

PART 1 - GENERAL

- 1.1 Related Work
- .1 Section 03 20 00 - Concrete Reinforcement
  - .2 Section 03 30 00 - Concrete
- 1.2 Reference Standards
- .1 CSA A23.1/A23.2-2014, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
  - .2 CSA S269.1-1975 (R2003), Falsework for Construction Purposes.
- 1.3 Submissions
- .1 Shop Drawings:
    - .1 Upon request, submit to Departmental Representative for review four (4) sets of formwork and falsework shop drawings, in accordance with Section 01 33 00, at least four (4) weeks prior to erection. All such drawings to be stamped and signed by a professional engineer registered in the Province of Nova Scotia.
    - .2 Clearly indicate method and schedule of construction, materials, arrangement of joints, ties, shores, liners, and locations of temporary embedded parts. Comply with CSA S269.1 for falsework drawings.
  - .2 Product Data/Samples:
    - .1 Provide product data and samples for form ties.
  - .3 Provide submissions in accordance with Section 01 33 00.

PART 2 - PRODUCTS

- 2.1 Materials
- .1 Formwork lumber: plywood and wood formwork materials to CSA A23.1.
  - .2 Falsework materials: to CSA S269.1.
  - .3 Form stripping agent: colourless mineral oil, free of kerosene, with viscosity between 70 and 110 s Saybolt Universal, 15 to 14 mm<sup>2</sup>/s at 40DC, flash-point minimum 150DC, open cup.
  - .4 Form ties: removable or snap-off metal ties, fixed or adjustable length, free of devices leaving holes larger than 25 mm dia. in concrete

surface. When forms are removed, no metal will be less than 50 mm from the surface of the concrete.

### PART 3 - EXECUTION

#### 3.1 Erection

- .1 Verify lines and levels before proceeding with formwork and ensure dimensions agree with drawings.
- .2 Construct forms to produce finished concrete conforming to shape, dimensions, locations and levels indicated within tolerances required by CSA A23.1
- .3 Line forms with material only as approved by Departmental Representative.
- .4 Construct falsework in accordance with CSA S269.1.
- .5 Align form joints and make watertight. Keep form joints to minimum.
- .6 Use 25 mm chamfer strips on external corners.
- .7 Clean formwork in accordance with CSA A23.1, before placing concrete.
- .8 Leave formwork in place for at least seven (7) days, exclusive for days when temperature falls below 5°C, unless otherwise directed by Departmental Representative.
- .9 Re-use of formwork and falsework subject to requirements of CSA A23.1.
- .10 Plug all holes from form ties and rods with mortar to requirements of CSA A23.1. When forms are removed, no metal must be less than 25 mm from the surface of the concrete.

#### 3.2 Falsework

- .1 Design and construct formwork and falsework to resist severe exposed wave conditions.
  - .2 Submit formwork and falsework design to Departmental Representative for review prior to construction.
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- .3 Formwork and falsework design to be approved by an engineer registered in the Province of Nova Scotia.

**END OF SECTION**

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PART 1 - GENERAL

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|--------------------------------|---|
| 1.1 <u>Related Work</u>        | .1    Refer to other Specification Sections for related information.  |
|                                | .2    Refer to Section 01 33 00 for Shop Drawing/ Submission requirements.  |
| 1.2 <u>Reference Standards</u> | .1    CSA A23.1/A23.2-2014, Concrete Materials and Methods of Concrete Construction/Concrete Quality Testing.   |
|                                | .2    Reinforcing Steel Manual of Standard Practice (28 <sup>th</sup> Edition) by Reinforcing Steel Institute of Ontario.   |
|                                | .3    CSA G30.18-09 (R2014), Billet-Steel Bars for Concrete Reinforcement.  |
|                                | .4    ASTM C1116/C1116M-2010A, Standard Specification for Fibre Reinforced Concrete.  |
|                                | .5    ASTM A1064/A1064M-17, Standard Specification for Carbon Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.   |
| 1.3 <u>Source Sampling</u>     | .1    Upon request, provide Departmental Representative with certified copy of mill test of steel supplied showing physical and chemical analysis not less than two (2) weeks prior to commencement of work.  |
| 1.4 <u>Submissions</u>         | .1    Shop Drawings:<br>.1    Clearly indicate bar sizes, spacing, location and quantities of reinforcement and mesh with identifying code marks to permit correct placement without reference to structural drawings; to Reinforcing Steel Manual of Standard Practice.<br>.2    Detail placement of reinforcing where special conditions occur.<br>.3    Design and detail lap lengths and bar development lengths to CSA standard A23.1, unless otherwise specified on drawings. |
|                                | .2    Product Data/Samples:<br>.1    Provide product data for supports and spacers.   |
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- .3 Test Results:
  - .1 Provide Mill Test Certificates cross referenced to the product supplied to the site.
- .4 Provide submissions in accordance with Section 01 33 00.
- .5 Provide manufacturer's data sheets of fibres to be used.

1.5 Storage

- .1 Store reinforcing steel on racks or sills that will permit easy access for identification and handling and prevent it from becoming coated with material which would adversely affect bond.
- .2 Do not store reinforcing steel in direct contact with the ground.
- .3 Use of synthetic fibres to be as recommended by the manufacturer.

PART 2 - PRODUCTS

2.1 Materials

- .1 Reinforcing steel: to CSA G30.18; billet steel grade 400 deformed bars.
- .2 Wire ties: to ASTM A1064 plain, cold drawn annealed steel wire.
- .3 Spacers: PVC, Fabricated to suit site dimensions.
- .4 Fibrillated fibres:
  - .1 To conform to ASTM C1116/C1116M, Type III.
  - .2 Dosage to be 0.9 kg/cu. metre.

2.2 Reinforcing Steel Fabrication

- .1 Fabricate reinforcing to CSA standard A23.1
- .2 Fabrication tolerances for reinforcing steel to Reinforcing Steel Manual of standard Practice.
- .3 Obtain Departmental Representative's acceptance for locations of reinforcement splices other than shown on steel placing drawings.
- .4 Ship bundles of bar reinforcement, clearly identified in accordance with bar list.
- .5 Do not weld reinforcing steel.

PART 3 - EXECUTION

- 3.1 Placing
- .1 Accurately place reinforcing in positions indicated and hold firmly during placing, compacting and setting of concrete.
  - .2 Tie reinforcement where spacing in each direction is:
    - .1 Less than 300 mm: - tie at alternate intersections.
    - .2 300 mm or more: - tie at each intersection.
- 3.2 Field Bending
- .1 Do not field bend reinforcement except where indicated or authorized by Departmental Representative.
  - .2 When authorized, bend reinforcement without heat, by applying slow and steady pressure.
  - .3 Replace bars which develop cracks or splits.
- 3.3 Cleaning
- .1 Clean reinforcing before placing concrete.
- 3.4 Inspection
- .1 Do not place concrete until Departmental Representative has inspected and accepted reinforcement work in place.
- 3.5 Surface Conditions
- .1 Reinforcement, at time concrete is placed, to be free from mud, oil or other non-metallic coatings that adversely affect bonding capacity.
  - .2 Reinforcement, with rust, mill scale, or combination of both to be considered as satisfactory, provided minimum dimensions, including height of deformations, and mass of hand wire brushed test specimen are not less than specified requirements in applicable CSA Standards.

**END OF SECTION**

PART 1 - GENERAL

- 1.1 Related Work
- .1 Section 03 10 00 - Concrete Formwork and Falsework.
  - .2 Section 03 20 00 - Concrete Reinforcement
- 1.2 Reference Standards
- .1 Do structural concrete work in accordance with CSA A23.1, Concrete Materials and Methods of Concrete Construction, except where more stringent standards specify otherwise.
  - .2 CSA A3000-13, Cementitious Materials Compendium.
  - .3 ASTM C494-13, 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 Nova Scotia.
    - .2 Upon request, 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 (winter/summer/green/white/red), evaporation retardant and finishing aids, expansion joint materials/sealants, grouts.
  - .3 Certificates:
    - .1 Minimum four (4) weeks prior to starting concrete work submit to Departmental Representative 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.
    - .2 Provide certification that plant, equipment, and materials to be used in concrete work comply with requirements of CSA A23.1
    - .3 Provide certification that mix proportions selected will produce concrete of specified quality and yield and that strength will comply with CSA A23.1

- .4 Provide certification that concrete will not include alkali - reactivity aggregates.
- .4 Methodology:
    - .1 Submit methodology for cold weather concreting.
    - .2 Submit methodology for hot weather concreting.
    - .3 Submit methodology for concrete placement operations.
    - .4 Submit methodology for concrete deck finishing operations.
    - .5 Submit methodology 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 and 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.
  - .4 Use storage methods which prevent damage and straining of pre-cast concrete elements.
- 1.5 Source Sampling
  - .1 At least four (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 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 metres.



- .7 Time of loading or first mixing of aggregate, cement and water.
- .8 Time of discharge of concrete.
- .9 Admixtures added at plant.
- .10 Amount of water added at plant.

## PART 2 - PRODUCTS

### 2.1 Materials

- .1 Aggregates: to CSA A23.1, for Class "C-1" exposure.
- .2 Portland Cement: to CSA A3000, normal Type GU.
- .3 Water: to CSA A23.1.
- .4 Admixtures:
  - .1 Air entraining admixtures: to CSA A3000.
  - .2 Chemical admixtures: to CSA A3000 and ASTM C494.
  - .3 Pozzolanic mineral admixtures: to CSA A3000.
- .5 Non-shrink grout: premixed compound consisting of non-metallic aggregate, Portland cement, water reducing and plasticizing agents, of pouring consistency, capable of developing compressive strength of 50 MPa at 28 days.
- .6 Curing compound: To ASTM C309 and CSA A23.1 type 1, ID, or 2.
- .7 Adhesive Anchors: high strength epoxy to ASTM C881, Type IV, Grade 3. Acceptable products:
  - .1 Epcon C6+ Epoxy Concrete Adhesive.
  - .2 Hilti HIT-RE 500 V3.
  - .3 Simpson Strong-Tie SET-XP.

### 2.2 Concrete Mixes

- .1 Prior to starting concrete work, submit to the Departmental Representative the proposed mix design(s) stamped and signed by Engineer licensed to practice in Nova Scotia for approval. Mix design (s) to be in accordance with Alternative 1 of Table 5 in CSA A23.1. Comply with additional requirements of CSA A23.1, Clause 4.1.1.5 for concrete placed near sea water.
  - .1 For concrete caps, deck, retaining wall and for concrete to be placed inside the steel piles (above bottom 2.0m) use concrete mix designed to produce air entrained concrete meeting the following requirements:

- .1 Cement to be normal Portland cement, Type GU.
  - .2 Minimum compressive strength at 28 days: 35 MPa.
  - .3 Exposure: Class C-1.
  - .4 Maximum aggregate size to CSA A23.1 table II, Group 1, 10 mm sieve size.
  - .5 Air content: 5 to 8%.
  - .6 Maximum water/cement ratio to be 0.40.
  - .7 Slump at time and point of discharge 80 mm  $\pm$  20 mm. Where the nature of the work requires larger slumps, they are to be obtained by the use of admixtures rather than increasing the water content. Use of such admixtures and the increase in slump to be approved by the Departmental Representative prior to implementation in the work.
- .2 For fiber reinforced concrete pile jackets use concrete mix designed to produce air entrained concrete meeting the following requirements:
- .1 Cement to be normal Portland cement, Type GU.
  - .2 Minimum compressive strength at 28 days: 35 MPa.
  - .3 Exposure: Class C-1.
  - .4 Maximum aggregate size to CSA A23.1 table II, Group 1, 20 mm sieve size.
  - .5 Air content: 6 to 8%.
  - .6 Maximum water/cement ratio to be 0.40.
  - .7 Slump at time and point of discharge 190 mm  $\pm$  40 mm.
  - .7 Micro fibers to be fibrillated polypropylene that complies with ASTM C1116/C1116M, Section 4.1.3, Type III and Note 2. Acceptable products: Master Fiber F100, ConLoc, Tuf-Strand SF by Euclid, or approved equivalent.
    - .1 Fiber Length: 38mm
    - .2 Dosage: 2.0kg/m<sup>3</sup>
- .3 For reinforced concrete rock sockets and bottom 2.0m of steel piles for rock socketed batter piles use concrete mix designed to provide concrete meeting the following requirements with consolidation/non-shrink characteristics:

- .1 Cement to be normal Portland cement: Type GU.
- .2 Minimum compressive strength at 28 days: 40 MPa.
- .3 Exposure class: C-1.
- .4 Maximum aggregate size: 10mm.
- .5 Air content: 5 to 8%.
- .6 Maximum water to cement ratio: 0.40.
- .7 Slump at time and point of discharge 80 ±20mm. Where the nature of the work requires larger slumps, they are to be obtained by the use of admixtures rather than increasing the water content. Use of such admixtures and the increase in slump to be approved by the Departmental Representative prior to implementation in the Work.
- .4 Modify concrete mix to the approval of the Departmental Representative to accommodate pumping.
- .5 Admixtures to the approval of the Departmental Representative and the recommendation of the manufacturer. Admixtures must be dispersed separately into mixing water.
- .6 Do not use calcium chloride or compounds containing calcium chloride.
- .7 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 Departmental Representative upon request.
- .8 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 satisfaction of the Departmental Representative.
- .9 Provide certification that plant, equipment and all materials to be used in concrete comply with the requirements of CSA A23.1.

- .10 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 Obtain Departmental Representative's approval before placing concrete. Provide 24 hours' notice of intended placement. Concrete to be placed in dry form condition.
- .2 Place, consolidate, finish, cure and protect concrete to CSA A23.1 except where specified otherwise.
- .3 Prior to placing of concrete, obtain Departmental Representative's approval of proposed method for protection of concrete during placing and curing in adverse weather.
- .4 Comply with additional requirements of CSA A23.1 except where specified otherwise, for concrete exposed to seawater environment.
- .5 Do not commence placing concrete until Departmental Representative has inspected/reviewed forms, inserts, dowels, reinforcing steel, joints; conveying, consolidation and protective methods.
- .6 Do not disturb reinforcement and anchorage during placement.
- .7 Maintain accurate records of placed concrete items to indicate date, location of pour, quality, air temperature and test samples taken.
- .8 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 Nova Scotia.

- .9 Comply with additional requirements of CSA A23.1, for concrete exposed to seawater environments during placement and curing.
- 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 to 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 three (3) weeks before placement of concrete. Drawings, will show formwork details and illustrate dimensions, method of placing of concrete, connections and support.
  - .5 Strip formwork after minimum seven (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. Concrete to be placed in dry form condition, by coordinating pour with low tide.
  - .2 If allowed 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 Deposit concrete as neatly as practicable, directly in its final position, and do not allow to flow in a manner to permit or cause segregation.

.4 Vibrate and tamp each layer of concrete with an appropriate vibrator as allowed by the Departmental Representative. Compact the concrete to the maximum practicable density, free of air pockets, and until it is in complete contact with the reinforcement and formwork.

### 3.5 Finishing

.1 Finish concrete in accordance with CSA A23.1.

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

.3 When concrete has hardened sufficiently, give deck surface a uniform finish free from porous spots, irregularities, depressions, small pockets or rough spots.

.4 Provide coarse broom finish to the wharf deck surface using steel wire or stiff, coarse, fibre broom. Use broom in a transverse ridges satisfactory to Departmental Representative. Brooming will be delayed until concrete is sufficiently hard to retain ridges.

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

### 3.6 Field Quality Control

.1 Inspection and testing of concrete and concrete materials will be carried out by Testing Laboratory designated by the Departmental Representative in accordance with CSA A23.1.

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

- .3 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 and CSA A23.2.
- .5 Arrange and pay for inspection and testing when necessary for production control to meet requirements.
- 6 Inspection and testing by Departmental Representative will not augment Contractor's quality control or relieve him of contractual responsibility.

3.7 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.

**END OF SECTION**

PART 1 - GENERAL

- |     |                            |    |   |
|-----|----------------------------|----|---|
| 1.1 | <u>Related Sections</u>    | .1 | Section 03 30 00 - Concrete   |
| 1.2 | <u>Reference Standards</u> | .1 | CSA A23.1/A23.2-2014, Methods of Test for Concrete.   |
|     |                            | .2 | CAN/CSA-3000-13, Cementitious Materials Compendium.   |
|     |                            | .3 | ASTM C494-13, Chemical Admixtures for Concrete  |
| 1.3 | <u>Definitions</u>         | .1 | Tremie concrete is placed underwater 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 a similar manner to a tremie pipe.   |
| 1.4 | <u>Samples</u>             | .1 | Submit shop drawings in accordance with Section 01 33 00 - Shop Drawings, Product Data, Samples and Mock-Up.  |
| 1.5 | <u>Certificates</u>        | .1 | Minimum two (2) weeks prior to starting concrete work submit to Departmental Representative, manufacturer's test data and certification by qualified independent inspection and testing laboratory that the following materials will meet specified requirements:<br>.1 Cement Type HS<br>.2 Admixtures<br>.3 Aggregates<br>.4 Water<br>.5 Microsynthetic fiber |
|     |                            | .2 | Provide certification that plant, equipment and materials to be used in concrete comply with requirements of CSA standard A23.1   |
|     |                            | .3 | Provide certification that mix proportions selected will produce concrete of specified quality, yield, strength, and will comply with CSA standard A23.1  |



1.6 Ready-Mix  
Concrete Supply

- .1 Provide with each load of concrete delivered to site, duplicate delivery slips containing following:
  - .1 Name of ready-mix batch plant.
  - .2 Serial number of ticket.
  - .3 Date and truck number.
  - .4 Name or number of project.
  - .5 Class of concrete or mix.
  - .6 Amount of concrete in cubic metres.
  - .7 Time of loading or first mixing of aggregate, cement and water.
  - .8 Time that discharge of concrete begins and ends.
  - .9 Type and quantity of admixtures added at plant.
  - .10 Quantity of water added at plant.

PART 2 - PRODUCTS

2.1 Materials

- .1 Portland Cement: to CSA A3000, Use type HS cement.
- .2 Water, fine aggregates, normal density, coarse aggregates: to CSA standard A23.1
- .3 Air entraining admixture: to CSA A3000.
- .4 Reinforcing Steel: Comply with Section 03 20 00.
- .5 Micro-synthetic fibre: comply with Section 03 20 00.

2.2 Concrete Mixes

- .1 Concrete mixes: to Section 03 30 00 - Concrete.
- .2 Admixtures will be subject to approval of the Departmental Representative. Use admixtures to correct deficiencies in mix or to improve placement of concrete.
  - .1 Departmental Representative may withdraw prior approval of admixtures if conditions encountered during the course of the work indicate unsatisfactory results.

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 admixture if conditions encountered during course of work indicate unsatisfactory performance.
3. Do not use calcium chloride or materials containing calcium chloride.

### PART 3 - EXECUTION

#### 3.1 General

- .1 Do concrete work in accordance with CSA standard A23.1

#### 3.2 Preparation

- .1 Notify Departmental Representative at least 24 hours in advance of intention to commence underwater work.
- .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 Where concrete must bond to existing surfaces, clean surfaces just prior to starting concrete placement. Use water jets, mechanical scraper or other means.

#### 3.3 Tremie Method

- .1 Provide tremie pipe which is watertight and sufficiently large to allow free flow of concrete. Diameter of tremie pipe to be not less than 200mm or less than eight times maximum size of coarse aggregate.
- .2 Provide hopper at top of tremie pipe and means to raise and lower tremie.
- .3 Provide plug or foot valve at end of tremie pipe to permit filling pipe with concrete initially.
- .4 Provide minimum of two (2) tremie pipes for every 9m<sup>2</sup> of pour plan area or maximum of 3 m centre to centre. Do not move tremie pipes laterally by dragging through concrete.
- .5 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.

- .6 If seal is lost, allowing water to enter pipe, withdraw pipe immediately.
- .7 If tremie operation is interrupted so that a horizontal construction joint has to be made, cut surface laitance by jetting, within 24 to 36 h and remove loose material by pumping or air lifting before placing next lift.
- .8 Do not place concrete in flowing water. 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 tremie pipe.

**END OF SECTION**