PART 1 – GENERAL

1.1 RELATED WORK

.1 Refer to Section 01 33 00 for Shop Drawing/Submission requirements.

1.2 REFERENCE STANDARDS

.1 Do structural concrete work in accordance with CSA A23.1-14 (or latest edition), Concrete Materials and Methods of Concrete Construction, except where stricter standards specify otherwise.

.2 CAN/CSA-A5/A8/A362-93 (or latest edition), Portland Cement/ Masonry Cement / Blended Hydraulic Cement.

.3 CSA A23.5-M86 (R1992) or latest edition), Supplementary Cementing Materials.

.4 ASTM C494-92 (or latest edition), Chemical Admixtures for Concrete.

1.3 SUBMISSIONS

.1 Shop Drawings:
.1 Upon request, submit shop drawings and erection drawings for formwork and falsework. All such drawings to be stamped and signed by a Professional Engineer registered in the Province of Prince Edward Island.
.2 Submit placement drawings for reinforcing steel.
.3 Upon request, submit placement drawings for miscellaneous items.

.2 Product Data/Samples:
.1 Provide technical data and/or samples for curing compounds, evaporation retardant and finishing aids, expansion joint materials/sealants, grouts.

.3 Certificates:

.1 Minimum four weeks prior to starting concrete work; submit to Departmental Representative the manufacturer's test data and certification by qualified independent inspection and testing laboratory that the following materials will meet specified requirements:

.1 Portland cement.

.2 Admixtures.

.3 Aggregates

.2 Provide certification that the plant, equipment, and material to be used in the concrete work comply with the requirements of CSA A23.1.

.3 Provide certification that the mix proportions selected will produce concrete of specified quality and strength that will comply with CSA A23.1.

.4 Provide certification that concrete will not include alkali reactivity aggregates.

.4 Methodology:

.1 Submit methodologies for cold weather concreting in marine environment.

.2 Submit methodologies for hot weather concreting.

.3 Submit methodologies for concrete placement operations.

.4 Submit methodologies for concrete deck finishing operations.

.5 Submit methodologies for supporting reinforcing steel.

.5 Test Results:

.1 Provide design mix tests results.

.2 Provide mill test certificates for reinforcing steel.

1.4 STORAGE OF MATERIALS

.1 Store all materials to prevent contamination or deterioration, whether at the plant or at the job site.

.2 Store cement in watertight bins or silos that provide protection from dampness an easy access for inspection and identification of each shipment whether at the plant or at the job site.

.3 Prevent stored liquid admixtures and compounds from freezing and powdered admixtures and compounds from absorbing moisture.

1.5 SOURCE SAMPLING

.1 At least 4 weeks prior to commencing work, inform Departmental Representative of proposed source of aggregates and provide access for sampling.

1.6 READY-MIX CONCRETE SUPPLY

.1 Provide, with each load of concrete delivered to pre-cast panel fabrication site, duplicate delivery slips containing following:

.1 Name of ready-mix batch plant.
.2 Serial number of ticket.
.3 Date and truck number.
.4 Project identification.
.5 Class of concrete or mix.
.6 Amount of concrete in cubic meters.
.7 Time and loading or first mixing of aggregate, cement and water.
.8 Time of discharge of concrete.
.9 Admixtures added to plant.
.10 Amount of water added to plant.

1.7 MEASUREMENT OF PAYMENT

.1 Heating of water and aggregates and providing cold weather and marine environment protection will not be measured but considered incidental to work.

.2 Cooling of concrete and providing hot weather protection will not be measured but considered incidental to work.

.3 Supply of anchor bolts, washers, lifting inserts and nuts will not be measured but considered incidental to work. Bolt grouting will be considered incidental to the work.

.4 Supply of installation of cast in sleeves, expansion joint, sealants, sealers and curing compounds, or other compounds will be considered incidental to the work.

.5 Concrete work will be measured in accordance with Section 01 10 10.

.6 No deduction will be made for volume of concrete displaced by reinforcing steel or structural steel.

.7 All joint sealant shall be considered incidental to the work.

.8 Unit price for pre-cast units shall include all materials, labour and equipment to fabricate, handle, transport, lift and install pre-cast units.

PART 2 – PRODUCTS

2.1 MATERIALS

.1 Aggregates: to CSA A23.1, for Class "C-1" exposure.

.2 Portland Cement: to CSA A5, normal type 10.

.3 Water: to CSA A23.1.

.4 Admixtures:
.1 Air entraining admixtures: to CSA

A23.5 and ASTM A26.
.2 Chemical admixtures: to CSA A23.5 and ASTM C494.
.3 Pozzolanic mineral admixtures: to CSA A23.5.

.5 Curing compound: to ASTM-C309-M81 and CSA A23.1-14 (or latest edition) type 1D with fugitive dye.

.6 Joint sealer: self-leveling, two component sealant capable of remaining resilient over temperatures ranging from -25° C to 35° C. Material will be capable of an elongation of 300%, have tensile recovery of 90% ASTM D412-75 (or latest edition), hardness of 25-35 Shore A and have a high bond strength to the concrete faces.

.7 Silane Sealer: self-penetrating, 100% silane, clear, breathable. Hydrozo 100 or equal.

2.2 CONCRETE MIXES

.1 Prior to starting concrete work, submit to the Departmental Representative the proposed mix design(s) for approval. Mix design(s) to be in accordance with Alternative 1 of Table 11 in CSA A23.1-14 (or latest edition). Comply with additional requirements of CSA A23.1-14 (or latest edition), Section 15 for concrete placed near sea water.

.2 Use concrete mix designed to produce air entrained concrete meeting the requirements as listed on drawing M1.

.3 Do not use calcium chloride or compounds containing calcium chloride.

.4 Weigh aggregates, cement, water and admixtures separately when batching.

Inspect and test scales for accuracy as directed. Accuracy to be such that successive quantities can be measured to within one percent of desired amounts. Test certificates to be submitted to Engineer upon request.

.5 Where seven day strength is less than 70% of specified 28 day strength, provide additional protection curing and make changes to mix proportions to the satisfactions of the Departmental Representative.

.6 Provide certification that plant, equipment and all materials to be used in concrete comply with the requirements of CSA A23.1-14 (or latest edition).

.7 Provide certification from independent testing and inspection company that mix proportions selected will produce concrete of specified quality and can be effectively placed and finished for all work under this contract.

PART 3 – EXECUTION

3.1 GENERAL

.1 Place, consolidate, finish, cure and protect concrete to CSA A23.1-14 (or latest edition) except where specified otherwise.

.2 Prior to placing of concrete, obtain Departmental Representative's approval of proposed method for protection of concrete during placing and curing in adverse weather.

.3 Comply with additional requirements of CSA A23.1-14 (or latest edition) Section 15 except where specified otherwise, for concrete exposed to seawater environment.

.4 Do not commence placing concrete until a Departmental Representative has inspected/reviewed forms, inserts, dowels, reinforcing steel, joints, conveying, spreading, consolidation, finishing, curing and protective methods.

.5 Ensure that reinforcement and anchorage are not disturbed during placing.

.6 Maintain accurate records of placed concrete items to indicate date, location of pour, quality, air temperature and test samples taken.

.7 Do not place load(s) upon new concrete until Departmental Representative is satisfied that the Contractor has carried out all calculations and tests necessary to confirm that the load(s) will not cause damage or create a safety hazard. Calculations and tests to be stamped by a Professional Engineer registered in the Province of Prince Edward Island.

.8 Concrete Sealers: use penetrating silane sealers on all concrete surfaces. Acceptable product Hydrozo 100 or equal.

.9 Provide uniform broom finish on top surface of cast in place deck panels.

.10 Provide smooth uniform finish on pre-cast wall units.

.11 Ensure pre-cast units fit together tightly and are level and plumb.

.12 Repair all cracks greater than 0.2mm in width with an epoxy injection grout. Repair methods and materials to be submitted to a Departmental Representative for approval.

3.2 REINFORCING STEEL

.1 Place new reinforcing steel according to Section 03 20 00.

.2 Provide 75 mm minimum cover for all reinforcing steel unless indicated otherwise on drawings.

3.3 FORMWORK

.1 Verify field dimensions to determine applicable sizes of formwork.

.2 Design and construct form work to allow adequately for proper placement and consolidation while conforming with shape and dimensions shown on plans.

.3 Formwork design will include closures at both top and bottom of form, and all necessary hardware to support the forms.

.4 Upon request, submit drawings for review by the Departmental Representative, at least 3 weeks before placement of concrete. Drawings, will show formwork details and illustrate dimensions, method of placing of concrete, connections and support.

.5 As a rule, strip formwork after minimum 7 days. This condition might be waived only if an alternative method to curing and preventing alternate wetting and drying is provided, to the satisfaction of the Departmental Representative. This condition will be waived if the forms are left permanently in place, where approved by the Departmental Representative.

3.4 PLACEMENT OF CONCRETE

.1 Place and consolidate concrete to CSA A23.1-14 (or latest edition).

.2 If allowed by the Departmental Representative, pump concrete to following

requirements:

.1 Arrange equipment so that no vibrations result which might damage freshly placed concrete.

.2 Where concrete is conveyed and placed by mechanically applied pressure, provide suitable equipment.

.3 Operate pump so that concrete, without air pockets, is produced.

.4 When pumping is discontinued and concrete remaining in pipe line is to be used, void pipe line in a manner that prevents contamination of concrete or separation of ingredients.

.3 Concrete will be deposited in all cases as neatly as practicable, directly in its final position, and will not be caused to flow in a manner to permit or cause segregation.

.4 Each layer of concrete will be vibrated and tamped with an appropriate vibrator as allowed by the Departmental Representative. The concrete must be compacted to the maximum practicable density, free of air pockets, and until it is in complete contact with the reinforcement and formwork.

.5 Surface of finished concrete to be within 15 mm of elevation indicated and variation in elevation indicated and variation in elevation over whole area not to exceed 25 mm.

3.5 INSERTS

.1 Set galvanized sleeves and other inserts and openings as indicated or specified elsewhere. Sleeves and opening greater than 100 x 100 mm not indicated on drawings must be approved by Departmental Representative.

.2 Do not eliminate or displace reinforcement to accommodate hardware. If inserts cannot be located as specified, obtain approval of all modifications from the Departmental Representative before placing of concrete.

.3 Galvanized items embedded in concrete will be completely separated from reinforcing steel.

.4 Anchor bolts:
.1 Set anchor bolts to templates under supervision of appropriate trade prior to placing concrete.
.2 With Departmental Representative's concurrence, epoxy anchored anchor bolts are to be set in holes at least 3mm larger in diameter than the diameter of the bolt.

3.6 PROTECTION AND CURING

.1 Provide protection and curing in accordance with CSA A23.1-14.

.2 Protect concrete with windproof and waveproof shelter to allow free circulation of inside air around fresh concrete. Do not let walls of shelter touch formwork and provide sufficient space for removal of formwork.

.3 Supply approved heating equipment to maintain inside air at following temperatures:
.1 For an initial three days, at not less than 10° C nor more than 25° C at surfaces.
.2 At not less than 10° C for an additional 4 consecutive days or for the time necessary to attain 70% of the specified 28-day compressive strength of the concrete.
.3 Reduce temperature near end of curing

period at rate not exceeding 20° C per day.

.4 Do not overheat.

.4 Provide a fully "wet cure" for the concrete deck slab through the use of wet burlap or soaker hoses. Keep concrete surfaces continuously moist during protection stage and allow concrete to dry before removal of protection.

.5 Freshly deposited concrete will be protected from premature drying and excessively hot and cold temperatures, will be maintained without drying at a relatively constant temperature for the period of time necessary for hydration of the cement and proper hardening of the concrete. It will be protected from harmful effects of sunshine, drying winds, cold weather, running or surface water and mechanical shock.

.6 Wood floating, broom finishing, placing of burlap and inspection of concrete to be done from transverse bridges of rigid construction free from wobbles and springing under use, unless other methods have been submitted and accepted.

3.7 FINISHING

.1 Finish concrete in accordance with CSA A23.1-14 (or latest edition).

.2 Grind off fins, nibs and other raised protuberances with an approved hand stone.

.3 Rub exposed sharp edges of concrete with carborundum to produce 3 mm radius edges unless otherwise detailed.

3.8 FIELD QUALITY

.1 Inspection and testing of concrete and

CONTROL

concrete materials will be carried out by Testing Laboratory designated by the Departmental Representative in accordance with CSA A23.1-94 (or latest edition).

.2 The Departmental Representative will pay for costs of tests as specified in Section 01 45 00.

.3 The Departmental Representative will take additional test cylinders during cold weather concreting. Cure cylinders on job site under same conditions as concrete which they represent.

.4 If tests do not meet requirements of the Departmental Representative, take such measures as indicated in CSA A23.1-14 and CSA A23.2-14 (or latest editions).

.5 Arrange and pay for inspection and testing when necessary for production control to meet requirements.

.6 Inspection and testing by the Departmental Representative will not augment Contractor's quality control or relieve him of contractual responsibility.

3.9 DEFECTIVE WORK

.1 Concrete is defective when:
.1 Failing to meet any requirement of this specification.
.2 Concrete contains honeycombing or embedded debris.
.3 28-day strength in any area is less than 95% of specified minimum.

.2 Repair or remove and replace defective work as directed by the Departmental Representative.

.3 Take corrective measures as directed by the Departmental Representative to prevent

occurrence of further defective concrete.

.4 Seal all cracks in concrete deck with epoxy injection repair. It is intended that cracks as small as 0.2 mm will be repaired.

END OF SECTION