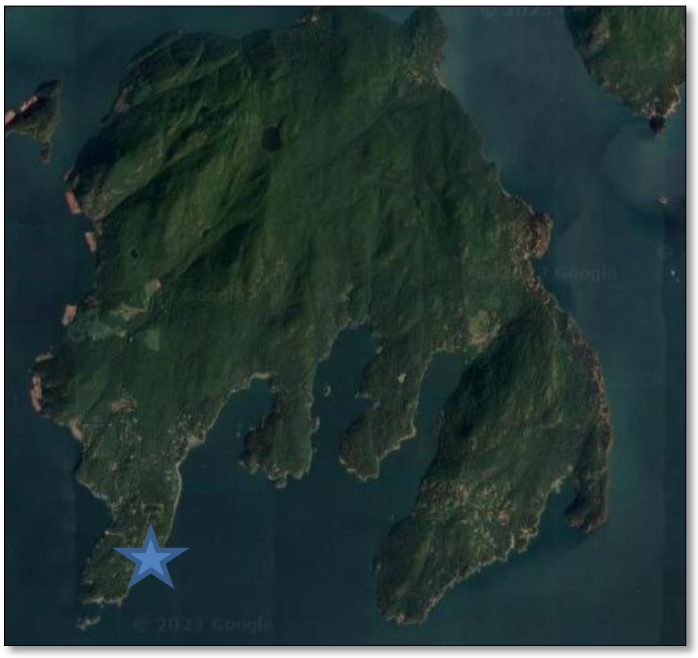


Figure 2.1: Gambier Harbour Site Location (Gambier Island)

2.2 Geometry

The overall geometry of the facility’s main components is as follows:

Approach	-	4.7m x 90.8m
Wharfhead	-	12.5m x 16.2m
Gangway Approach	-	3.7m x 8.4m
Gangway	-	1.2m x 13.3m
Float	-	4.3m x 24.4m

The general layout of the facility is as per the Herold Engineering Drawings 4551-012 S01 and S02 located in Appendix C.

2.3 Reference System

The reference system used for this report is as per the drawings found in Appendix C. For the purpose of this report, the approach, wharfhead, gangway, and float all generally run north to south, and the gangway approach section runs east to west.

Along the approach and wharfhead the pile bents are numbered from the abutment (Bent 0) to the wharf face (Bent 21). The pile rows are lettered from east to west as Gridlines A through to D.

There is one steel pontoon float at the facility, accessed by an aluminum gangway. The float is moored by treated timber mooring piles.

The general arrangement of the facility is shown in Photograph 1 & 2, located in Appendix A.

2.4 Approach & Wharfhead

The facility is a typical legacy Transport Canada facility, with some modification. The approach and wharfhead are mixed construction. The deck is a cast in place slab supported on treated timber substructure. Topside elements include steel vehicle guards, as well as timber guards along either side of the approach, and timber guarding only around the wharfhead perimeter. There is a derrick crane and service shed located on the wharfhead, as well as a life ring and miscellaneous signage.

The substructure is comprised of treated timber laminated decking, pile caps and bearing piles. The approach and wharfhead have intermittent lateral and longitudinal bracing, and the wharfhead is battered at the seaward end.

The abutment (Bent 0) appears to be a buried timber construction. The arrangement was not accessible for review at the time of the assessment.

Typical member sizes and spans are as follows:

Handrails	-	galvanized steel vehicle guard
	-	38mm x 89mm mid-rail
	-	89mm x 89mm x 1.5m posts
Approach Decking	-	114mm thick concrete deck
	-	38mm x 140mm laminated timber deck
Vehicle guard	-	191mm x 241mm
Risers	-	38mm x 140mm
Pile caps	-	356mm x 394mm creosote treated
Cross Bracing	-	152mm x 203mm
All Piles	-	Size 36 (305Ø) creosoted treated/concrete

2.5 Gangway

An aluminum gangway is located on the seaward edge of the gangway approach. The gangway provides access to a steel pontoon float. Truss member sizes are as follows:

Top Chord	-	HSS75x75
Bottom Chord	-	HSS75x75
Verticals	-	HSS75x75
Cross Beams	-	HSS75x75
Decking	-	51mm thick serrated aluminum

2.6 Float

Topsides of the float include painted steel tube bull rails and risers and treated timber decking. There is a timber landing pad with guide angles secured to the float deck.

The float substructure is a mixed construction consisting of treated timber stringers supported on steel cross ties and steel pipe pontoons. The float is moored by two compact mooring dolphins each comprised of six timber piles and stiffened with a header beam.

Typical component sizes and spans are as follows:

Decking	-	51mm x 305mm
Bull Rails	-	75mm diameter coated steel tube
Risers	-	75mm diameter coated steel tube
Pile Well Guards	-	102mm x 152mm
Rubboards	-	75mm x 305mm
Mooring Piles	-	Size 36 (305 Ø) creosote treated

3.0 Health & Safety Background

Legacy Transport Canada marine facilities of this kind have a similar construction and arrangement which is somewhat typical within the Pacific region. The majority of marine facilities are not able to meet areas of governing regulations for health and safety. It is at the discretion of the owners of the facility as to the stringency with which the following requirements are followed.

3.1 OH&S Requirements

3.1.1 Ladders

Fixed ladders must be provided at every dock for access to and egress from the water and should:

- Be spaced at intervals not exceeding 30 meters.
- Extend from the top of the float or fixed wharf structure deck to at least 1 meter below the lowest water level.
- Be maintained free of barnacles and marine growth, and
- Have their location identified by high visibility paint on the curb or bull rail.

3.1.2 Lifesaving Equipment

Appropriate lifesaving equipment must:

- Be provided and maintained for the rescue of any worker/users in danger of drowning, and
- Be positioned at intervals not exceeding 50 meters in conspicuous locations as near as practicable to the danger area.
- Throwing lines fitted to lifebuoys or similar equipment must be of suitable size and length and made of buoyant material.
- Lifesaving equipment includes lifebuoys, throwing bags, grapples, boat hooks or other equipment appropriate to the circumstances.

3.1.3 Curbs, Bull Rails, Guardrails, and Barriers

A curb or bull rail must be installed along the open sides of each float, dock, wharf, pier and similar other area where mobile equipment might be used.

Each curb and bull rail must be of substantial construction and be at least 250mm high.
Where practicable, guardrails meeting the requirements of Part 4 (General Conditions)
must be installed at:

- Dangerous breaks in the continuity of the wharf, dock or pier and
- Dangerous corners, edges and other parts of a wharf, dock, or pier.
- See section 3.1.5 for Part 4 (General Conditions) requirements (below).

Moveable warning barriers may be used where the use of standard guardrails is impracticable.

3.1.4 Markings

Where circumstances require, curbs, bull rails, guardrails, and barriers must be painted solid yellow, yellow and black stripes or checkers, or yellow against a suitable contrasting background.

Retroreflective paint or patches must be applied to curbs, bull rails, guardrails, and barriers where mobile equipment is operated at night

3.1.5 Fall Protection (OH&S Part 4 – General Conditions)

An area accessible to workers must have guards or guardrails installed in any of the following circumstances:

- If a raised floor, open-sided floor, mezzanine, gallery, balcony, work platform, ramp, walkway, or runway is 1.22 meters or more above the adjacent floor or grade level;
- On both sides of any walkway over or adjacent to any substance which is a hazard if a worker fell in, or on it, or which is over machinery or work areas;
- Around the perimeter of any open container or containment area such as an open vat, bin, tank or pit which is 1.22 meters or more in depth and which has sides that do not extend at least as high as required for a guardrail above the adjacent grade or work surface;

It is to be noted that these requirements pertain to workers and may not be relevant for the use of a port facility.

3.2 Fire Protection

The placement of fire-extinguishing equipment shall be planned in cooperation with the authority having jurisdiction and the local responding fire departments at least annually in order to accommodate changing conditions and personnel responsible for fire control in the facility.

The placement of portable fire extinguishers on piers and along bulkheads where vessels are moored or are permitted to be moored shall meet the following criteria:

- Extinguishers listed for Class A, B, and C fires shall be installed at the pier/land intersection on a pier that exceeds 7.62m in length.
- Additional fire extinguishers shall be placed such that the maximum travel distance to an extinguisher does not exceed 22.86 meters.
- All portable fire extinguishers shall be maintained in accordance with Chapter 6 of NFPA 10, Standard for Portable Fire Extinguishers, and shall be clearly visible and marked.

4.0 Best Management Practices Gap Analysis

Pacific coastal municipalities and First Nations groups are beginning to provide regulations and guidelines for marine dock construction, management and remediation in attempts to ensure infrastructure is adhering as best as is practicable to Fisheries and Oceans Canada guidelines and best management practices.

A gap analysis has been conducted for the facility to identify items which may fall short of new regulations/guidelines and to identify items which the SCRD may want to use in the future to develop their own permitting requirements, regulations and best management practices for floating docks within their jurisdiction.

The following Best Management Practices (BMP) documents have been used in the gap analysis as provided by the SCRD:

- Pender Harbour Dock Management Plan. Ministry of Forests, Lands, Natural Resource Operations and Rural Development. March 2021.
- Shisha'lh Nation Best Management Practices for Marine Docks. Version 20180605.
- Atl'ka7tsem/Howe Sound Biosphere Region Best Management Practices for Marine Docks. Draft 10. June 13, 2021.

All three documents have very similar requirements/recommendations. Some items are specific to new construction; however, several items can be incorporated into existing facilities during regular service, repair, renovation and/or decommission activities to improve environmental and societal impacts.

It is to be understood that the water body surrounding Gambier Island and the Sunshine Coast Mainland is deemed by DFO and the Canadian Species at Risk Act to be a habitat for extirpated, endangered of threatened marine species. For this reason new construction and any major maintenance activities involving in water works are required to be reviewed,

at minimum, by DFO to ensure that all habitat and species are kept safe during the associated activities. For this reason, the best management practices noted above heavily emphasize DFO regulations and mitigation measures for marine facilities and construction. Some of the items do not apply to this port facility.

Gambier Harbour is a legacy port facility that was constructed as appropriate for its time. Since the facility is existing, and no reports of negative interactions with marine life have been reported during its current service life (ie: as a public facility), we can say that the infrastructure has now likely become part of the marine habitat and there is no known reason to believe the facility poses any threat to marine life.

The following checklist details the gap analysis between the Gambier Harbour Port Facility as found during the condition assessment and the BMP's outlined in the above documents.

Table 4.1 Gap Analysis Checklist

BEST MANAGEMENT PRACTICE	2022	REMARKS
Dock Facility that facilitate numerous upland owners	✓	*Facilities service large(r) communities with several people utilizing the facility*
No critical habitats are impacted per Canadian Species at Risk Act (SC 2022, c.29)	✓	*Not directly applicable to the structure in service, but it is considered during upgrades and maintenance activities.*
Do not block the free movement of water along the shoreline	✓	*Piled structures allow for this requirement to be met*
All building codes and bylaws administered by all levels of government must be adhered to for all structures	✗	*Service shed on structure does not conform*
Clearance to underside of float is minimum 1.5 meters	✗	*Clearance at Lower Low Water Large Tide is less than 1.5 meters*
Aligned in a North to South direction	✓	
Access ramps/walkways are minimum 1.0 meters above HHWLT	✓	
Access ramps/walkways 1.2 meters wide maximum	✗	*Wharfhead and approach are wider than this. Serviceability for large (public) populations using the facility to bring in supplies makes achieving this BMP impractical*
Decking material allows (43%) light penetration	✓	
Use of encased, wrapped or uncovered polystyrene products	✓	
Using preferred materials	✓	*Structure(s) are constructed from preferred materials, but the float is the only structure constructed to BMP specified "best" material, which is steel.*
Upland dock elements (including anchor points) do not disturb the riparian area	✓	*N/A*
Maintenance and construction activities take place in appropriate DFO timing windows	✓	*N/A*
Consultation with appropriate First Nations stakeholders prior to construction, with specific sensitivity to archeological significance of site	✗	*Unsure if this is part of the SCRD process during upgrades/maintenance activities.*

BEST MANAGEMENT PRACTICE	2022	REMARKS
Allow access to shoreline for First Nations harvesting of marine resources FN	✓	*N/A*
Seasonal floats	✗	*Not seasonal*
No vessel moorage during winter	✗	*Temporary vessel moorage permitted all year round*
Construction does not include native materials	✓	*N/A*
Adhere to Canadian Navigable Waters Protection Act	✓	*No navigation hazards identified within site boundary at time of assessment*
Ongoing maintenance is in accordance with appropriate BMPs	✓	*N/A*

The facility adheres to several of the BMPs set out in the reference material. The majority of nonconformance is a result of the facility being existing at the time of BMP implementation.

There are items which currently do not adhere to the BMPs, but could be remediated during major upgrades/maintenance or changes to the service requirements as follows:

- Construct/upgrade any future and/or current buildings on the structure to the most current edition of The British Columbia Building Code.
- Consideration should be given to prohibiting vessel moorage in the winter season.

5.0 Assessment Results

The results of the on-site assessment are based mainly on visual review, probing and sounding timber with a hammer. While all the piles were reviewed, these assessments are somewhat limited in detection of the severity and extent of the damage particularly damage due to marine borers.

The general condition of the various elements is as indicated below. For information on specific components, see Appendix B.

The following is an explanation of the rating scale used in Section 4 as it relates to the estimated time before the next required repair to a specific item.

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.

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

Poor: Advanced deterioration or overstressing is 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.

Fair: All primary structural elements are sound, but minor to moderate defects or deterioration is 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.

Satisfactory: Limited minor to moderate defects or deterioration are observed, but no overstressing is observed. No repairs are required.

Good: No visible damage, or only minor damage is noted. Structural elements may show very minor deterioration, but no overstressing is observed. No repairs are required.

5.1 Approach and Wharfhead

General views of the approach, wharfhead, and float are shown in Photograph 1 & 2 (Appendix A).

5.1.1 Topsides

Generally the topside elements (handrails, guard timber, and decking) are in overall good serviceable condition. The majority of the repairs are concentrated to the guarding system (timber and steel), as well as the items located on the wharfhead (service shed, safety ladders etc.).

The timber guard along the approach and wharfhead is in fair to poor condition. There is evidence of cracking and deterioration of the internal cross section. There are eight sections of guard recommended to be replaced, as well as all of the timber guarding around the wharfhead perimeter.

There is one timber post supporting the steel vehicle guard which requires replacement.

The concrete deck is in satisfactory condition with no noted damage.

The timber stair set adjacent to the wharfhead is in fair condition. There are four sections of decking and two sections of handrail which are deteriorated and require replacement.

The signage is in fair condition with minor damage. The post supporting the sign at Bent 0 is significantly decayed and requires replacement. The safety ladder on the wharfhead does not have any signage. Signage is recommended visible from both water and land.

The service shed is in satisfactory condition. The bottom 100mm of the wall sheeting has areas of coating failure, with visible corrosion and reduction in the cross sectional area. Replacement of the lower sections of sheeting is recommended around the shed perimeter at the next major upgrade.

5.1.2 Abutment

The abutment is in overall satisfactory condition. Accessibility was limited at the time of the assessment.

5.1.3 Laminated Decking

Decks of this nature are somewhat difficult to assess due to the nature of the arrangement. The deck is comprised of creosote treated timber placed on edge and nailed to create a laminated section. The nailing is inaccessible for assessment, and deterioration (corrosion) of the hardware is a common cause of failure for decks of this form.

The laminated decking is in overall fair condition. There is visible evidence of moisture ingress with no significant deterioration noted. Moisture in a marine environment will result in corrosion of steel hardware, and a detailed assessment of the laminated deck is recommended during the next major upgrade (when accessibility to the underside of the structure is more feasible).

5.1.4 Pile Caps

Generally, the pile caps are in overall good condition, with minor to moderate biological and mechanical damage. One pile cap was noted as having a minor check in the underside of the member. Ongoing monitoring is recommended.

5.1.5 Bearing Piles

The bearing piles are in overall fair condition. There are nine concrete footings which are significantly spalled, with visible reinforcing. Re-casting of the footing is recommended.

One pile was noted as having a small hole with a soft cross section when probed. Plugging and patching of the hole is recommended.

5.1.6 Cross-Bracing and Wale Timbers

The cross bracing at the facility is in fair condition. There are nine cross braces which require replacement, and two braces which are missing and are recommended to be provided.

The wale timbers are in overall good condition. There is one section recommended to be replaced.

There are four locations where the wale timber/cross bracing connections have deteriorated. Re-securing the connections is recommended.

5.1.7 Fender System

The fender system is in overall good condition. There is one fender chock recommended to be replaced.

5.2 Gangway Walkway

5.2.1 Topsides

The walkway is in overall good condition. The topsides have no noted damage and ongoing monitoring is recommended.

5.2.2 Laminated Decking

Decks of this nature are somewhat difficult to assess due to the nature of the arrangement. The deck is comprised of creosote treated timber placed on edge and nailed to create a laminated section. The nailing is inaccessible for assessment, and deterioration (corrosion) of the hardware is a common cause of failure for decks of this form.

The laminated decking is in overall fair condition. There is visible evidence of moisture ingress with no significant deterioration noted. Moisture in a marine environment will result in corrosion of steel hardware, and a detailed assessment of the laminated deck is recommended during the next major upgrade (when accessibility to the underside of the structure is more feasible).

5.2.3 Pile Caps

Generally, the pile caps are in overall good condition, with minor to moderate biological and mechanical damage. Ongoing monitoring is recommended.

5.2.4 Bearing Piles

The bearing piles are in overall good condition. Ongoing monitoring is recommended.

5.2.5 Cross-Bracing and Wale Timbers

The cross bracing is in fair condition. There are six cross braces which require replacement, and one location where the brace connection have deteriorated and is loose. Re-securing the connection is recommended.

5.3 Soundings

Sounding were taken around the wharfhead and approach perimeter. The soundings may be used to identify any scouring, undermining, and/or sediment transport that may be happening at the facility. It is recommended that sounding measurements be taken during scheduled maintenance and periodic condition assessments to monitor variations in the seabed and/or listing of the structure(s).

Table 5.3.1 Fixed Structure Soundings (m)
**All measurements were taken from top of deck to mudline.*

Location	2018	2022
1C’	3.0m	3.6m
5C’	-	4.8m
6C’	6.1m	-
7C	4.1m	-
8C’	4.3m	4.2m
18A	8.5m	-
18D	8.2m	-
21A	10.0m	-
21D	9.1m	8.9m
at gangway	6.1m	-

There are minor changes in the sounding values since the 2018 assessment. This is indicative of some moderate sediment transport at the facility. This is expected in a location such as Gambier Harbour where there is significant environmental loading (wind/wave and current). Ongoing monitoring is recommended.

5.4 Gangway

The gangway is in overall good condition. There is visible decay to the timber sections at the drop hinge connections. Ongoing monitoring is recommended, and replacement of the timber elements in the connection is recommended at the next major upgrade.

5.5 Float

The float is in overall good condition.

There is one mooring pile with moderate abrasion and cross section loss. Ongoing monitoring is recommended.

The steel tube bullrails and risers have localized areas of coating failure with surface corrosion. Field touch ups to the bull rail coating is recommended.

There is no visible signage at the safety ladder location. Signage visible from the water and the float deck is recommended to be installed at the ladder location.

The floatation is in overall good condition. No deterioration was noted on the pontoons, and the floatation system is functioning as intended.

Table 5.5.1 Main Float Freeboard Measurements (mm)
**All measurement from waterline to top of float deck*

Location	2018	2022
Northwest	431	431
Northeast	431	431
Southwest	406	406
Southeast	356	356

The freeboard is in good condition, and is considered typical for a float of this form and function. The freeboard differential between the measurements is within generally accepted limits.

5.6 Health and Safety

The following health and safety items were noted during the assessment.

5.5.1 Ladders

- Ladders along the float and the approach and wharfhead are spaced at intervals exceeding 30 meters.
- The ladder location is not identified with signage and/or high visibility paint on either side of the guard on the wharfhead.

5.5.2 Lifesaving Equipment

- The life ring is mounted to the service shed, and is clearly identifiable when at the facility.

5.5.3 Curbs, Bull Rails, Guardrails, and Barriers

- The float bull rail/riser arrangements do not meet minimum height requirements of 250mm consistently at the facility. This requirements is typically not met at facilities of this nature.

5.5.4 Fall Protection

The existing handrails are climbable, and have openings larger than 102mm at a deck elevation that exceeds 610mm.

5.5.5 Lighting

There are no lights installed at the facility.

5.5.6 Fire Protection

No observed portable fire extinguishers and/or fire protocols at the facility.

5.5.7 Navigation

No items were identified as being a navigation issue.

6.0 Load Rating & Residual Life Estimates

6.1 Load Rating

There is no posted load rating for the approach and wharf head at the facility. Herold Engineering generated a load rating for the structure in 2019. Posting of the rating has been delayed as repairs have not yet been completed to qualify the rating.

6.1.1 Approach and Wharfhead

For the approach and wharfhead the load rating calculations were completed in accordance with the prescribed method in CAN/CSA S6-19 for calculating maximum gross vehicle weight (GVW) for different analysis vehicle model configurations as required (Section 14). The vehicle loading models applied to the structure are in accordance with CAN/CSA S6-19 and are defined as follows:

CL2-W (Two Unit Vehicle)

Axle 1	-	.08 W	=	50 kN (5,097 kg)
Axle 2	-	.20 W	=	125 kN (12,742 kg)
Axle 3	-	.20 W	=	125 kN (12,742 kg)
Axle 4	-	.28 W	=	175 kN (17,839 kg)
TOTAL	**-**	**0.76W**	**=**	**475 kN (48,420 kg)**

CAN/CSA defines the following as Two Unit Vehicles:

- Tractor – Semitrailer
- Car - Trailer
- Truck – Trailer
- Other vehicles consisting of two units

CL3-W (Single Unit Vehicle)

Axle 1	-	.08 W	=	50 kN (5,097 kg)
Axle 2	-	.20 W	=	125 kN (12,742 kg)
Axle 3	-	.20 W	=	125 kN (12,742 kg)
TOTAL	**-**	**0.48W**	**=**	**300 kN (30,581 kg)**

CAN/CSA defines the following as Single Unit Vehicles:

- Trucks
- Buses
- Cars
- Other vehicles consisting of a single unit

Bending, shear and compressive capacities were determined using methods prescribed in Section 14 of CAN/CSA S6-19. Member sizes and spacing were taken from Herold Engineering drawing set(s) 4551-002 and 4551-006 and confirmed (as required) by field measurements. The analysis was done based on designed member capacities. Structural capacities assume that the recommended repairs, relevant to the load rating, have been completed. See Appendix B where remedial action required to qualification the load rating is identified.

A maximum GVW for individual elements was determined using the prescribed method in Section 14 of CAN/CSA S6-19. This method is used for standardized posting of commercial vehicle weight limits on structures. The analysis involves determining a Live Load Capacity Factor, (F), based on the elements dead load effect (self-weight), live load effect (vehicle loading), and the evaluated member capacity. This Live Load Capacity Factor corresponds to a posting limit for a specified vehicle model.

Table 6.1.1 Approach & Wharfhead Load Rating Governing Condition

Load Type	Element	Failure Mode	Posting Factor	Maximum GVW (kg)
CL2-W	Pile cap	Shear	FAILED	FAILED
CL3-W	Pile cap	Shear	0.013	8,125

By analyzing each element, an overall governing condition is determined. In the case of this structure, shear in the pile cap on the approach was determined to be the overall governing structural condition. The load rating was achieved by applying a maximum speed of 10 km/hour to the design vehicles. As such, speed limit signage stating this maximum is also required at the facility. The following signage is recommended to be placed at the entry to the approach once the required repairs are completed:

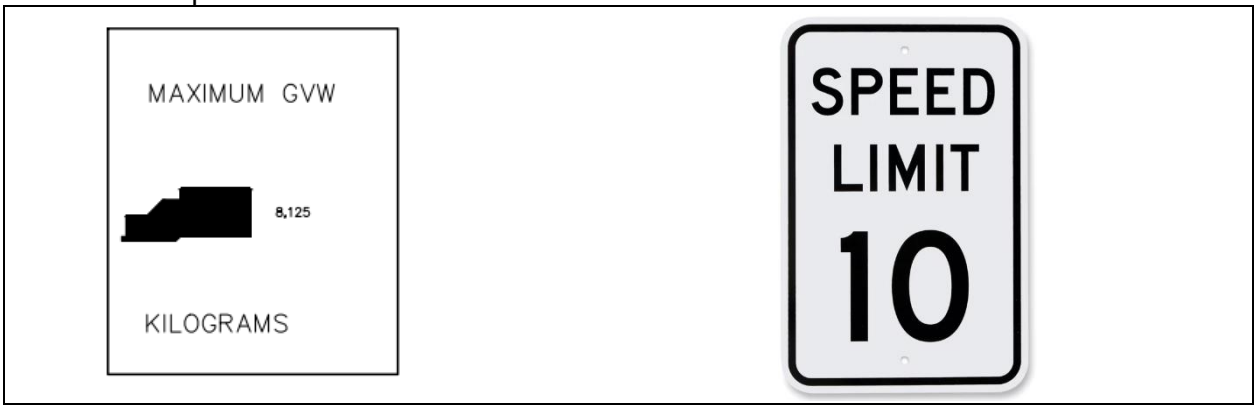


Figure 6.2.1 Load Limit Signage

6.1.2 Gangway

The gangway is an aluminum truss construction. There were no load rating stamps identified at the time of the review. The following assumptions have been made for the load rating analysis:

- Aluminum material type: 6061-T6
- Tube section wall thickness = 3.2mm

Material resistance factors used for design are as follows:

- Flexure (Φ_R) = 0.9
- Shear (Φ_R) = 0.9
- Compression (Φ_R) = 0.8

Load factors used for the load rating are as follows:

- Dead load factor (α_D) = 1.1 (deck) / 1.1 (other)
- Live load factor (α_L) = 1.7

Table D1 (Appendix D) summarize the results of the load rating and assumes all recommended repairs have been completed. By analyzing each element, an overall governing condition is determined as follows:

Table 6.1.1 Approach, Wharfhead and Gangway Load Rating Governing Condition

Load Type	Element	Failure Mode	Maximum Load (kPa)
Area Load	Top Chord	Compression	1.5

Compression in the top chord of the truss was determined to be the overall governing mode of failure. This maximum allowable live load is not in accordance with CAN/CSA S6-19 specified live load of 4.0kPa. However, it does exceed the generally accepted design load of 1.2kPa for gangway structures. No load limit signage is recommended at the facility.

6.1.3 Float

The steel pontoon float was load rated for serviceability failure. The following assumptions have been made:

- No stability analysis was performed.
- No partial loading of the float was considered.
- Serviceability failure at full submersion of the floatation units (pontoons).

The floatation units are fully submerged at a service load of 1.13kPa (113kg/m^2).

6.2 Residual Life Estimates

The residual life estimates are based on Section 2.5 of “Procedures for Inspection and Assessment of Fixed Timber Docks, 4th Edition” by R.G. Sexsmith Ltd. These estimates represent the worst case members inspected in any member group. For this reason, the overall condition of the member group is not necessarily reflected by the following residual life estimates. As noted in the above referenced material, the following applies:

- Where treated wood has been examined for presence of decay, and found sound, a life of 8-10 years is appropriate.
- Where evidence of some decay, but very limited extent was found present, a life of 3-6 years is appropriate.

- Where an element has weakened cross-section due to decay, the life can be presumed to be negligible (i.e. 0 years).

Residual life estimates for sacrificial items, intentionally designed for a shortened life span, have been approximated based on our previous experience with elements of this form and function and are as follow:

- Where element retains greater than 50% of its cross section and is secured to structure as designed, a life of 1-2 years is appropriate.
- Where the element retains less than 50% of its cross section and/or shows signs of fatigue/overstress at the connection points to structure, a life of less than one year is appropriate,
- Where the element retains 0% of its cross section (ie: failed) and/or has failed at any of the connection points it is considered to be “missing” and it is appropriate to presume the life of the element is negligible (0 years)

See Appendix B to determine which members the residual life estimate applies to.

6.2.1 Approach and Wharfhead

Topsides*	0 years (based on required replacement of sections of timber guard); 8-10 years otherwise
Laminated Deck	3-6 years (based on overall condition of elements)
Pile Caps	3-6 years (based on overall condition of elements)
Piles	0 years (based on the condition of nine footings), 8-10 years otherwise

**Note: topside items include handrails, vehicle guards, decking and any accessories which exist on the topside of the fixed structure(s).*

6.2.2 Gangway

Aluminum	8-10 years with ongoing maintenance
Serrated Aluminum Decking	8-10 years (based on overall condition of element)
Shoreward Transition	3-6 years based on condition of timber elements at connection, 8-10 years otherwise
Seaward Transition	8-10 years

6.2.3 Float

Bull Rails	1-3 years (based on overall condition of elements)
Timber Decking	8-10 years (based on overall condition of members)
Rub Boards	1-3 years (based on overall condition of members)
Pontoons	8-10 years (based on overall condition of members)
Mooring Piles	3-6 years (based on the condition of one pile); 8-10 years otherwise

Appendix A
Site Photographs

Photograph 1: Gambier Harbour, note: general arrangement from shore looking south

Photograph 2: Gambier Harbour, note: general arrangement from seaward end looking northwest

Photograph 3: Timber guard at Bent 0, note: mechanical damage and decay

Photograph 4: Timber guard at Bent 1, note: significant decay and cross section loss

Photograph 5: Timber Guard, note: hole with internal deterioration

Photograph 6: Timber guard at gangway walkway, note: deteriorated end

Photograph 7: Timber guard along gridline 21, note: vegetative growth and cracking

Photograph 8: Guard at 21A, note: cross section deterioration and decay

Photograph 9: Timber guard along gridline A, note: cracking and decay

Photograph 10: Handrail post at 21.9m C', note: cracking

Photograph 11: Stairs, note: deteriorated decking

Photograph 12: Stairway, note: deteriorated mid rail

Photograph 13: Safety ladder, note: no signage

Photograph 14: Service shed, note: damage to sheeting

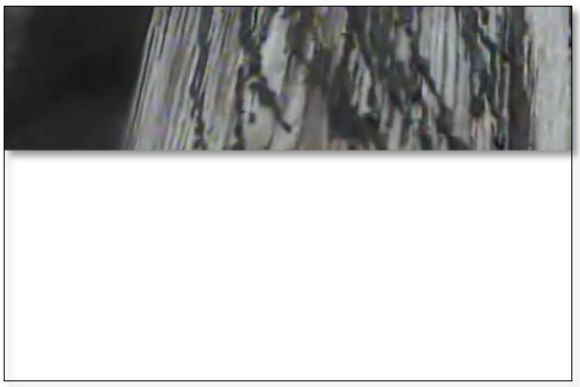
Photograph 15: Pile Cap at Bent 2, note: check in underside

Photograph 16: Footing at Bent 3, note: deteriorated footing

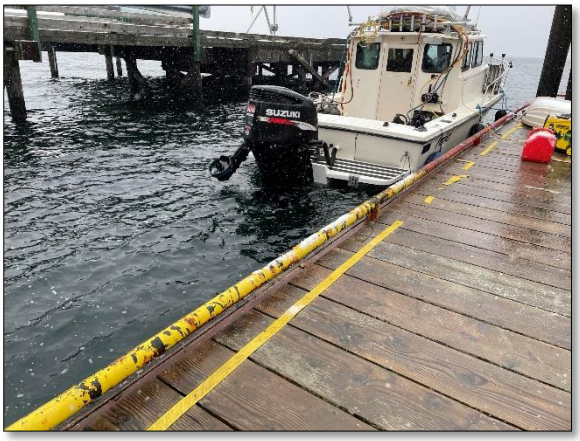
Photograph 17: Footing at Bent 4, note: deteriorated footing

Photograph 18: Cross Brace at 12C, note: failed connection

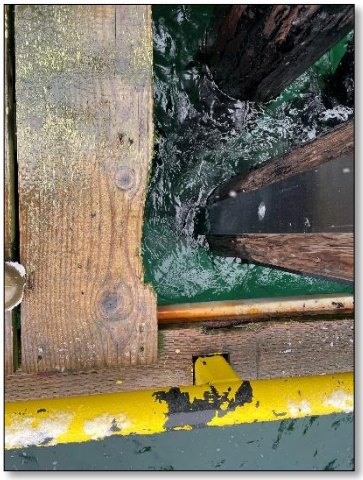
Photograph 19: Failed cross brace at 1B on gangway walkway



Photograph 20: Cross brace at 3B on gangway walkway, note: loose connection



Photograph 21: Float bull rail, note: coating failures



Photograph 22: Pile well, note: abrasion

Photograph 23: Float ladder, note: no signage

Appendix B
Damage Table

Table B1 Facility Damage Table
Note: items required to certify the load rating in Section 5 are identified in **BOLD*

ITEM	LOCATION	DAMAGE	CONDITION	COMMENTS	RECOMMENDATION	REMEDIAL YEAR
Approach & Wharfhead						
Timber Guard	**First (4) sections – two on either side of approach**	**Mechanical/ Biological**	**Very Poor**	**Mechanical and biological damage and deterioration of the cross sections**	**Replace (4) sections of treated timber vehicle guard**	**2023/2024**
Timber Guard	**25.6m at C'**	**Mechanical/ Biological**	**Very Poor**	**Mechanical and biological damage to guard, section is compromised**	**Replace section of timber guard**	**2023/2024**
Timber Guard	**38.4m at D**	**Mechanical/ Biological**	**Very Poor**	**Mechanical and biological damage to guard, section is compromised**	**Replace section of timber guard**	**2023/2024**
Timber Guard	**76.5m**	**Mechanical/ Biological**	**Very Poor**	**Mechanical and biological damage to guard, section is compromised. Exposed bolt holes are soft when probed.**	**Replace section of timber guard**	**2023/2024**
Timber Guard	**85.3 at D**	**Mechanical/ Biological**	**Very Poor**	**Mechanical and biological damage to guard, section is compromised**	**Replace section of timber guard**	**2023/2024**
Timber Guard	**Around wharfhead perimeter**	**Mechanical/ Biological**	**Very Poor**	**Mechanical and biological damage to guard, section is compromised**	**Replace all guarding around wharfhead perimeter**	**2023/2024**
Timber Guard	At derrick crane	Missing	Very Poor	No guarding present at derrick crane.	Provide guarding or signage to indicate guarding is missing	2023/2024
Steel Guard	**21.9m at C'**	**Mechanical**	**Poor**	**Post split through top**	**Replace post**	**2023/2024**
Stairway	Adjacent to the approach	Mechanical/ Biological	Very Poor	Four sections of decking are deteriorated	Replace (2) - 51mmx305mm and (2)-89mmx305mm sections of decking	2023/2024
Stairway	Adjacent to the approach	Mechanical/ Biological	Very Poor	Handrails have two deteriorated lengths of guarding	Replace (1) mid-rail and (1) top-rail	2023/2024
Signage	Bent 0	Mechanical/ Biological	Very Poor	Post is significantly decayed	Replace post	2023/2024
Safety Ladder	Wharfhead	Missing	Very Poor	No signage provided for the ladder	Provide signage visible from land and water ingress/egress	2023/2024
Service Shed	Wharfhead	Mechanical/ Corrosive	Fair - Poor	Wall sheeting is deteriorated and failing along the bottom	Replace sheeting at next major upgrade	-
Pile Cap	Bent 2	Mechanical	Fair	Check in pile cap	Ongoing monitoring	-
Bearing Pile	Bent 3	Mechanical/ Corrosive	Fair - Poor	Footings are significantly spalled	Recast footings (3) locations at Bent 3	2023/2024
Bearing Pile	Bent 4	Mechanical/ Corrosive	Fair - Poor	Footings are significantly spalled	Recast footings (3) locations at Bent 4	2023/2024
Bearing Pile	4C'	Mechanical	Fair	Moderate abrasion due to contact with log debris	Ongoing monitoring	-
Bearing Pile	4D	Mechanical	Fair	Moderate abrasion due to contact with log debris	Ongoing monitoring	-
Bearing Pile	Bent 5	Mechanical/ Corrosive	Fair - Poor	Footings are significantly spalled	Recast footings (3) locations at Bent 5	2023/2024

ITEM	LOCATION	DAMAGE	CONDITION	COMMENTS	RECOMMENDATION	REMEDIAL YEAR
Bearing Pile	**5D**	**Biological**	**Fair**	**Small hole noted with approx. 25mm of penetration. Soft when probed**	**Plug and patch hole**	**2023/2024**
Bearing Pile	17D	Mechanical/ Biological	Fair	Splitting at base with 25mm of penetration when probed. Solid interior.	Ongoing monitoring	2023/2024
Cross Brace	**3C'^{TOP} to 3D^{BOT}**	**Mechanical**	**Very Poor**	**Brace has failed**	**Replace cross brace**	**2023/2024**
Cross Brace	**9D**	**Mechanical/ Corrosive**	**Very Poor**	**Bolt has sheared off and brace is loose**	**Re-secure connection to bearing pile**	**2023/2024**
Cross Brace	**9C**	**Missing**	**Very Poor**	**Brace is missing**	**Install cross brace**	**2023/2024**
Cross Brace	**10C**	**Missing**	**Very Poor**	**Brace is missing**	**Install cross brace**	**2023/2024**
Cross Brace	**12C**	**Mechanical**	**Very Poor**	**Brace connection has failed and brace is hanging from substructure**	**Re-secure connection to bearing pile**	**2023/2024**
Cross Brace	**Bent 13**	**Missing**	**Very Poor**	**Bent is missing transverse bracing**	**Provide (2) cross braces along Bent 13**	**2023/2024**
Cross Brace	**14C**	**Mechanical/ Biological**	**Very Poor**	**Cracking in brace through lower connection. Brace is soft when probed**	**Replace cross brace**	**2023/2024**
Cross Brace	**14D**	**Mechanical/ Biological**	**Very Poor**	**Cracking in brace through lower connection. Brace is soft when probed**	**Replace cross brace**	**2023/2024**
Cross Brace	**15C**	**Mechanical/ Biological**	**Very Poor**	**Cracking in brace through lower connection. Brace is soft when probed**	**Replace cross brace**	**2023/2024**
Cross Brace	**16D^{BOT}**	**Mechanical/ Biological**	**Very Poor**	**Cracking in brace through lower connection.**	**Ongoing monitoring**	**2023/2024**
Cross Brace	**17D**	**Mechanical/ Biological**	**Very Poor**	**Cracking in brace through lower connection. Brace is soft when probed**	**Replace cross brace**	**2023/2024**
Cross Brace	**Bent 18**	**Missing**	**Very Poor**	**Bent is missing transverse bracing**	**Provide (2) cross braces along Bent 18**	**2023/2024**
Wale Timber	**19B to 20B**	**Mechanical**	**Poor**	**Bolt has backed out of connection and brace is loose**	**Re-secure wale timber at connection**	**2023/2024**
Wale Timber	**20C to 21D**	**Mechanical**	**Poor**	**Large cracks in wale**	**Replace wale timber**	**2023/2024**
Fender Chock	**21C to 21D**	**Mechanical/ Biological**	**Very Poor**	**Significant deterioration and loss of section**	**Replace fender chock**	**2023/2024**
Gangway Walkway						
Cross Bracing	**1B**	**Mechanical**	**Very Poor**	**Both braces are broken**	**Replace (2) cross braces**	**2023/2024**
Cross Bracing	**2A**	**Mechanical**	**Very Poor**	**Failed brace**	**Replace cross brace**	**2023/2024**
Cross Bracing	**2B**	**Mechanical**	**Very Poor**	**Failed brace**	**Replace cross brace**	**2023/2024**
Cross Bracing	**3A**	**Mechanical**	**Very Poor**	**Both braces are broken**	**Replace (2) cross braces**	**2023/2024**
Cross Bracing	**3B**	**Mechanical/ Corrosive**	**Very Poor**	**Failed bolt connection**	**Re-secure brace**	**2023/2024**
Gangway						
Drop hinge brackets	Shoreward End	Biological	Fair to Poor	Visible vegetative growth at the bracket plate connections to the approach.	Ongoing monitoring. Consideration should be given to replacing the timber elements associated with the connection(s) at the next major upgrade	-
Float						

ITEM	LOCATION	DAMAGE	CONDITION	COMMENTS	RECOMMENDATION	REMEDIAL YEAR
Mooring Pile	C1	Mechanical	Poor to Fair	Moderate abrasion and cross section loss	Ongoing monitoring	-
Steel Tube Bull Rails	General	Mechanical/ Corrosive	Fair to Poor	Several localized coating failures with visible surface corrosion	Recoat/ provide touch ups to bull rails	2023/2024
Safety Ladder	-	Missing	Very Poor	No signage present at ladder	Provide signage visible form land and water access	2023/2024

Appendix C
Reference Drawings

ARCHITECTURAL D 24" x 36"

GENERAL:

1. READ STRUCTURAL DRAWINGS IN CONJUNCTION WITH ALL OTHER CONTRACT DRAWINGS AND DOCUMENTS. REPORT ANY CONFLICTS TO THE ENGINEER BEFORE COMMENCING WORK
2. VERIFY ALL DIMENSIONS AND ELEVATIONS PRIOR TO CONSTRUCTION.
3. NOTIFY THE ENGINEER 48 HOURS IN ADVANCE FOR INSPECTION OF STRUCTURAL CONNECTIONS BEFORE COVERING UP.
4. CONTRACTOR'S RESPONSIBILITY: THESE DRAWINGS SHOW COMPLETED STRUCTURAL COMPONENTS OF THE DOCKS. THE REQUIRED TEMPORARY BRACING AND SHORING TO PERFORM THE WORK SAFELY IS THE RESPONSIBILITY OF THE CONTRACTOR.
5. ENVIRONMENTAL WORK PROCEDURES, TIMING AND SPECIAL PRECAUTIONS SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS AND LIMITATIONS OF THE FEDERAL DEPARTMENT OF FISHERIES AND OCEANS, AND THE PROVINCIAL MINISTRY OF WATER, LAND AND AIR PROTECTION.
6. DIMENSIONS ARE IN MILLIMETRES AND ELEVATIONS ARE IN METRES, UNLESS OTHERWISE NOTED.
7. HORIZONTAL DATUM U.T.M NAD 83.
8. VERTICAL DATUM (ELEVATIONS AND CONTOURS) TO CHART DATUM (C.D.).
9. TIDE ELEVATIONS AT THE SITE ARE BASED ON VALUES PUBLISHED BY THE CANADIAN HYDROGRAPHIC SERVICE (CHS) FOR THE SITE AS FOLLOWS:

HIGHER HIGH WATER, LARGE TIDE (H.H.W.L.T.)	5.1 METRES
HIGHER HIGH WATER, MEAN TIDE (H.H.W.M.T.)	4.6 METRES
MEAN WATER LEVEL (M.W.L.)	3.2 METRES
LOWER LOW WATER, MEAN TIDE (L.L.W.M.T.)	1.3 METRES
LOWER LOW WATER, LARGE TIDE (L.L.W.L.T.)	0.1 METRES

10. SUBMIT SHOP DRAWINGS FOR REVIEW PRIOR FABRICATION.

ABBREVIATIONS:

CL.	–	CLEAR
C	–	CENTRELINE
CP.	–	COMPLETE PENETRATION
C/W	–	COMPLETE WITH
DWG.	–	DRAWING
EL.	–	ELEVATION
I.D.	–	INSIDE DIAMETER
LLH	–	LONG LEG HORIZONTAL
LLV	–	LONG LEG VERTICAL
MAX.	–	MAXIMUM
MIN.	–	MINIMUM
N.T.S.	–	NOT TO SCALE
OPP.	–	OPPOSITE
PL	–	PLATE
R	–	RADIUS
SIM.	–	SIMILAR
S.S.	–	STAINLESS STEEL
T.O.	–	TOP OF
TYP.	–	TYPICAL
U/S	–	UNDERSIDE
U.N.O.	–	UNLESS NOTED OTHERWISE
WP	–	WORK POINT

ISSUED FOR REPORT

NOT FOR CONSTRUCTION

ISSUES								
No.	DATE YYY.MM.DD	ISSUED FOR	No.	DATE YYY.MM.DD	ISSUED FOR	No.	DATE YYY.MM.DD	ISSUED FOR
A	2023.03.24	CLIENT REVIEW						

SUB CONSULTANT

DRAFTED PHU

DRAFTING REVIEW

DESIGNED SPS

DESIGN REVIEW

HEROLD ENGINEERING
3701 Shenton Rd, Nanaimo, BC V9T 2H1
Tel: 250-751-8558 Fax: 250-751-8559
Email: mail@heroldengineering.com

ENGINEERS SEAL

GAMBIER HARBOUR: GENERAL NOTES AND KEY PLAN

PORTS CONDITION ASSESSMENT
GAMBIER HARBOUR, GAMBIER ISLAND

1975 FIELD ROAD SECHELT BC V0N 3A1

SUNSHINE COAST REGIONAL DISTRICT

HEL PROJECT No.	CLIENT DWG. No.
4551-012	N/A
SCALE: AS SHOWN	PERMIT No.: N/A
HEL DRAWING No.: S01	REVISION: A

DESTROY ALL DRAWINGS SHOWING PREVIOUS REVISION

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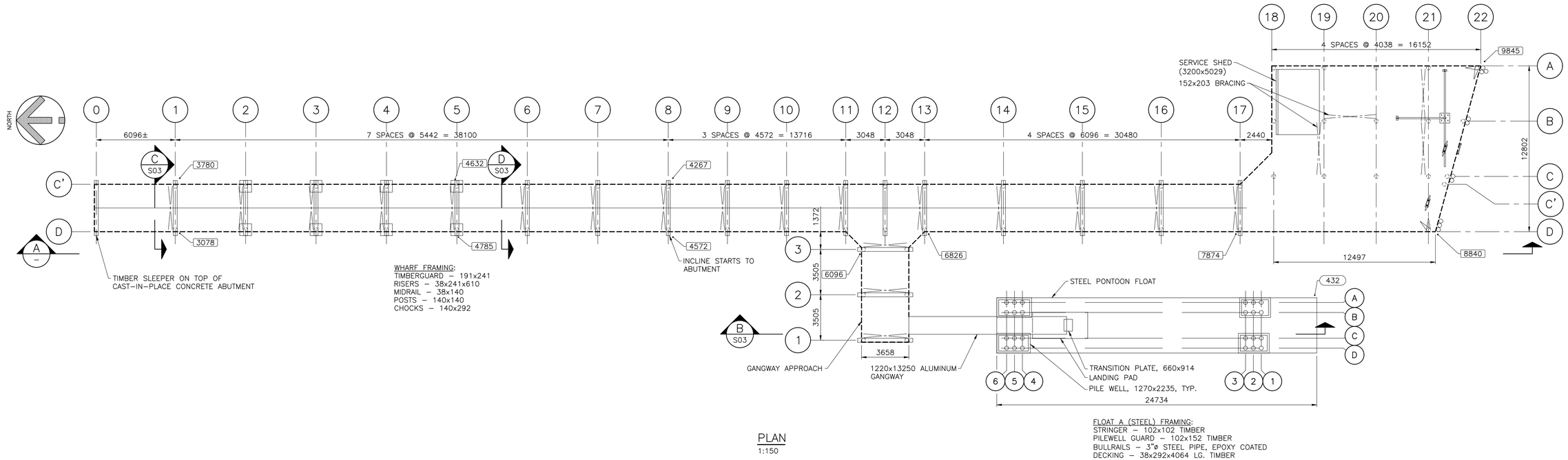
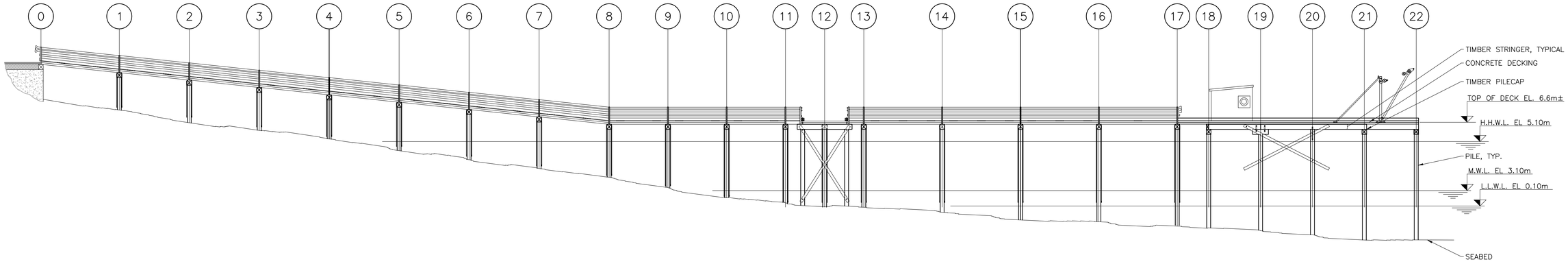


PLAN
1:150

FLOAT A (STEEL) FRAMING:
STRINGER – 102x102 TIMBER
PILEWELL GUARD – 102x152 TIMBER
BULLRAILS – 3"ø STEEL PIPE, EPOXY COATED
DECKING – 38x292x4064 LG. TIMBER



A
–
SECTION
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ISSUED FOR REPORT

NOT FOR CONSTRUCTION

NOTES:

1. FOR GENERAL NOTES, SEE DWG. S01.
2. ALL ITEMS ARE TIMBER, UNLESS NOTED OTHERWISE.
3. ALL DIMENSIONS ARE APPROXIMATE AND ARE TO BE VERIFIED PRIOR TO REMEDIATION/CONSTRUCTION ACTIVITIES

ISSUES								
No.	DATE YYY.MM.DD	ISSUED FOR	No.	DATE YYY.MM.DD	ISSUED FOR	No.	DATE YYY.MM.DD	ISSUED FOR
A	2023.03.24	CLIENT REVIEW						

SUB CONSULTANT

DRAFTED PHU
DRAFTING REVIEW
DESIGNED SPS
DESIGN REVIEW

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3701 Shenton Rd, Nanaimo, BC V9T 2H1
Tel: 250-751-8558 Fax: 250-751-8559
Email: mail@heroldengineering.com

ENGINEERS SEAL

GAMBIER HARBOUR: GENERAL ARRANGEMENT - SHEET 1

PORTS CONDITION ASSESSMENT
GAMBIER HARBOUR, GAMBIER ISLAND

1975 FIELD ROAD SECHELT BC V0N 3A1
SUNSHINE COAST REGIONAL DISTRICT

HEL PROJECT No.	CLIENT DWG. No.
4551-012	N/A
SCALE: AS SHOWN	PERMIT No.: N/A
HEL DRAWING No.: S02	REVISION: A

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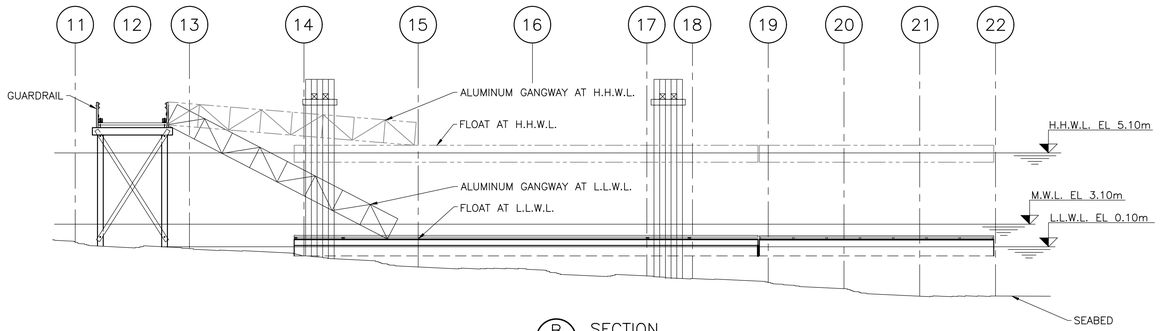

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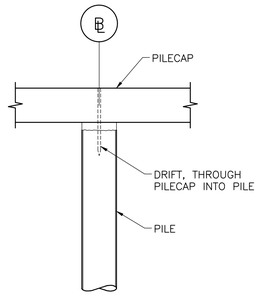

PILE TO PILECAP CONNECTION
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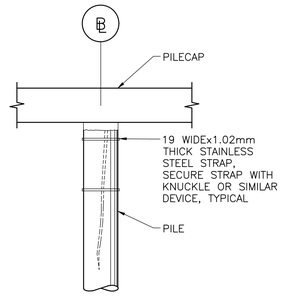

PILE STRAPPING DETAIL
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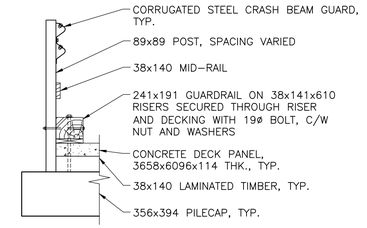

HANDRAIL AND GUARDRAIL DETAILS
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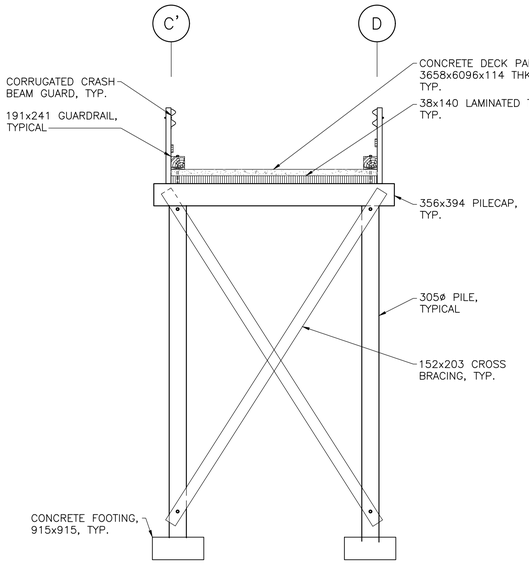

C / S02 SECTION
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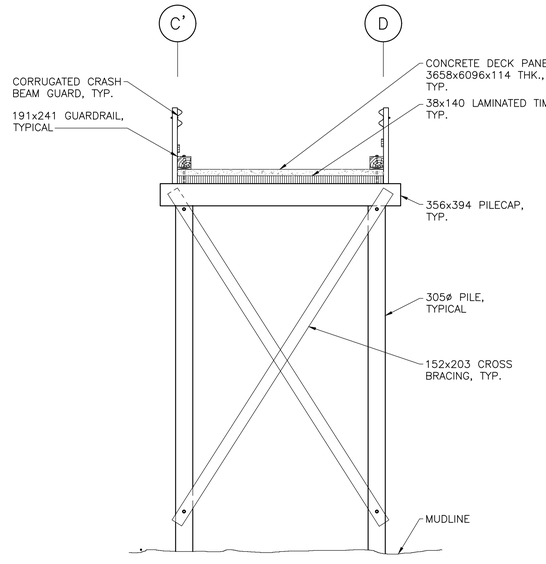

D / S02 SECTION
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ISSUED FOR REPORT

NOT FOR CONSTRUCTION

NOTES:

1. FOR GENERAL NOTES, SEE DWG. S01.
2. ALL ITEMS ARE TIMBER, UNLESS NOTED OTHERWISE.
3. ALL DIMENSIONS ARE APPROXIMATE AND ARE TO BE VERIFIED PRIOR TO REMEDIATION/CONSTRUCTION ACTIVITIES

ISSUES								
No.	DATE YYY.MM.DD	ISSUED FOR	No.	DATE YYY.MM.DD	ISSUED FOR	No.	DATE YYY.MM.DD	ISSUED FOR
A	2023.03.24	CLIENT REVIEW						

SUB CONSULTANT

DRAFTED PHU
DRAFTING REVIEW
DESIGNED SPS
DESIGN REVIEW

HEROLD ENGINEERING
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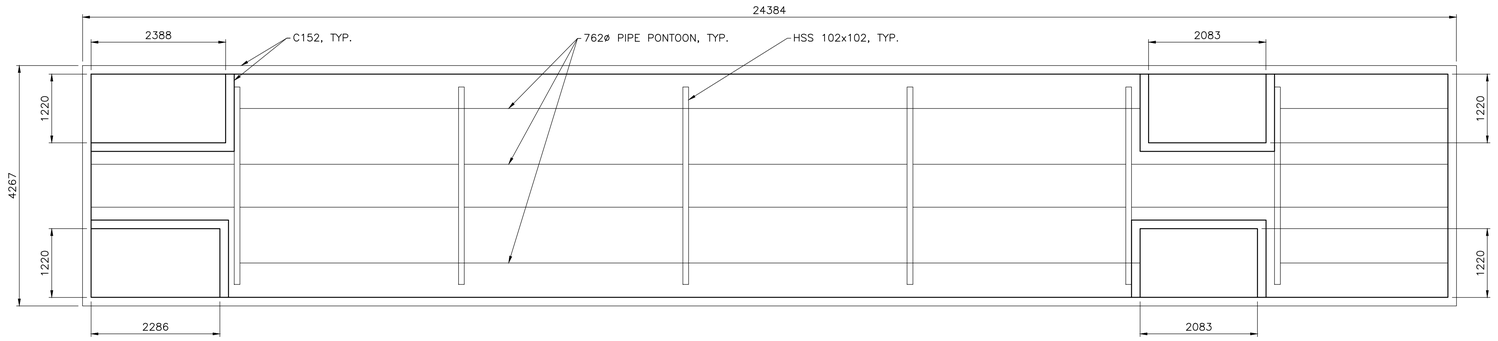
ENGINEERS SEAL

GAMBIER HARBOUR: GENERAL ARRANGEMENT - SHEET 2

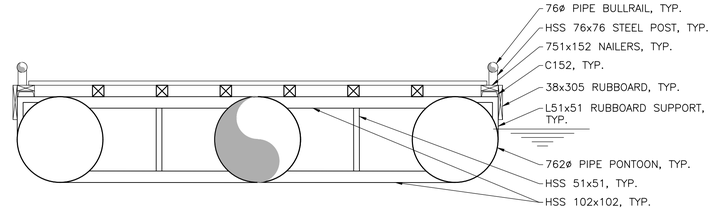
PORTS CONDITION ASSESSMENT
GAMBIER HARBOUR, GAMBIER ISLAND
1975 FIELD ROAD SECHELT BC V0N 3A1
SUNSHINE COAST REGIONAL DISTRICT

HEL PROJECT No.	CLIENT DWG. No.
4551-012	N/A
SCALE: AS SHOWN	PERMIT No.: N/A
HEL DRAWING No.: S03	REVISION: A

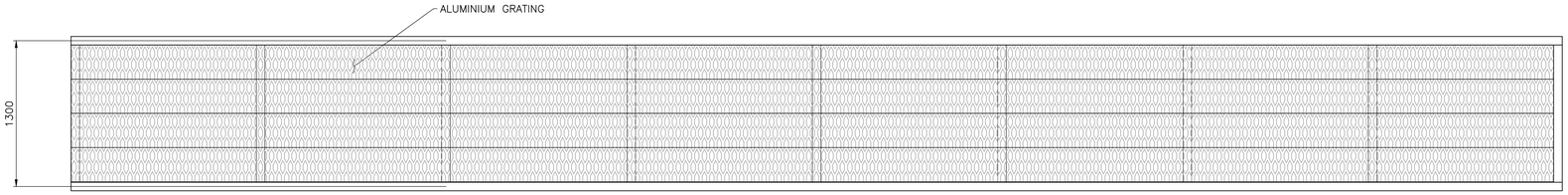
DESTROY ALL DRAWINGS SHOWING PREVIOUS REVISION



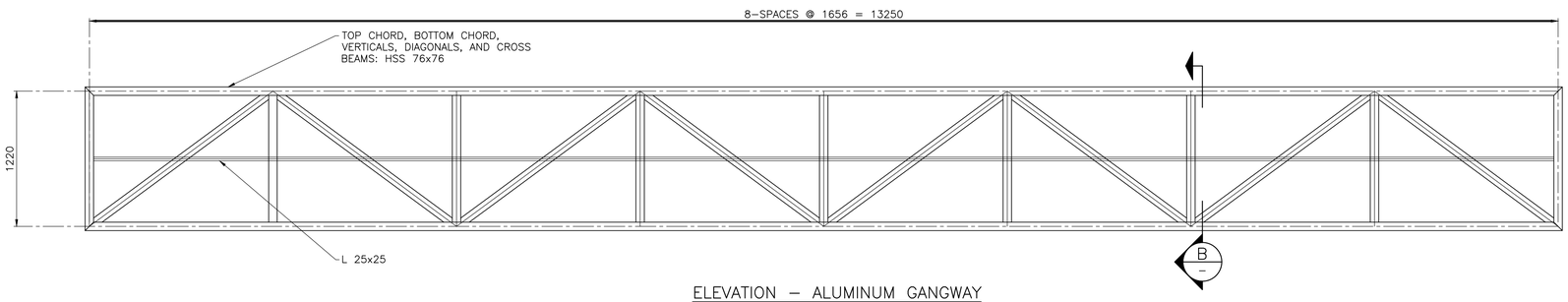
PLAN – FLOAT
1:50



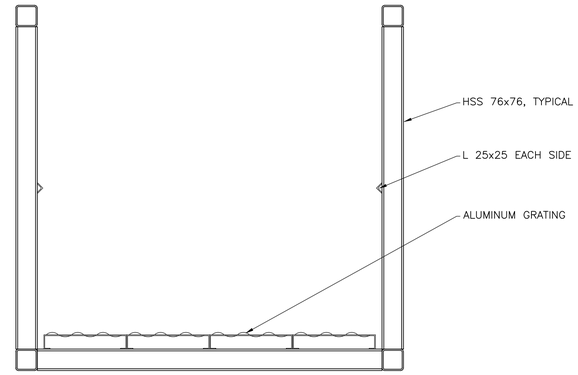
TYPICAL SECTION THROUGH FLOAT
1:25



PLAN – ALUMINUM GANGWAY
1:25



ELEVATION – ALUMINUM GANGWAY
1:25



B – SECTION
1:10

ISSUED FOR REPORT

NOT FOR CONSTRUCTION

NOTES:

1. FOR GENERAL NOTES, SEE DWG. S01.
2. ALL ITEMS ARE TIMBER, UNLESS NOTED OTHERWISE.
3. ALL DIMENSIONS ARE APPROXIMATE AND ARE TO BE VERIFIED PRIOR TO REMEDIATION/CONSTRUCTION ACTIVITIES

ISSUES

No.	DATE YYYY.MM.DD	ISSUED FOR
A	2023.03.24	CLIENT REVIEW

SUB CONSULTANT

DRAFTED PHU
DRAFTING REVIEW
DESIGNED SPS
DESIGN REVIEW

HEROLD ENGINEERING
3701 Shenton Rd, Nanaimo, BC V9T 2H1
Tel: 250–751–8558 Fax: 250–751–8559
Email: mail@heroldengineering.com

ENGINEERS SEAL

GAMBIER HARBOUR: GANGWAY AND FLOAT - PLANS AND SECTIONS

PORTS CONDITION ASSESSMENT
GAMBIER HARBOUR, GAMBIER ISLAND

1975 FIELD ROAD SECHELT BC V0N 3A1
SUNSHINE COAST REGIONAL DISTRICT

HEL PROJECT No.	CLIENT DWG. No.
4551–012	N/A
SCALE: AS SHOWN	PERMIT No.: N/A
HEL DRAWING No.: S04	REVISION: A

DESTROY ALL DRAWINGS SHOWING PREVIOUS REVISION

Appendix D
Load Rating Calculations

TO BE INCLUDED IN FINAL ISSUE

Routine Thrice-yearly Inspection Report #8

Gambier Harbour Port
Gambier Island, BC

Date on Site: June 6th, 2022
Report Submitted: July 18, 2022

SUBMITTED TO:

Sunshine Coast Regional District
1975 Field Road
Sechelt, BC, V0N 3A1
Attention: Sam Adams
sam.adams@scrd.ca

SUBMITTED BY:

Summerhill Fine Homes Inc.
#102 – 675 Industrial Way
Gibsons, BC, V0N 1V7

Kyle Paisley – Project Manager
kyle@summerhillfinehomes.com
778-288-1696

1. INTRODUCTION

On June 6th, 2022 Summerhill Fine Homes (SFH) attended the Marine Facility located in Gambier Harbour B.C. to complete a thrice-yearly inspection and maintenance visit under General Service Contract #18 354 with the Sunshine Coast Regional District (SCRD). The inspectors were Jake Stanley and Charlie Durrant. The site was visually inspected for any signs of deficiency or apparent public safety risk. The observations, actions and recommendations documented in this report are intended for the use of SCRD staff to prioritize and plan future maintenance activities and capital upgrades.

1.1. Description of Structure

The Gambier Harbour Marine Facility is located on Gambier Island, in Howe Sound, B.C.

The facility consists of a timber approach and Wharfhead with a concrete deck extending in a southerly direction from shore. A metal shed is located on the northeast corner of the Wharfhead. On the west side of the approach there is a finger extending to the west. From the south side of the approach finger there is a gangway accessing a float that is moored with float anchor piles and a secondary float which is anchored with 1" chains connected to submerged concrete anchor blocks.

1.2. Scope of Work

The scope of the inspection included conducting a visual assessment of all the structural and non-structural components of the port above the waterline at the time of inspection.

1.3. Limitations

Summerhill strives to ensure the completeness and accuracy of this report within the limitations of a visual inspection. This report is not however intended to provide assessment of the structural integrity or assurance of the public safety of the port location. Refer to engineering reports for further information regarding structural condition assessment.

2. REPORT

2.1. Approach & Wharf Head

2.1.1. Railings

The railings are comprised of galvanized metal highway crash rails supported by painted wood posts which are bolted through the pile caps.

Observations:

- Generally in acceptable condition since galvanized spray during previous inspection visit.

2.1.2. Deck

The decking is comprised of concrete decking and laminated timber sub-decking supported by pile caps, and timber bearing piles and one (1) concrete pile at Bent 11 Row A.

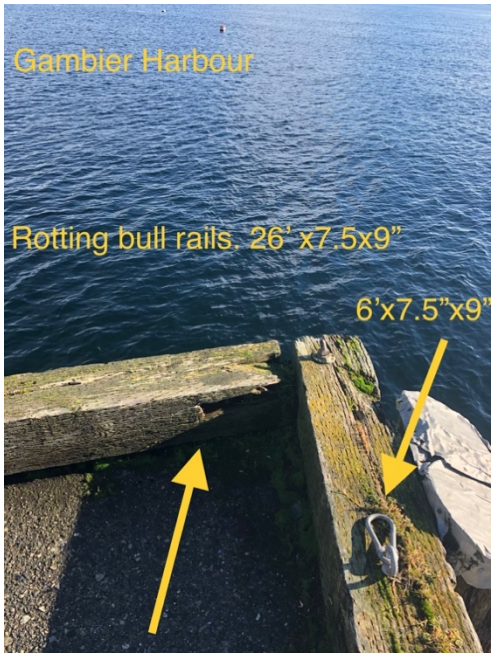
Observations: Generally in good condition

2.1.3. Bullrails/Curb Rails

The bullrails/curb rails are treated timber bolted through the concrete decking on riser blocks.

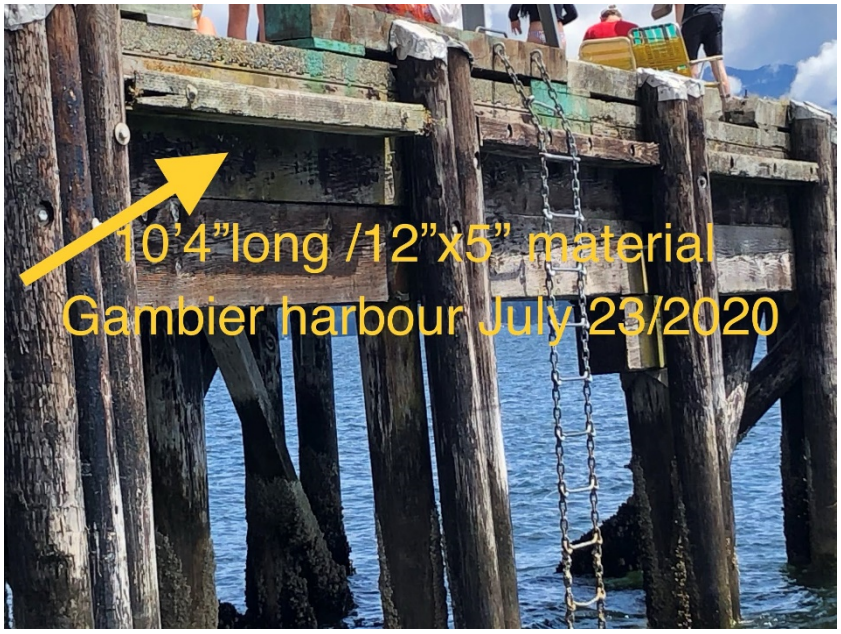
Observations: Deficiencies noted below:

- (From previous inspection April 2019) Damage and rotting observed on the first curb rail on the approach along Row D. Replacement is recommended with 9 ½" x 7 ½"x 18' 7"



- (From Previous Inspection May 2021) East curb rail (shown above, left arrow) is no longer secured on the south side. Safety concern. Updated photo on the right. Replacement recommended.

- (As mentioned in January 2021 Report) Damage noted on horizontal member between fender piles on the end of the wharf head. Recommend considering replacement as part of future capital upgrades. Continue to monitor



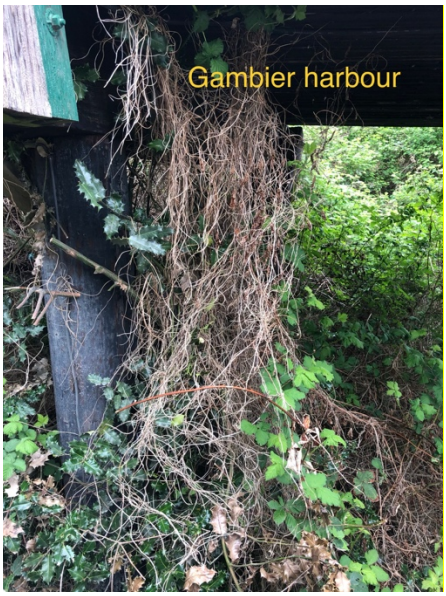
2.1.4. Bents (Piles, Pile Caps, Cross Braces, Stringers)

Timber bearing piles and one (1) concrete pile at Bent 10 Row D.

Timber piles caps 356x394 bearing above timber piles and one (1) concrete pile
Timber cross braces 152x203 generally bolted through the pile cap at the top and the timber piles at the bottom.

Observations: Deficiencies noted below:

- **(From Previous Inspection November 2021) Bent 1** covered in vegetation. Recommended to remove for longevity and to allow a more accurate inspection.

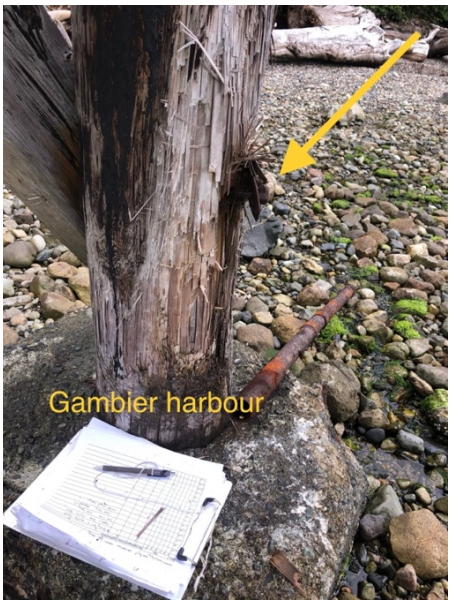


- **Bent 2** Pile 2C Slanted. Monitor closely, could be getting worse due to the creek.
- **Bent 3**
  - (From Previous Inspection November 2021) Footing 3C and 3D Cracked. Loose cross brace. Cross brace and bolt have failed at Pile D

- **Bent 4** (From previous inspection April 2019) Damage observed on pile on Row C' Bent 4. 254mm of pile thickness remaining, engineer review recommended to determine if replacement is required. Bolt connecting the bottom of the cross brace needs to be replaced at a minimum, see photo for reference. Chipped footings also

to be reviewed by Herold Engineering. 20" x 1 ½" threaded rod needed to replace bolt.

- (Previous recommendation from April 2019) Herold Engineering to review and make recommendation. * further decay visible during May inspection.



- **Bent 5** (From previous inspection September 2019) Wear and deterioration on concrete pile footings noted on pile bent 5. Herold Engineering to review and make recommendation. * Deterioration continuing. Rusted Bolts require replacing.

- **Bent 6** Bolt Going to Fail Soon.
- **Bent 7** (From previous inspection April 2019) Piles tilted slightly at Row 7, recommend monitoring on future inspections
- **Bent 9** Missing cross brace
- **Bent 10 (**From Previous Inspection) Requires new cross brace. Rusty bolt on Pile 10D upper connection.

- **Bent 11** (From Previous Inspection) Requires new Cross brace**.**
- **Bent 12** (From Previous Inspections) 2 New Cross Braces Required.

Bents 12&13 Broken Cross braces

- **Bent 13** (From Previous Inspections) Cross brace Broken. Review by Herold Engineering recommended.
- **Bent 15** (From Previous Inspections) Bent 15 has a cross brace with a bolt that needs replacing by 24" x ¾"
- **Bent 19** Lateral brace bolts have failed/are about to fail. See white spray-painted white spots in following images.

- **Bent 21** Damage to Cap On South East Side

  Notes:

  10+ cross braces have failed and have been like this for 5 years or more.

  14 Bolts have failed on Lateral Braces under Wharf Head. 1' Tide required to inspect/work.

  Estimated 30 @ 20" x 1" bolts NEED REPLACING.

2.1.5. Lighting

Two light posts, one located at Bent 1 with one light fixture and another located at Bent 13 with two light fixtures, one on each side for the approach and the float

Observations: Generally in good condition, no deficiencies noted

2.1.6. Shed

Metal service shed located on northwest corner of the Wharf Head

Observations: Deficiencies noted below:

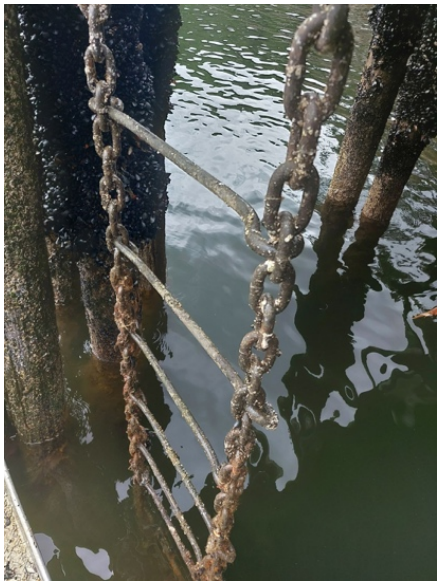
- (From previous inspection April 2019) Metal wall cladding showing significant rust, recommend monitoring on future inspections
  - Shed needs to be upgraded.
  - Steady increase in rust since last inspections – continue to monitor until renovation/replacement.

2.1.7. Ladder

Metal ladder secured at the top and bottom

Observations: Generally in good condition.

- Ladders were cleaned during inspection round 8, as per contract.



2.1.8. Derrick

Derrick crane locate in the southeast corner of the wharfhead

Observations: Generally in good condition.

2.1.9. Wharf head Signage

Observations: Deficiencies noted below:

- (From Previous inspection January 2021) Signage locations and sizes observed per Autumn's request. All signage is due for replacement

- Bench on wharfhead requires repairing or replacing. Confirm if in scope for SCRD

2.1.10. Life ring

- (As mentioned in Previous report January 2021) Minor damage to life ring encasement (shroud). Aesthetic issue rather than safety concern. Continue to monitor at future inspections.

2.2. Gangways

The gangway accessing Float A is located at the south side of the approach finger and is positioned in a north to south alignment.

2.2.1. Railings

The aluminum gangway railings are trusses comprised of HSS sections and flat stock

Observations: Generally in excellent condition.

- As mentioned in the Halkett Bay May 2021 report, most of the SCRD gangways have large enough opening in which a child could fall through. At Plumper Cove and at BC ferries they have far more horizontal members that reduce this risk. Consider welding extra strips on either side.

- A detached horizontal member on gangway was reattached during round 8.

2.2.2. Deck

The decking is comprised of aluminum grating welded to the aluminum frame

Observations: Generally in good condition.

2.2.3. Hinge and Wheels

Steel hinge connection top, steel wheels rolling on landing pad and retained by steel angle

Observations:

- Gangway guide was extended to match other side, as it was not functioning during sub 1' tides. Monitor at future inspections

2.3. Floats

There are two floats, the original timber Float is positioned in a north to south alignment with pontoons, steel framing and 4 pile wells. Float went through major repairs in June 2021, and was in great condition in November.

2.3.1. Deck Condition

Deck boards are 38x292 on Float A and 51x286 on Float B (seaward). Decking on Float A recently replaced.

Observations: New and generally in good condition

2.3.2. Bullrail and Cleats

Metal bullrails comprised of 3" HSS or Steel Pipe

Observations:

- ½ of the float was painted during this inspection. Bullrails on float showing corrosion, will likely rust out within 5-7 years. Painting to be finished during the next round.

2.3.3. Pile Wells, Mooring Piles and Wear Strips

4 pile wells located on Float A, each containing mooring pile groups tied together by steel wire and cross beams at the top.

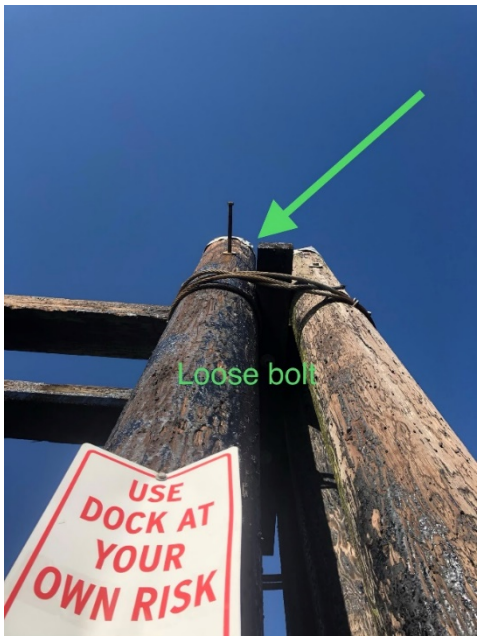
Observations: Deficiencies noted below:

- Wear strip on pile requires ½" x 4" Lag Bolt (deferred).
    - Divers required to add 10' sections of wear strips on piles on south side of float below water line

Gambier Harbour. Float Pile wear strip.

- Pile well wear strips on 2 southern pile wells were repaired during this visit.

- (Previous recommendation from February 2020) Loose bolts noted at the top of dolphin pile connection to cross beams.
    - High tide, calm weather and longer ladder required. Tighten or replace bolts at next maintenance visit. *Tides and weather again not favorable during May visit.
        - Unable to access safely to complete due to height, not a risk of failure. Recommend we take off the list.



2.3.4. Anti-skid

Anti skid comprised of a combination of SS mesh strips held in place by round head SS fasteners and yellow grip-stop strips on Float A. Float B requires anti slip.

Observations: Deficiencies noted below:

- Several missing or loose get-a-grip strips.
  - Plastic anti-skid is failing, recommend to install stainless steel instead on half of wharf during next site visit.

2.3.5. Signage

Observations:

- No Signs on float at present.
- (Previous recommendation from February 2020) SCRD to provide permanent moorage signage for installation during next maintenance visit (typ.)

2.3.6. Ladder

Observations: Generally in good condition.

- Ladders were cleaned during this inspection visit (as per contract)
- Note rusting of new ladder. Aluminum Ladders are superior.

3. CONCLUSION

Based on our visual inspection, the approach, wharf head and gangway are generally in good condition except for damaged bull rails on approach & wharf head. The substructure of the approach requires extensive work, specifically to footings, cross braces and cross brace bolts.

Recommend Engineering Review of the following items:

Herold Engineering to review the condition of pile C4 as noted above and advise if any remediation is required in the short term. Also, review and advise on deterioration on concrete pile footings noted on pile bents 3,4 & 5 and the tiled pile bent #7. Herald Engineering also to review and advise on possible replacement of the dislodged fender pile on the SE corner of the wharf head as well as piles and cross braces noted in 2.1.4

Divers required to add 10' sections of wear strips on piles on south side of float.

3.1 Work Update per Approved Change Orders:

Work Item	*Description*	*SCRD Contract Category*	*Status*
GH6	Extra Lag bolts were added to 2 pile well wear strips	Maintenance	Completed June 2022

3.2 Additional work to be billed T&M:

Work Item	*Description*	*SCRD Contract Category*	*Status*
	Horizontal member on gangway was refastened	Safety	Completed June 2022
	Gangway guide was extended to match other side, as it was not functioning during sub 1' tides.		

3.3 Recommended work for future visits:

Work Item	*Description*	*SCRD Contract Category*	*Status*
GH8	14 Bolts have failed on Lateral Braces under Wharf Head. 1' Tide required to inspect/work. (Estimated 30 @ 20" x 1" bolts NEED REPLACING on wharf)	Safety	
GH9	Divers required to add 10' sections of wear strips on south side of float.	Maintenance	
GH10	Bench on wharfhead requires repairing or replacing. Confirm if in scope for SCRD	Maintenance	

ARCHITECTURAL D 24" x 36"

GENERAL:

1. READ STRUCTURAL DRAWINGS IN CONJUNCTION WITH ALL OTHER CONTRACT DRAWINGS AND DOCUMENTS. REPORT ANY CONFLICTS TO THE ENGINEER BEFORE COMMENCING WORK.
2. VERIFY ALL DIMENSIONS AND ELEVATIONS PRIOR TO CONSTRUCTION.
3. NOTIFY THE ENGINEER 48 HOURS IN ADVANCE FOR INSPECTION OF STRUCTURAL CONNECTIONS BEFORE COVERING UP.
4. CONTRACTOR'S RESPONSIBILITY: THESE DRAWINGS SHOW COMPLETED STRUCTURAL COMPONENTS OF THE DOCKS. THE REQUIRED TEMPORARY BRACING AND SHORING TO PERFORM THE WORK SAFELY IS THE RESPONSIBILITY OF THE CONTRACTOR.
5. ENVIRONMENTAL WORK PROCEDURES, TIMING AND SPECIAL PRECAUTIONS SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS AND LIMITATIONS OF THE FEDERAL DEPARTMENT OF FISHERIES AND OCEANS, AND THE PROVINCIAL MINISTRY OF WATER, LAND AND AIR PROTECTION.
6. DIMENSIONS ARE IN MILLIMETRES AND ELEVATIONS ARE IN METRES, UNLESS OTHERWISE NOTED.
7. HORIZONTAL DATUM U.T.M. NAD 83.
8. VERTICAL DATUM (ELEVATIONS AND CONTOURS) TO CHART DATUM (C.D.).
9. TIDE ELEVATIONS AT THE SITE ARE BASED ON VALUES PUBLISHED BY THE CANADIAN HYDROGRAPHIC SERVICE (CHS) FOR BEDWELL HARBOUR, PENDER ISLAND AND ARE AS FOLLOWS:

HIGHER HIGH WATER, LARGE TIDE (H.H.W.L.T.)	5.1 METRES
HIGHER HIGH WATER, MEAN TIDE (H.H.W.M.T.)	4.6 METRES
MEAN WATER LEVEL (M.W.L.)	3.2 METRES
LOWER LOW WATER, MEAN TIDE (L.L.W.M.T.)	1.3 METRES
LOWER LOW WATER, LARGE TIDE (L.L.W.L.T.)	0.1 METRES

10. SUBMIT SHOP DRAWINGS FOR REVIEW PRIOR TO FABRICATION.

DEMOLITION:

1. ALL UNSALVAGEABLE MATERIAL FROM SITE TO BE DISPOSED OF IN ACCORDANCE WITH ALL LOCAL, PROVINCIAL AND FEDERAL REGULATIONS AT THE CONTRACTOR'S EXPENSE.
2. USED TIMBER PILES REMOVED FROM SITE ARE TO BE DISPOSED OF IN ACCORDANCE WITH ALL LOCAL, PROVINCIAL AND FEDERAL REGULATIONS AT THE CONTRACTOR'S EXPENSE.

TIMBER:

1. ALL TIMBER SHALL BE PRESSURE TREATED NLGA NO. 1 COAST DOUGLAS FIR OR BETTER. LUMBER TO BE GRADED TO NLGA STANDARD GRADING RULES FOR CANADIAN LUMBER, 2003.
2. TIMBER PILES TO BE SUPPLIED SIZE 36
3. ALL TIMBERS SHALL BE CUT TO THE REQUIRED LENGTH PRIOR TO TREATMENT. FIELD CUT TIMBERS WILL BE REJECTED AND REPLACED AT THE CONTRACTOR'S EXPENSE, EXCLUDING CROSS BRACE DRILLING AT THE TOP CONNECTIONS.
4. TREATMENT TO BE IN ACCORDANCE WITH CSA O80:

4.1. CATEGORY 3.2 EXPOSED TO WEATHER, NOT IN GROUND CONTACT. INCLUDING BULLRAILS AND RISERS.

4.1.1. ACZA, 4.0kg/m³
4.1.2. CCA, 4.0kg/m³

4.2. CATEGORY UC 4.1 CONTACT WITH SPLASH ZONE. INCLUDING WHARF JOISTS. STRINGERS, FISH PLATES, PLYWOOD NOT COVERED UNDER UC5A, PILECAPS & BLOCKING.

4.2.1. ACZA, 6.4kg/m³
4.2.2. CCA, 6.4kg/m³
4.2.3. CREOSOTE:
4.2.3.1. 160kg/m³ IF THICKNESS LESS THAN 115MM
4.2.3.2. 120kg/m³ IF THICKNESS GREATER THAN OR EQUAL TO 115MM

4.3. USE CATEGORY UC5A, MARINE. INCLUDING WOOD PILES, PLYWOOD, CROSS BRACES, WALES.
4.3.1. ACZA, 30kg/m³ OR
4.3.2. CCA, 24kg/m³ OR
4.3.3. CREOSOTE 290kg/m³
4.3.3.1. PENETRATION IN ACCORDANCE WITH O80

4.4. AFTER CUTOFF, TREAT PILE TOPS WITH TWO COATS OF HOT CREOSOTE OIL AND ONE COAT OF APPROVED MASTIC AT LEAST 6mm THICK.

4.5. ALL FENDER PILES TO BE COVERED A SHEET OF 24 GUAGE ANNEALED CORROSION RESISTANT ALUMINUM, CUT 300mm LARGER THAN THE PILE TOP.

4.6. ALL DRILLED BOLT HOLES COMPLETED AFTER TREATMENT MUST BE FIELD TREATED WITH TWO COATS OF HOT CREOSOTE AND BOLTS/PLUGS MUST BE DIPPED IN CREOSOTE PRIOR TO INSTALLATION.

4.7. PLUG ALL UNUSED BOLT HOLES WITH TIGHT FITTING CREOSOTE TREATED BOLTS, AND NEOPRENE GASKET AND WASHER EACH END.

4.8. TIMBER HANDLING
4.8.1. ALL TREATED TIMBER AS TO NOT PUNCTURE THE TREATED LAYER. ANY MEMBERS IDENTIFIED AS BEING DAMAGED THROUGH THE TREATED LAYER EITHER PRIOR TO OR DURING INSTALLATION WILL BE REJECTED AT THE EXPENSE OF THE CONTRACTOR.

4.9. ALL SHIMS MUST BE CREOSOTE TREATED PLYWOOD AND MUST BE SECURED IN PLACE BY AT LEAST TWO (2) NAILS AT OPPOSITE CORNERS OF THE SHIM OR APPROVED EQUIVALENT

5. PROPOSED ALTERNATIVES TO THE SUPPLIED DESIGN TO BE APPROVED BY ENGINEER.

6. PILE DRIVING
6.1. PILES ARE TO BE DRIVEN TIP DOWN UNTIL A DRIVING ENERGY OF 25–30 kJ IS ACHIEVED OR TO REFUSAL (5 BLOWS / 25mm).
6.2. DRIVE TO THE FOLLOWING TOLERANCES
6.2.1. LOCATION OF PILES: 25mm ±
6.2.2. VERTICAL TOLERANCE: 2% OR 1:50

7. PILE REPLACEMENT

7.1. EXISTING PILES TO BE REPLACED SHALL BE FULLY EXTRACTED
7.2. REPLACEMENT PILES TO ACHIEVE A MINIMUM PENETRATION EQUAL TO THAT OF THE REMOVED PILE AND TO SATISFY THE PILE DRIVING CRITERIA NOTED ABOVE.

METAL FABRICATIONS:

1. UNLESS NOTED OTHERWISE BY THE ENGINEER IN WRITING THE STEEL AND/OR ALUMINUM FABRICATOR SHALL SUPPLY THE ENGINEER WITH SHOP DRAWINGS FOR REVIEW PRIOR TO FABRICATION. SHOP DRAWINGS SHALL INDICATE ALL DETAILS, MATERIAL SPECIFICATIONS AND DESIGN LOADS.
2. A COPY OF THE FABRICATOR'S CANADIAN WELDING BUREAU CERTIFICATES SHALL BE INCLUDED WITH THE SHOP DRAWING SUBMISSION.
3. ALL WELDING SHALL BE IN ACCORDANCE WITH CSA W59–03 (R2008) AND SHALL BE PERFORMED BY FABRICATORS "FULLY APPROVED" BY THE CANADIAN WELDING BUREAU UNDER CSA W55.3–08. FABRICATING SHOP TO HAVE A MINIMUM DIVISION 2.1 CERTIFICATION BY THE CANADIAN WELDING BUREAU TO THE REQUIREMENTS OF CSA W47.1 (STEEL). THE FABRICATOR SHALL SUBMIT PROOF OF CERTIFICATION PRIOR TO START OF WORK.
4. DESIGN FABRICATIONS TO CSA–S16–09, LIMIT STATES DESIGN OF STEEL STRUCTURES.
5. EXCEPT PARTS OF MEMBERS TO BE EMBEDDED IN CONCRETE, GALVANIZED OR UNLESS NOTED OTHERWISE ON THE DRAWINGS, ALL STEEL WORK SHALL BE SHOP PRIMED. PRIMING SHALL BE IN ACCORDANCE WITH CISC/CPMA–1–73A "QUICK DRYING PRIMER" WHEN NO TOP COAT IS REQUIRED AND IN ACCORDANCE WITH CISC/CPMA–2–75 WHEN A TOP COAT IS SPECIFIED. IF A TOP COAT IS SPECIFIED THE PRIMER SHALL BE SELECTED ENSURING COMPATIBILITY WITH THE SPECIFIED SYSTEM. ITEMS SPECIFIED TO BE GALVANIZED SHALL BE HOT DIPPED GALVANIZED TO ASTM A–123–08, MINIMUM ZINC COATING OF 600G/SQ.M. FIELD TOUCH–UP ALL ABRASIONS, SCRATCHES, WELDS OR BOLTS
6. ISOLATE ALUMINUM FROM DISSIMILAR METALS EXCEPT STAINLESS STEEL, ZINC OR WHITE BRONZE WITH BITUMINOUS PAINT. ALL FASTENERS TO BE COMPATIBLE WITH THE MATERIALS THROUGH WHICH THEY PASS.
7. DELIVER, STORE, HANDLE AND PROTECT MATERIALS FROM DAMAGE. INSTALL PLUMB AND TRUE IN EXACT LOCATIONS, SECURELY FASTENED TO THE BUILDING STRUCTURE AS DETAILED.
8. THE CONTRACTOR SHALL PROVIDE TEMPORARY BRACING DURING CONSTRUCTION. THE BRACING SHALL BE DESIGNED, INSTALLED AND MAINTAINED BY THE CONTRACTOR. THE BRACING SHALL BE REMOVED ONLY AFTER THE INSTALLATION IS COMPLETE.
9. ALL WELDS TO CONTINUOUS SEAL WELDS.
10. ALL STEELWORK SHALL BE COATED PRIOR TO DELIVERY TO THE SITE WHERE POSSIBLE. ONLY FIELD TOUCH–UP SHOULD BE REQUIRED. IF IT IS NECESSARY TO FIELD PAINT, CONTAINMENT MEASURES SATISFACTORY TO THE ENGINEER SHALL BE IN PLACE BEFORE PREPARATION AND PAINTING COMMENCE

ENVIRONMENTAL CONSTRUCTION REQUIREMENTS:

1. ENVIRONMENTAL WORK PROCEDURES, TIMING AND SPECIAL PRECAUTIONS SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS OF FISHERIES AND OCEANS CANADA AND THE PROVINCIAL MINISTRY OF ENVIRONMENT.
2. CONTRACTOR TO FOLLOW THE REQUIREMENTS OF THE "BEST MANAGEMENT PRACTICES FOR CONSTRUCTING DOCKS AND FLOAT IN THE SOUTH COAST AREA (SUNSHINE COAST – VANCOUVER ISLAND), FISHERIES AND OCEANS CANADA", AND "BEST MANAGEMENT PRACTICES FOR PILE DRIVING AND RELATED OPERATIONS – BC MARINE PILE DRIVING CONTRACTOR'S ASSOCIATION, NOVEMBER 2003", FOR ALL WORK ON THIS PROJECT.
3. SECTION 9 NOTIFICATION AND DFO APPROVAL REQUIRED.
4. CONDITIONS OF MELP AND DFO APPROVALS TO BE FOLLOWED.
5. CONTRACTOR MUST EMPLOY METHODS TO MITIGATE HARM TO FISH AND USE DEBRIS CONTROL DEVICES WHEN DRILLING OR WORKING OVER WATER.
6. ALL DEBRIS, SAWDUST AND SHAVINGS FALLING INTO THE WATER CAUSED BY THE WORK SHALL BE CONTAINED AND PROMPTLY CLEANED UP AND PROPERLY DISPOSED OF.
7. CONTRACTOR MUST HAVE EMERGENCY SPILL EQUIPMENT AVAILABLE WHENEVER WORKING ON OR NEAR THE WATER.
8. WHEN GRINDING OR CORING CURED CONCRETE, THE DUST AND FINES ENTERING THE WATER MUST NOT EXCEED THE ALLOWABLE LIMIT FOR SUSPENDED SOLIDS. WHEN GRINDING GREEN OR INCOMPLETELY CURED CONCRETE AND THE DUST OR FINES ARE ENTERING THE WATER, pH MONITORING SHALL BE CONDUCTED TO ENSURE ALLOWABLE RANGES ARE MAINTAINED. IN THE EVENT THAT THE LEVELS ARE OUTSIDE THE ACCEPTABLE RANGES, PREVENTATIVE MEASURES SHALL BE INTRODUCED. THIS MAY INCLUDE INTRODUCING SILT CURTAINS TO CONTAIN THE SOLIDS AND PREVENT FISH FROM ENTERING A CONTAMINATED AREA OR CONSTRUCTING CATCH BASINS TO COVER THE RUN OFF AND NEUTRALIZING IT PRIOR TO DISPOSAL.
9. SPILLS: WHEN PATCHING CONCRETE, ALL SPILLS MUST BE CONTAINED AND PREVENTED FROM ENTERING THE WATER.
10. WHENEVER THERE IS THE POSSIBILITY OF CONTAMINANTS ENTERING THE WATER, THE CONTRACTOR WILL MONITOR pH LEVELS TO ENSURE ACCEPTABLE LEVELS.
11.

ABBREVIATIONS

CL.	–	CLEAR
C	–	CENTRELINE
CP.	–	COMPLETE PENETRATION
C/W	–	COMPLETE WITH
DWG.	–	DRAWING
EL.	–	ELEVATION
I.D.	–	INSIDE DIAMETER
LLH	–	LONG LEG HORIZONTAL
LLV	–	LONG LEG VERTICAL
MAX.	–	MAXIMUM
MIN.	–	MINIMUM
N.T.S.	–	NOT TO SCALE
OPP.	–	OPPOSITE
PL	–	PLATE
R	–	RADIUS
SIM.	–	SIMILAR
S.S.	–	STAINLESS STEEL
T.O.	–	TOP OF
TYP.	–	TYPICAL
U/S	–	UNDERSIDE
U.N.O.	–	UNLESS NOTED OTHERWISE
WP	–	WORK POINT

KEY PLAN
1:500

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ISSUES											
No.	DATE YYY.MM.DD	ISSUED FOR	No.	DATE YYY.MM.DD	ISSUED FOR	No.	DATE YYY.MM.DD	ISSUED FOR
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B	2019.02.15	REPORT						

SUB CONSULTANT

DRAFTED JJMC
DRAFTING REVIEW
DESIGNED SPS
DESIGN REVIEW

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ENGINEERS SEAL

GAMBIER HARBOUR: GENERAL NOTES & KEY PLAN

SCRD PORT FACILITIES - LOAD LIMIT SAFETY
1975 FIELD ROAD SECHELT BC V0N 3A1
SUNSHINE COAST REGIONAL DISTRICT

HEL PROJECT No. 4551–002	CLIENT DWG. No. N/A
SCALE AS SHOWN	PERMIT No. N/A
HEL DRAWING No. S01	REVISION B

DESTROY ALL DRAWINGS SHOWING PREVIOUS REVISION

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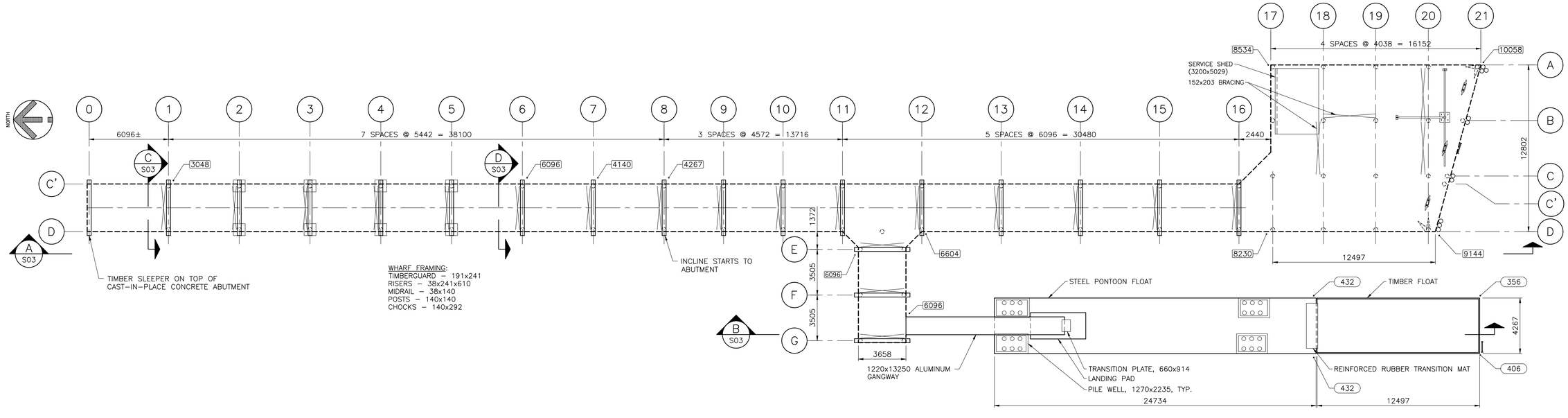
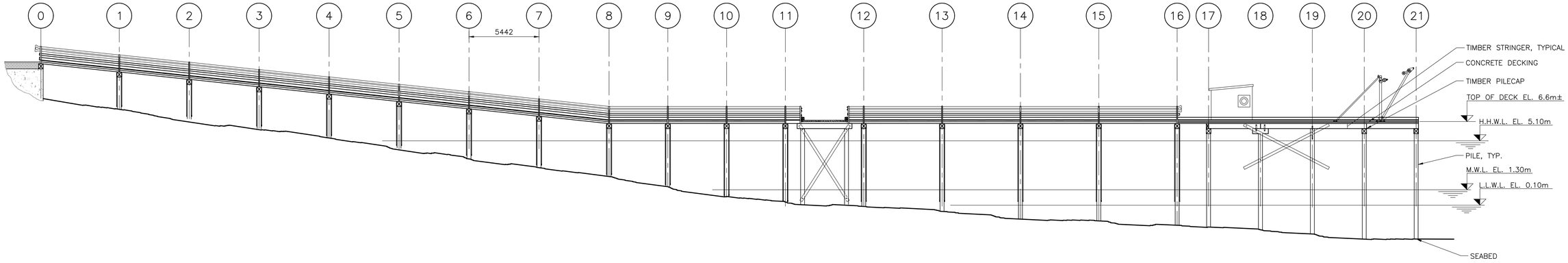


PLAN
1:150

FLOAT A (STEEL) FRAMING:
STRINGERS – 102x102 TIMBER
PILEWELL GUARD – 102x152 TIMBER
BULLRAILS – 3"ø STEEL PIPE, EPOXY COATED
DECKING – 38x292x4064 LG. TIMBER

FLOAT B (TIMBER) FRAMING:
PILEWELL GUARD – 102x152
BULLRAILS – HSS 76x76 STEEL
DECKING – 51x286x4216 LG.
RUBBOARDS – 75x356
RISERS – HSS 76x76x127 HIGH @ 1778 o/c



A S02 SECTION
1:150

LEGEND:

- 7445 — SOUNDING: TOP OF DECK TO SEABED IN MILLIMETRES.
- 229 — FLOAT FREEBOARD: TOP OF DECK TO WATERLINE IN MILLIMETRES.
- LIFE RING
- SAFETY LADDER
- DECK CLEAT

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NOTES:

1. FOR GENERAL NOTES, SEE DWG. S01.
2. ALL ITEMS ARE TIMBER, UNLESS NOTED OTHERWISE.
3. ALL DIMENSIONS ARE APPROXIMATE AND ARE TO BE VERIFIED PRIOR TO REMEDIATION/CONSTRUCTION ACTIVITIES.

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ENGINEERS SEAL

GAMBIER HARBOUR: GENERAL ARRANGEMENT - SECTION

SCRD PORT FACILITIES - LOAD LIMIT SAFETY

1975 FIELD ROAD SECHELT BC V0N 3A1
SUNSHINE COAST REGIONAL DISTRICT

HEL PROJECT No.	CLIENT DWG. No.
4551-002	N/A
SCALE	PERMIT No.
AS SHOWN	N/A
HEL DRAWING No.	REVISION
S02	B

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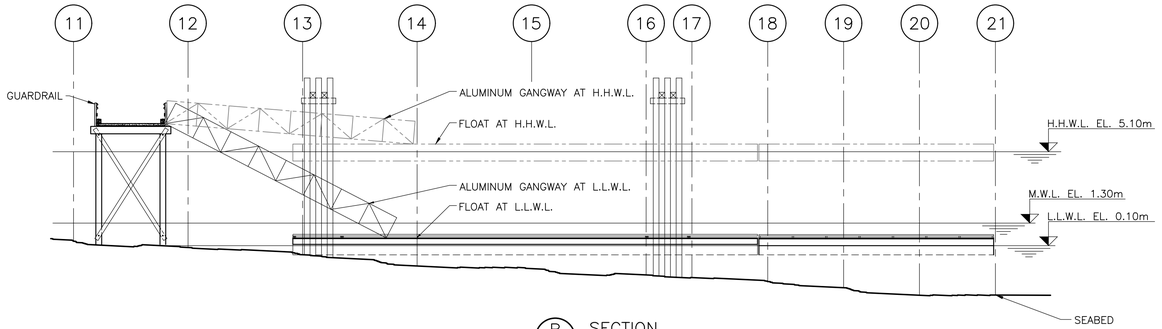

B / S02 SECTION
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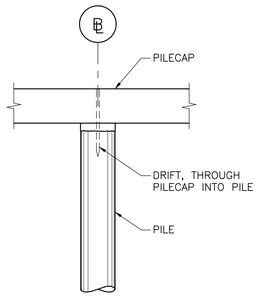

PILE TO PILECAP CONNECTION
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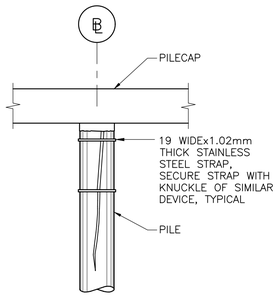

PILE STRAPPING DETAIL
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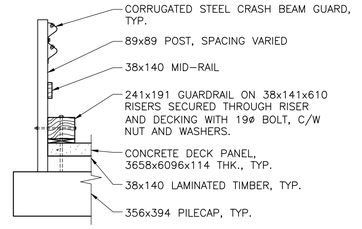
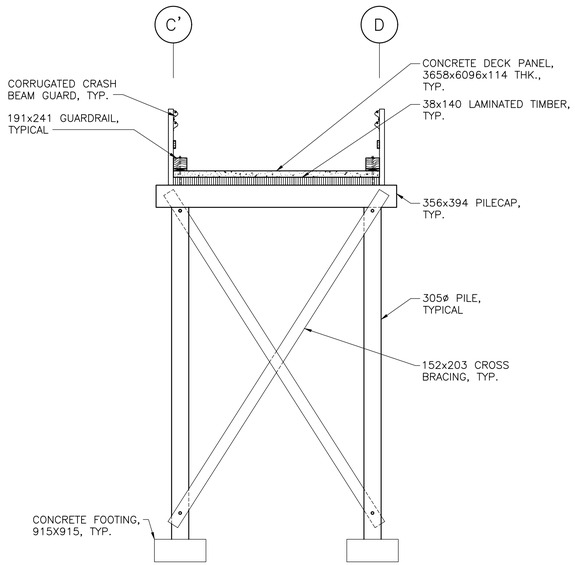


HANDRAIL AND GUARDRAIL DETAILS
1:25



C / S02 SECTION
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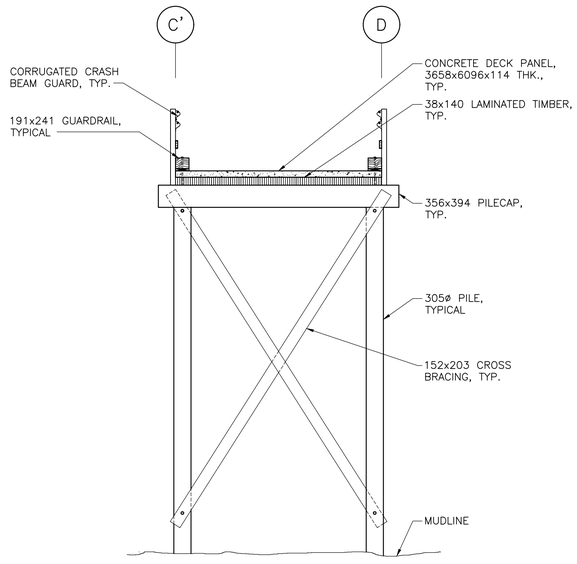

D / S02 SECTION
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ENGINEERS SEAL

GAMBIER HARBOUR: SECTIONS AND DETAILS

SCRD PORT FACILITIES
- LOAD LIMIT SAFETY
1975 FIELD ROAD SECHELT BC V0N 3A1
SUNSHINE COAST REGIONAL DISTRICT

HEL PROJECT No.	CLIENT DWG. No.
4551-002	N/A
SCALE: AS SHOWN	PERMIT No.: N/A
HEL DRAWING No.: S03	REVISION: B

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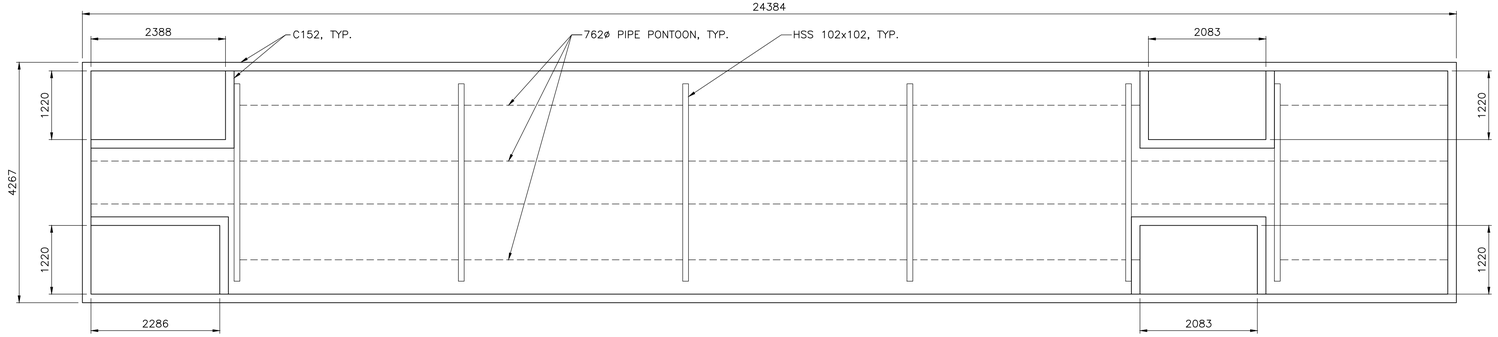
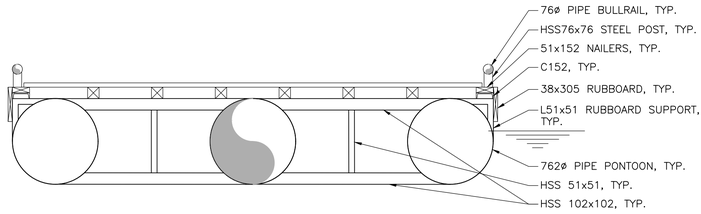
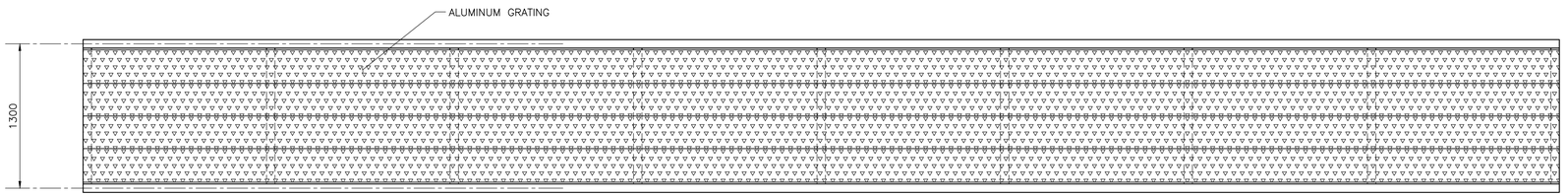


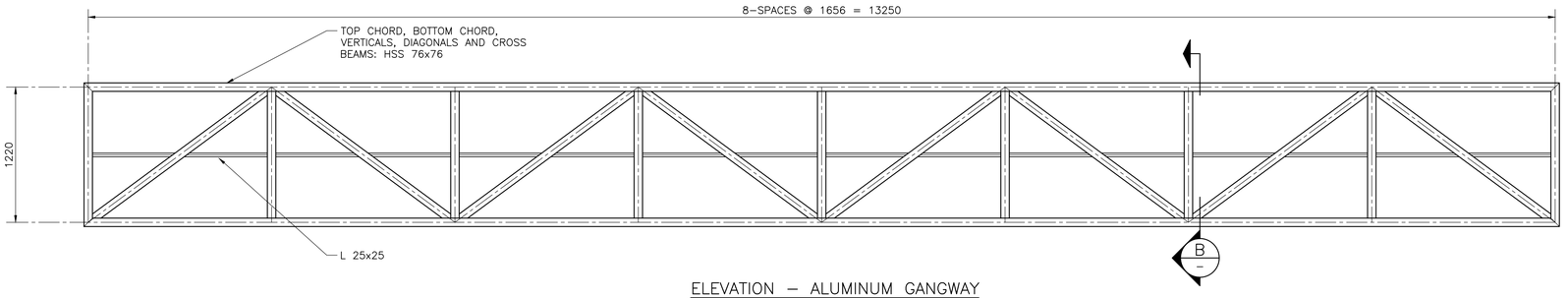
PLAN – FLOAT A (STEEL)
1:50



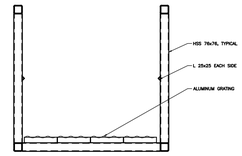
TYPICAL SECTION THROUGH STEEL FLOAT
1:25



PLAN – ALUMINUM GANGWAY
1:25



ELEVATION – ALUMINUM GANGWAY
1:25



B SECTION
1:10

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ENGINEERS SEAL

GAMBIER HARBOUR: GANGWAY AND FLOAT A - PLANS AND SECTIONS

SCRD PORT FACILITIES - LOAD LIMIT SAFETY

1975 FIELD ROAD SECHELT BC V0N 3A1
SUNSHINE COAST REGIONAL DISTRICT

HEL PROJECT No.	CLIENT DWG. No.
4551–002	N/A
SCALE	PERMIT No.
AS SHOWN	N/A
HEL DRAWING No.	REVISION
S04	B

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