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Pacific Region
401 - 1230 Government Street
Victoria, B.C.
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SOLICITATION AMENDMENT
MODIFICATION DE L'INVITATION

The referenced document is hereby revised; unless otherwise
indicated, all other terms and conditions of the Solicitation
remain the same.

Ce document est par la présente révisé; sauf indication contraire,
les modalités de l'invitation demeurent les mêmes.

Comments - Commentaires

Vendor/Firm Name and Address
Raison sociale et adresse du
fournisseur/de l'entrepreneur

Issuing Office - Bureau de distribution
Public Works and Government Services Canada -
Pacific Region
401 - 1230 Government Street
Victoria, B. C.
V8W 2Z4

| | |
|--|--|
| Title - Sujet Design / Build - Breakwater Floats | |
| Solicitation No. - N° de l'invitation F1571-145021/A | Amendment No. - N° modif. 002 |
| Client Reference No. - N° de référence du client F1571-145021 | Date 2014-11-06 |
| GETS Reference No. - N° de référence de SEAG PW-\$XLV-211-6572 | |
| File No. - N° de dossier XLV-4-37123 (211) | CCC No./N° CCC - FMS No./N° VME |
| Solicitation Closes - L'invitation prend fin at - à 02:00 PM on - le 2014-11-17 | |
| F.O.B. - F.A.B. Plant-Usine: <input type="checkbox"/> Destination: <input type="checkbox"/> Other-Autre: <input type="checkbox"/> | |
| Address Enquiries to: - Adresser toutes questions à: Buchan, Torrey | Buyer Id - Id de l'acheteur xlv211 |
| Telephone No. - N° de téléphone (250) 363-3249 () | FAX No. - N° de FAX (250) 363-3960 |
| Destination - of Goods, Services, and Construction: Destination - des biens, services et construction: | |

Instructions: See Herein

Instructions: Voir aux présentes

| | |
|--|--|
| Delivery Required - Livraison exigée | Delivery Offered - Livraison proposée |
| Vendor/Firm Name and Address Raison sociale et adresse du fournisseur/de l'entrepreneur | |
| Telephone No. - N° de téléphone Facsimile No. - N° de télécopieur | |
| Name and title of person authorized to sign on behalf of Vendor/Firm (type or print) Nom et titre de la personne autorisée à signer au nom du fournisseur/ de l'entrepreneur (taper ou écrire en caractères d'imprimerie) | |
| Signature | Date |

Solicitation No. - N° de l'invitation

F1571-145021/A

Amd. No. - N° de la modif.

002

Buyer ID - Id de l'acheteur

xlv211

Client Ref. No. - N° de réf. du client

F1571-145021

File No. - N° du dossier

XLV-4-37123

CCC No./N° CCC - FMS No/ N° VME

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Question & Answer – Solicitation F1571-145021/A

The following Q&A has been posted in response to questions posed by potential bidders.

Q20) Page 15 - Clause 2.2.1 :“The new float shall be 3.66m wide x 1.22m Deep x 122m Long”, i.e. the float depth and width are already specified. Will the wave conditions as stated in A9 (0.3m maximum height at 0.87% exceedance) be met using these float dimensions?

A20: It is the owner's opinion that the proposed float dimensions, which is based on the dimensions of existing float and environmental restraints, would suffice to meet the provided design criteria. The contractor's tasks are specifically listed in clause 1.1.3.

Q21) Shall the bid documentation include resumes of design team to verify that all bids will include engineers registered in BC?

A20: Yes.

Q22) Are you requiring that the design team include a hydrotech engineer to review the specified design loads such as wind, current and wave that must have been determined for the specific site and marina layout along with vessels?

A22: See AD15

Addendum – Solicitation F1571-145021/A

The following Amendment have been made to the Solicitation.

Amendments to Annex A – Statement of Work

AD14) Clause 1.1.1 should read: “Marine Structures Engineer with knowledge and experience of reinforced pre- cast concrete design, including sizing floating breakwaters, calculation of lifting and handling stresses as well as stresses imposed by wind, waves, berthing vessels, river current, ice flows, and live loads.”

AD15) Delete Clause 1.1.2

All other terms and conditions of the solicitation remain the same.

See the following pages for the revised Annex A.

ANNEX A STATEMENT OF WORK

1 Introduction

The Department of Fisheries and Oceans, Small Craft Harbours Branch is seeking tenders from Design-Build teams to design, supply, fabricate and deliver a concrete breakwater floats to the designated storage area for installation at a Small Craft Harbour Facility in the spring of 2015 (installation will be by others and is not included in the scope of this specification).

1.1 Scope of Design Work

Design shall be carried out by Professional Engineers registered in the province of British Columbia and sealed, with specialized experience in the design of floating marine structures. The following design specialties shall be used as a minimum:

- 1.1.1 Marine Structures Engineer with knowledge and experience of reinforced pre-cast concrete design, including sizing floating breakwaters, calculation of lifting and handling stresses as well as stresses imposed by wind, waves, berthing vessels, river current, ice flows, and live loads..
- 1.1.2 REMOVED
- 1.1.3 Marine Structures design shall include as a minimum:
 - Design and drafting of pre-cast reinforced concrete
 - Buoyancy design to meet freeboard requirements
 - Design and detailing of the connection system for the floats under all loading including hogging and sagging waves (see Appendix for sample connections)
 - Design and detailing of anchor attachment points to suit the current chain and anchor mooring system
- 1.1.5 Design shall include drafting and checking of design drawings as well as shop detail drawings (may be combined into shop drawings only, if prepared by the same firm).
- 1.1.6 Design shall include anchor chain attachment points and drawings shall indicate performance capabilities of the attachment points (i.e. maximum chain size and loading).
- 1.1.7 Design shall be in accordance with the criteria given in section 2 and the attached NMS specification 034100 "Precast Structural Concrete"

1.2 Scope of Supply, Fabrication and Delivery Work

- 1.2.1 Supply and fabricate all pre-cast reinforced concrete components and foam flotation billets
- 1.2.2 Supply and fabricate all risers and mooring rails, bull-rails and other fendering components, mooring cleats, chain anchor attachments, connecting bolts and other hardware, removal and patching of shop handling and shipping devices other than those required for final field installation.
- 1.2.3 Include handling and delivery to the Small Craft Harbours facility at Steveston Harbour, Richmond BC.

2 Design Criteria

2.1 Marina Characteristics

- 2.1.1 Class B Marina
- 2.1.2 Design Freeboard for floats (dead load only including utilities) = 457 mm
- 2.1.3 Tidal (significant river currents also present)
- 2.1.4 Main vessel mooring configuration – timber bull-rails on 102mm risers on top of floats, 100x300 timber rub-rails mounted flush with top of float

2.2 Floating Breakwater Geometry

- 2.2.1 The new float shall be 3.66 m Wide x 1.22 m Deep x 122 m Long. (+/- 10% variance at depth, and +/- 2% variance at width and length) and may be provided as a combination of several connected pontoon units (as per existing), with a maximum of 5 units total at a minimum of 24.39m long per unit, or may be provided as longer segments if feasible.
- 2.2.2 Float shall be designed with anchor points to attach to the existing chain mooring system (twenty-four (24) connection points – twenty (20) lateral mooring lines and four (4) longitudinal mooring lines). Design for minimum 25 mm diameter anchor chain, with access to anchor points from float deck for periodic adjustments. (See Appendix B for existing layout). Design anchor point loading to exceed 25 mm diameter anchor chain.
- 2.2.3 Float shall be closed (concrete) bottom, pre-cast concrete floats filled with foam flotation blocks.
- 2.2.4 Float shall be designed with three (3) PVC conduits of minimum 4” diameter for services (electrical, pump-out and water). Each conduit shall have risers to the deck services 6.10m from the end of the float and every 12.20m therein, for a total of 10 risers per conduit.

2.3 Codes, Standards and Specifications

- 2.3.1 The current editions of the following codes shall be used as a minimum:
 - CSA A23.3
 - CSA A23.4
 - CSA S6 shall be used to supplement A23.3 and A23.4 for durability requirements for structures in Marine Environments
 - Design Manual Pre-cast and Pre-stressed Concrete 4th Edition
 - ACI 357.2R-10 and ACI 408.2-12

2.4 Reference Materials

- 2.4.2 Department of Fisheries and Oceans Canada Drawings
- 2.4.3 ASCE “Planning and Design Guidelines for Small Craft Harbours”
- 2.4.4 American Society for Testing and Materials (ASTM):
 - ASTM A123/A123M-02, Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - ASTM A252-98 (2002), Specification for Welded and Seamless Steel Pipe Piles.

- ASTM A307-04, Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.
- 2.4.5 Canadian Coast Guard (CCG):
 - MA 2080, General Specifications for Moorings for Aids to Navigation, Issue C (September 1999).
- 2.4.6 Canadian Institute of Treated Wood/Western Wood Preservers Institute (CITW/WWPI):
 - Best Management Practices for the Use of Treated Wood in Aquatic Environments (BMP), July 1996.
 - BMP Amendment #1, 17 April 2002.
- 2.4.7 Canadian Standards Association (CSA):
 - CSA B111-1974 (R2003), Wire Nails, Spikes and Staples.
 - CSA G40.21-04, Structural Quality Steels.
 - CAN/CSA-G164-M92 (R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.
 - CAN3-O56-M79 (R2001), Round Wood Piles.
 - CSA-O80 Series- 08, Wood Preservation.
 - CSA O121-M1978 (R2003), Douglas Fir Plywood.
 - CAN/CSA-S16-01, Limit States Design of Steel Structures.
 - CSA W47.1-03, Certification of Companies for Fusion Welding of Steel.
 - CSA W59-03, Welded Steel Construction (Metal Arc Welding).
- 2.4.8 National Lumber Grades Authority (NLGA):
 - Standard Grading Rules for Canadian Lumber, 2003 edition.

2.5 **Design Loads**

2.5.1 Design shall account for the following parameters:
Assumptions:

- Design Vessel: 19.8m length x 6.0m beam x 2.4m draft (65ft x 20ft x 8ft)
- Wind: Maximum gust velocity: 145 km/h (40.3m/s) over Winter; 70 km/h (19.4m/s) in Freshet (June)
- Current: Maximum surface flow: 2.5 kts (1.3 m/s) over Winter; 8kts (4.1 m/s) in Freshet (June)
- Floating Ice Impact: Estimated mass 100 Tonnes travelling 1.3 m/s in Winter
- Floating Root Ball Impact: Estimated mass 4 Tonnes travelling 4.1 m/s in Freshet
- Waves from tug traffic – short duration wave with max. 2.2 sec period and 0.3m wave height
- Site subject to two critical load scenarios: Winter storm and Freshet
- Withstand hogging and sagging based on a wave 0.6 m to 1.0 m high and 15 to 20 m long crest to crest.
- Failure strength of 25mm diameter mooring chain is 258kN (58,000 lb)

Environmental Loads

Winter Scenario: loading is based on 1 design vessel moored on the inside face of every 24.4m of the entire concrete float (i.e. 5 vessels moored on 122m of float).

- Wind Load: 48kN (41.6kN Lateral/24.0kN Longitudinal)
- Current Load: 3.4kN (0 Lateral/3.4kN Longitudinal)
- Wave Load: 4.5kN (3.9kN Lateral/2.3kN Longitudinal)
- Effects of Snow and Ice - 4 inches of Ice loading (density of 57.4 lb/cu.ft) and 6 inches of snow loading (density of 10 lb/cu.ft)
- Ice Impact Load applied as impact force of 51.9kN (26.0kN Lateral/45.0kN Longitudinal) (note: wave load will not coincide with ice impact loading)

Freshet Scenario: loading is based on 1 design vessel moored on both inside and outside face of every 24.4m of the entire concrete float (i.e. 10 vessels moored on 122m of float).

- Wind Load: 18.3kN (15.9kN Lateral/9.2kN Longitudinal)
- Current Load: 67.1kN (0 Lateral/67.1kN Longitudinal)
- Wave Load: 4.5kN (3.9kN Lateral/2.3kN Longitudinal)
- Root Ball Impact Load: 27.6kN (13.8kN Lateral/23.9kN Longitudinal)

Operation load:

- Live loads – Floats shall remain stable and maintain freeboard of 152mm at 3.0 kPa (62.5 psf)

Dead Loads

- Weight of structure
- Utility – water line, power line and cabinets, sewage line (3.5 kg per liner metre)
- Gangway – Steel truss gangway (3603kg)
- The metacentric height (GM) of the structure must not be less than 1.37m in operating, transit, and design weather conditions, and not less than 0.3m while changing draught between these conditions.

Load Combinations

The float system shall withstand the following load conditions:

- Apply all applicable load combination under given environmental scenarios to each pontoon unit and the full float with the mooring chain forces
- Apply a maximum 100mm heave differential between pontoons for connections with a hinge type behavior.
- Drag tension capacity to withstand worst longitudinal load combination
- Impact loading capacity to withstand worst lateral and longitudinal load combination
- Apply a maximum chain tension to two mooring wells on opposite corners of pontoon unit, with lateral forces and hogging and sagging wave.

3 Materials

3.1 General

- 3.1.1 Use only new materials except where specified otherwise.
- 3.1.2 Use products of 1 manufacturer for material and equipment of the same type or classification unless otherwise specified.
- 3.1.3 Unless otherwise specified, comply with manufacturer's latest printed instructions for materials and installation methods.
- 3.1.4 Notify Departmental Representative in writing of any conflict between these specifications and manufacturer's instructions. Departmental Representative will designate which document is to be followed.
- 3.1.5 Provide metal fastenings and accessories in the same texture, colour and finish as base metal in which they occur.
- 3.1.6 Prevent electrolytic action between dissimilar metals.
- 3.1.7 Use non-corrosive fasteners, anchors and spacers for securing exterior work.
- 3.1.8 Use fastenings of standard commercial sizes and patterns with material and finish suitable for service.

- 3.1.9 Use heavy hexagon heads, semi-finished unless otherwise specified.
- 3.1.10 Bolts may not project more than 1 diameter beyond nuts.
- 3.1.11 Deliver, store and maintain packaged material and equipment with manufacturer's seals and labels intact.
- 3.1.12 Prevent damage, adulteration and soiling of products during delivery, handling and storage. Immediately remove rejected products from site.
- 3.1.13 Store products in accordance with suppliers' instructions
- 3.2 Timber**
- 3.2.1 Timber to NLGA, No. 1 Structural Grade Coast Douglas Fir conforming to NLGA Standard Grading Rules for Canadian Lumber 2003 unless otherwise specified.
- 3.2.2 Frame and bore timber before treating unless specified otherwise.
- 3.2.3 Unless otherwise specified, fasten members as per existing.
- 3.3 Treatment of Timber Materials**
- 3.3.1 Produce and install treated wood products in accordance with CSA 080-08 series and the Western Wood Preservers Institute and Canadian Institute of Treated Wood Best Management Practices for Treated Wood in Western Aquatic Environments, latest edition, (BMP).
- 3.3.2 Testing:
- SCH will carry out materials testing, including core sampling, at the treating plant. Data will be made available to the Contractor for information only.
 - Notwithstanding SCH's testing program, Contractor will ensure that materials meet SCH's requirements in all respects. SCH reserves the right to reject materials on site.
 - Before shipping material to site, provide a certificate from the treated wood producer that BMP's were utilized, including a description of the BMP's that were utilized.
- 3.3.3 Use **Category UC 3.2**, solid sawn products, exposed to weather, not in ground contact. May be coated for aesthetics. Includes decking, guard raisers, wharf guards, float upper splice blocks, float bull-rails, float rub boards, handrails, handrail posts if no ground contact. Treat in accordance with CSA O80 for products under use category UC 3.2 and Clause 9.2 of O80.1.
- Preservatives, retention, and penetration:
ACZA, 4.0 kg/m³ or
CCA, 4.0 kg/m³
Penetration of solid sawn products in accordance with O80:
10 mm and 90% of sapwood if material is less than 115 mm thick, or
13 mm and 90% of sapwood if material is greater than or equal to 115 mm
- 3.3.4 Use **Category UC 4.1**, contact with ground, freshwater, and/or salt water splash. For solid sawn products, treat in accordance with CSA O80 for products under use category UC 4.1 and Clause 9.2 of O80.1

Preservatives, retention, and penetration:

ACZA, 6.4 kg/m³ or

CCA, 6.4 kg/m³

Penetration of solid sawn products in accordance with O80:

10 mm and 90% of sapwood if material is less than 115 mm thick, or

13 mm and 90% of sapwood if material is greater than or equal to 115 mm thick

3.3.5 **Use Category UC5A**, Marine (salt water exposure).

Includes round wood piles, solid sawn products, and plywood, including piles, pile braces, pile whalers, bulkhead timbers, retaining wall materials, float cross ties, float flanges, lower and middle splice blocks for float flanges and stringers.

Treat in accordance with CSA O80 for products under use category UC5A and Clause 9.8 of O80.1

Preservatives, retention, and penetration:

ACZA, 30 kg/m³ or

CCA, 24 kg/m³

Penetration of solid sawn products in accordance with O80:

10 mm and 90% of sapwood if material is less than 115 mm thick

13 mm and 90% of sapwood if material is greater than or equal to 115 mm thick

3.4 Steel

3.4.1 Small fastenings: to CSA B111.

3.4.2 Drift bolts, machine bolts, washers and miscellaneous iron: to CSA G40.21 and hot dip galvanized to CAN/CSA-G164.

3.4.3 Spikes and nails: hot dip galvanized to CAN/CSA-G164 unless otherwise specified.

3.4.4 All other hardware specified to be galvanized: hot dip galvanized to CAN/CSA- G164 unless specified otherwise.

3.4.5 Items manufactured or fabricated from scrap steel of unknown chemical composition or physical properties are not acceptable.

3.4.6 Bolts: all bolts are to be machine bolts unless specified otherwise.

Machine bolts:

- Conform to ASTM A307 (Unless noted otherwise)
- Provide with steel plate washers under head and nut, unless specified otherwise.

Drift bolts: unpointed, with ragged edges beaten off.

3.4.7 Steel plate washers:

- Shape: round, unless specified to be square.
- Size: select from table below, unless specified otherwise:

| WASHER DIMENSIONS | | | |
|-------------------|-----------|----------------------|------------------------|
| Bolt Size | Thickness | Round Plate Diameter | Square Plate Side Size |
| 12.7 mm | 5 mm | 62 mm | 62 mm |
| 15.9 mm | 6 mm | 69 mm | 69 mm |
| 19.1 mm | 6 mm | 75 mm | 75 mm |
| 22.2 mm | 8 mm | 81 mm | 81 mm |
| 25.4 mm | 9 mm | 87 mm | 87 mm |

| | | | |
|---------|-------|--------|--------|
| 31.8 mm | 11 mm | 100 mm | 100 mm |
| 38.1 mm | 11 mm | 112 mm | 112 mm |

- 3.4.8 Bolt holes:
- Machine bolts: bore holes to provide a driving fit.
 - Drift bolts: bore holes 1.5 mm less than bolt diameter.

- 3.4.9 Welding:
- Unless specified otherwise, welding is to be in accordance with CSA W59.
 - Provide evidence that welding companies are certified to CSA W47.1.

- 3.4.10 Steel Grades:
- Channels and Angles: 350W
 - Miscellaneous Plate: 300W

- 3.4.11 Finish:
All fabricated steel channels, angles and plates are to be hot dipped galvanized unless otherwise noted.

3.5 **Hardware**

- 3.5.1 Bolts (drift, machine, carriage, lag, etc.), nuts and washers: hot dip galvanized to CAN/CSA-G164.
- 3.5.2 Spikes and nails: hot dip galvanized to CAN/CSA-G164 unless otherwise specified.
- 3.5.3 All other hardware specified to be galvanized: hot dip galvanized to CAN/CSA- G164 unless specified otherwise.

3.6 **Chain and Shackles**

- 3.5.4 Chain: to CCG MA 2080 C.
- 3.5.5 Black carbon steel, 19 mm, long-link mooring chains.
- 3.5.6 Shackles: Crosby load-rated shackles or alternate approved by addendum during tendering.
- 3.5.7 Secure pin against rotation after fastening with No. 12 gauge (2.052 mm) insulated copper wire.

3.7 **Buoyancy Billets**

- 3.7.1 Billets to have dimensions and be positioned as shown in the Plans and Specifications and to be secured to the float frame with nylon banding.
- 3.7.2 All billets are to be fabricated of polystyrene.
- 3.7.3 Polystyrene, expanded: uniform cellular structure, free of voids. If a beaded product is to be used, beads shall be fused so that, when the product is broken by hand pressure, there is an excess of broken or sheared beads

| PROPERTY | POLYSTYRENE |
|---|-------------|
| Compressive strength at 10% deformation (minimum) | 76 kPa |
| Flexural strength (minimum) | 124kPa |
| Water absorption by volume (maximum) | 4% |
| Density (minimum) | 16kg/m3 |

3.7.4 REMOVED

3.7.5 REMOVED

3.7.6 REMOVED

3.7.7 REMOVED

3.7.8 Contractor is to provide flotation unit supplier information as well as fabrication schedule at least 1 week prior to delivery of billets so that SCH may arrange inspection.

3.8 REMOVED

4 Schedule

4.1 Design

The project schedule current calls for the design to be completed by December 12th, 2014.

4.2 Fabrication and Delivery

The project schedule currently calls for fabrication and delivery to be completed by March 13th, 2015

4.3 Milestones

The project milestones as defined in the table below shall form the basis for progress payments.

| Milestone # | Milestone Description | Projected Date |
|-------------|--|----------------|
| 1 | Float design completed with final review, performance calculation, and shop drawings | 12-Dec-14 |
| 2 | Form work and base steel work of all floats completed and inspected | 16-Jan-15 |
| 3 | Upper steel work, flotation installation of all floats completed and inspected | 6-Feb-15 |
| 4 | Concrete pour of all floats completed and inspected | 20-Feb-15 |
| 5 | Hardware installation of all floats completed and inspected | 6-Mar-15 |
| 6 | Delivery completed and acceptance on site | 13-Mar-15 |

APPENDIX 1

Pre-cast Concrete Specifications

Part 1 General

"1.7 MEASUREMENT PROCEDURES

- .1 Measure precast elements in units supplied and delivered
- .2 Precast elements measured as individual units, will include cost, supply, and delivery of risers and mooring rails, bull-rails and other fendering components, mooring cleats, UHMW for pile wells, chain anchor attachments, connecting bolts and other hardware, removal and patching of shop handling and shipping devices other than those required for final field installation

"2.7 REFERENCES

- .1 **American Society for Testing and Materials International (ASTM)**
 - .1 ASTM A185/A185M-05a, Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
 - .2 ASTM A775/A775M-04a, Standard Specification for Epoxy-Coated Reinforcing Steel Bars.
 - .3 ASTM C260-01, Standard Specification for Air-Entraining Admixtures for Concrete.
 - .4 ASTM D412-98a (2002) e1, Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers - Tension.
 - .5 ASTM D2240-05, Standard Test Method for Rubber Property - Durometer Hardness.
- .2 **Canadian General Standards Board (CGSB)**
 - .1 CAN/CGSB-1.40-97, Anticorrosive Structural Steel Alkyd Primer.
 - .2 CAN/CGSB-1.181-99, Ready Mixed Organic Zinc-Rich Coating.
- .3 **Canadian Standards Association (CSA International)**
 - .1 CSA-A23.1/A23.2-2004, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
 - .2 CSA-A23.3-04, Design of Concrete Structures.
 - .3 CSA-A23.4-05, Precast Concrete - Materials and Construction.
 - .4 CAN/CSA-A3000-03, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
 - .1 CSA-A3001-03, Cementitious Materials for Use in Concrete.
 - .5 CAN/CSA-G30.18-M92(R2002), Billet-Steel Bars for Concrete Reinforcement.
 - .6 CAN/CSA-G40.20/G40.21-2004, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .7 CAN/CSA-G164-M92(R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.
 - .8 CAN/CSA-S6-2005, Canadian Highway Bridge Design Code.
 - .9 CSA-W47.1-03, Certification of Companies for Fusion Welding for Steel.
 - .10 CAN/CSA W48-01(R2006), Filler Metals and Allied Materials for Metal Arc Welding (Developed in co-operation with the Canadian Welding Bureau).
 - .11 CSA-W59-03, Welded Steel Construction (Metal Arc Welding) (Metric version).
 - .12 CSA-W186-M1990 (R2002), Welding of Reinforcing Bars in Reinforced Concrete Construction.
- .4 **The Master Painters Institute (MPI) - Architectural Painting Specification Manual (ASM) February 2004**
 - .1 MPI # 18, Organic Zinc Rich Primer.

.2 MPI # 23, Oil Alkyd Primer.

.5 **Underwriters' Laboratories of Canada (ULC)**

.1 CAN/ULC-S701-05, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.

"3.7 DESIGN REQUIREMENTS

- .1 Design precast elements to CSA-A23.3 and CSA-A23.4 to carry handling stresses.
- .2 Design connections/attachments of precast elements to load/forces specified and as calculated
- .3 Provide detailed calculations (if requested) and design drawings for typical precast elements and connections.

"4.7 PERFORMANCE REQUIREMENTS

- .1 Tolerance of precast elements to CSA-A23.4.
- .2 Length of precast elements not to vary from design length by more than plus or minus 30 mm (based on 24m float sections)
- .3 Cross sectional dimensions of precast elements not to vary from design dimensions by more than plus or minus 5 mm.
- .4 Deviations from straight lines not to exceed 12 mm in 10 m.
- .5 Pre-cast elements not to vary by more than plus or minus 5 mm from true overall cross sectional shape as measured by difference in diagonal dimensions.
- .6 Minimum concrete cover of 50mm on exterior surfaces, and minimum cover of 30mm on interior surfaces.

"5.7 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit shop drawings in accordance with CSA-A23.4 and include following items:
 - .1 Design calculations for items designed by manufacturer (if requested)
 - .2 Details of pre-stressed and non-pre-stressed members, reinforcement and their connections.
 - .3 Camber.
 - .4 Finishing schedules.
 - .5 Methods of handling and erection.
 - .6 Openings, sleeves, inserts and related reinforcement.
- .2 Submit 3 full size copies of design drawings for typical precast elements and connections for review by Departmental Representative and Consultant, 3 weeks prior to manufacture.
- .3 Shop Drawings: submit drawings stamped and signed by qualified professional engineer registered or licensed in the Province of British Columbia, Canada.
- .4 Submit sample and sample number of each finish to be used on project to Departmental Representative.

"6.7 QUALITY ASSURANCE

- .1 Quality Control Plan: submit written report to Departmental Representative verifying compliance that concrete provided meets performance requirements of concrete as established in PART 2 - PRODUCTS.

"7.7 QUALIFICATIONS

- .1 Fabricate and erect precast concrete elements by manufacturing procedures in accordance to CSA-A23.4
- .2 Precast concrete manufacturer will be required to submit documentations showing products produced and erected are in accordance with CSA-A23.4 procedures and standards for quality control and assurance purposes.
- .3 REMOVED
- .4 Welding companies certified to CSA-W47.1.

"8.7 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, handle and store precast/pre-stressed units according to manufacturer's instructions.
- .2 Protect unit corners from contacting earth to prevent from staining.

"9.7 WARRANTY

- .1 Contractor warrants but for 2 years, that precast elements will not spall or show visible evidence of corrosion of embedded steel and cracking that is detrimental to structural integrity of the float as assessed by an Engineer. Contractor is to warrant that proper water pond curing of seven days for C-XL and e-1 exposure classes, in accordance with the General Conditions.

Part 2 Products

2.1 MATERIALS

- .1 Cement to CAN/CSA-A3001, Type GU.
- .2 Supplementary cementing materials: with 10-15% Type F fly ash replacement and 8% min. Type SF Silica Fume, by mass of total cementitious materials to CAN/CSA A3001. Total supplementary cementing materials not to exceed 18% by mass of total cementitious material.
- .3 Water: to CSA-A23.1/A23.2.
- .4 Reinforcing steel: to CAN/CSA-G30.18, bare or galvanized bars with silica fume.
- .5 Pre-stressing steel tendons and bars: to CAN/CSA-S6.
- .6 Welded wire fabric: to ASTM A185/A185M, coated (no epoxy).
- .7 Hardware and miscellaneous materials: to CSA-A23.1/A23.2.
- .8 Forms: to CSA-A23.4.
- .9 Anchors and supports: to CAN/CSA-G40.21 Type 300 W, galvanized after fabrication.
- .10 Welding materials: to CSA W48.
- .11 Welding electrodes: to CSA W48, certified by Canadian Welding Bureau.
- .12 Galvanizing: hot dipped galvanizing with minimum zinc coating of [610] g/m2 to CAN/CSA-G164.

- .13 Steel primer: to CAN/CGSB-1.40.
- .14 Zinc-rich primer: to CAN/CGSB-1.181.
- .15 Post-tensioning ducts: to CSA-A23.1/A23.2.
- .16 Air entrainment admixtures: to ASTM C260.
- .17 Shims: plastic.
- .18 Weep-hole tubes: purpose made plastic.

2.2 MIXES (CONCRETE)

- .1 Alternative 1 - Performance Method for specifying concrete: to meet Departmental Representative performance criteria in accordance with CAN/CSA-A23.1/A23.2.
 - .1 Ensure concrete supplier meets performance criteria as established below
 - .2 Provide concrete mix to meet following hard state requirements:
 - .1 Durability and class of exposure: C-XL.
 - .2 Minimum compressive strength at 56 days: 40 MPa.
 - .3 Intended application: continuous water submersion and splash zone (frequent wetting and drying cycles)
 - .4 Volume stability: acceptable strain range due to shrinkage, creep and freeze thaw cycle is between 0.0002 and 0.0005.
 - .5 Surface texture: non-skid finish on top, steel trowel or steel form finish on sides and bottom of floats.
 - .6 Geometrical requirements: 1.5 % slope for drainage.

- .3 Provide quality management plan to ensure verification of concrete quality to specified performance, include concrete supplier's certification.
- .4 Placement of deck and walls in one pour to allow concrete to shrink wrap onto foam and keel
- .5 Foam must be secured to keel to prevent foam movement
- .6 Water pond cure for 7 days to prevent short and long term cracking.

2.3

MANUFACTURED UNITS

- .1 Manufacture units in accordance with CSA-A23.4.
- .2 Mark each precast unit to correspond to identification mark on shop drawings for location with date cast on part of unit not to be exposed.
- .3 Provide hardware suitable for handling elements.
- .4 Design tendons and anchorages and install post tensioning ducts in accordance with CSA-A23.3 and CAN/CSA-S6.
- .5 Galvanize anchors and steel embedments after fabrication and touch up with zinc-rich primer (Zinga) after welding.

2.4

FINISHES

- .1 Finish units to standard grade to CSA-A23.4.

2.5

SOURCE QUALITY CONTROL

- .1 Provide Departmental Representative with certified copies of quality control tests related to this project as specified in CSA-A23.4 and CSA-G279.
- .2 Inspect pre-stressed concrete tendons in accordance with CSA-G279.
- .3 Provide records from in-house quality control programme based upon plant certification requirements to Departmental Representative for inspection and review.
- .4 Upon request, provide Consultant with certified copy of mill test report of reinforcing steel supplied, showing physical and chemical analysis.
- .5 Precast plants should keep complete records of supply source of concrete material, steel reinforcement, pre-stressing steel and provide to Departmental Representative for review upon request.

**APPENDIX A2
Existing Mooring Layout**

**APPENDIX A3
Sample Connection Detail**

Appendix A2 and A3 are available upon request of the Contracting Authority.