

**UCLUELET WEST OUTER HARBOUR
CATAMARAN BREAKWATER INSTALLATION
2016**

FISHERIES AND OCEANS CANADA
SMALL CRAFT HARBOURS – PACIFIC REGION

200 – 401 Burrard Street
Vancouver, British Columbia
V6C 3S4



Pêches et Océans
Canada

Fisheries and Oceans
Canada

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END OF SECTION



For reference only. Not for submission.

SCHEDULE OF QUANTITIES

ITEM	CLASS OF LABOUR PLANT OR MATERIAL	UNIT OF MEASURE	QTY
1 Mobilization/Demobilization			
.1	Mobilization/Demobilization	L.S.	1
2 Catamaran Delivery and Installation			
.1	Catamaran Delivery and Alignment	L.S.	1
.2	Catamaran Installation	L.S.	1
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END OF SECTION



Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 00 10 00 SCHEDULE OF QUANTITIES
- .2 Section 01 35 29.06 HEALTH AND SAFETY REQUIREMENTS
- .3 Section 01 35 43 ENVIRONMENTAL PROCEDURES
- .4 Section 01 45 00 QUALITY CONTROL
- .5 Section 05 50 00 METAL FABRICATIONS
- .6 Section 31 62 16.19 STEEL PILES

1.2 DEFINITIONS

- .1 Throughout contract documents, the words “Owner,” “Contracting Authority,” “Harbour Authority,” “Engineer/Departmental Representative,” “Contractor,” or “Department,” shall be defined as follows:
 - .1 Owner: Small Craft Harbours Program of the Department of Fisheries and Oceans, 200-401 Burrard Street Vancouver B.C. V6C 3S4
 - .2 Contracting Authority: Tian Lam, PWGSC, Real Property Contracting Telephone: 604-775-9382, Email: tian.lam@pwgsc-tpsgc.gc.ca
 - .3 Harbour Authority: Ucluelet Harbour Authority, Box 910, Ucluelet, B.C. V0R 3A0
 - .4 Engineer/Departmental Representative: An employee of the Owner or Engineer assigned by the Owner as the Engineer for this project, or the Engineer’s representative assigned by the Engineer as his representative for the project.
 - .5 Contractor: The party accepted by the Owner with whom a formal contract is entered to complete the work of this project.
 - .6 Department: The Department of Fisheries and Oceans, Canada.



1.3 DRAWINGS

.1

216104-001-A	SITE PLAN
216104-002-A	OUTER HARBOUR GENERAL ARRANGEMENT
216104-003-A	PILE WELL & BOLLARD
216104-320-A	PILE MOORING WELL C/W PILE WELL FRAME
BW-CAT-310-B	160' DUAL LAYER – FABRICATION SHEET 1 OF 3
BW-CAT-311-B	160' DUAL LAYER – FABRICATION SHEET 1 OF 3
BW-CAT-312-B	160' DUAL LAYER – FABRICATION SHEET 1 OF 3
BW-CAT-320-B	160' DUAL LAYER – PILE MOORING WELL
BW-CAT-330-B	END PLATE DETAILS
BW-CAT-351-B	160' DUAL LAYER – DECKING PLAN – PILE MOORING
SCH	ANODE INSTALLATION INSTRUCTIONS V.1.

1.4 PROJECT SITE

.1 The Ucluelet West Outer Small Craft Harbour (The Project Site) is located at the end of Hemlock Street in town of Ucluelet, on the west coast of Vancouver Island about 180km west of Vancouver, B.C

1.5 WORK COVERED BY CONTRACT DOCUMENTS

.1 Work covered in this section comprises the supply of steel pipe piles and installation of two (2) new floating steel catamaran breakwaters with steel piling mooring system

1.6 COMMENCEMENT AND COMPLETION

.1 All work under this contract will be completed no later than December 31, 2016.



1.7 SCHEDULE OF QUANTITIES DESCRIPTION

The following descriptions are provided in reference to Section 01 11 00 – SCHEDULE OF QUANTITIES.

.1 MOBILIZATION/ DEMOBILIZATION

.1 MOBILIZATION/DEMOBILIZATION

The lump sum cost for this item shall include the supply of materials, equipment, tools, services, labour and all things necessary to complete the following:

- .1 Mobilization/Demobilization of crew and equipment to Project Site.
- .2 All crew living expenses and other associated costs.
- .3 Any overhead costs not covered in other items.
- .4 Site clean-up.

.2 CATAMARAN DELIVERY AND INSTALLATION

.1 CATAMARAN DELIVERY AND ALLIGNMENT

The lump sum cost for this item shall include the supply of materials, equipment, tools, services, labour and all things necessary to complete the following:

- .1 Take delivery of two (2) 8.5 m wide by 48.8 m long new dual layer catamaran breakwaters at Port Alberni Small Craft harbours Site and transport to Ucluelet West Small Craft Harbours site.
- .2 Position new catamaran breakwaters in location identified on contract drawings prior to installation of steel piles. This includes maintaining position of catamaran breakwaters throughout pile driving process.

.2 CATAMARAN INSTALLATION

The lump sum cost for this item shall include the supply of materials, equipment, tools, services, labour and all things necessary to complete the following:

- .1 Supply and install eight (8) 19.1mm x 762mm diameter unpainted straight seam steel pipe piles securing the catamaran as shown on the contract drawings.
- .2 Once specified penetration achieved and pile completion is accepted by Engineer, cut pile top to final elevation and weld top plate as shown on contract drawings.
- .3 Install one (1) Owner supplied anode to each pile as per Anode Installation Instructions V.1 including supply of all hardware.
- .4 Install 16 owner supplied anodes on each catamaran units as directed by the Engineer. Anodes will be connected to mooring



lugs and will require removal and replacement of 8 timber deck planks per catamaran unit.

- .5 Supply, fabricate and install eight (8) painted pile well frames on the catamaran as shown on the contract drawings. Contractor to ensure that piles come to bear evenly against all mooring wells.

.3 ADDITIONAL PILE DRIVING

The additional pile driving item is to be used at the direction of the Departmental Representative. The items outlined below are reserved for unforeseen site conditions and are to be allotted at the discretion of the Departmental Representative.

This item includes the unit rate cost for the supply of materials, equipment, tools, services, labour and all things necessary to complete the following:

- .1 Additional Pile Driving into Bedrock
 - .1 Churn/drill socket into bedrock one (1) metre and drive piling into socket one (1) metre.
 - .2 Total socket depth to be determined as per Section 31 62 16.19 STEEL PIPE PILES or direction of Engineer onsite.
 - .3 Contractor must be capable of churning/drilling socket with pile already in place and driven through available overburden.
 - .4 Contractor to include allowances for probable interruptions to driving for changing/modifying/maintaining churning equipment or other pile driving or barge equipment.
 - .5 Contractor is to notify the Departmental Contact Immediately in writing upon encountering conditions that require churning/drilling/socketing
 - .1 Notice to include pile, location, and current depth reached at refusal
 - .6 No churning/drilling/socketing or actions towards this item are to take place without acknowledgement of this notice, and written direction to proceed.
 - .7 Quantities for this item reflect an estimate of bedrock conditions at the site, and no claim for additional quantities will be entertained without written direction from Departmental Contact.



1.8 WORK SEQUENCE

- .1 Owner to move existing mooring vessels out of work area prior to start of construction.
- .2 Contractor to provide a minimum 7-day notice to the Owner and receive a written response from Owner that existing vessels have been relocated as per clause 1.9.1 prior to mobilization to site.
- .3 Co-ordinate Progress Schedule and co-ordinate with Owner Occupancy during construction.
- .4 Co-operate with Owner in scheduling operations to minimize conflict and to facilitate Owner usage.

1.9 CONTRACTOR USE OF PREMISES

- .1 Co-ordinate use of premises under direction of Owner.
- .2 Obtain and pay for use of additional storage or work areas needed for operations under this Contract.
- .3 Repair or replace portions of existing work which have been altered during construction operations to match existing or adjoining work, as directed by Engineer.
- .4 At completion of operations condition of existing work: equal to or better than that which existed before new work started.
- .5 The Contractor shall obey all navigation regulations and conduct operations so as to interfere as little as possible with the use of berthing spaces, fairways and passages. Install and maintain any and all protection to navigation as may be required by any properly constituted authority or by the Engineer. During the course of construction and cleanup, do not dispose of surplus, waste or demolished materials in navigable waters.
- .6 The Contractor shall upon instruction of the Owner or Engineer, promptly remove any of the Contractor's equipment located outside the specified work area and obstructing any harbour operation.

1.10 OWNER OCCUPANCY

- .1 Owner will occupy premises during entire construction period for execution of normal operations.
- .2 Co-operate with Owner in scheduling operations to minimize conflict and to facilitate Owner usage.

1.11 OWNER FURNISHED ITEMS

- .1 The following materials will be supplied by the Owner:



- .1 Two dual layer catamarans will be supplied floating in the water at Port Alberni Small Craft Harbours site, Latitude: 49° 6' 46" Longitude: -124° 49' 13"
- .2 Zinc Pile Anodes as per Drawing "Anode Installation Instructions V.1" – QTY: 40 at French Creek Harbour, 1055 Lee Road, Parksville, BC, V9P 2E1 upon contract award

1.12 EXISTING SERVICES

- .1 Notify, Engineer and utility companies of intended interruption of services and obtain required permission.
- .2 Where Work involves breaking into or connecting to existing services, give Engineer 48 hours notice for necessary interruption of mechanical or electrical service throughout course of work. Minimize duration of interruptions. Carry out work at times as directed by governing authorities with minimum disturbance to tenant operations.
- .3 Establish location and extent of service lines in area of work before starting Work. Notify Engineer of findings.
- .4 Submit schedule to and obtain approval from [Consultant] for any shut-down or closure of active service or facility including power and communications services. Adhere to approved schedule and provide notice to affected parties.
- .5 Provide temporary services [when directed by [Consultant]] to maintain critical building and tenant systems.
- .6 Where unknown services are encountered, immediately advise [Consultant] and confirm findings in writing.
- .7 Protect, relocate or maintain existing active services. When inactive services are encountered, cap off in manner approved by authorities having jurisdiction.
- .8 Record locations of maintained, re-routed and abandoned service lines.
- .9 Construct requisite barriers, fences, warning signs, lights and watching for the protection of persons and property on or adjacent to the site.



1.13 DOCUMENTS REQUIRED

- .1 Maintain at job site, one copy each document as follows:
 - .1 Contract Drawings.
 - .2 Specifications.
 - .3 Addenda.
 - .4 Reviewed Shop Drawings.
 - .5 List of Outstanding Shop Drawings.
 - .6 Change Orders.
 - .7 Other Modifications to Contract.
 - .8 Field Test Reports.
 - .9 Copy of Approved Work Schedule.
 - .10 Health and Safety Plan and Other Safety Related Documents.
 - .11 All regulatory permits required for the work.
 - .12 Associated Best Management Practices documentation.

Part 2 Products

2.1 NOT USED

- .1 Not used.

Part 3 Execution

3.1 NOT USED

- .1 Not used.

END OF SECTION



Part 4 General

4.1 RELATED REQUIREMENTS

- .1 Section 01 35 29.06 HEALTH AND SAFETY REQUIREMENTS
- .2 Section 01 45 00 QUALITY CONTROL
- .3 Section 31 62 16.19 STEEL PIPE PILES

4.2 REFERENCES

- .1 Definitions:
 - .1 Environmental Pollution and Damage: presence of chemical, physical, biological elements or agents which adversely affect human health and welfare; unfavourably alter ecological balances of importance to human life; affect other species of importance to humans; or degrade environment aesthetically, culturally and/or historically.
 - .2 Environmental Protection: prevention/control of pollution and habitat or environment disruption during construction.

4.3 IN WATER WORKS

- .1 Construction equipment to be operated on land or from floating barge.
- .2 Waterways to be kept free of excavated fill, waste material and debris.
- .3 Do not skid logs or construction materials across waterways.

4.4 POLLUTION CONTROL

- .1 Control emissions from equipment and plant in accordance with local authorities' emission requirements.
- .2 Prevent sandblasting and other extraneous materials from contaminating air and waterways beyond application area.

4.5 NOTIFICATION

- .1 Engineer will notify Contractor in writing of observed noncompliance with Federal, Provincial or Municipal environmental laws or regulations, permits, and other elements of Contractor's Environmental Protection plan.
- .2 Contractor: after receipt of such notice, inform Engineer of proposed corrective action and take such action for approval by Engineer.
 - .1 Take action only after receipt of written approval by Engineer
- .3 Engineer will issue stop order of work until satisfactory corrective action has been taken.
- .4 No time extensions granted or equitable adjustments allowed to Contractor for such suspensions.



Part 5 Products

5.1 NOT USED

- .1 Not Used.

Part 6 Execution

6.1 PILE DRIVING

- .1 Pile driving shall be conducted in accordance with the following Best Management Practices:
 - .1 Machinery is to arrive on site in a clean, washed condition and be free of fluid leaks.
 - .2 Complete works using appropriate timing windows related to species that may be affected by the works and or methods used.
 - .3 Underwater pressure waves not to exceed 30 kPa during driving.
 - .4 A vibratory hammer is to be used if driving conditions permit.
 - .5 Any water-based equipment or machinery moored or used during the Project must not ground on the intertidal foreshore or subtidal river or sea bed. The only exception to this condition is that use may be made of vertical spuds or other anchors to hold the water-based machinery or equipment in place.
 - .6 Wash, refuel and service machinery and store fuel and other materials for the machinery at least 30 metres away from the water in order to prevent any deleterious substance from entering the water.
 - .7 Pile cut-offs, waste or any miscellaneous unused materials must be recovered for either disposal in a designated facility or placed in storage.
 - .8 Report any incidents of habitat damage to the Environmental Monitor or DFO to ensure that appropriate action (restoration) is taken.
 - .9 If fish spawn in the area or on equipment all work should stop and the Environmental Monitor or DFO notified.

6.2 CLEANING

- .1 Leave Work area clean at end of each day.
- .2 Ensure public waterways, storm and sanitary sewers remain free of waste and volatile materials disposal.
- .3 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment to approval of the Owner.

END OF SECTION



Part 7 General

7.1 RELATED REQUIREMENTS

- .1 Not used

7.2 REFERENCES

- .1 Construction General Conditions

7.3 INSPECTION

- .1 Allow Departmental Representative access to Work. If part of Work is in preparation at locations other than Place of Work, allow access to such Work whenever it is in progress.
- .2 Give timely notice requesting inspection if Work is designated for special tests, inspections or approvals.
- .3 If Contractor covers or permits to be covered Work that has been designated for special tests, inspections or approvals before such is made, uncover such Work, have inspections or tests satisfactorily completed and make good such Work.
- .4 Departmental Representative will order part of Work to be examined if Work is suspected to be not in accordance with Contract Documents. If, upon examination such work is found not in accordance with Contract Documents, correct such Work and pay cost of examination and correction.

7.4 ACCESS TO WORK

- .1 Allow inspection/testing agencies access to Work, off site manufacturing and fabrication plants.
- .2 Co-operate to provide reasonable facilities for such access.

7.5 PROCEDURES

- .1 Notify appropriate in advance of requirement for tests, in order that attendance arrangements can be made.
- .2 Submit samples and/or materials required for testing, as specifically requested in specifications. Submit with reasonable promptness and in orderly sequence to not cause delays in Work.
- .3 Provide labour and facilities to obtain and handle samples and materials on site. Provide sufficient space to store and cure test samples.

7.6 REJECTED WORK

- .1 Refer to Construction General Conditions for stipulated interpretation..
- .2 Remove defective Work, whether result of poor workmanship, use of defective products or damage and whether incorporated in Work or not, which has been rejected by failing to conform to Contract Documents. Replace or re-execute in accordance with Contract Documents.



- .3 Make good other Contractor's work damaged by such removals or replacements promptly.
- .4 If in opinion of Owner it is not expedient to correct defective Work or Work not performed in accordance with Contract Documents, Owner will deduct from Contract Price difference in value between Work performed and that called for by Contract Documents, amount of which will be determined by The Engineer.

7.7 REPORTS

- .1 Submit 4 copies of inspection and test reports to Owner

7.8 MILL TESTS

- .1 Submit mill test certificates as required of specification Sections.

Part 8 Products

8.1 NOT USED

- .1 Not Used.

Part 9 Execution

9.1 NOT USED

- .1 Not Used.

END OF SECTION



Part 10 General

10.1 SCOPE OF WORK

- .1 This section refers to the placement of the catamaran.

Part 11 Products

11.1 2.1 GENERAL

- .1 The Contractor shall be responsible for the supply of small item materials and any materials required to complete the installation.

Part 12 Products

12.1 GENERAL

- .1 All work shall be inspected by the Engineer.
- .2 Contractor is to co-operate with Engineer in providing access for inspection of materials, assembly and pile placement location during the performance of work.

12.2 CONNECTIONS

- .1 All connections and hardware must be to the satisfaction of the Engineer prior to placement of piles and final alignment of catamaran.

12.3 PILE INSTALLATION

- .1 The Contractor must have equipment capable of lifting, placing, repositioning and attaching specified mooring piles and pile wells as shown on the drawings.
- .2 The contractor will take direction from the Engineer for on-site adjustments to the catamaran alignment.
- .3 Floating equipment to be capable of passing safely between new catamaran and adjacent structure(s).
- .4 Before final approval of catamaran the bearing and location of the mooring piles shall be approved by the Engineer.

END OF SECTION

Part 13 General

13.1 RELATED REQUIREMENTS

- .1 Section 31 62 16.19 – STEEL PILES

13.2 REFERENCES

- .1 ASTM International
 - .1 ASTM A53/A53M-[07], Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
 - .2 ASTM A269-[08], Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
 - .3 ASTM A307-[07b], Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
- .2 CSA International
 - .1 CSA G40.20/G40.21-[04(R2009)], General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .2 CAN/CSA G164-[M92(R2003)], Hot Dip Galvanizing of Irregularly Shaped Articles.
 - .3 CSA S16-[09], Design of Steel Structures.
 - .4 CSA W48-[06], Filler Metals and Allied Materials for Metal Arc Welding (Developed in co-operation with the Canadian Welding Bureau).
 - .5 CSA W59-[M03(R2008)], Welded Steel Construction (Metal Arc Welding) [Metric].
- .3 Health Canada / Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .4 The Master Painters Institute (MPI)
 - .1 Architectural Painting Specification Manual - [current edition].

13.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section [01 33 00 - Submittal Procedures].
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for piling and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Submit drawings with metric dimensions
 - .2 The Contractor shall submit three prints or an electronic copy in PDF of the shop drawings for the Engineer's review prior to commencing fabrication. If shop drawings are not to the Engineer's satisfaction, they will be returned with the notation "Resubmit". Drawings that have been

returned with the notation "Reviewed" would allow fabrication to commence.

- .3 The review of shop drawings will be for size and arrangement of members and strength of connections. Any errors in dimensions shown on the shop drawings shall be the responsibility of the Contractor.
- .4 Upon completion of the project, all reviewed shop drawings shall be submitted to the owner along with the As-Built marked drawings. In addition, diskettes containing all shop drawings in AutoCAD format shall be submitted.

13.4 QUALITY ASSURANCE

- .1 Test Reports: submit certified test reports showing compliance with specified performance characteristics and physical properties.
- .2 Certifications: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

13.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Replace defective or damaged materials with new.

Part 14 Products

14.1 MATERIALS

- .1 Steel sections and plates: to CSA G40.20/G40.21, Grade 350W unless otherwise noted.
- .2 All other rolled sections and plates: to CSA G40.20/G40.21, Grade 300W unless otherwise noted.
- .3 Steel pipe: to ASTM A53/A53M standard weight galvanized finish.
- .4 Welding materials: to CSA W59.
- .5 Welding electrodes: to CSA W48 Series.
- .6 Bolts and anchor bolts: to ASTM A325.
- .7 Grout: non-shrink, non-metallic, flowable, 15 MPa at 24 hours.
- .8 All structural steel members shall be made of the size and weight shown on the drawings unless written approval is obtained by the Departmental Representative

14.2 FABRICATION

- .1 Fabricate work square, true, straight and accurate to required size, with joints closely fitted and properly secured.
- .2 Where possible, fit and shop assemble work, ready for erection.

- .3 Ensure exposed welds are continuous for length of each joint. File or grind exposed welds smooth and flush.
- .4 Unless noted otherwise, all welds shall develop the full strength of the connected members, and shall be continuous seal welds with a minimum 6mm leg length.
- .5 Where on the drawings it is called for double sided welding; the welding details called for on the near side shall be duplicated on the far side if not called up otherwise.

14.3 FINISHES

- .1 Galvanizing: hot dipped galvanizing with zinc coating 610 g/m² to CAN/CSA-G164.
- .2 Except as noted below, all structural and miscellaneous steel for pile wells and bollards shall be painted in accordance with the requirements of Section 00 98 00 – Painting.
- .3 Pipe piles shall not be painted.
- .4 Bolts, washers and nuts shall be hot dip galvanized in accordance with ASTM Specifications A-153 or A-123 or CSA G 164-M (minimum zinc coating 610 g/m²).

14.4 SHOP PAINTING

- .1 All structural and miscellaneous steel for pile wells and bollards shall be painted in accordance with the requirements of Section 09 97 19 – Painting

Part 15 Execution

15.1 EXAMINATION AND INSPECTION

- .1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for metal fabrications installation in accordance with manufacturer's written instructions.
- .2 The Contractor shall furnish all facilities for inspecting and testing the weight, dimensions and quality of workmanship at the shop where the material is fabricated.
- .3 The Departmental Representative shall be notified well in advance of the start of work, in order to allow sufficient time for inspection of material and workmanship.
- .4 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

15.2 ERECTION

- .1 Do welding work in accordance with CSA W47, W48 AND W59 unless specified otherwise.
- .2 Erect metalwork square, plumb, straight, and true, accurately fitted, with tight joints and intersections.
- .3 Touch-up rivets, field welds, bolts and burnt or scratched surfaces with primer after completion of:
 - .1 Primer: maximum VOC limit [250] g/L [to GS-11].
- .4 Touch-up galvanized surfaces with zinc rich primer where burned by field welding.
 - .1 Primer: maximum VOC limit [250] g/L [to GS-11].

15.3 CLEANING

- .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section [01 74 11 - Cleaning].

15.4 PROTECTION

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by metal fabrications installation.

END OF SECTION

Part 16 General

16.1 RELATED REQUIREMENTS

- .1 Section 05 90 00 – STEEL HARDWARE
- .2 Section 31 62 16.19 – STEEL PILES

16.2 SCOPE OF WORK

- .1 This section relates to the following:
 - .1 Painting of fabricated structural steel components.
 - .2 This specification defines the method of surface preparation, materials and paint application;
 - .3 The work described herein shall include all necessary labour, materials, tools and equipment, scaffolding and cartage to supply, mix and apply all shop and field applied paint materials, including surface preparation.

16.3 REFERENCES

- .1 The Master Painters Institute (MPI)
 - .1 Exterior Structural Steel and Metal Fabrications, [07].
 - .1 EXT 5.1D, Alkyd.
 - .2 EXT 5.1G, Polyurethane, Pigmented (over epoxy zinc rich primer and high build epoxy).
 - .3 EXT 5.4, Aluminum.
- .2 ASTM International
 - .1 ASTM D3359-09e2, Standard Test Method for Measuring Adhesion by Tape.
 - .2 ASTM D3276-07, Standard Guide for Paint Inspectors (Metal Substrates)
- .3 Federal Standard (FS)
 - .1 FED-STD-595B-[89], Colours Used in Government Procurement.
- .4 The Society for Protective Coatings (SSPC)
 - .1 SSPC-SP 1-[82(R2004)], Solvent Cleaning.
 - .2 SSPC-SP 2-[82(R2004)], Hand Tool Cleaning.
 - .3 SSPC-SP 3-[82(R2004)], Power Tool Cleaning.
 - .4 SSPC-SP 6/NACE No. 3-[07], Commercial Blast Cleaning.
 - .5 SSPC-SP 7/NACE No. 4-[07], Brush-off Blast Cleaning.
 - .6 SSPC-Vis-1-[89], Visual Standard for Abrasive Blast Cleaned Steel (Standard Reference Photographs) Editorial Changes September 1, 2000 (Steel Structures Painting Manual, Chapter 2 - Surface Preparation Specs.).
 - .7 SSPC-SP 10/NACE No. 2-[07], Near White Blast Cleaning.
 - .8 SSPC-PA 2[04], Measurement of Dry Coat Thickness with Magnetic Gauges.

- .9 SSPC Good Painting Practices, Volume 1, 4th Edition.
- .5 BC Waste Management Act (SWEP)
- .6 Health Canada / Workplace Hazardous Materials Information System (WHMIS)
- .1 Material Safety Data Sheets (MSDS).

16.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Contractor to submit details of proposed construction procedures at time of tender. Details shall clearly describe equipment and methods used for surface preparation, masking and hoarding and coating material application. Contractor shall submit details outlining procedures for product handling, spill contingency plans, and response procedures in the event of spillage of solvent, paint, or other material, at least 10 days prior to commencement of production work.
- .2 Provide Product Data Sheets and MSDS sheets for all products supplied in this section.
- .3 The coating contractor shall prepare and submit a Quality Control/Assurance Program including an inspection and testing plan, subject to approval by the Engineer. The inspection and testing plan shall include a project schedule for all phases of the work all inspection hold points, test method, test frequency and acceptance criteria for each procedure of the project work. The coating contractor shall implement the plan and prepare and issue reports. The plan shall be submitted to the Engineer for review and acceptance prior to initiating work of this section.

16.5 QUALITY ASSURANCE

- .1 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

16.6 DELIVERY, STORAGE AND HANDLING

- .1 All waste materials to be handled and disposed of in safe and environmentally sound manner. Waste material to be disposed of at approved and authorized disposal site.
- .2 All hazardous materials to be disposed of in approved manner as stated in "Workers' Compensation Board" reference manual "WHMIS Core Material" and "Occupational Health and Safety Regulations".
- .3 Upon completion of the Project all surplus materials to be removed from the site and disposed by the Contractor. Site to be cleared to the satisfaction of the Engineer.

16.7 PROTECTION AND CLEAN-UP

- .1 Coating Contractor to be responsible to protect all adjacent equipment, structures, pavement or surfaces not to be painted, at all times, from paint drips, spattering, over-spray or other damage related to paint application. Any surfaces damaged to be restored to a condition as good as or better than that which existed prior to initiating work and to the satisfaction of the Engineer.

Part 17 Products

17.1 GENERAL

- .1 The dry film thickness (DFT) shall be stated in mils where 1 mil = 1/1000 inch.
- .2 All materials in coating system, including thinners, shall be from same manufacturer and shall not have exceeded shelf life, or one year from date of manufacture, whichever is less. Where practical, all similar materials shall be of same batch number.

17.2 MATERIALS

- .1 The following paint system is approved for application:

Coat No.	Type	Binder	Product Name	Dry Film Thickness
1	Primer	Zinc-Rich Epoxy	Interzinc 52	2.5 mils
2	Mid Coat	Polyamide Epoxy	Interseal 670HS	7 mils
2	Stripe Coat	Polyamide Epoxy	Interseal 670HS	5 mils
3	Topcoat	Polyamide Epoxy	Interseal 670HS	7 mils
-	-	-	-	16.5 mils minimum

- .2 Minimum DFT of finished coating system to be 16.5 mils at any location.
- .3 Coating Contractor may submit alternative coating systems/manufacturers to the Engineer for consideration. The request to consider an alternate coating system shall be submitted to the Engineer in writing and shall include all necessary information to assess the alternative system for equivalence to that specified. If an alternate coating system is approved, the minimum DFT of the finished alternative coating system shall not be less than that specified for the originally specified coating system.

Part 18 Execution

18.1 WORKMANSHIP

- .1 All work to be completed by skilled, qualified tradesmen in accordance with the best safety practice standards and in manner acceptable to Engineer. Tradesmen qualifications to be presented at the pre-construction meeting. If alternate tradesmen to be employed subsequently, qualifications to be presented prior to commencing work.
- .2 All coating materials to be applied in manner directed in coating manufacturer's literature. The dried film for each coat shall be smooth and continuous and free of porosity, pinholes, blisters, runs and sags or other film defects. All dry spray to be removed prior to over coating.

- .3 Coating Contractor to comply with all directions pertaining to temperature, humidity, surface preparation, dew point, mixing ratios, induction times if required, and touch-up procedures as set forth by coating manufacturer.
- .4 Coating Contractor to furnish and be familiar with use of wet and dry film thickness gauges and other instruments or gauges as required.
- .5 All tools and equipment provided by coating Contractor to be in good working order including moisture traps in air lines running from compressor to surface preparation and application equipment. Moisture trap to be set for continuous bleed during spray procedure.
- .6 Special attention to be given to ensure sufficient coating thickness is obtained. In areas difficult to coat with ordinary spray applications, other application procedures shall be applied.
- .7 All coating materials including thinners to be placed on project site in original containers, properly sealed and labelled.
- .8 Coating color as indicated on Contract Drawings.

18.2 SURFACE PREPARATION

- .1 All surfaces to be painted shall be prepared in accordance with Society of Protective Coatings (SSPC), particularly but not limited to:
 - .1 SSPC-SP1 - Solvent Cleaning (degreasing)
 - .2 SSPC-SP10 - Near White Metal Blast
- .2 Prior to blast cleaning, all areas to be solvent cleaned, in accordance with SSPC-SP1 solvent cleaning (degreasing), to remove oil and grease.
- .3 Only abrasives acceptable to the Workers' Compensation Board, Fisheries and Oceans Canada, Environment Canada and BC Environment to be used. Minimum profile depth shall be 50 micron (2mils). Maximum profile depth shall not exceed one third of dry film thickness for entire coating system.
- .4 Prior to blast cleaning, all weld splatter and slag on welds to be removed. All sharp edges to be radiused to 3 mm for paint retention.
- .5 All blast cleaning shall conform to SSPC-SP10 - Near White Metal Blast in accordance with SSPC-SP Manuals Volume 1 and 2.
- .6 All blast cleaned surfaces shall be coated within eight (8) hours. Any surfaces left longer than eight (8) hours before coating application shall be re-blasted to SSPC-SP10 standard.
- .7 All blast cleaning shall be carried out under cover and in an area protected from weather and other detrimental conditions.
- .8 All surfaces to be coated shall be inspected and accepted by the Engineer or authorized representative prior to coating material application.

18.3 COATING APPLICATION

- .1 All specified coating materials to be applied in accordance with this specification and the manufacturer's data sheets. In the event of conflict between the provisions of technical specification or manufacturer's data sheets, the technical specification shall overrule.
- .2 Coating application shall be executed within a shelter of sufficient size to accommodate the full length of the fabricated assembly. The shelter shall be

- equipped with all necessary equipment to control environmental conditions to comply with manufacturer recommended minimum requirements irrespective of weather conditions external to the shelter.
- .3 The requirement for field welds shall be minimized. No paint shall be applied to surfaces 50mm each side of areas to be field welded.
 - .4 Coatings shall not be applied over damp steel or over previous coats not sufficiently dried. Ambient air temperature and steel substrate temperature shall be 5°C minimum and 35°C maximum during coating application. The relative humidity shall be less than 85% and substrate temperature shall not be less than 3°C above dew point during all coating applications.
 - .5 All high solid material shall be applied by Conventional or Airless Spray. Spray painting equipment shall be of ample capacity and shall be kept clean and in good working order at all times. Spray guns shall be suited to the type of paint used and shall be operated with orifices, nozzles, and air pressure suited to type of paint and consistency. If conventional paint pots are used they shall be of ample capacity and shall be equipped with means of controlling air pressure at the gun.
 - .6 Air lines shall be equipped with water traps to positively remove condensed moisture.
 - .7 Newly painted surfaces shall be protected from rain, condensation, contamination, snow and freezing temperatures until paint is thoroughly dry. Curing periods shall exceed manufacturer's recommendations.
 - .8 A 'Stripe Coat' brush application of coating material, thinned approximately 10%, shall be applied to all welds, corners, crevices and other discontinuities prior to the first spray application of the coating material.
 - .9 Each coat of paint shall have a definite colour difference from the proceeding and following coats of paint.
 - .10 Additions of paint thinner must be from the same manufacturer as the coating system and must not exceed the manufacturer's recommendations.
 - .11 Inspection of preparation, application and final dry film thickness will be carried out by a qualified representative of the Owner. Inspector will have authority to stop Work if conditions not within specifications.

18.4 SURFACE PREPARATION FOR TOUCH-UP WORK

- .1 All field welds shall be cleaned of slag, debris, and burnt paint and painted as specified herein.
- .2 All steel surfaces to receive coating material shall be fresh water power washed at a minimum of 3500 PSI to remove all dust, dirt, soluble salts, or other foreign matter. Soluble salt contamination shall be less than 7 PPM prior to any coating material application. Remove all grease and oil by washing with solvents/degreaser to SSPC-SP1.
- .3 All steel surfaces to receive coating material shall be prepared in accordance with SSPC-SP11 (Power Tool Cleaning to Bare Metal). Coating areas adjacent to area to be touched up shall be covered and protected during power tool use to prevent any degradation to coating areas already completed.

- .4 Only tightly adhering coating material can remain on the substrate prior to recoating. All rough welds or protruding miscellaneous metal attachments in the areas to be coated shall be ground smooth prior to coating material application.
- .5 All surfaces to be coated shall be inspected and accepted by the Engineer prior to coating material application.

18.5 CONTAINMENT

- .1 Contractor to provide containment to prevent overspray damage to adjacent property, structures, vehicles, or pedestrians. All overspray damage shall be corrected at the Contractor's expense to satisfaction of the Engineer.

18.6 COATING MATERIAL APPLICATION FOR TOUCH-UP WORK

- .1 All specified coating materials to be applied in accordance with this specification and manufacturer's data sheets. In the event of conflict between the provisions of technical specification or manufacturer's data sheets, the technical specification govern.
- .2 Coatings shall not be applied over damp steel or over previous coats that have not sufficiently dried. Ambient air temperature and steel substrate temperature shall be 5°C minimum and 35°C maximum during coating application. Relative humidity shall be less than 85% and the substrate temperature shall not be less than 3°C above dew point during all coating applications.
- .3 All prepared steel surfaces to receive coating material shall be brush or roller applied in two or more coats to provide the originally specified DFT for new construction.
- .4 Additions of paint thinner to be from the same manufacturer as coating system and must not exceed manufacturer's recommendations.
- .5 Newly painted surfaces shall be protected from rain, condensation, contamination, snow, and freezing temperatures until paint thoroughly dry. Curing periods shall exceed manufacturer's recommendations.
- .6 Inspection of preparation, application and final dry film thickness will be carried out by a qualified representative of the Owner. Inspector will have authority to stop Work if conditions not within specifications.

18.7 INSPECTION

- .1 Coating Contractor fully responsible for quality assurance/control of work, products and materials used, surface preparation and coating application and for ensuring work is executed in accordance with the specified requirements and procedures. Coating Contractor shall employ NACE certified inspection personnel to provide these services.
- .2 The Engineer may engage the services of a third party to perform independent quality assurance.
- .3 All surface preparation and coating applications are subject to acceptance. All surface preparation must be inspected and approved by the Engineer representative before any coating material may be applied. If coating Contractor proceeds without approval, he may, at the discretion of the Engineer, be required to remove or recoat such work at no additional cost to Owner.

- .4 Coating Contractor shall take wet film thickness measurements or spreading rate checks at least once every ten minutes or once after each 4.5 square meters of surface is coated to assure that specified film thickness is achieved. The Engineer may require more frequent checks.
- .5 At the discretion of the Engineer, occasional spot checks for coating material adhesion may be performed. Such test areas shall be repaired at expense of the Contractor.
- .6 Newly painted surfaces shall be inspected when the paint has thoroughly dried. The painted surfaces shall be considered to lack uniformity, continuity, and soundness if any of the following defects are apparent to the Inspector:
 - .1 runs and sags, hiding or shadowing caused by inefficient application methods
 - .2 evidence of poor coverage at rivet heads, plate edges, lap joints, crevices, pockets, corners, and re-entrant angles
 - .3 damage due to touching before the paint is sufficiently dry or any other contributory cause
 - .4 damage due to application on moist surfaces or caused by inadequate protection from the weather
 - .5 damage and/or contamination of the paint due to wind-blown contaminants (dust, sand blast materials, etc.)
- .7 Rejected painted surfaces shall be made good at the expense of the Contractor. Small affected areas may be touched up; large affected areas, or where insufficient dry film thickness has been attained, will involve the application of additional coating material to provide the specified DFT. Runs, sags, or paint damaged in handling shall be removed by scraper prior to further application of paint.
- .8 The contractor shall measure and record the dry film thickness (DFT) of the completed coating application and shall report the results to the Engineer. Measurement procedures shall be as follows:
 - .1 The accuracy of the thickness measurement gage shall be confirmed immediately prior to conducting the field measurement using a clean uncoated section of bare steel and at least four standard shims of varying thickness;
 - .2 DFT measurements shall be conducted at representative locations on all end plates, gusset plates, brackets and other appurtenances;
 - .3 On the surfaces of pipe sections, at least four DFT measurements shall be taken at intervals of 2.0 m or less along the length of each member. The four measurement locations at each interval shall be evenly spaced around the cross section of the pipe.
 - .4 Measurement locations and results shall be indicated on a suitable diagram.
- .9 The Engineer may independently verify the DFT of the completed coating.
- .10 The coating system shall be fully completed, inspected and approved before subsequent aspects of the work are advanced.

18.8 SHIPPING AND HANDLING

- .1 Handle surfaces that have been coated to the above Specifications using the following:
 - .1 after the finish coat has been applied, use only nylon ropes or rubber-covered slings for handling steel
 - .2 after paint has been applied, take special precautions in handling and shipping to prevent damage to the coating. For shipment, strap smaller members into bundles. Use wood softeners to prevent movement while in transit. Use wood softeners also when stacking steel for storage at the site and provide blocking between the steel and the ground surface.
- .2 The coating application on the completed assembly will be inspected following delivery to the site. Any observed damage to the coating shall be repaired to a condition conforming to this section.

END OF SECTION

Approved: 2013-06-30

Part 19 General

19.1 RELATED REQUIREMENTS

- .1 Section 01 11 00 SUMMARY OF WORK
- .2 Section 01 35 43 ENVIRONMENTAL PROCEDURES
- .3 Section 31 62 16.19 STEEL PIPE PILES

19.2 REFERENCES

- .1 Canada Labour Code, Part 2, Canada Occupational Safety and Health Regulations
- .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .3 Province of British Columbia
 - .1 Workers Compensation Act, RSBC 1996 - Updated [2012].

19.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit site-specific Health and Safety Plan: Within 7 days after date of Notice to Proceed and prior to commencement of Work. Health and Safety Plan must include:
 - .1 Results of site specific safety hazard assessment.
 - .2 Results of safety and health risk or hazard analysis for site tasks and operation.
- .2 Submit 3 copies of Contractor's authorized representative's work site health and safety inspection reports to Departmental Representative
- .3 Submit copies of reports or directions issued by Federal, Provincial and Territorial health and safety inspectors.
- .4 Submit copies of incident and accident reports.
- .5 Submit WHMIS MSDS - Material Safety Data Sheets.
- .6 Departmental Representative will review Contractor's site-specific Health and Safety Plan and provide comments to Contractor within 5 days after receipt of plan. Revise plan as appropriate and resubmit plan to Departmental Representative 5 days after receipt of comments from Departmental Representative.
- .7 Departmental Representative's review of Contractor's final Health and Safety plan should not be construed as approval and does not reduce the Contractor's overall responsibility for construction Health and Safety.
- .8 On-site Contingency and Emergency Response Plan: address standard operating procedures to be implemented during emergency situations.

19.4 FILING OF NOTICE

- .1 File Notice of Project with Provincial authorities prior to beginning of Work.
- .2 Contractor shall be responsible and assume the Principal Contractor role for each work zone location and not the entire complex. Contractor shall provide a written acknowledgement of this responsibility with 3 weeks of contract award.
- .3 Work zone locations include:
 - .1 Ucluelet West Outer Small Craft Harbour.
- .4 Contractor shall agree to install proper site separation and identification in order to maintain time and space at all times throughout life of project.

19.5 SAFETY ASSESSMENT

- .1 Perform site specific safety hazard assessment related to project.

19.6 MEETINGS

- .1 Schedule and administer Health and Safety meeting with Departmental Representative prior to commencement of Work.

19.7 PROJECT/SITE CONDITIONS

- .1 Contractor shall be responsible for understanding site and project specific conditions which may affect health and safety

19.8 GENERAL REQUIREMENTS

- .1 Develop written site-specific Health and Safety Plan based on hazard assessment prior to beginning site Work and continue to implement, maintain, and enforce plan until final demobilization from site. Health and Safety Plan must address project specifications.
- .2 Departmental Representative may respond in writing, where deficiencies or concerns are noted and may request re-submission with correction of deficiencies or concerns.

19.9 RESPONSIBILITY

- .1 Be responsible for health and safety of persons on site, safety of property on site and for protection of persons adjacent to site and environment to extent that they may be affected by conduct of Work.
- .2 Comply with and enforce compliance by employees with safety requirements of Contract Documents, applicable federal, provincial, territorial and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan.

19.10 COMPLIANCE REQUIREMENTS

- .1 Comply with Workers Compensation Act, B.C. Reg.
- .2 Comply with R.S.Q., c. S-2.1, an Act respecting Health and Safety, and c. S-2.1, r.4 Safety Code for the Construction Industry.

- .3 Comply with Occupational Health and Safety Regulations, 1996.
- .4 Comply with Occupational Health and Safety Act, General Safety Regulations, O.I.C..
- .5 Comply with Canada Labour Code, Canada Occupational Safety and Health Regulations.

19.11 UNFORSEEN HAZARDS

- .1 When unforeseen or peculiar safety-related factor, hazard, or condition occur during performance of Work, follow procedures in place for Employee's Right to Refuse Work in accordance with Acts and Regulations of Province having jurisdiction and advise Departmental Representative verbally and in writing.
- .2 When unforeseen or peculiar safety-related factor, hazard, or condition occur during performance of Work, advise Health and Safety co-ordinator and follow procedures in accordance with Acts and Regulations of Province having jurisdiction and advise Departmental Representative verbally and in writing.

19.12 HEALTH AND SAFETY CO-ORDINATOR

- .1 Employ and assign to Work, competent and authorized representative as Health and Safety Co-ordinator. Health and Safety Co-ordinator must:
 - .1 Have site-related working experience specific to activities associated with marine construction.
 - .2 Have working knowledge of occupational safety and health regulations.
 - .3 Be responsible for completing Contractor's Health and Safety Training Sessions and ensuring that personnel not successfully completing required training are not permitted to enter site to perform Work.
 - .4 Be responsible for implementing, enforcing daily and monitoring site-specific Contractor's Health and Safety Plan.

19.13 POSTING OF DOCUMENTS

- .1 Ensure applicable items, articles, notices and orders are posted in conspicuous location on site in accordance with Acts and Regulations of Province having jurisdiction, and in consultation with Departmental Representative.

19.14 CORRECTION OF NON-COMPLIANCE

- .1 Immediately address health and safety non-compliance issues identified by authority having jurisdiction or by Department Representative.
- .2 Provide Departmental Representative with written report of action taken to correct non-compliance of health and safety issues identified.
- .3 Departmental Representative may stop Work if non-compliance of health and safety regulations is not corrected.

19.15 BLASTING

- .1 Blasting or other use of explosives is not permitted

19.16 WORK STOPPAGE

- .1 Give precedence to safety and health of public and site personnel and protection of environment over cost and schedule considerations for Work.

Part 20 Products

20.1 NOT USED

- .1 Not used.

Part 21 Execution

21.1 NOT USED

- .1 Not used.

END OF SECTION

Part 22 General

22.1 RELATED REQUIREMENTS

- .1 Section 01 35 43 – ENVIRONMENTAL PROCEDURES
- .2 Section 05 50 00 – METAL FABRICATIONS
- .3 Section 09 97 19 – PAINTING EXTERIOR METAL SURFACES

22.2 MEASUREMENT PROCEDURES

- .1 Method 1:
 - .1 Measure supply of steel pipe piles in metres delivered to site, in lengths indicated on Drawings and approved by Departmental Representative.
 - .2 Measure installations of piles in number of piles and lengths acceptably driven,
- .2 Method 2:
 - .1 Measure supply and installation of piles in metres of pile acceptably incorporated into work.
- .3 Mobilization of equipment: paid as lump sum item.
- .4 Actual number and lengths of piles installed: established by Departmental Representative from piling records.
- .5 Unit of measurement for piles: per metre measured from tip elevation (lowest point of pile) to cut off elevation at pile cap.

22.3 PILE DRIVING RECORDS

- .1 The Contractor shall maintain an accurate record of pile driving. The Contractor shall submit a copy of his record to the Engineer/ Department Representative. The Contractor shall co-operate with the Engineer/ Department Representative in maintaining these records.
- .2 The Contractor shall record for each pile:
 - .1 Pile number and location.
 - .2 Cut off elevation.
 - .3 Date and time driven.
 - .4 Soil penetration.
 - .5 Length of pile driven.
 - .6 Tip elevation.
 - .7 Type of pile driving hammer.
 - .8 Final set and hammer energy.

Part 23 Products

23.1 2.1 MATERIALS

- .1 Steel pipe piles shall be 762mm O.D. x 12.7mm thick, painted straight seam steel pipe pile as shown on contract drawings 216105-003 – Pile Well & Bollard and 216105-320 – 160ft Dual Layer Pile Mooring Well C/W Pile Well Frame.

- .2 Steel pipe piles shall have minimum yield strength of 310 MPa meeting the requirements of the last edition of at least one of the following specifications:
 - .1 ASTM A252 Grade 3
 - .2 API 5L Grade X46
 - .3 CSA Z245.1-M with the following provisions:
 - i) Chemical analysis of material shall show a minimum copper content of 0.20%.
 - ii) All welds shall be full strength and shall satisfy the requirements of either ASTM A53 or CSA Z245.1-M.
 - iii) Flattening tests for ductility shall be conducted in accordance with the procedure and frequency stipulated in CSA Standard Z245.1-M or ASTM Standard A53.
 - iv) Unless longitudinal welds are certified as conforming to the requirements of ASTM A53, CSA Z245.1-M or API 5L to the satisfaction of the Engineer, welds shall be 100 percent inspected by ultrasonic or electromagnetic inspection according to the requirements of ASTM A53. This inspection shall be conducted at the Contractor's expense.
 - v) The Contractor shall bear the expense of repairing and re-inspecting all rejected welds.
 - vi) Allowable tolerance on dimensions shall meet the requirements of CSA Z245.1-M.

- .3 The minimum length of a pile section used in the fabrication of piles shall be 3.0 m.

- .4 Welded steel piles shall have full strength welds.

- .5 The Contractor shall provide necessary certification to demonstrate that the material meets the above standards.

23.2 HANDLING

- .1 Piling shall be handled and stored so as to avoid over stressing or injury, and any piles bent or damaged, or in any way made defective in the opinion of the Engineer, shall be made good to his satisfaction or replaced.

Part 24 Execution

24.1 FABRICATION

- .1 Welding practice and qualifications of fabricators and erectors of welded construction shall conform to the requirements of CSA Standards W47, W48, and W59, latest editions.
- .2 Piles shall be spliced to the required lengths in a workshop or similar suitable place that will ensure good quality splices.
- .3 Lengths to be joined shall be manipulated in jigs so that only down-hand welding is employed.
- .4 The splice shall be complete joint penetration welds and shall develop the full strength of the pile section. Splices shall be made in a manner that will ensure good alignment of the spliced parts. The number of splices shall be held to a minimum.
- .5 The longitudinal welds of pipe pile lengths to be joined shall be staggered 90 degrees.
- .6 The end profile of a pile section to be butt welded shall not have a deviation of more than 1.0 - 1.6 mm from a plane perpendicular to the axis of the pile.
- .7 Maximum deviation of the line of the pile at the splices shall be 3 mm when measured with a 3.0 m straight edge.
- .8 All pile splices shall be 100 percent inspected and tested. This inspection shall be conducted at the Contractor's expense.
- .9 Inspections of pile splices shall be by non-destructive ultrasonic tests in accordance with the requirements of AWS D1.1; static. The test results shall be made available to the Engineer. If the inspection of a weld should indicate poor alignment of the pile sections, insufficient penetration of the weld, lack of fusion,

slag inclusions, porosity or any such defects, the Contractor shall take the necessary corrective measures to provide a full strength weld to the satisfaction of the Engineer. The cost of correcting defective welds and re-testing shall be borne by the Contractor.

24.2 3.2 INSTALLATION

- .1 Piles shall be installed in accordance with Best Management Practice for Pile Driving and Related Operations – BC Marine and Pile Driving Contractors Association – November; 2003.
- .2 All piles shall be installed to the pile tip elevation shown on the drawings. All piles may be installed to final tip elevation with a standard air, diesel, hydraulic, drop or vibratory hammer. The ground conditions may not allow the contractor to install the piles to final pile tip elevation with a vibratory hammer. The contractor shall be prepared to drive the piles with a standard air, diesel, hydraulic, drop hammer or socket the pile into hard layers encountered before the specified tip elevation is reached as shown on the drawings

All pile driving equipment shall be in good mechanical condition and shall be capable of delivering the manufacturer's rated energy output and shall be operated in accordance with the manufacturer's instructions.
- .3 Pile driver leads shall be constructed in a manner which affords freedom of movement of the hammer and they shall be held in position by guys, stiff braces or by attaching to cranes or derricks so as to ensure proper support for the pile during driving. Hammer blows at all times shall be in direct line with the axis of the pile.
- .4 Steel piles shall be driven without excessive deformation of the head of the pile. The head of the pile shall be cut square and a driving cap shall be provided to hold the axis of the pile in line with the axis of the hammer.
- .5 The driving cap shall fit continuously over the top of the pile and shall project about 150 mm down over/into the pile and shall be such that the pile is held properly in line with the leads. A cushion of hardwood, fibre, plywood or other suitable material shall be placed between the driving cap and the hammer. The cushion shall be replaced if so directed by the Engineer.
- .6 Piles shall be driven in the positions shown on the drawings. Piles shall be driven and installed within a tolerance of +/- 50 mm in location and within 0.5% from the specified axial alignment. The Engineer may reject piles driven out of alignment or damaged in any way after inspection. Cost of remedial measures decided by the Engineer shall be borne by the Contractor.

24.3 PILE SOCKETING INTO BEDROCK

- .1 If available overburden is less than 9m, pile will have to be socketed into bedrock as outlined in Table 1 below.

Table 1. Rock Penetration for 762 x 12.7 Pipe Piles

Penetration Obtained in Overburden	Required Additional Penetration into Bedrock
9m or more	Not Required
8m	0.4m
7m	0.8m
6m	1.2m
5m	1.6m
4m	2.0m
3m	2.4m
2m or less	2.8m

- .2 Additional penetration is in addition to the overburden depth.
- .3 Rock socket diameter must be approximately the same diameter as the outside diameter of the pile. The pile must be a tight fit with the hole diameter being no larger than $\frac{1}{4}$ " + pile diameter.
- .4 Additional rock penetration depth to start once tight hole diameter requirement achieved not at contact with rock.

24.4 STEEL PILE CUTTING SHOES

- .1 Pile cutting shoes will not be required.

24.5 MOORING WELLS

- .1 Mooring wells to be installed as outlined on drawing 2016105-003 – Pile Well and Bollard.

24.6 3.6 CUT OFFS

- .1 After driving, piles shall be cut off at the elevations shown on the plans. In driving, sufficient length above cut off shall be allowed so that no part of the head of the pile damaged or deformed during driving remains in the work.
- .2 Piles shall be cut in a flat horizontal plane. A suitable guide shall be used to aid in cutting piles so that the cut off plane is within specified butt weld splice

tolerances. If a satisfactory hand-held cut cannot be obtained, the Contractor shall cut the pile with an automatic cutter.

24.7 TEMPORARY RESTRAINT OF DRIVEN PILES

- .1 Contractor shall furnish sufficient labour and materials to adequately secure the piles of any given group against motion relative to others in the group.
- .2 Temporary restraints once erected and approved shall be maintained in good order until completion of the structure.

24.8 CORROSION PROTECTION

- .1 Piles are to be protected by the installation of sacrificial anodes. Piles shall not be painted.

END OF SECTION

