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CONCRETE

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**1.0 GENERAL**

- .1 This section refers to those portions of the work for concrete reinforcing, concrete forming and accessories, concrete, finishing and tolerances.
- .2 The abbreviated standard specifications for testing, materials, fabrication and supply, referred to herein, are fully described in Section 01 42 00 – Reference Specifications.
- .3 Comply with Section 01 33 00 – Submittal Procedures and Section 01 34 00 – Shop Drawings and Product Data.

**1.1 CONCRETE REINFORCING**

- .1 Reinforcing steel shall be billet steel deformed bars to CAN/CSA-G30.18. Grade 400.
- .2 Chairs, bolsters, bar supports, spacers; acceptable non-metallic material in accordance with CAN/CSA-A23.1.
- .3 Do not field bend or field weld reinforcement except where indicated or authorized by the Engineer. When field bending is authorized, bend without heat, applying a slow and steady pressure.
- .4 Replace bars which develop cracks or splits, or exhibit excessive surface contamination.
- .5 Place reinforcing steel as indicated on reviewed shop drawings and in accordance with CAN/CSA-A23.1.
- .6 Prior to placing concrete obtain the Engineer's approval of reinforcing steel and placement.
- .7 Ensure cover to reinforcement is maintained during concrete pour.

**1.2 CONCRETE FORMING AND ACCESSORIES**

- .1 Formwork limber plywood and wood formwork materials to CAN/CSA-086.1. CAN/CSA-086.1S1 formwork: design all forms in accordance with CAN/CSA-A23.1 and WCB Requirements.
- .2 Falsework materials: to CSA S269.1
- .3 Form ties: removable or snap-off metal ties, fixed or adjustable length, free of tie devices leaving holes no larger than 25mm diameter in concrete surface. The portion which remains embedded in the concrete shall have a minimum cover of 50mm after patching.
- .4 Form release agent: chemically active release agents containing compounds that react with free lime present in concrete to provide water insoluble soaps that are marine safe, preventing concrete from sticking to forms.
- .5 Form stripping agent: colourless mineral oil, free of kerosene, with viscosity between 70 and 110 S saybolt universal 15 to 24 mm<sup>2</sup>/s at 40° C, flashpoint minimum 150° C, and open cup.
- .6 Construct forms to produce finished concrete conforming to shape, dimensions, locations and levels indicated within tolerances required by CAN/CSA-A23.1. Do not strip forms until the concrete has achieved a minimum strength of 10MPa.

**1.3 CONCRETE**

- .1 Concrete materials, mix design and placement methods shall conform to CAN/CSA-A23.1 and A23.4.
- .2 Minimum concrete cover to reinforcing shall be 50mm, unless noted otherwise on the drawings.
- .3 Prior to any concrete repair work, pre-wash the existing surface to be repaired with a high strength pressure washer that has a minimum pressure of 3000 PSI and 2.5 GPM, to ensure proper adhesion of new concrete to the old surface.
- .4 Portland cement: type MS to CSA A3001, type GU cement may be used if tri-calcium aluminate content is between 4.0% and 7.5%.

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- .5 Supplementary cementing materials: type F fly ash or type CI fly ash or type SF silica fume, to CAN/CSA-A23.5-M.
- .6 Water: to CAN/CSA-A23.1-M.
- .7 Aggregates: to CAN/CSA-A23.1-M, normal density.
- .8 Air entraining admixture: to CAN/CSA-A23.1-M (which refers to ASTM C260).
- .9 Chemical admixtures: to CAN/CSA-A23.1-M (which refers to ASTM C494). Use of accelerating or set retarding admixtures during cold and hot weather placing to be subject to the Engineer's approval. Calcium Chloride shall not be used. Chemical admixtures in exposure Class C-1 concrete shall be free of chloride ions.
- .10 Superplasticizing admixtures are permissible.
- .11 Curing compound: to CAN/CSA-A23.1-M white or to ASTM C3.9, type 1-1-chlorinated rubber type 1-D with fugitive dye.
- .12 Concrete mix shall be proportioned to provide a workable mix without secretion or bleeding.
- .13 Proportion normal density concrete in accordance with CAN/CSA-A23.1-M. Alternative 1, for the specified exposure class, to give the following properties:
  - Exposure Class C-1
  - Compressive Strength at 28 Days 35 MPa
  - Maximum Aggregate Size 20mm
  - Maximum Slump 75+/-20mm
  - Air Content 6+/-1%
  - Water/Cement Ratio (by weight) 0.40

No work shall commence until approval by the Engineer for concrete materials and mix design.

- .14 Finishing and treatment of concrete surfaces shall be in accordance with CAN/CSA-A23.1-04 Clause 7.5 and Table 22 for Class A finish. Finished surfaces shall be free from open texturing, plucked aggregate and local projections.
- .15 The dimensional tolerances for concrete work shall be as given in CAN/CSA-A23.1-04 Clause 6.4, unless noted otherwise.

**END OF SECTION 03 33 00**

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STEEL FABRICATIONS

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**1.0 GENERAL**

- .1 This section refers to those portions of the work for structural steel work, rolled steel sections and plates, plate washers, welded connections and structural aluminum.
- .2 The abbreviated standard specifications for testing, materials, fabrication and supply, referred to herein, are fully described in Section 01 42 00 – Reference Specifications.
- .3 Comply with Section 01 33 00 – Submittal Procedures and Section 01 34 00 – Shop Drawings and Product Data.

**1.1 STRUCTURAL STEEL**

- .1 All structural steelwork shall conform to CSA S16.
- .2 Structural steel fabricator and erector shall be certified under CSA W47.1 and Regulations to Div. 2.1.

**1.2 ROLLED STEEL SECTION AND PLATES**

- .1 Rolled steel sections and plates: To CAN/CSA-G40.21, Grade 300W, UNO
- .2 Hollow Steel Sections: To CSA- G40.21, Grade 350W, UNO
- .3 Steel Pipe: To ASTM A53, Grade B, UNO
- .4 Structural Bolts, Nuts and Washers: To ASTM A325M Type 1 Plain
- .5 Stainless Steel: To ASTM A167 Type 316
- .6 Bolts for Anchor Bolts, UNO: To ASTM A307 Galvanized
- .7 Threaded Rod: To ASTM A36 Grade, Hot Dip Galvanized, UNO
- .8 Expanded Metal Mesh: Hot-dip Galvanized
- .9 Bar Grating: ASTM A569, Hot –Dip Galvanized, Standard Welded Bar Grating
- .10 UNO = unless noted otherwise.
- .11 Anchors installed into hardened concrete, UNO: Hilti HY200 Adhesive Anchors, Standard Embedment Type 316 Stainless.
- .12 All bolts shall be minimum 19mm (0.75”) diameter, UNO.

**1.3 PLATE WASHERS**

- .1 Plate washers to be provided at both nut and head, unless otherwise noted. Plate washers shall have the following dimensions:
  - Bolt Size (mm) Washer Size (Dia mm x T mm)
  - 12 64 x 5
  - 16 70 x 6
  - 19 76 x 6
  - 25 87 x 9
- .2 For countersunk holes, use malleable iron washers. For vertical piles, use curved washers. Tighten bolts turning the nut, not the head.

**1.4 WELDED CONNECTIONS**

- .1 Welded connections shall conform to CSA W59 and be made by CWB qualified welders, field welded connections shall not be used unless approved by the consultant.
- .2 All steel embedment fixtures and fasteners shall be hot-dip galvanized, which shall be in accordance with ASTM F2329 and ASTM A153. Minimum thickness of zinc to be 0.11mm, unless noted otherwise.

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STEEL FABRICATIONS

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- .3 Where coated steel is used, coating should be suitable for a marine salt-water environment (e.g. Interseal 670HS or approved equal) and steel should receive appropriate surface preparation in accordance with the manufacturer's recommendations for the product.
- .4 All HSS members to be provided with minimum 6mm end plates and seal welded. All HSS members to be fully sealed. All HSS splices to be complete penetration full strength welds.
- .5 At all full splice welds, all backing bars to be removed.
- .6 Fabricate work square, true, straight and accurate to required size, with joints closely fitted and properly secured. Do not use intermittent welds, file or grind exposed welds smooth and flush. Seal weld all joints unless restricted otherwise by W59.
- .7 At completion of installation, touch up connections, welds and burned or damaged surfaces with approved compatible zinc-rich primer.

### 1.5 STRUCTURAL ALUMINUM FRAMING

- .1 Structural Aluminum: Alloy 6061-T6 to CSA HA series, minimum thickness of any section 4.8mm
- .2 Structural Steel for connection to supporting structures: to section 05 50 00
- .3 Fasteners: Aluminum or 316 stainless steel fasteners for connecting aluminum products to structural steel shall be stainless.
- .4 Welding wire: to HA.6.4043 or as specified under CSA CAN3-S157.
- .5 Fabricate aluminum in accordance with CSA CAN3-S157, fabricate structural steel in accordance with section 05 50 00. Do welding in accordance with CSA W59.2 or W59 as applicable.
- .6 Close all tubular sections with end plates and seal airtight with welds unless otherwise noted on the drawings. Design all connections to avoid creating recesses, pockets or other features which may entrap dirt, debris or marine deposits.
- .7 Do not use intermittent welds. Seal weld all joints unless restricted otherwise by CSA W59.2 or W59. File or grind exposed welds smooth and flush.
- .8 Welding procedures employed shall ensure that minimal welding distortion occurs and the completed geometry of the fabrication complies with the specified tolerances.
- .9 All joint preparation and completed welds shall be visually inspected for conformance with the requirements of CSA W59 Clause 11.
- .10 Remove and replace portions of welds not meeting the acceptance criteria. Re-inspect repaired welds.
- .11 Welds may also be inspected and/or tested by an inspector appointed by the Consultant at the Owners expense. Such additional inspection and/or testing will not augment or replace the Contractor's quality control nor relieve the Contractor of contractual responsibility.
- .12 If the Consultant's inspection of a weld should indicate poor alignment of the parts, insufficient penetration of the weld, lack of fusion, slag inclusion. Porosity, or otherwise fail to meet the requirements of this section, take the necessary corrective measures to provide a weld to the satisfaction of the Consultant. The cost of correcting defective welds and retesting shall be borne by the Contractor.

### 1.6 SPECIFICATIONS FOR STEEL PILES

- .1 Steel pipe for piling shall be seamless or welded pipe conforming to CSA Z245.1, Grade 359, Category 1 or API 5Lx52, PSL-2 (no hydro testing required).

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STEEL FABRICATIONS

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- .2 Pipe manufactured to other specifications may be only used with the approval of the Owner. Additional testing of chemical composition, welds and mechanical properties, to the level of that specified in CSA Z245.1 or API 5L, may be required of such pipe.
- .3 Subject to the approval of the Owner, steel pipe for piling conforming to ASTM A252 Grade 3, may be acceptable with the following provisions:
  - a. Minimum Yield Strength of 350 MPa;
  - b. Chemical analysis of materials shall show an equivalent carbon content of less than 0.30%;
  - c. All welds shall be full strength and shall satisfy the requirements of CSA Z245.1-M;
  - d. Flattening tests for ductility shall be conducted in accordance with the procedure and frequency stipulated in CSA Standard Z245.1-M;
  - e. Unless longitudinal welds are certified as conforming to the requirements of CSA Z245.1-M or API 5L to the satisfaction of the Engineer, welds shall be 100% inspected by ultrasonic or electromagnetic inspection according to the requirements of ASTM A53. This inspection shall be conducted at the Contractor's expense;
  - f. The Contractor shall bear the expense of repairing and re-inspecting all rejected welds.
  - g. Allowable tolerance on dimensions shall meet the requirement of CSA Z245.1-M.

**END OF SECTION 05 50 00**

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TIMBER

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**1.0 GENERAL**

- .1 All timber work shall be in accordance with CAN/CSA-086.1. Lumber grade shall conform to the requirements of the NLGA Standard Grading Rules.
- .2 All timber shall be Coast Douglas Fir No. 1 structural grade or better.
- .3 All sawn lumber shall be properly air-dried and seasoned, containing not more than 20% moisture.
- .4 All round timber piles shall conform to CSA 056 and be unused, clean peeled, uniformly tapered, one piece from butt to tip. Checks shall be limited to 100mm (4 inches) in length and 1.5mm (1/16 inch) in width. No knots shall exceed 25mm (1 inch) in diameter.
- .5 All timber at or above deck level such as deck planks, guards, bullrails, handrails or posts shall be salt-treated. All timber and pilings below deck level, except rub boards, shall be creosote treated.
- .6 This section refers to those portions of the work for timber, treatment of materials and connections.
- .7 The abbreviated standard specifications for testing, materials, fabrication and supply, referred to herein, are fully described in Section 01 42 00 – Reference Specifications.
- .8 Comply with Section 01 33 00 – Submittal Procedures and Section 01 34 00 – Shop Drawings and Product Data.

**1.1 TREATMENT OF MATERIALS**

- .1 Preservation treatment, inspection and re-treatment shall be in accordance with CSA Standard 080.
- .2 All timbers to be treated to Canadian Institute of Treated Wood's Best Management Practices for use of wood in aquatic environments.
- .3 Treated Timber that will be in contact with seawater shall be allowed to air-dry for 45 days prior to contact with seawater.
- .4 Treated timber and pile to be carefully handled to avoid damage to the treated surfaces.
- .5 The owner may carry out testing of materials, including core sampling at the treatment plant. Data will be made available to the contractor for information only.
- .6 Creosote-treated materials:
  - All creosote treated materials to be treated in accordance with CSA Standard 080 to a net retention of 320 kg/m<sup>3</sup>
  - Pile tops shall be treated with 2 coats of creosote, mastic and aluminum caps.
- .7 Salt-treated materials:
  - All timber to be treated with water-borne salts to be treated in accordance with CSA Standard 080 with ACZA to 6.4 kg/m<sup>3</sup> and a depth penetration of 10mm as specified in CSA 080.
- .8 Incise all treated timber 75mm and over before treatment.
- .9 All salt treated members that are modified (cut or drilled) shall be field treated with two coats of copper naphthenate or pentachlorophenol. When field treating by brushing, spraying, dipping or soaking do so in such a manner that the preservative does not drip into the water or ground. Ensure the creosote or other preservatives are properly stored and protected in case of spillage.

**1.2 CONNECTIONS**

- .1 Nails for timber greater than 51mm shall be galvanized ardox mails and for timber less than 51mm to be stainless steel annular ring nails conforming to CSA-B111. Bolts, nuts and washers through timber shall conform to ASTM A307.
- .2 Drift pins shall conform to CSA G40.21 Grade 260W.
- .3 All spikes, nails and staples to conform to CSA B111.

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TIMBER

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- .4 All lag screws to conform to CSA B34.
- .5 Hot-dip galvanize all miscellaneous metal and fasteners in accordance with CSA G164 unless noted otherwise.
- .6 Unless noted otherwise, use plate washers under heads and nuts of all bolts bearing on timber; plate washers against piles shall be curved.

**END OF SECTION 06 15 00**

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SPECIALIZED MATERIALS AND EXECUTION

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**1.0 GENERAL**

- .1 This section refers to those portions of the work for flotation materials, execution for approach and float component repairs, pile driving, gangway including design, installation and stripping and coating, plus abutment fill including materials and execution.
- .2 Comply with Section 01 33 00 – Submittal Procedures and Section 01 34 00 – Shop Drawings and Product Data.

**1.1 FLOTATION MATERIALS**

- .1 The flotation material shall be fabricated of materials manufactured for marine use. The flotation material shall be 100% warranted for a minimum of 8 years against sinking, becoming waterlogged, cracking, peeling, fragmenting, or losing beads. Flotation shall resist puncture and penetration. The flotation material shall be fire resistant. The use of new or recycled plastic or metal drums or non-compartmentalized air containers for encasement or floats is prohibited. Approved products include: Permafloat Dock Flotation by Cellofoam or approved equal.
- .2 Flotation units will be supplied by the Contractor. Contractor shall conduct site visit to verify the exact quantity and size of flotation units prior to ordering. It is the Contractor's responsibility to ensure that the finished units will fit into the frame of the float, without damage.
- .3 Buoyancy fillets shall be secured to float frame members with nylon banding, or approved alternative.

**1.2 EXECUTION OF APPROACH AND FLOAT COMPONENT REPAIRS (as applicable)**

- .1 Rub boards are to meet in square butt joints. Supply sufficient nails so that the rub boards can be secured to outside of stringers and flanges with 127mm galvanized spiral nails, staggered at 300mm intervals and also two 127mm spiral nails per cross-tie contact.
- .2 Deck planking will be laid perpendicular to stringers, heart side down, and sorted so that the vertical height difference between adjacent timbers is less than 6mm. Allow 10mm space between timbers at 15% moisture content. Supply sufficient hardware to secure deck to stringers and joists with 127mm galvanized spiral nails, two per contact. Decking will be wane free and will have no split ends. Decking shall be pre-drilled at the ends to deter splitting.

**1.3 PILE DRIVING**

- .1 Take all necessary precautions, including the provision of suitable screening fences or barriers to protect the public, existing structures, facilities, and services from damage due to the pile installation and associated works. Refer to Section 01 41 00 Regulatory Requirements 1.0.5.
- .2 Timber piling shall be carefully driven and continuous to design tip elevation or refusal.
- .3 Ensure the leads of the pile driving equipment do not exert lateral forces on the piles during driving. No adjustment of a possible misalignment will be permitted during driving, except at the very initial stages.
- .4 Installation of each pile will be subject to the approval of the Engineer, who will be sole judge of acceptability of each pile with respect to final driving resistance, depth of penetration or other criteria used to determine pile capacities.
- .5 Do not remove the pile installation equipment rig from the site until the Engineer has approved installation of all piles.



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SPECIALIZED MATERIALS AND EXECUTION

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**1.4 ABUTMENT FILL**

- .1 Fill shall consist of quarry tailings or similar materials with following gradation:

% Larger Than (by mass)	Nominal Size (mm)
85%	5
15%	40

Execution of Abutment Fill

- .2 Place fill as indicated on the drawings or as directed by the Engineer. Use methods to ensure that finer one third of gradation is evenly distributed throughout the layer and over the surface being covered.
- .3 Begin placement of slope protection at the toe of the slope and continue working up the slope. Place the rock in such a manner as to create firm bedding and interlocking of individual pieces to obtain a tightly packed structure. The finished surface shall be densely packed by placing suitably sized rocks within voids so that fill is uniform. Fill voids and re-work fill to the satisfaction of the Engineer.

**1.5 GANGWAY DESIGN**

- .1 Aluminum gangways shall be designed in accordance with CSA CAN3-S157 to carry the following specified live loads:
- i. Uniform live load of 4.8 KPA (100 PSF).
  - ii. Concentrated live load of 2.3 KN (500 lbs.) at any point.
  - iii. Snow load as per NBCC (Gangways 0)
  - iv. Wind load as per NBCC (1/30 year return).
- .2 Gangway length shall be as indicated on the drawings. Clear width of gangway inside truss members not including handrails shall be not less than 2000mm minimum.
- .3 Gangways shall be pony (U) truss design.
- .4 Gangways together with their guardrails and toe rails shall comply with the requirements of the Industrial Health and Safety Regulations of the Workers' Compensation Board of British Columbia.
- .5 Gangways shall be provided with a serrated edge aluminum grating deck surface or pre-approved alternate.
- .6 Gangways shall be provided with full length, continuous aluminum handrails on each side.
- .7 Handrails for the gangway shall be designed for 0.7 KN/M (50 pounds per linear foot) uniform horizontal load and a concentrated load of 0.9 KN (200 pounds) horizontally on the top rail. Handrails shall be placed on both sides of the gangway with a minimum clear distance between them of 1.07m (42 inches).
- .8 The decking shall be a non-skid surface to prevent slippage when wet and at maximum angle of inclination.
- .9 The gangway connection to the upper landing shall be able to pivot to compensate for water level fluctuations and any gap between the landing and gangway shall not exceed 25mm (1 inch).
- .10 The gangway connection to the floating docks shall be capable of free movement and shall be protected from damaging the dock's decking. Gangways shall include a toe plate along the length and on both sides of the truss frame of the gangway. A 150mm (6 inch) UHMW fender strip shall be installed along the edge of the floating dock deck to protect it from gangway damage during elevated water levels.

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SPECIALIZED MATERIALS AND EXECUTION

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- .11 All hardware shall be heavy duty, suitable for the intended service, and appropriate for a saltwater environment. The handrail height and configuration shall conform to applicable local access codes.
- .12 Formed aluminum U-Channel deck grating shall not be used as it is not suitable for point loads.
- .13 The maximum deflection of any gangway under full live load shall be not more than 1/240 of its length.
- .14 Install gangways as indicated on the drawings and in accordance with the reviewed shop drawings.

**1.6 GANGWAY STRIPPING AND COATING**

- .1 Strip the underside of ramp, including all cross members, of all scale and oxidation, observing environmental regulations.
- .2 Coat entire ramp with approved coating system in accordance with manufacturer's recommendations.

**END OF SECTION 5**