PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Section 01 74 19 - Construction/Demolition Waste Management And Disposal.

.2 Section 03 10 00 – Concrete Forming and Accessories

.3 Section 03 27 36 – Underwater Placed Concrete

.4 Section 31 62 16.19 – Steel Pipe Pile

1.2 REFERENCES

.1 Canadian Standards Association (CSA)
- .1 CAN/CSA-A23.1, Concrete Materials and Methods of Concrete Construction.
- .2 CAN/CSA-A23.2-00, Methods of Test for Concrete.
- .3 CAN/CSA-A3000-98-A5-98, Portland Cement.
- .4 CAN/CSA-G30.18-M92(R1998), Billet-Steel Bars for Concrete Reinforcement.

1.3 SUBMITTALS

.1 Shop Drawings
- .1 Submit placing drawings prepared in accordance with plans to clearly show size, shape, location and all necessary details of reinforcing.
- .2 Submit drawings showing formwork and falsework design to: CAN/CSA-A23.1.
- .3 Drawings to bear stamp and signature of qualified professional engineer registered or licensed in Province of New Brunswick, Canada.

1.4 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management And Disposals.

.2 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.

.3 Place materials defined as hazardous or toxic in designated containers.

.4 Ensure emptied containers are sealed and stored safely.

.5 Use trigger operated spray nozzles for water hoses.

.6 Designate cleaning area for tools to limit water use and runoff.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Portland cement: to CAN/CSA-A3000-A5, Type 10.

.2 Reinforcing bars: to CAN/CSA-G30.18, Grade 400.

.3 Water: to CAN/CSA-A23.1

.4 Aggregates: to CAN/CSA-A23.1. Coarse aggregate to be normal density.

.5 Air Entraining Admixture: to ASTM C 260.

.6 Chemical admixtures: to ASTM C 494. Departmental Representative to approve accelerating or set retarding admixtures during cold weather placing.

.7 Concrete Retarders: to ASTM C 494, low VOC, solvent free. Do not allow moisture of any kind to come in contact with the retarder film

.8 Joint sealer/filler: grey, to CAN/CGSB-19.24, Type 1, Class B.

.9 Sealer: proprietary poly-siloxane resin blend.

.10 Other concrete materials: to CAN/CSA-A23.1.

2.2 MIXES

.1 Proportion concrete in accordance with CAN/CSA-A23.1.

.2 Minimum compressive strength at 35 MPa as specified by Departmental Representative.

.3 Nominal maximum size of coarse aggregate: to CAN/CSA-A23.1.

.4 Slump: to CAN/CSA-A23.1.

.5 Air content: concrete to contain purposely entrained air in accordance with CAN/CSA-A23.1, Table 10.

.6 Admixtures: to CAN/CSA-A23.1.

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

.8 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. Tests certificates to be submitted to Departmental Representative upon request.

.9 Provide certification that plant, equipment and all materials to be used in concrete comply with the requirements of CSA A23.1-00.

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

PART 3 - EXECUTION

3.1 PREPARATION

.1 Obtain Departmental Representative's approval before placing concrete. Provide 24 hours' notice to placing concrete.

.2 Pumping of concrete is permitted only after approval of equipment mixture.

3.2 CONSTRUCTION

.1 Do concrete work in accordance with CAN/CSA-A23.1.

.2 If allowable by 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 practical, directly in its final position, and will not be caused to flow in a manner to permit or cause segregation.

3.3 INSERTS

.1 Cast in sleeves, ties, slots, anchors, reinforcement, frames, conduit, bolts, waterstops, joint fillers and other inserts required to be built-in. Sleeves and openings greater than 100 mm x 100 mm not indicated, must be approved by Departmental Representative.

3.4 FINISHES

.1 Concrete deck, guard:
  .1 Screed to plane surfaces and use wood floats.
  .2 Provide round edges and joint spacings using standard tools.
  .3 Trowel smooth and provide lightly brushed non-slip finish.

3.5 CONTROL JOINTS

.1 Cut control joints in slabs on grade and cope walls at locations indicated, in accordance with CAN/CSA-A23.1 and install specified joint sealer/filler.

3.6 CURING

.1 Cure and protect concrete in accordance with CAN/CSA-A23.1.
  .1 Do not use curing compounds where bond is required by subsequent topping or coating.

3.7 SEALING

.1 Following curing, apply poly-siloxane resin blend sealer at 4 m^2/L.

3.8 SITE TOLERANCES

.1 Concrete deck slab finishing tolerance in accordance with CAN/CSA-A23.1.

3.9 FIELD QUALITY CONTROL

.1 Concrete testing: to CAN/CSA-A23.2 by testing laboratory designated and paid for by Departmental Representative.

PART 1 - GENERAL

1.1 SECTION INCLUDES

.1 Materials and installation for concrete underwater by tremie, pumped concrete, bottom dump bucket, or bagged concrete method.

1.2 RELATED SECTIONS

.1 Section 01 74 19 - Construction/Demolition Waste Management And Disposal.

.2 Section 03 05 10 – Concrete General

1.3 MEASUREMENT PROCEDURES

.1 No measurement for payment will be made under this section for the concrete supplied and placed to fill the Steel Pipe Piles, cost will be included in the supply and installation of Steel Piles under section 31 62 16.19.

.2 Heating of water and aggregate and providing cold weather protection such as insulated blankets will not be measured but considered incidental to the work.

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

.4 Supply and installation of concrete additives as recommended by the supplier will not be measured but considered incidental to the work.

1.4 REFERENCES

.1 Canadian Standards Association (CSA International)
.1 CAN/CSA-A23.1/A23.2-00(August 2001), Concrete Materials and Methods of Concrete Construction/Methods of Test for Concrete.

1.5 DEFINITIONS

.1 Tremie concrete is placed underwater through tube called tremie pipe.
.1 Tremie pipe has a hopper at upper end and may be open ended or may have foot valve, plug or travelling plug to control flow of concrete.
.2 Concrete is placed in hopper and sufficient head of concrete is maintained in tremie pipe to provide desired rate of flow.

.2 Pumped concrete method of placing concrete underwater uses concrete pump with

discharge line used in similar manner to a tremie pipe.

.3 Bottom-dump bucket method of placing concrete underwater requires use of bucket designed to discharge from bottom after it has contacted foundation or surface of previously placed concrete.

.4 Bagged concrete method of placing underwater concrete consists of diver placing bags partially filled with dry concrete mix.

1.6 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for in accordance with Section 01 74 19 - Construction/Demolition Waste Management And Disposal.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Divert unused concrete materials from landfill to local facility approved by Departmental Representative.

.5 Divert chemical additive materials from landfill to official hazardous material collections site approved by Departmental Representative.

.6 Do not dispose of unused chemical additive materials into sewer systems, into lakes, streams, onto ground or in any other location where it will pose health or environmental hazard.

.7 Fold up metal banding, flatten and place in designated area for recycling.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Concrete materials: to Section 03 30 00 - Cast-in-Place Concrete.

2.2 MIXES

.1 Use type 50 cement.

.2 Minimum compressive strength at 28 days: 30MPa.

.3 Class of exposure: C-XL.

.4 Maximum water cement ratio by mass: 0.45.

.5 Nominal size of coarse aggregate: 20 mm.

.6 Fine aggregate content: 45 % of total aggregate mass.

.7 Slump at point and time of submergence: 170mm placed with tremie pipes, 100 to 125mm for pumped and bottom dumped concrete.

.8 Admixtures: to approval of Departmental Representative. Use admixtures to correct deficiencies in mix or to improve placement of concrete.
- .1 Departmental Representative may withdraw prior approval of admixture if conditions encountered during course of work indicate unsatisfactory results.
- .2 Do not use calcium chloride or materials containing calcium chloride.

PART 3 - EXECUTION

3.1 PREPARATION

.1 Where concrete must bond to existing surfaces, clean surfaces just prior to starting concrete placement.
- .1 Use water jets, mechanical scrapers or other means, and when quantities of mud or rock cuttings are present, remove by air lift.

3.2 INSTALLATION

.1 Do concrete work in accordance with Section 03 30 00 - Cast-in-Place Concrete to CAN/CSA-A23.1/A23.2. Testing for concrete to CAN/CSA-A23.1/A23.2, except where specified otherwise.

.2 Where concrete placement extends above water surface, protect concrete from direct contact with air at temperature below 5 degrees C for 21 days.

.3 Place concrete in one continuous operation to full depth required.
- .1 Supply complete equipment for every phase of operation.
- .2 Provide sufficient supply of concrete to complete pour without interruption.

.4 Tremie method.
- .1 Provide water-tight tremie pipe sized to allow free flow of concrete. Diameter of tremie pipe to be minimum 200 mm and minimum eight times maximum size of coarse aggregate.
- .2 Provide hopper at top of tremie pipe and means to raise and lower tremie pipe.
- .3 Provide plug or foot valve at bottom of tremie pipe to permit filling pipe with concrete initially.
- .4 Provide minimum of one tremie pipe for every 30 m^2 of plan area and to maximum spacing of 6 m centre to centre. Do not move tremie pipes laterally through concrete.
- .5 Start placement with tremie pipe full of concrete. Keep bottom of pipe buried minimum 300 mm in freshly placed concrete. Control rate of flow by varying depth of pipe bottom in concrete.

.6 If seal is lost, allowing water to enter pipe, withdraw pipe immediately. Refill pipe, and continue placing as specified.

.7 If tremie operation is interrupted so that horizontal construction joint has to be made, cut surface laitance by jetting, within 24 to 36 hours and remove loose material by pumping or air lifting before placing next lift.

.8 Do not place concrete in flowing water having current exceeding 3 m/min. Do not vibrate, disturb or puddle concrete after placement.

.5 Pumped concrete method.

.1 Follow procedures as for tremie method in placing concrete using discharge line from concrete pump as tremie pipe.

.2 Pump discharge line to have minimum diameter of 125 mm.

.6 Bottom-dump bucket method.

.1 Fill bucket with concrete, cover top surface and lower slowly through water to prevent backwash.

.2 Discharge concrete only when bucket is in contact with surface on which concrete is to be deposited.

.3 Withdraw bucket until it is above concrete to maintain still water at point of discharge to approval of Departmental Representative.

.4 Do not place concrete in flowing water having current exceeding 3 m/min. Do not vibrate, disturb or puddle concrete after placement.