PART 1 - GENERAL

1.1 SECTION INCLUDES

.1 This section specifies requirements for supply and placement of underwater concrete into bags by tremie, or pumped method.

1.2 TERMINOLOGY

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

.2 Pumped concrete method of placing concrete underwater uses a concrete pump with a discharge line used in similar manner to tremie pipe.

1.3 MEASUREMENT FOR PAYMENT

.1 Underwater Placed Concrete: Concrete placed underwater will be measured in cubic meters (m^3) based on quantity of concrete placed, as measured by in place volume of concrete in finished work. The Contractor is to confirm the volume of underwater concrete required and reach an agreement on quantity with Departmental Representative, prior to placement of concrete.

.2 The supply and installation of concrete bags and other materials required for facilitating placement of the concrete shall be considered incidental to the measured unit for underwater placed concrete.

1.4 REFERENCES

.1 Canadian Standards Associations (CSA)
  .1 CAN/CSA-A23.1, latest edition, Concrete Materials and Methods of Concrete Construction.

.2 CAN/CSA-A23.2, latest edition, Methods of Test for Concrete.

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Use trigger operated spray nozzles for water hoses.

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

PART 1 - GENERAL (CONT'D)

1.5 WASTE MANAGEMENT AND DISPOSAL (CONT'D)

.3 Carefully coordinate the specified concrete work with weather conditions.

.4 Ensure emptied containers are sealed and stored safety for disposal away from children.

.5 Prevent plasticizers, water-reducing agents and air-entraining agents from entering drinking water supplies or streams. Using appropriate safety precautions collect liquid or solidify liquid with an inert, noncombustible material and remove for disposal. Dispose of all water in accordance with applicable local, provincial and national regulations.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Refer to Section 03 30 00 for material requirements for production of concrete except as specified otherwise herein.

.2 Portland cement: Type GU to CAN/CSA-A3001.

.3 Bags by Fabriform, or approved equal

2.2 CONCRETE MIXES

.1 Minimum compressive strength at 28 days: 35 Mpa.

.2 Class of exposure: C3.

.3 Maximum water cement ration by mass: 0.50.

.4 Nominal size of coarse aggregate: 20mm.

.5 Fine aggregate content: 42 to 45% of total aggregate mass.

.6 Slump at point and time of discharge.
- .1 By Tremie Pipes: 170 mm.
- .2 Pumped Method: 100 to 125 mm.

.7 Air dry density: 2240 to 2400 kg/m^3.

PART 2 - MATERIALS (CONT'D)

2.3 ADMIXTURES

.1 Admixtures will be subject to approval of Departmental Representative. Admixtures will only be permitted to correct deficiencies in mix or to improve placement of concrete.

.2 Departmental Representative may withdraw prior approval of admixtures if conditions encountered during course of work indicate unsatisfactory performance.

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

PART 3 - PRODUCTS

3.1 GENERAL

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

.2 Contractor to submit method of construction for concrete bag installation, for Departmental Representative's approval. Obtain Departmental Representative's approval of construction methodology before placing concrete.

.3 Method of construction to be approved by Provincial, Federal and Municipal Authorities. Contractor to ensure all permits required for placement of underwater concrete are in place prior to initiating work.

3.2 INSTALLATION

.1 Where concrete must bond to existing concrete surfaces, rock surfaces, piling, sheet piling or anchor rods, clean thoroughly just prior to starting concrete placement. Use water jets and when quantities of silt or mud are present remove by air lift.

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

.3 Pumping of concrete is permitted only after approval of equipment and mix.

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

PART 3 - PRODUCTS (CONT'D)

3.3 TREMIE METHOD

.1 Provide a tremie pipe which is watertight and sufficiently large to allow free flow of concrete. Diameter of tremie pipe to be not less than 200 mm or less than eight times maximum size of coarse aggregate.

.2 Provide a hopper at top of tremie pipe and means to raise and lower tremie. Provide plug or foot valve at end of tremie pipe to permit filling pipe with concrete initially.

.3 Provide a minimum of one tremie pipe for every 30 m^2 of pour plan area and to a maximum spacing of 6 m center to center. Do not move tremie pipes laterally by dragging through concrete.

.4 Start pour with tremie pipe full of concrete and keep end of pipe buried in freshly placed concrete at least 300 mm. Control rate of flow by increasing or decreasing depth of end in concrete.

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

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

.7 Do not place concrete in flowing water having current exceeding 3m/min. Do not vibrate, disturb or puddle concrete after it has been placed.

3.4 PUMPED CONCRETE METHOD

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

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

3.5 TESTING

.1 As per Section 03 30 00 – Cast-In-Place Concrete.