



Fisheries and Oceans  
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Canada

**Small Craft Harbours  
Pacific Region**

**TECHNICAL SPECIFICATIONS**

**PORT EDWARD, BC**

**PHASE 3 – WHARF 423 EXPANSION**

**May 2021**

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**REFERENCE DRAWINGS:****Phase 1 Wharf Expansion:**

<b>219113-014</b>	Steel Structure; Sections and Details; Sheet 1 of 2
<b>219113-015</b>	Steel Structure; Sections and Details; Sheet 2 of 2
<b>219113-020</b>	Concrete Deck Plan; Sections and Details
<b>219113-021</b>	Concrete Abutment; Sections
<b>219113-022</b>	Modular Wharf Edge; Plan, Sections and Details

**GENERAL**

- .1 PWGSC's General Conditions and related contract documents form an integral part of this section.

**2 MINIMUM STANDARDS**

- .1 In the absence of other standards specified in the Contract Documents, all work is to conform to, or exceed, the minimum standards of the Canadian Government Specifications Boards, the Canadian Standards Association, the American Society for Testing of Materials, or the National Building Code of Canada, whichever is applicable.
- .2 All work to be done in accordance with Work Safe BC regulations.

**3 INTERFERENCE WITH OPERATION**

- .1 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 clean up, do not dispose of surplus, waste or demolished materials in navigable waters.
- .2 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.

**4 BARRIERS, LIGHTS AND WATCHING**

- .1 The Contractor shall provide all requisite barriers, fences, warning signs, lights and watching for the protection of persons and property on or adjacent to the site.

**5 SITE ACCESS**

- .1 The Contractor shall make his own arrangements subject to the approval of the Engineer, for access to the site. Site access shall be coordinated with the local Harbour Authority.
- .2 The Contractor shall maintain routes of travel, the Engineer being the sole judge as to what may be deemed reasonable.
- .3 The Contractor shall erect and maintain barriers, fences, lights, warning devices, and other protective devices as may be required for prevention of theft or damage of goods and protection of the public and workers, or if so ordered by the Engineer.

**6 CONSTRUCTION AREA**

- .1 The Contractor shall regulate construction traffic on public areas and comply with all local ordinances in connection therewith, including load limitation and removal of debris.

- .2 The Contractor shall confine the operations on the site to those areas actually required for the work including routes and regulations approved by the Owner for haulage of materials.

## **7 NIGHT WORK**

- .1 The Contractor shall keep proper lights each night between the hours of sunset and sunrise upon all floating plant and false-work, upon all ranges and other stakes where necessary, and upon all buoys of such size and in such locations as required by a governing authority. When work is done at night, maintain from sunset to sunrise such lights on or about the work and plant as necessary for the proper observation of the work and the efficient prosecution thereof.

## **8 CLEAN-UP**

- .1 At all times the Contractor shall keep the site free from accumulation of waste material and debris and leave the site clean and tidy on completion.

## **9 TEMPORARY SERVICES**

- .1 On site the Contractor shall make its own arrangements for supply of water and electricity.
- .2 The Contractor shall supply for its own use; sanitary, first aid, and all other temporary services and facilities required for the work.

## **10 PROGRESS REPORT**

- .1 The Contractor shall keep a daily record of progress of the work available for inspection by the Engineer.
- .2 The daily record shall include particulars of weather conditions, number of workers, plant and equipment working and work performed.

## **11 ENGINEER'S ACCESS**

- .1 The Contractor shall provide access to the work for the Engineer's inspectors and surveyors as required.

## **12 PERMITS AND ROYALTIES**

- .1 Permits and licenses required for the Contractors work are the responsibility of the Contractor and shall be for the Contractor's account. The Contractor shall have the appropriate business license.

## **13 PROTECTION OF EXISTING STRUCTURES**

- .1 Existing structures, adjacent marine facilities, roads, services, piping or equipment within the work area which are not to be replaced shall be properly protected from any injury or

damage, direct or indirect. Any damage that is caused as a result of the operations of the Contractor shall be repaired and made good at the Contractor's expense to the satisfaction of the Engineer.

#### **14 WEATHER**

- .1 No work shall be undertaken by the Contractor when, in the opinion of the Engineer, the weather is unsuitable or unfavourable for a particular class of work. Time lost by the Contractor due to stoppage on account of adverse weather conditions may be allowed the Contractor, at the discretion of the Engineer, as an extension of time for the completion of the work over and above the date of completion specified in the contract agreement.

#### **15 PREVENTION OF WATER AND AIR POLLUTION**

- .1 The Contractor shall comply with Federal and Provincial laws, orders and regulations concerning the control and abatement of water and air pollution.

#### **16 SOIL DATA AND EXISTING TOPOGRAPHY**

- .1 The Contractor shall notify the Engineer of any subsurface conditions at the place of the work that may differ materially from those indicated in the Contract Documents.

#### **17 UTILITIES AND SERVICES**

- .1 The Contractor shall be responsible for any damage to overhead, underwater and/or underground utilities and/or services caused by the Contractor's operations and shall repair and make good the repairs at the Contractor's own expense.
- .2 The Contractor shall be responsible, unless otherwise agreed to by the Engineer, for all temporary or construction services and utilities, and first aid facilities.

#### **18 CARE OF FINISHED WORK**

- .1 The Contractor shall protect all finished work from injury, defacement, unauthorized entry, or trespass until such time as the work described in the Contract Documents is substantially complete.

#### **19 NOISE BY-LAWS**

- .1 The Contractor shall comply with the requirements of any local or other Noise By-Laws.

#### **20 TIMING REQUIREMENTS**

- .1 No site work may commence prior to August 1, 2021. Offsite work may begin immediately upon award.

- .2 All work including clean-up and demobilization must be completed by November 30<sup>th</sup>, 2021.
- .3 The Contractor is expected to be familiar with the site including current and historical weather conditions and is to make allowances as necessary in order to complete the work as specified during the indicated work dates.
- .4 No allowance will be made for delay of work over and above the date of completion specified in the contract agreement on account of weather conditions that could have been reasonably predicted from a historical knowledge of site conditions.

## **21 CONSTRUCTION WORK SCHEDULE**

- .1 The contractor shall provide to the Owner a Bar Chart (GANTT Chart) schedule of all works to be completed in the contract within 10 days of contract award, and within 5 days of owners request for updated schedules during construction should there be any approved change orders or extension of time.
- .2 The Contractor shall work whatever shifts required in order to ensure the work meet regulatory windows and is completed by the completion date of the contract.
- .3 The Contractor shall normally perform all work within the hours of daylight except in instances where the Contractor has requested and received approval for shift changes.

## **22 CO-OPERATION WITH HARBOUR AUTHORITY AND OTHERS**

- .1 The contractor will give the owner a minimum 48 hours' notice for work that may interrupt access to any part of the harbour. Provide and locate necessary buoys or markers to indicate active work areas as necessary.
- .2 The site shall be left in a safe condition at the completion of each work day.
- .3 The Contractor should work together with the Harbour Authority and Engineer's Representative to set up risk management plan for the project. This aims to identify risk of individual work item, streamline communications and minimize the associated risk to safety and operation in the harbour. The plan may include but not limited to revision of schedule and methodology, close monitoring of weather condition, navigation, Owner occupancy and management during construction. Failure to implement the risk management plan may cause liability to the Contractor for damages of the harbour property during construction.
- .4 The cost for use of any Harbour Authority services are those of the Contractor and the cost of any such services should be included in the cost of this tender.

**END OF SECTION**

## 1 GENERAL

- .1 PWGSC's General Conditions and related contract documents form an integral part of this section.

## 2 WORK INCLUDED

- .1 The work under this contract shall include the supply of equipment, labour and materials for the performance of all work as required by the Contract Documents. All replaced items, cut-offs and waste material shall be disposed by the contractor in strict accordance with provincial, local, and municipal regulations and Part 8 of the National Building Code and with the Canadian Construction Safety Code.
- .2 The work to be carried out under this contract includes the extension of the existing 50.6 m long concrete Wharf 423 in Port Edward. The work generally consists of, but is not limited to the following items:

### Works Items

- .1 **Mobilisation/Demobilisation for all Work Items**  
Mobilisation / demobilisation for all Mandatory Work Items, this shall include the supply of materials, equipment, tools, services, labour and all things necessary to complete the following:
- .1 Moving all crew, equipment, and materials on and off the site.
- .2 Site clean-up after completion of the work.
- .3 Any necessary works not identified in other items.
- .2 **Supply and install Concrete Anchors**  
Supply and install complete anchor assemblies, from gridlines 13 to 21 (Module 1 to Module 3), as shown on the drawings.
- .3 **Supply and install Pile Caps and Deck Beams**  
Supply and install steel pile caps, deck beams and cap plates complete from grid lines 13 to 21 (Module 1 to Module 3), as shown on the drawings.
- .4 **Supply and Cast Concrete Deck and Abutment**  
Supply and cast reinforced concrete deck and abutment from gridlines 13 to 21 (Module 1 to Module 3), as shown on the drawings.
- .5 **Supply and install Fender Piles, Guardrail, Railing, Ladders and Cleats**  
Supply and install fender piles, guardrail, railing, ladders and cleats from gridlines 13 to 21 (Module 1 to Module 3), as shown on the drawings.

**END OF SECTION**



**1 General****.1 SECTION INCLUDES**

Health and safety considerations required to ensure that Small Craft Harbours/DFO shows due diligence towards health and safety on construction sites, and meets the requirements laid out in PWGSC/RPB Departmental Policy DP 073 - Occupational Health and Safety - Construction.

<http://publiservice.tpsgc-pwgsc.gc.ca/ipm-dpi/politique-policy/p073-eng.html>

**.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 2006.
  - .2 Occupational Health and Safety Act, S.N.S. [1996].

**.3 SUBMITTALS**

- .1 Make submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 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 found in work plan.
  - .3 Risk Management and Safety Procedure for possible events including but not limited to storm, fire, and fall.
- .3 Submit one copy of Contractor's authorized representative's work site health and safety inspection reports to Departmental Representative weekly.
- .4 Submit copies of reports or directions issued by Federal, Provincial and Territorial health and safety inspectors.
- .5 Submit copies of incident and accident reports.
- .6 Submit WHMIS MSDS - Material Safety Data Sheets if requested.

- .7 Departmental Representative may 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 within 5 days after receipt of comments from Departmental Representative.
- .8 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.
- .9 Medical Surveillance: where prescribed by legislation, regulation or safety program, submit certification of medical surveillance for site personnel prior to commencement of Work, and submit additional certifications for any new site personnel to Departmental Representative.
- .10 On-site Contingency and Emergency Response Plan: address standard operating procedures to be implemented during emergency situations.

#### **.4 FILING OF NOTICE**

- .1 File Notice of Project with Provincial authorities prior to beginning of Work.

#### **.5 SAFETY ASSESSMENT**

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

#### **.6 MEETINGS**

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

#### **.7 REGULATORY REQUIREMENTS**

- .1 Do Work in accordance with Section 01 41 00 - Regulatory Requirements.

#### **.8 PROJECT/SITE CONDITIONS**

- .1 Work at site will involve contact with:
  - .1 Harbour Manager.
  - .2 Departmental Representative.

#### **.9 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.

#### **.10 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.

#### **.11 COMPLIANCE REQUIREMENTS**

- .1 Comply with Workers Compensation Act, B.C.
- .2 Comply with Occupational Health and Safety Regulations.
- .3 Comply with Canada Labour Code, Canada Occupational Safety and Health Regulations.

#### **.12 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.

#### **.13 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 dredging and material transportation.
  - .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.
  - .5 Be on site during execution of Work.

**.14 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.

**.15 CORRECTION OF NON-COMPLIANCE**

- .1 Immediately address health and safety non-compliance issues identified by authority having jurisdiction or by Departmental 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.

**.16 BLASTING**

- .1 Blasting or other use of explosives is not permitted without prior receipt of written instruction by Departmental Representative.

**.17 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.

**END OF SECTION**

**1 General****1.1 RELATED REQUIREMENTS**

- .1 Not used

**1.2 REFERENCES**

- .1 Not used

**1.3 IN WATER WORKS**

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

**1.4 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 written notification from Engineer Contractor will propose corrective action and take such action after receipt of written approval by the 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.

**2 Products****2.1 NOT USED****3 Execution****3.1 PROJECT SCHEDULING**

- .1 Juvenile salmon emerge from the local rivers and can be found along the shoreline in the spring. In addition, most herring spawn between March 15 and May 1. In late summer and early fall, adult salmon return to their native streams. For those reasons, DFO prefers works to be performed between November 30 and February 15 (DFO for Area 4 – Lower Skeena). However, it is common for many marine construction projects that do not involve dredging to be extended to

March 31 and begin construction August 1st. Therefore, it is proposed that any in water works be performed between August 1 and March 31.

- .2 The Owner will provide an environmental monitor. The role of the environmental monitor will be to ensure compliance with environmental mitigation procedures.
- .3 The Contractor shall provide 5 days' notice to the Environmental Monitor prior to any in water works or other works that occur below the high water mark.
- .4 Works generating exposed sediments shall not be scheduled during extreme rainfall events unless appropriate sediment erosion control systems are in place such that no release of sediment into the marine environment will occur.

### **3.2 SITE PREPARATION**

- .1 During site preparation and construction, a number of materials may be removed from the site. Mitigation measures that shall be employed by the Contractor during these works include:
  - .1 Where a risk of debris entering the water exists, a containment boom will be deployed to capture any debris.
  - .2 All debris will be collected and removed from the site at an appropriate upland disposal facility.
  - .3 The site shall be left in a clean condition each day.
  - .4 Works shall be conducted in a safe manner to ensure the safety of both work crews and the public. The Contractor must have a Safety Plan in place.
  - .5 Proper marking of the site shall be in place to ensure that all areas being demolished are clearly visible.
  - .6 No heavy machinery shall be permitted to enter the water unless appropriate mitigation measures are identified by the Contractor and authorized by the Engineer in writing.
  - .7 A spill kit will be on site at all times.
  - .8 The Contractor will have a Spill Management Plan and will carry out that plan in the event of a spill.
  - .9 Water quality conditions resulting from these works shall not exceed water quality criteria in Part 5.

- .10 The works shall not generate vibrations (pressure waves) that exceed 30 kPa in the marine environment.
- .11 Saw dust and particles shall be cleaned up daily so as to prevent their release into the marine environment.
- .12 The Contractor shall create an Environmental Management Plan.

### 3.3 CONSTRUCTION

- .1 Conduct works in a manner that complies with the law and avoids, mitigates or lessens potential impacts to aquatic and riparian habitats, water quality and quantity, fish and wildlife populations, and public safety and property.
- .2 Enforce good housekeeping, worker's compensation board, and relevant codes and by-laws, for site services and conditions.
- .3 If the water quality requirements identified in Section 3.5 cannot be met, a full height silt curtain will be required around the area being filled.
- .4 The Contractor shall inspect equipment to ensure it is in good working order, clean and free of leaks.
- .5 Heavy equipment is to be kept out of the water. This is defined as the tracks of the machines out of the water itself.
- .6 Clearly survey and mark infill boundaries onsite prior to construction to ensure the correct areas are worked on.
- .7 All stockpiled materials shall be placed away from any drainage or the high water mark wherever possible.
- .8 All stock piled materials shall remain covered with polyethylene or tarps during any rainfall event, or, after 3 days of dry weather if no rainfall has occurred.
- .9 Public roadways must be kept clean. Daily cleaning will be required if any observed sedimentation has occurred.
- .10 Perform all works within the project footprint only.
- .11 Plan project to minimize exposure of fines to tide cycles which will generate plume during high tides.
- .12 Have an Environmental Monitor onsite when there is potential for juvenile salmon to be onsite as defined by the DFO Fisheries Window typically after March 15th.

- .13 Where practical, remove invertebrates from the project footprint to an adjacent site of equal habitat conditions.
- .14 Following Best Management Practices for Pile Driving.
- .15 Use a vibratory hammer if driving conditions permit.
- .16 Employ bubble curtain if required.
- .17 Preventing grounding of barges or equipment on foreshore.

## **4 Environmental Impact Mitigation**

### **4.1 SEDIMENT CONTROL DEVICES**

- .1 A silt curtain will be deployed at the discretion of the Environmental Monitor in consultation with Small Craft Harbours based on water quality readings. If water quality is not an issue, as defined below in Part 5, no silt curtain will be deployed.
- .2 Gravel pads shall be placed where trucks pull out onto paved areas.
- .3 Sand bags shall be placed beside catchment basins during the works to collect any sediment.
- .4 Any upland works shall be isolated from the marine environment with the use of a silt fence if that surface slopes towards the High Water Mark.

## **5 Water Quality**

### **5.1 WATER QUALITY TESTING**

- .1 Turbidity shall not exceed 8 NTU above background located at any point outside of the Small Craft Harbour water lot as measured by the Environmental Monitor.

## **6 Spill Response Plan**

### **6.1 EQUIPMENT AND SUPPLIES**

- .1 At a minimum, the following equipment and supplies shall be onsite during any construction activities:
  - .1 Absorbent pads
  - .2 Spill booms
  - .3 Clearly marked spill kit



- .4 Gloves
- .5 Hard copy of this Spill Response Plan

## **6.2 TRAINING**

- .1 All personnel on the project must have been trained to use the equipment and supplies listed above and be familiar with these spill response procedures to ensure a spill is avoided and immediate action is taken in the event of a spill.

## **6.3 PLANNING**

- .1 The Contractor shall ensure that when planning the project:
  - .1 Only equipment that is free of leaks are used on the project
  - .2 The equipment is of sufficient size and capable of performing the work without becoming overloaded.
  - .3 All equipment is inspected prior to daily use
  - .4 All equipment and work surfaces are in a clean condition.
  - .5 The location of the spill kit has clearly been communicated to all work crew members.
  - .6 Ensure that a skiff is available to perform clean-up.

## **6.4 CLEAN UP PROCEDURE**

- .1 In the event of a spill, the Contractor shall perform the following immediately:
  - .1 Stop the source of the spill. If the spill is from a machine in or near the marine environment, remove it to a contained upland area.
  - .2 Contain the spill by deploying the spill booms from a skiff if in water.
  - .3 Use absorbent pads to collect the spilled material.
  - .4 Collect photographs of both the site impacted and the equipment that failed.
  - .5 Report the findings to a designate as determined by Small Craft Harbours.

- .6 Document the events, including:
  - .1 Name of Contractor personnel(s) present and contact phone number;
  - .2 Name and telephone number of the person who caused the spill;
  - .3 Location and time of the spill;
  - .4 Type and quantity of the substance spilled;
  - .5 Cause and effect of the spill;
  - .6 Details of action taken or proposed;
  - .7 Description of the spill location and surrounding area;
  - .8 Names of agencies on scene; and
  - .9 Names of other persons or agencies advised concerning the spill.
- .2 If the spill exceeds the values in B.C. Reg. 63/88 below, the following must be contacted:

B.C. Ministry of Environment Environmental Emergency:	1-800-663-3456
Marine Spill Reporting:	1-800-OILS-911
Canadian Coast Guard:	1-800-889-8852
Port Edward Harbour Authority:	1-250-628-9220
Small Craft Harbours – Andrew Cornell:	1-604-666-6724
Fisheries and Oceans Canada:	1-250-627-3499

## 6.5 SPILL REPORTING REGULATION

- .1 If the spill exceeds any of the following, it must be reported to the provincial government.

**B.C. Reg. 63/88.**

Item	Column 1 Substance spilled	Column 2 Specified amount
1	Class 1, Explosives as defined in section 2.9 of the Federal Regulations	Any quantity that could pose a danger to public safety or 50 kg
2	Class 2.1, Flammable Gases, other than natural gas, as defined in section 2.14 (a) of the Federal Regulations	10 kg
3	Class 2.2 Non-Flammable and Non-Toxic Gases as defined in section 2.14 (b) of the Federal Regulations	10 kg
4	Class 2.3, Toxic Gases as defined in section 2.14 (c) of the Federal Regulations	5 kg
5	Class 3, Flammable Liquids as defined in section 2.18 of the Federal Regulations	100 L
6	Class 4, Flammable Solids as defined in section 2.20 of the Federal Regulations	25 kg
7	Class 5.1, Oxidizing Substances as defined in section 2.24 (a) of the Federal Regulations	50 kg or 50 L
8	Class 5.2, Organic Peroxides as defined in section 2.24 (b) of the Federal Regulations	1 kg or 1 L
9	Class 6.1, Toxic Substances as defined in section 2.27 (a) of the Federal Regulations	5 kg or 5 L
10	Class 6.2, Infectious Substances as defined in section 2.27 (b) of the Federal Regulations	1 kg or 1 L, or less if the waste poses a danger to public safety or the environment
11	Class 7, Radioactive Materials as defined in section 2.37 of the Federal Regulations	Any quantity that could pose a danger to public safety and an emission level greater than the emission level established in section 20 of the "Packaging and Transport of Nuclear Substances Regulations"
12	Class 8, Corrosives as defined in section 2.40 of the Federal Regulations	5 kg or 5 L

13	Class 9, Miscellaneous Products, Substances or Organisms as defined in section 2.43 of the Federal Regulations	25 kg or 25 L
14	waste containing dioxin as defined in section 1 of the Hazardous Waste Regulation	1 kg or 1 L, or less if the waste poses a danger to public safety or the environment
15	leachable toxic waste as defined in section 1 of the Hazardous Waste Regulation	25 kg or 25 L
16	waste containing polycyclic aromatic hydrocarbons as defined in section 1 of the hazardous Waste Regulation	5 kg or 5 L
17	waste asbestos as defined in section 1 of the Hazardous Waste Regulation	50 kg
18	waste oil as defined in section 1 of the Hazardous Waste Regulation	100 L
19	waste containing a pest control product as defined in section 1 of the Hazardous Waste Regulation	5 kg or 5 L
20	PCB Wastes as defined in section 1 of the Hazardous Waste Regulation	25 kg or 25 L
21	waste containing tetrachloroethylene as defined in section 1 of the Hazardous Waste Regulation	50 kg or 50 L
22	biomedical waste as defined in section 1 of the Hazardous Waste Regulation	1 kg or 1 L, or less if the waste poses a danger to public safety or the environment
23	A hazardous waste as defined in section 1 of the Hazardous Waste Regulation and not covered under items 1 – 22	25 kg or 25 L
24	A substance, not covered by items 1 to 23, that can cause pollution	200 kg or 200 L
25	Natural gas	10 kg, if there is a breakage in a pipeline or fitting operated above 100 psi that results in a sudden and uncontrolled release of natural gas

## 7 Environmental Monitoring

### 7.1 QUALIFICATION OF THE ENVIRONMENTAL MONITOR

- .1 Appropriate qualifications for the Environmental Monitor shall include knowledge and experience relating to:

- .1 Local marine biology and ecology,
- .2 Experience and background in the limitations and abilities of the equipment performing the project,
- .3 The potential adverse environmental effects of the Project,
- .4 Measures that can be employed to mitigate known and unknown adverse environmental effects that are likely to occur, and,
- .5 Relevant legislation, guidelines, and best management practices.

## **7.2 ROLE OF THE ENVIRONMENTAL MONITOR**

- .1 The Environmental Monitor will:
  - .1 Have written authority from the Proponent to modify or halt any construction activity as required to minimize impacts to fish or fish habitat,
  - .2 Explain the conditions of any permits including authorizations, letters of advice or aquatic environment effects determinations to each contractor prior to that contractor starting work at the project site,
  - .3 Monitor the project for compliance with the conditions of any permits including authorizations, letters of advice or aquatic environment effects determinations, guidelines, and best management practices,
  - .4 Direct project construction works as necessary to ensure compliance with any permits including authorizations, letters of advice or aquatic environment effects determinations, guidelines, and best management practices. This includes stopping or altering project works and directing works to avoid or mitigate adverse environmental effects, and,
  - .5 Provide written reports describing the findings of the monitoring program.
  - .6 Note: the Environmental Monitor does not have the authority to change the Project or the terms or conditions of any permits including authorizations, letters of advice or aquatic environment effects determinations.

## **7.3 TIMING OF MONITORING**

- .1 The Environmental Monitor will be onsite whenever there are works with the potential to adversely affect the aquatic environment or, at any time during the course of the project when there is the potential for adverse impacts to fish or fish

habitat or the potential deposit of a deleterious substance into the aquatic environment.

#### **7.4 MONITORING SPECIFICS**

- .1 The monitoring will include the following:
  - .1 The works undertaken each day and wildlife present,
  - .2 Assessment of the effect of the project on the project environment, including observation, photography and physical measurements,
  - .3 Assessment of compliance with the conditions of any permits including authorizations, letters of advice or aquatic environment effects determinations, guidelines, and best management practices, and,
  - .4 Identification of any significant environmental issues and impacts and details of specific mitigation measures put in place to address those issues and impacts.

#### **7.5 CONSTRUCTION MONITORING**

- .1 The monitor will create written daily monitoring reports describing the findings for each day the monitor is onsite including:
  - .1 A summary of the works and activities carried out or undertaken that day,
  - .2 Commentary on the works and activities conducted from a fish and fish habitat perspective,
  - .3 Identification of any potential issues or impacts to fish or fish habitat that arose or occurred, and details of specific migratory measures put in place to address these issues and impacts.
- .2 The monitor will keep the daily reports on file to be provided upon request. In addition to the daily monitoring reports, the monitor will provide a written summary monitoring report for the project works.

#### **7.6 SPECIES AT RISK MONITORING**

- .1 Species at risk that have the potential to be in the general area of the site include:
  - .1 Northern Resident Killer Whale
  - .2 Fin Whale

- .3 Bigg's Killer Whale
- .4 Northern Abalone
- .2 A 1 km buffer zone will be established around the project site, if any cetaceans are observed within 1 km during pile driving, work will be stopped until 30 minutes after they have left the safety zone. A 500 m safety zone around the project site will be established for all other marine mammals, within which their behaviour will be observed and reported to the Environmental Monitor immediately. If the animal is deemed to be at risk or in distress, works will be stopped until the animal is considered no longer at risk or has left the buffer zone.
- .3 An Environmental Monitor will be onsite whenever the project is producing in water pressure waves in excess of 30 kPa or when a plume occurs that is expected to exceed the perimeter of the project water lot boundary. When on site, the Environmental Monitor shall use binoculars during the day and a hydrophone during the night to monitor the presence of any cetaceans in the area during periods of the work likely to impact cetaceans.
- .4 The Environmental Monitor shall be empowered in writing by the Contractor to stop work in the event that any species at risk are observed at or near the site within the Safety Zone.
- .5 If a species at risk is observed, information on the species observed, location, behaviour, and duration on site, shall be recorded. The report will include a description of the Contractor's activities, the times that work stopped and started, and if the works appeared to have an impact on the species at risk.

## **8 Pile Works**

### **8.1 PILE DRIVING BEST PRACTICES**

- .1 Have a preconstruction meeting to go over environmental requirements.
- .2 Machinery is to arrive on site in a clean, washed condition and be free of fluid leaks.
- .3 All equipment is maintained in good proper running order to prevent leaking or spilling of potentially hazardous or toxic products.
- .4 Wash, refuel and service machinery and store fuel and other materials for the machinery at least 30 m away from the water in order to prevent any deleterious substance from entering the water.
- .5 Any water-based equipment or machinery (for example, clamshell dredge or pile driver on a barge) moored or used during the Project must not ground on the

intertidal foreshore or subtidal seabed. 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 Storage of fuels and petroleum products will comply with safe operating procedures, including containment facilities in case of a spill.
- .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 On site emergency spill equipment available whenever working near or on the water.
- .9 Position water borne equipment in a manner that will prevent damage to identified fish habitat.
- .10 Report any incidents of habitat damage to the Environmental Monitor or DFO. to ensure that appropriate action (restoration) is taken.
- .11 If fish spawn in the area or on equipment all work should stop and the Environmental Monitor or DFO notified.
- .12 Work in least risk timing windows for fish and employ silt or bubble curtains to prevent harm to fish or fish habitat.
- .13 Environmental monitoring of pressure waves is not required if appropriate vibratory hammer equipment is employed.
- .14 For any extraction of existing piles, reasonable efforts are to be applied to remove the entire length of the pile from the intertidal foreshore or subtidal seabed.
- .15 If pile driving is results in pressure waves above 30 kPa bubble curtains or other mitigation measures should be employed to reduce or pressure wave values or maintain marine life at a distance where pressure waves do not exceed 30 kPa.
- .16 Follow any project plans including Environmental Management, Water Quality Monitoring, Environmental Monitoring, Spill Prevention and Emergency Response Plan.
- .17 Best Practices are guidelines only.
- .18 All permits, authorizations, laws and regulations take precedence over this document.



## 8.2 PILE REMOVAL BEST PRACTICES

- .1 Measures should be implemented to control turbidity and sediments re-entering the water column during pile removal, and to dispose of removed piles and debris.
- .2 Existing pilings within the project footprint should be extracted using direct pull and/or vibratory techniques in accordance with the following resource protection measures.
- .3 Vibratory extraction is the preferred method of piling removal and should be used where available and feasible depending on piling condition and substrate type. Vibration reduces friction between the pile and substrate to avoid disturbing large amounts of sediment. Typically little or no sediment remains attached to the pile during vibratory withdrawal.
- .4 When appropriate for the substrate type and structural integrity of the piling, a crane or excavator may be used to pull the pilings out of the sediment. To the extent practicable, pilings should be removed in their entirety; however, no jetting, excavation, or other significant disturbance of the sediment should occur to facilitate piling removal.
- .5 Work should be done during low water/low tide to the extent possible. Individual piles should be removed slowly to ensure sediment disturbance and resulting turbidity in the water column is minimized. All sediment and contaminants associated with removed piles should be contained during handling and transport to prevent re-introduction to the water. No effort should be made to remove sediment or other material from chemically treated piles, either in or over the water.
- .6 In the event that the pile breaks at or near the existing mudline and cannot be removed, the pile should be cut off at least 1 foot below the mudline. For creosote treated piles, the remaining stump should be covered with clean sediment. Any other holes remaining after piling removal should not be filled.
- .7 All floating surface debris should be collected and disposed of along with the piling. All wooden piling treated with preservatives, together with associated sediments, and debris from piling removal should be permanently removed from the water and disposed of at a facility approved for collection of hazardous waste.
- .8 Extracted piles and debris should be placed in a lined stockpile area or directly loaded into transport container or vehicle.
- .9 Appropriate controls should be used to prevent runoff from leaving the stockpile and entering surface water or ground water. Steel pipe piling may be recycled or reused if the piling condition is suitable for reuse.
- .10 Best Management Practices are guidelines only.
- .11 All permits, authorizations, laws and regulations take precedence over this document.

## 9 Concrete Works

### 9.1 CONCRETE USE BEST PRACTICES

- .1 Ensure that all works involving the use of concrete, cement, mortars, and/or other Portland cement or lime-containing construction materials will not deposit (directly or indirectly) sediments, debris, concrete, leachate concrete fines, wash or contact water into or about any watercourse.
- .2 Cast in place concrete must remain isolated from water inside sealed formed structures until cured (approximately 48-72 hours), as concrete leachate is highly toxic to fish and other aquatic life.
- .3 Ensure a carbon dioxide (CO<sub>2</sub>) tank with regulator, hose and gas diffuser (bubbler) is readily available during concrete work to neutralize pH levels should a spill occur. Staff must be trained in its proper use.
- .4 Provide containment facilities for wash-down water from concrete delivery trucks, concrete pumping equipment, and other tools and equipment.
- .5 Immediately report any spills of sediments, debris, concrete fines, wash or contact water of reportable quantities to the Provincial Emergency Program Environmental Emergency Management Plan Incident Reporting Hotline 1-800-663-3456 and DFO's Observe, Record and Report Hotline 1-800-465-4336.
- .6 Implement emergency mitigation and clean-up measures (such as use of CO<sub>2</sub> and immediate removal of the material).
- .7 Monitor pH frequently within worksite and immediately downstream of the isolated worksite until the works are completed. Emergency measures should be implemented if downstream pH has changed more than 1.0 pH unit, measured to an accuracy of +/- 0.2 pH units from the background level, or is below 6.0 or above 9.0 pH units.
- .8 Prevent any water that contacts deleterious uncured or partly cured concrete (during activities like exposed aggregate wash-off, wet curing, or equipment washing) from directly or indirectly entering any watercourse or storm water system.
- .9 Isolate and hold any water that contacts uncured or partly cured concrete until the pH is between 6.5 and 8.0 pH units and the turbidity is less than 25 nephelometric turbidity units (NTU), measured to an accuracy of +/- 2 NTU.

## **10     Cleaning**

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

**END OF SECTION**

**1 GENERAL**

- .1 All work shall be carried out in conformance with CSA Standard CAN3.A23.1-M.

**2 MATERIALS**

- .1 Cement to CAN/CSA-A3001, Type MS.
- .2 Supplementary cementing materials: with 10% Type F fly ash replacement and 5% Type SF Silica Fume, by mass of total cementitious materials to CAN/CSA A3001. Total supplementary cementing materials not to exceed 15% by mass of total cementitious material.
- .3 Water: to CSA-A23.1/A23.2.
- .4 Reinforcing steel: to CAN/CSA-G30.18.
- .5 Hardware and miscellaneous materials: to CSA-A23.1/A23.2.
- .6 Forms: to CSA-A23.4.
- .7 Air entrainment admixtures: to ASTM C260.
- .8 Fine aggregate shall conform to Clause 5.3 CSA Standard CAN3.A23.1-M.
- .9 Coarse aggregate shall conform to Clause 5.4 CSA Standard CAN3.A23.1-M group 1. Max aggregate size to be 12 mm (1/2").
- .10 Water shall be clean and free from injurious amounts of oil, alkali, organic matter and deleterious materials.

**3 CONCRETE MIXES**

- .1 Concrete to meet performance criteria in accordance with CAN/CSA-A23.1/A23.2.
- .2 Durability and class of exposure: C-1.
- .3 Minimum compressive strength at 28 days: 35 MPa.
- .4 Intended application: continuous water submersion and splash zone (frequent wetting and drying cycles).
- .5 Maximum water cement ratio shall be 0.40.
- .6 Air content shall be between 5% and 8%.
- .7 Set retarding admixtures shall not be used unless approved by the Engineer.
- .8 The concrete mix design shall be submitted to the Engineer for approval prior to placing concrete. The mix design including admixtures shall not be changed without prior approval of the Engineer.

#### **4 PLACING, FINISHING AND CURING CONCRETE**

- .1 All concrete shall be placed in accordance with the requirements of Clause 19 CSA Standard CAN3.A23.1-M and as indicated on the drawings.
- .2 All concrete shall be placed continuously between start of placement and a control joint. Control joint locations shall be proposed by the contractor and are subject to prior approval by the Engineer. Joint surfaces of cured concrete shall be roughened and thoroughly cleaned.
- .3 Accurate records shall be maintained for all cast-in-place concrete including date of placement, location, quantity, temperature and test samples taken.
- .4 The Engineer shall be notified prior to commencement of concrete placement as specified in Clause 6.0.
- .5 All defective concrete shall be removed and replaced as directed by the Engineer.
- .6 Concrete shall be vibrated adequately by means of mechanical vibrators. Rock pockets and honeycombing shall not be accepted.
- .7 Surface texture: non-skid finish on top, steel trowel or form finish on sides and bottom.
- .8 Cold and hot weather concrete work shall be carried out in conformance with Clause 21 of CSA Standard CAN3.A23.1-M. Procedures for this work shall be submitted to the Engineer for approval.
- .9 All concrete shall be protected and cured in accordance with CSA Standard CAN3.A23.1-M.

#### **5 SHOP DRAWINGS**

- .1 Submit shop drawings in accordance with CSA-A23.4.

#### **6 INSPECTION AND TESTING**

- .1 Provide the Engineer with certified copies of quality control tests related to this project as specified in CSA-A23.4 and CSA-G279.
- .2 Provide records from in-house quality control programme based upon plant certification requirements for inspection and review.
- .3 Upon request, provide Consultant with certified copy of mill test report of reinforcing steel supplied, showing physical and chemical analysis.
- .4 The Engineer shall be notified 24 hours prior to placement of concrete.

- .5 Unless noted otherwise an inspection and testing firm appointed and paid for by the Contractor will collect and test a minimum of 3 concrete cylinders per concrete batch. One concrete cylinder shall be tested after 7 days. The remaining 2 cylinders shall be tested after 28 days. The test results shall be made available to the Engineer.
  
- .6 The Contractor shall permit the testing firm free access to all portions of the work and shall co-operate with the testing firm in carrying out the work.

**END OF SECTION**

**1 WORKMANSHIP**

- .1 All fabrication and erection of structural steel shall comply with CSA Standard CAN3-S16.1, latest revision.

**2 MATERIALS**

- .1 Hollow structural steel sections shall conform to CSA Standard G40.20/G40.21-M, Class "C", Grade 350W.
- .2 All other rolled sections and miscellaneous plate shall be grade 300W, unless noted otherwise on the drawings, in conformance with CSA Standard G40.20/G40.21-M.
- .3 All structural steel members shall be made of the size and weight shown on the drawings unless written approval for any change is first obtained from the Engineer.
- .4 Bolts, washers and nuts shall conform to ASTM specification A325.

**3 WELDING**

- .1 Welding practice and qualifications of welders and erectors of welded construction shall conform to the requirements of CSA Standards W47, W48, and W59 latest editions. The metallurgy of weld metal shall be similar to the parent material.
- .2 Unless noted otherwise, all welds shall develop the full strength of the connected members, and shall be continuous seal welds with a minimum 6 mm leg length.
- .3 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.

**4 INSPECTION**

- .1 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.
- .2 The Engineer shall be notified well in advance of the start of work, in order to allow sufficient time for inspection of material and workmanship.

**5 SHOP DRAWINGS**

- .1 The Contractor shall prepare and submit shop drawings.
- .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.

## **6 COATINGS**

- .1 Except as noted below, all structural and miscellaneous steel shall be painted in accordance with the requirements of Section 09 97 19 – Exterior Metal Surfaces.
- .2 All bolts, inserts, 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/m<sup>2</sup>).
- .3 Anchor bars shall have standard double corrosion protection.
- .3 Damaged painted or galvanized surfaces shall be coated with Galvacon immediately after the damage has occurred. Final touch up of painted steel shall be as per Section 09 97 19 – Exterior Metal Surfaces.

**END OF SECTION**



## 1 GENERAL

- .1 The Contractor shall supply all material and bolts required for the work.
- .2 This section covers the requirements for the supply, detailing, fabrication, assembly and delivery of the steelwork shown in the Drawings and Specifications.
- .3 The latest edition of, and any standard referenced by, the following standards shall apply to the work.
  - a) CSA G40.21M - Structural Quality Steel
  - b) CSA W48.1 - Mild Steel Covered Arc - Welding Procedures
  - c) CSA W59 - Welded Steel Construction
- .4 **Alternative Details**  
All details shall, in general conform to those shown on the Drawings. Alternative details may be substituted to facilitate the Contractor's shop procedures and to suit his standard detailing practice, provided such alternative details comply in all respects with these Specifications and do not require an appreciable increase in weight of metal. The Contractor shall submit all proposed Alternate Details for review and acceptance by the Engineer prior to performing any of the Work or procuring any of the material for the Alternative Details.

## 2 WORKING DRAWINGS

- .1 Working drawings shall consist of shop detail drawings, assembly diagrams and other working drawings showing details, dimensions, sizes, material and other information necessary for the complete fabrication of the steelwork.  
  
The Contractor shall submit shop drawings in accordance with Section 05 12 33. The Contractor shall allow a minimum of one (1) week for review of shop drawings by the Engineer.
- .2 Discrepancies or vague references shall be clarified by the Contractor before proceeding with the fabrication of metal work; otherwise, errors in dimensions shall be corrected at the Contractor's expense.

## 3 QUALIFICATIONS AND EQUIPMENT

- .1 **Contractor**  
  
The fabricator shall appoint, subject to the Engineer's approval, an employee who shall assist and be responsible to the welding engineer.  
  
Unless such information has already been forwarded to the Owner, the Contractor shall submit to the Engineer the names of the welding engineer, welding supervisors and shop inspectors who are to be employed on the work.
- .2 **Welding Equipment**

All equipment to be used in the work shall be in good working order and shall be subject to the inspection of the Engineer.

.3 Welding Procedures

The Contractor shall submit copies of the welding procedures which he intends to use for examination and approval by the Engineer.

Such procedures shall be accompanied by documentary proof that they have been qualified previously by the Canadian Welding Bureau at the plant where the work is to be carried out.

The procedures shall include the following information: joint type, welding process, welding position, base metal specification, welding consumable specification and size, preheat requirements, amperage and voltage requirements, speed, polarity, and welding equipment, including a description of travel for automatic welding.

#### 4 MATERIALS

.1 Structural Steel

Steel shall conform to the requirements as called for on the drawings.

Prior to fabrication, the Contractor shall supply to the Engineer, manufacturer's mill certificates giving details of all chemical and physical properties of the steel to be used in the work.

Steel shall be supplied free of surface defects and internal discontinuities, with due regard for the end use of the steel in the contract.

Edges of all plates will be subject to inspection by the Engineer. Any discontinuities will be explored and may be accepted, subject to ASTM A435.

The Engineer shall be supplied with a record of all observed discontinuities.

Repairs to defective plates shall not proceed until approval of the proposed repair has been given by the Engineer.

.2 Welding Consumables

Welding consumables for all processes shall be certified by the manufacturer as complying with the requirements of the following specification:

- a) Manual, shielded metal arc welding - All electrodes for manual shielded metal arc welding shall conform to A.W.S. Specifications A.5.1 classification E7018.
- b) Gas, metal arc welding - All electrodes used in the gas, metal arc welding process shall be composite electrodes conforming to A.W.S. Specification A.5.18, classification E70T-9. The use of micra wire will not be permitted.
- c) Shielding gas shall be welding grade carbon dioxide with a guaranteed dew point of -45°C.

d) Submerged arc welding - Welding electrodes and fluxes used in the submerged arc welding process shall conform to A.W.S. Specification A.5.17 and shall produce a weld to classification F72 - EM 12 K or approved equivalent.

.3 Bolts

Bolts, nuts and washers shall be hot-dip galvanized and shall conform to the requirements of ASTM Specification A325, Type I of North American or European manufacture only.

## 5 MATERIAL STORAGE

.1 Steel

Structural material, either plain or fabricated, shall be stored at the Contractor's shop or elsewhere, above the ground upon platforms, skids, or other supports. It shall be kept free from dirt and other foreign matter, and shall be protected as far as practical from corrosion. Long members shall be supported on skids placed near enough together to prevent injury from deflection.

Prior to fabrication, all steel shall be marked for identification by the heat number and specification by a marking system approved by the Engineer.

.2 Welding Consumables

All electrodes having low hydrogen coverings shall be dried for at least two (2) hours between 230°C and 260 °C before they are used. Electrodes shall be stored immediately after drying in storage ovens held at a temperature of at least 120°C. Electrodes that are not used within four (4) hours after removal from a drying or storage oven shall be re-dried before use. Electrodes which have been wet shall not be used.

Electrode wire used in submerged arc welding and gas metal arc welding shall be stored in the original container at room temperature and kept free of moisture, oil, dirt or other contaminants.

Flux used for submerged arc welding shall be dry and free of contamination from dirt, mill scale, oil or other foreign material. Fused flux shall not be used on the work.

Gas for gas metal arc welding shall be stored in marked steel bottles and shall not be subjected to temperatures in excess of 50°C nor temperatures of less than 0 °C.

## 6 PREPARATION OF MATERIAL

.1 Straightening Material

Prior to being used in fabrication, all structural steel shall be straight and free from kinks or bends. If straightening is necessary, it shall be done by methods that will not injure the metal. The steel shall not be heated unless permission is given by the Engineer. Sharp kinks and bends will be cause for rejection of the steel.

.2 Edge Preparation for Welding

The edges of plates or sections which are to be welded together shall be prepared by sawing, shearing, flame-cutting, machining, chipping or arc air gouging to the details shown on the shop drawings.

Surfaces and edges to be welded shall be smooth, uniform and free from fins, tears, cracks and other defects which would adversely affect the quality or strength of the weld. Surfaces to be welded shall also be free from loose scale, slag, rust, grease, moisture or other material that will prevent proper welding. Mill scale that withstands vigorous wire brushing, a light film of drying oil or a thin rust inhibitive coating may remain except that all mill scale shall be removed from the surfaces on which flange-to-web welds are to be made by submerged arc welding or by shielded metal arc welding with low hydrogen electrodes. Surfaces within 50 mm of any weld location shall be free from any paint or other material that would prevent proper welding or produce objectionable fumes while welding.

Edges of material thicker than specified in the following list shall be trimmed if and as required to produce a satisfactory welding edge wherever a weld among the edges to carry calculated stress:

- Sheared edges of material thicker than 12 mm
- Rolled edges of plates (other than Universal Mill Plates thicker than 10 mm)
- Toes of angles or rolled shapes (other than wide flange section thicker than 16 mm)
- Universal Mill Plates or edges of wide flange section thicker than 25 mm.

Edges may be prepared by oxygen cutting, provided a smooth and regular surface free from cracks and notches is secured, and providing that an accurate profile is secured by the use of a mechanical guide. Free hand cutting shall be done only where approved by the Engineer.

In all oxygen cutting, the cutting flame shall be so adjusted and manipulated as to avoid cutting beyond (inside) the prescribed lines. Roughness of cut surfaces shall not be greater than that defined by the United States Standards Institute surface roughness value of 1,000 U.S.A.I.B46.1, Surface Texture). Roughness exceeding this value shall be removed by machining or grinding.

### .3 Edge Preparation (non-welded edges)

Steel may be cut to size by sawing, shearing, flame cutting or machining. All steel after cutting shall be marked by a method agreed to by the Engineer so that its specification may be immediately identified.

Sheared edges of plates more than 16 mm in thickness shall be planed to a depth of 6 mm.

Special attention shall be given to the cutting of flange plates. Occasional gouges not in excess of 6 mm deep will be accepted in areas of low stress at the discretion of the Engineer. The repair or removal of such gouges shall be to the Engineer's instructions.

Corners of all exposed flame cut or sheared plates including flanges, gusset plates, etc. shall be ground to a minimum 1.5mm 45 degree bevel to facilitate painting. Re-entrant flame cuts shall be filleted to a radius of not less than 20 mm.

## 7 FABRICATION

### .1 Marking

Prior to fabrication, all steel shall be marked for identification by heat number and specification by a marking system approved by the Engineer.

**.2 Bolt Holes**

All holes for high tensile bolts shall be either punched, sub-punched and reamed, or drilled, and shall be of a nominal diameter not more than 2 mm in excess of the nominal bolt diameter.

Punched holes shall be clean cut, without torn or ragged edges. The diameter of the die shall not exceed the diameter of the punch by more than 2 mm. If a punched hole must be enlarged to admit a bolt, it shall be reamed.

Reamed holes shall be cylindrical and perpendicular to the member. Where practicable, reamers shall be directed by mechanical means. Reaming shall be done with twist drills. Drilling shall be done with twist drills. Burrs on the outside surfaces shall be removed. Poor matching of holes will be cause of rejection.

Allowable tolerance for bolt holes:

- .1 Matching holes for bolts to register so that a gauge 2 mm less in diameter than hole will pass freely through assembled members at right angles to such members.
- .2 Unless otherwise shown drill all bolt holes 1.6 mm larger than nominal bolt diameter.
- .3 Centre-to-centre distance between two holes of a group of holes to vary by not more than 2 mm from dimensioned distance between such holes.
- .4 Centre-to-centre distance between any group of holes to vary not more than following in Table 1:

<b>Centre to Centre distance in metres</b>	<b>Tolerance in plus or minus mm</b>
less than 10	1
10 to 20	2
20 to 30	3

- .5 Do not correct mis-punched or mis-drilled members without Engineer's approval.

**.3 Pin Holes**

All holes for pins shall be drilled and reamed to a diameter tolerance of 0.5 mm. Burrs on the outside surface shall be ground flush.

**.4 High Strength Bolts**

Installation of high strength bolts shall be in accordance with the latest edition of the AASHTO Specification Section 10.17.4.

Sufficient bolts, nuts and washers shall be furnished to complete the entire structure with an ample surplus to replace all bolts damaged or lost.

Holes in the girder field splices shall be sub-punched and, unless otherwise specified, reamed while assembled in the shop. The assembly, including camber, alignment and accuracy of holes shall be approved by the Engineer before reaming is recommended.

**.5 Butt Joints**

Except as called for on the drawings, butt joints will not be permitted.

The Contractor may submit an alternative butt joint design provided that such design has been pre-qualified under CSA Standard W59.

.6 Assembly and Welding Sequences

If requested by the Engineer, the Contractor shall supply full details of the proposed assembly and welding sequence of any particular weld.

.7 Shop splices

.1 Locate to Engineer's approval.

.2 Use complete joint penetration groove welds finished flush. Details of butt joints to CSA W59. Use only as approved by Engineer.

.8 Nylon Washers

Machining of washers shall be to the manufacturer's recommendations.

Installation shall be done without use of driving of components to fit. Minor adjustments in face-to-face tolerances of hinge components may be compensated for by planning thickness of washer. If greater than 6.0 mm is to be removed (or added) the steel components shall be corrected.

The Contractor shall supply to the Owner, spares of all sizes of fabricated washers as called for the drawings at the completion of the project.

.9 Bent Plates

When bending plates, the plates shall be so taken from the stock plates that the bend line will be at right angles to the direction of rolling. The radius of the bend measured inside shall be not less than the thickness of the plate. Before bending, the corners of the plate shall be rounded to a radius of 2 mm throughout that portion of the plate at which bending is to occur.

.10 Dimensional Tolerances

The dimensions of the completed steelwork shall comply with the appropriate dimensional tolerances as specified in CSA Standard W59 Welded Steel Construction.

.11 Shipping

Structural members shall be loaded on trucks, cars or barges in such a manner that they can be transported and unloaded at their destination without being excessively stressed, deformed or otherwise damaged.

## 8.0 WELDING

.1 General

Welding shall be done by the manual, shielded metal arc, gas shielded metal arc or submerged arc processes in accordance with the approved procedures and A.W.S. D1.1 Section 4, Technique.

All Welding shall be done under cover and, in the case of gas metal arc welding, shall be done in an area free from wind or draft.

Butt welds shall be extended beyond the edges of the parts to be joined by means of start and run-off tabs providing sufficient thickness to avoid the weld burning through and with a joint preparation similar to that on the main material. For manual shielded metal arc welding, the width of the tabs shall be not less than the thickness of the thicker part being joined or 75 mm, whichever is greater. For submerged arc welding, the width of the tabs shall be not less than 75 mm. Each weld pass shall be carried far enough beyond the edge of the parts being joined to ensure sound welds in the joint. Tabs shall be removed upon completion and cooling of the weld without damage to the parent plate, and the end of the weld made smooth and flush with the edges of the abutting parts.

In gas metal arc welding, the equipment shall be capable of sustaining a gas flow rate of from 0.85 to 1.25 m<sup>3</sup>/h.

## .2 Preheat and Interpass Temperatures

No welding shall be done when the temperature of the base metal is lower than - 20°C. At temperatures below 0 °C, the steel shall be preheated to a temperature of at least 10°C in excess of that stated in Table 2.

Preheat shall be applied to all steel to be welded so that the steel within 75 mm of the weld is heated to the temperature shown in Table 2.

Preheat shall be applied in such a manner that moisture from the heating equipment does not penetrate the joint.

For all welding processes, preheat and interpass temperatures shall be maintained during welding, at temperatures not less than stated in Table2.

THICKNESS OF THICKEST PART AT POINT OF WELDING	TEMP.
Less than 20mm	none
20mm to 35mm	21°C
40mm to 60mm	66°C
Over 60mm	107°C

Table 2: Minimum preheat and interpass temperatures

Preheat temperatures above the minimum shown in Table 2 may be required for highly restrained joints if designated by the Engineer.

Preheat temperature shall in no case exceed 200°C but there shall be no limit on interpass temperature.

Preheat requirements for tack welds shall be as in Table 2, except that where single pass tack welds are used and are to be incorporated and consumed in a weld made by the submerged arc and the gas metal arc processes, preheat is unnecessary.

.3 Assembly

The shop assembly of the various components of the weld shall be executed in accordance with A.W.S. D1.1, Subsections 3.3 and 3.4.

Tack welding shall be done by qualified operators, using the smallest size weld required to hold the components of the assembly together. Tack welds shall not be less than 100 mm in length and shall be incorporated in the final weld.

Tack welds shall be made with 5 mm maximum size electrodes and shall be subject to the preheat requirement of the Preheat Clauses.

.4 Welding

.1 When CAN/CSA-G40.21 grade 350A steel is specified, deposited weld metal to have a Charpy V-Notch value not lower than that of steel.

.2 Do welding in shop unless otherwise permitted by Engineer.

.3 Do not weld at locations where weld is not indicated.

.4 All welds are to be continuous over the entire length of the joint unless otherwise specified.

.5 Use minimum 6mm fillet weld unless otherwise shown.

.5 Quality and Details of Welds

The quality and details of welds shall be in accordance CSA Standard W59, Clause 12 unless noted otherwise or as specified by the Engineer. Fender panels, mooring structures, walkways, stairs and ladders shall be in accordance with Clause 11.

Undercut at the tow of the flange to web fillet weld will not be allowed except in regions of low stress at the discretion of the Engineer.

## 9.0 QUALITY ASSURANCE

.1 Inspection

All materials, welding procedures, shop drawings, and steelwork fabrication will be inspected by the Engineer to ascertain compliance with the Owner's Specifications and Drawings.



All phases of fabrication including cutting to size of plates, edge preparation of welded joints, weld assembly and welding will be subject to visual examination by the Engineer.

At his discretion and at the Owner's expense, the Engineer will appoint a testing agent to test any completed or partially completed weld by non-destructive testing methods. Generally, fillet welds will be tested by the dry powder magnetic particle method and butt welds by ultrasonic testing, but this does not preclude the use of another method of testing deemed necessary by the Engineer.

It is desirable that the inspection of welds is carried out as soon as possible after the completion of welding.

The Contractor shall be prepared to move and support the pieces being inspected so that, in general, the inspection can be done on the flat and so that a minimum of 1.25 m of headroom is available.

The Engineer will attempt to schedule non-destructive testing operations so as not to interfere with the progress of the work. However, the Contractor is expected to co-operate with the Engineer and the testing agency in the satisfactory expedition of inspection procedures. The Contractor shall furnish all facilities for access by the testing agency for inspection and testing. The Contractor shall ensure all slag and other residue is removed from the weld when it is completed and ready for weld inspection. Slag removal by the testing agency will be paid for by the Contractor. A minimum of 72 hours notice of any inspection stage being reached shall be given to the Engineer by the Contractor.

#### .2 Unacceptable Work

Any work found to be unacceptable, shall be corrected in accordance CSA Standard W59. The Contractor shall bear the cost of re-inspection of welds after defects are repaired.

No repair shall be made until agreed to by the Engineer.

## 10.0 COATINGS

Except as noted below, all structural steel shall be painted in accordance with the requirements of Section 09 97 19 – Exterior Metal Surfaces.

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/m<sup>2</sup>). The Contractor is advised to handle all painted materials delicately to prevent paint damage. Nylon slings are to be used at all times when lifting lugs are not available.

Touch up all damaged surfaces immediately upon delivery and supply 2 gallons of paint for field touch-up of any damaged paint surface during the installation as per Section 09 97 19 – Exterior Metal Surfaces.

**END OF SECTION**

## 1 SCOPE OF WORK

- .1 All work shall be carried out in accordance with Specification CAN/CSA 086.1-M, latest revision and in accordance with Best Management Practices (BMP) for the use of treated wood in aquatic environments.
- .2 Lumber identification: by grade stamp of an agency certified by Canadian Lumber Standards Accreditation Board.

## 2 PRODUCTS

- .1 Lumber Material
  - .1.1 Lumber grades shall conform to the requirements of the N.L.G.A. Standard Grading Rules for Canadian Lumber, latest revision.
  - .1.2 All lumber shall be D.Fir-L(N), No. 2 Structural grade or better as called for on the drawings.
  - .1.3 All lumber, unless specified otherwise, shall be properly air dried and seasoned, containing not more than 19% moisture.
- .2 Fasteners
  - .2.1 All bolts, nuts and washers shall be hot dip galvanised in accordance with Specification CAN/CSA G164-M.
  - .2.2 Bolt holes in timber shall be bored to provide driving fit. Holes for drift bolts shall be 2 mm undersize and longer than the drift bolts.
  - .2.3 All bolts to meet the requirements of Standard ASTM - A307.
- .3 Wood Preservative
  - .3.1 All preservative treatment, inspection and re-treatment shall be in accordance with Specification CAN/CSA 080-M, latest edition.
  - .3.2 All lumber shall be given a CCA or ACZA preservative treatment in accordance with the Best Management Practices.
  - .3.3 All treated timbers shall be incised before treatment.

## 3 EXECUTION

- .1 All timber, which has been given a preservative treatment, shall be carefully handled to avoid breaking through the treated surfaces. Cant hooks and rafting dogs shall not be used on timbers. No spikes shall be driven into timbers except to tack the timbers in their final position. If spikes are used, they shall be fully driven and left in.

- .2 Bolt holes and countersunk holes shall be filled with CCA or ACZA preservative and the bolts shall be dipped in CCA or ACZA preservative concentrate before the bolts are placed. Bolt holes with a final position at an elevation below water level shall be filled with approved mastic before the bolts are placed.
  
- .3 All structural timber used in the work shall be carefully and accurately placed in accordance with the drawings.

**END OF SECTION**

## 1 SCOPE OF WORK

- .1 All ferrous surfaces except galvanised components and existing steel pipe piles are to be painted.

## 2 APPLICABLE CODES

- .1 All work contained in this section shall comply with the latest edition of the following standards:

CGSB	Standards of the Canadian General Standards Board
SSPC-SP1	Solvent Cleaning (degreasing)
SSPC-SP2	Hand Tool Cleaning
SSPC-SP7	Brush-off Blast Cleaning
SSPC-SP10	Near White Blast Cleaning
SSPC-SP11	Power Tool Cleaning to Bare Metal
SSPC-GUIDE 6	Debris Containment
ASTM-03276	Recommended Practice Guide for Paint Inspection
ASTM-D3359	Method for Measuring Adhesion by Tape Test
Work Safe BC	Occupational Health and Safety Regulations
	BC Waste Management Act (SWEP)
SSPC-PA2	Procedure for Determining Conformance to Dry Coating Thickness Requirement

## 3 SURFACE PREPARATION

- .1 All steel surfaces to be painted shall be prepared in accordance with the SSPC Manual Volume II and the paint manufacturer's specifications.
- .2 Degrease according to SSPC-SP1 Solvent Cleaning. Remove all weld splatter and grind all welds and sharp edges. Blast clean to SSPC-SP10, Near White Metal Standard.
- .3 Minimum allowable motor anchor pattern is 50 microns (2 mils). Shape of surface profile shall be jagged and irregular, as opposed to peened.
- .4 If chloride substrates measurements are required by Engineer, the chloride concentration shall be less than  $3\mu\text{g}/\text{cm}^2$  measured by Chlor-Rid test.
- .5 The surface finish shall be approved by a representative of the Owner or the paint manufacturer before application of any coatings.

## 4 PAINT APPLICATION

- .1 Coatings shall be applied in accordance with the manufacturer's specifications. All blast cleaning and shop painting shall be carried out under cover in an area protected from weather and other detrimental effects.
- .2 Paint application should commence prior to any presence of rust bloom and within 8 hrs following abrasive blasting.

- .3 Paint manufacturers recommendation for application parameters shall be consulted to identify minimum and maximum temperatures, relative humidity and dewpoint restrictions and pot life. Consult paint manufacturer for further information.

## 5 PAINT SYSTEM

- .1 All dry film thickness (DFT) shall be stated in Mills (thousands of an inch). The equivalent measurement and conversions are as follows:

One thousandth of an inch (1 mil) = 25 microns

The detailed requirements of the paint schedule are given below.

- .2 Stripe coats shall be applied to all welds, lap joints, plate edges, corners, sharp edges and any other areas where spray application of the overall coating system may result in low dry film thickness.
- .3 The following paint systems shall be used for painting of all structural and miscellaneous steel except steel pipe piles and galvanized components:
- .3.1 Pile caps and miscellaneous steel

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

Note: Finished coating system Dry Film Thickness shall be a minimum of 16.5 Mills (412 microns) at each spot measurement. Stripe coat not included.

- .4 Topcoat to be a light grey colour (colour code RAL 7035).
- .4.1 Additional 2 mils colour top coat of Interthane 990 shall be applied to handrails. Handrails to have a red colour topcoat (RAL 3000).
- .5 All bolts, washers and nuts shall be hot dip galvanised in accordance with ASTM Specifications A-153 or A-123, or CSA Specification G 164-M (minimum zinc coating 610 g/m<sup>2</sup>).

## 6 WORKMANSHIP

- .1 The Contractor shall complete a daily reporting account for Shop/Field Quality Assurance.
- .2 An Engineer's Representative may request on site monitoring during paint preparation.

- .3 Each coat, including stripe coat shall be of contrasting colors and mixed in full proportions.
- .4 The preparation of surfaces to be painted and the application of the paints shall be as specified above.
- .5 Coating shall take place as soon as practicable after inspection of cleaning, but, in any event, within eight hours and before any visible or detrimental rusting or contamination occurs.
- .6 All coating material shall be applied by airless spray unless otherwise allowed or specified by the manufacturer. Spray painting equipment shall be of ample capacity and suitable for the work and shall at all times be kept clean and in good working order. Air lines shall be equipped with water traps to positively remove condensed moisture.
- .7 No thinner shall be added to any paint in excess of the paint manufacturer's recommendations.
- .8 Prior to spray application of primer, all crevices, appurtenances, and re-entrant surfaces which would otherwise be difficult to coat by spraying, together with all weld areas shall be brushed (stripe) in order to ensure a continuous film on all surfaces, and then painted as specified.
- .9 Newly coated surfaces will be inspected when the coating has thoroughly dried and immediately before the coated member is to be removed from the paint shop for shipment. The coated surfaces may be rejected if any of the following defects are apparent, and the Engineer or his representative, in his judgement, believes the coating performance and life will be impaired by these conditions:
  - a. Inadequate dry film thickness (DFT).
  - b. Runs, sags, holidays or shadowing caused by inefficient application methods.
  - c. Evidence of poor coverage at plate edges, lap joints, crevices, pockets, corners and re-entrant angles.
  - d. Damage to shop coat due to handling before the coating is sufficiently cured or any other contributory cause.
- .10 Coated surfaces rejected by the Engineer shall be made good by the Contractor at his own expense. The Contractor shall submit to the Engineer his proposed method of repair to the damaged surfaces.
- .11 Damage to adjacent property, vehicles, pedestrians and other portions of the structure due to the painting operations shall be made good without additional expenses to the Owner. No paint, equipment, scaffolding, et cetera shall obstruct traffic or pedestrians, except by written permission of the Owner's Representative, in which case proper warning signs, barricades, et cetera shall be placed, maintained and removed without additional expense to the Owner.
- .12 Field touch up painting shall be carried out in accordance with the paint manufacturer's specifications.

- .13 The Contractor shall provide sufficient paint for field touch-up of any damaged paint surface.
  
- .14 Only nylon ropes or rubber covered slings may be used for handling steel in either the Contractors shop during loading or shipment or during unloading and erection at the site. Where coatings are damaged during handling/erection, these areas shall be marked and recorded for remedial actions.

**END OF SECTION**

## 1 GENERAL

- .1 PWGSC's General Conditions and related contract documents form an integral part of this section.

## 2 MATERIALS

- .1 Gravel Fill: Well graded crushed rock, gravel, sand and fines with continuous gradation, free of any deleterious material, having a maximum diameter of 25 mm (1") and gradation conforming to the following requirements:

U.S. Standard Sieve Size	Percent Passing by Weight
25 mm Screen	100
19 mm Screen	60 - 90
9.5 mm Screen	30 - 70
4.75 mm Screen	20 - 50
2.36 mm Screen	15 - 30
1.18 mm Screen	10 - 25
0.300 mm Screen	5 - 15
0.075 mm Screen	0 - 5

Other gradations may be accepted at the Project Engineers discretion.

## 3 EXECUTION

- .1 Supply and place gravel fill in uniform layers with maximum thicknesses of 300 mm and compact to a minimum of 97% density Standard Proctor up to grade indicated.

**END OF SECTION**



## 1 GENERAL

- .1 PWGSC's General Conditions and related contract documents form an integral part of this section.
- .2 All work to be in accordance with Best Management Practices (BMP) for the use of treated wood in aquatic environments.

## 2 MATERIAL

- .1 Pile Material
  - .1.1 All timber piles shall be round Douglas Fir with a minimum butt diameter of 305 mm (12") and shall comply in quality with the requirements of Canadian Standard CAN/CSA 056, latest revision.
- .2 Fasteners
  - .2.1 All bolts, nuts, washers, drift pins, spikes and nails shall be hot dip galvanised in accordance with Specification CAN/CSA G164-M.
  - .2.2 Bolt holes in timber piles shall be bored to provide driving fit. Holes for drift pins shall be 2 mm undersize and longer than the drift pins. Hole sizes of lag screws are to be as specified in Standard CAN/CSA 086.1-M, latest edition.
  - .2.3 Unless otherwise specified, connection bolts, lag screws or drift bolts shall be placed through the centre of the timber piles and shall not be less than seven times the bolt diameter from the end of the timber pile.
  - .2.4 Plate washers shall be used under the heads and nuts of all bolts against timber piles.
  - .2.5 All bolts to meet the requirements of Standard ASTM - A307.
  - .2.6 Nails, spikes and staples to meet the requirements of Standard CAN/CSA B111-M.

## 3 PROTECTION

- .1 Avoid dropping, bruising or breaking of wood fibres.
- .2 Avoid breaking surfaces of treated piles.
- .3 Do not damage surfaces of treated piles below cut-off elevation by boring holes or driving nails or spikes into them to support temporary material or staging. Support staging in rope slings carried over tops of piles or by attaching to pile clamps of approved design.
- .4 Treat cuts, breaks or abrasions on surfaces of treated piles, bolt holes and field cuts in accordance with Standard CAN/CSA 080-M.

## 4 EXECUTION

- .1 Preparation
  - .1.1 Protect pile heads during driving and closely fit driving heads to top of pile. Where necessary protect pile heads by means of heavy steel straps or wrought iron rings.
  - .1.2 Protect treated piles to avoid breaking through the treated surface. Cant hooks and rafting dogs may be used only in the end of piles. No spikes shall be driven into the piles below high-water level. All cuts or breaks in the surfaces of creosote treated piles shall be treated with one coat of approved mastic.
  - .1.3 Bolt holes with a final position at an elevation above high water level shall be filled with CCA or ACZA preservative and the bolts shall be dipped in CCA or ACZA preservative concentrate before the bolts are placed. Bolt holes with a final position at an elevation below high water level shall be filled with approved mastic before the bolts are placed.
  - .1.4 Where timber piles have to be cut for plate washers, the cut surface shall be treated with two coats of CCA or ACZA preservative and a further coat of mastic before washers are placed.
- .2 Installation
  - .2.1 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.
  - .2.2 Piles shall be driven with standard equipment; vibrator, air, steam, diesel or drop hammer approved by the Engineer. Piles shall be driven tip down.
  - .2.3 Prior to any pile driving, the Contractor shall inform the Engineer about the equipment he intends to use. Based on the type and size of hammer, the Engineer will determine the final set requirements.
  - .2.4 Piles shall be driven to refusal or to a minimum penetration of 4 m.
  - .2.5 Piles shall be installed with a maximum deviation of 100 mm at the seabed from the given location and not more than 0.5% off alignment.
  - .2.6 Timber piles shall be driven in such a way that they are not broken or split. The heads of piles shall be sniped and the tips shall be fresh if the driving is hard in the opinion of the Engineer. A ring or wire mesh shall be used to prevent the head from splitting during hard driving. If the rings or wire mesh do not prevent splitting, steel tension bands 30 mm by 1 mm shall be used. These materials are to be supplied by the Contractor. After driving, the piles shall be cut off at the elevation shown on the drawings.
  - .2.7 Any pile which is split or otherwise damaged below the cut-off elevation or is driven out of position or location, so that in the opinion of the Engineer it is unfit for the use for which it is intended, shall be removed and replaced with a sound pile, at the Contractor's expense.

.3 Treatment of Pile Tops

.3.1 The tops of all piles shall be treated with two separate coats of CCA or ACZA preservative and one coat of approved mastic at least 5 mm thick.

.3.2 In addition, the tops of all piles shall be covered with a sheet of 1 mm annealed corrosion-resistant aluminium cut 150 mm larger than the diameter of the pile top. The overhanging edges shall be crimped and turned down and secured to the piles with eight aluminium roofing nails and shall not be cut to facilitate fitting.

**END OF SECTION**