

PART 1 - GENERAL

- | | | | |
|-----|--------------------------------------|----|--|
| 1.1 | <u>Related Sections</u> | .1 | Section 03 20 00 - Concrete Reinforcing. |
| | | .2 | Section 03 30 00 - Cast-in-Place Concrete. |
| 1.2 | <u>References</u> | .1 | Canadian Standards Association (CSA International) (latest editions): |
| | | .1 | CSA-A23.1-04/A23.2-14, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete. |
| | | .2 | CSA-O86-14, Engineering Design in Wood. |
| | | .3 | CSA O121-08(R2013), Douglas Fir Plywood. |
| | | .4 | CSA O151-09, Canadian Softwood Plywood. |
| | | .5 | CSA O153(R2013), Poplar Plywood. |
| | | .6 | CAN/CSA-O325-16, Construction Sheathing. |
| | | .7 | CSA O437 Series-93(R2011), Standards for OSB and Waferboard. |
| | | .8 | CSA S269.1-16, Falsework and Formwork. |
| | | .9 | CAN/CSA-S269.3-M92(R2013), Concrete Formwork, National Standard of Canada |
| 1.3 | <u>Submittals</u> | .1 | Submittals in accordance with Section 01 33 00 - Submittal Procedures. |
| | | .2 | Submit shop drawings for formwork and falsework. |
| 1.4 | <u>Waste Management and Disposal</u> | .1 | Separate and recycle waste materials in accordance with Section 01 74 21 - Construction / Demolition Waste Management and Disposal and the Waste Reduction Workplan. |
| 1.5 | <u>Measurement Procedures</u> | .1 | This item will not be measured separately. |

PART 2 - PRODUCTS

2.1 Materials

- .1 Formwork Materials:
 - .1 For concrete without special architectural features, use wood and wood product formwork materials to CSA-O121 and CAN/CSA-O86.
- .2 Form Ties:
 - .1 Use removable or snap-off metal ties, fixed or adjustable length, free of devices leaving holes larger than 25 mm diameter in concrete surface.
- .3 Form release agent: non-toxic, biodegradable, low VOC.
- .4 Form stripping agent: colourless mineral oil, non-toxic, biodegradable, low VOC, free of kerosene, with viscosity between 70 and 110s Saybolt Universal 15 to 24 mm² /s at 40 degrees C, flashpoint minimum 150 degrees C, open cup.
- .5 Falsework materials: to CSA-S269.1.

PART 3 - EXECUTION

3.1 Fabrication and Erection

- .1 Verify lines, levels and centres before proceeding with formwork/falsework and ensure dimensions agree with drawings.
- .2 Fabricate and erect falsework in accordance with CSA S269.1.
- .3 Do not place shores and mud sills on frozen ground.
- .4 Fabricate and erect formwork in accordance with CAN/CSA-S269.3 to produce finished concrete conforming to shape, dimensions, locations and levels indicated within tolerances required by CSA-A23.1/A23.2.
- .5 Align form joints and make watertight.
 - .1 Keep form joints to minimum.

- .6 Use 25 mm chamfer strips on external corners and/or 25 mm fillets at interior corners, joints, unless specified otherwise.
 - .7 Form chases, slots, openings, drips, recesses, expansion and control joints as indicated.
 - .8 Build in anchors, sleeves, and other inserts required to accommodate Work specified in other sections.
 - .1 Ensure that anchors and inserts will not protrude beyond surfaces designated to receive applied finishes, including painting.
 - .9 Clean formwork in accordance with CSA-A23.1/A23.2, before placing concrete.
- 3.2 Removal and Reshoring
- .1 Leave formwork in place for following minimum periods of time after placing concrete.
 - .1 Seven (7) days for all concrete.
 - .2 Re-use formwork and falsework subject to requirements of CSA-A23.1/A23.2.

-- END OF SECTION --

PART 1 - GENERAL

- | | | | |
|-----|-------------------------------|----|---|
| 1.1 | <u>Related Sections</u> | .1 | Section 03 10 00 - Concrete Forming and Accessories. |
| | | .2 | Section 03 30 00 - Cast-in-Place Concrete. |
| | | | |
| 1.2 | <u>Measurement Procedures</u> | .1 | This item will not be measured separately. |
| | | | |
| 1.3 | <u>References</u> | .1 | Canadian Standards Association (CSA International)(latest editions):
.1 CSA-A23.1-04/A23.2-14, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
.2 CSA-A23.3-14, Design of Concrete Structures.
.3 CAN/CSA-G30.18-09(R2014), Billet-Steel Bars for Concrete Reinforcement, A National Standard of Canada.
.4 CSA-G40.20/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
.5 CAN/CSA-G164-M92(R2003), Hot Dip Galvanizing of Irregularly Shaped Articles, A National Standard of Canada.
.6 CSA W186-M1990(R2016), Welding of Reinforcing Bars in Reinforced Concrete Construction. |
| | | .2 | Reinforcing Steel Institute of Canada (RSIC)
.1 RSIC-2004, Reinforcing Steel Manual of Standard Practice. |
| | | | |
| 1.4 | <u>Submittals</u> | .1 | Submittals in accordance with Section 01 33 00 - Submittal Procedures. |
| | | .2 | Prepare reinforcement drawings in accordance with RSIC Manual of Standard Practice. |
| | | .3 | Submit shop drawings including placing of reinforcement and indicate: |

- .1 Bar bending details.
 - .2 Lists.
 - .3 Quantities of reinforcement.
 - .4 Sizes, spacings, locations of reinforcement and mechanical splices if approved by Departmental Representative, with identifying code marks to permit correct placement without reference to structural drawings.
 - .5 Indicate sizes, spacings and locations of chairs, spacers and hangers.
- .4 Detail lap lengths and bar development lengths to CSA-A23.3, unless otherwise indicated.
- .5 Quality Assurance: in accordance with Section 01 45 00 - Quality Control and as described in PART 2 - SOURCE QUALITY CONTROL.
- .1 Mill Test Report: upon request, provide Departmental Representative with certified copy of mill test report of reinforcing steel, minimum 4 weeks prior to beginning reinforcing work.
- 1.5 Delivery, Storage and Handling
- .1 Waste Management and Disposal:
 - .1 Separate waste materials in accordance with Section 01 74 21 - Construction / Demolition Waste Management and Disposal.
 - .2 Place materials defined as hazardous or toxic in designated containers.

PART 2 - PRODUCTS

- 2.1 Materials
- .1 Substitute different size bars only if permitted in writing by Departmental Representative.
 - .2 Reinforcing steel: billet steel, grade 400, deformed bars to CAN/CSA-G30.18, unless indicated otherwise.
 - .3 Reinforcing steel: weldable low alloy steel deformed bars to CAN/CSA-G30.18.
 - .4 Cold-drawn annealed steel wire ties: to CSA G30.3.
 - .5 Chairs, bolsters, bar supports, spacers: to CSA-A23.1/A23.2.

- | | |
|--|--|
| 2.2 <u>Fabrication</u> | <ul style="list-style-type: none">.1 Fabricate reinforcing steel in accordance with CSA-A23.1/A23.2 and Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada..2 Obtain Departmental Representative's approval for locations of reinforcement splices other than those shown on placing drawings..3 Ship bundles of bar reinforcement, clearly identified in accordance with bar bending details and lists. |
| 2.3 Source Quality
<u>Control</u> | <ul style="list-style-type: none">.1 Upon request, provide Departmental Representative with certified copy of mill test report of reinforcing steel, showing physical and chemical analysis, minimum 4 weeks prior to beginning reinforcing work..2 Upon request inform Departmental Representative of proposed source of material to be supplied. |

PART 3 – EXECUTION

- | | |
|---|---|
| 3.1 <u>Field Bending</u> | <ul style="list-style-type: none">.1 Do not field bend/field weld reinforcement..2 Replace bars, which develop cracks or splits. |
| 3.2 Placing
<u>Reinforcement</u> | <ul style="list-style-type: none">.1 Place reinforcing steel as indicated on placing drawings and in accordance with CSA-A23.1/A23.2..2 Prior to placing concrete, obtain Departmental Representative's approval of reinforcing material and placement..3 Ensure cover to reinforcement is maintained during concrete pour. |

-- END OF SECTION --

PART 1 – GENERAL

- | | | | |
|-----|----------------------------|----|--|
| 1.1 | <u>Related Work</u> | .1 | Refer to other Specification Sections for related information on aggregates, form work and false work, concrete reinforcement, miscellaneous items. |
| | | .2 | Refer to Section 01 33 00 for Shop Drawing/Submissions requirements. |
| 1.2 | <u>Reference Standards</u> | .1 | Do structural concrete work in accordance with CSA A23.1-14, Concrete Materials and Methods of Concrete Construction, except where more stringent standards specify otherwise. |
| | | .2 | CSA A3000-13, Cementitious Materials Compendium. |
| | | .3 | ASTM C494-15A, Chemical Admixtures for Concrete. |
| | | .4 | ASTM C1116/C1116M – 10 (R2015) Standard Specification for Fiber-Reinforced Concrete. |
| 1.3 | <u>Submissions</u> | .1 | Shop Drawings:
.1 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 Submit placement drawings for reinforcing steel.
.3 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.
.2 Submit concrete mix design. |

- .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, yield, and strength and will comply with CSA A23.1.
 - .4 Provide certification that concrete will not include alkali - reactivity aggregates.
- .4 Methodology and Quality Control:
 - .1 Submit for review methodology and quality control procedures for the following:
 - .1 Cold weather concreting.
 - .2 Hot weather concreting.
 - .3 Concrete placement operations. Provide details of pour sequence and proposed layout of construction joints. Unless otherwise approved, the spacing of deck construction joints shall not exceed 13.5m.
 - .4 Concrete deck finishing operations.
 - .5 Supporting reinforcing steel.
 - .6 Protection and curing of concrete in cold and hot weather.
- .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.
- 1.5 Source Sampling
- .1 At least three (3) 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.
- 1.7 Measurement for Payment
- .1 Measurement for payment will be in accordance with Section 01 29 00 – Project Particulars and Measurement.

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 Pozzolan 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 and/or pumping 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: Redhead A7, AC 100 Chemical Anchors by Powers Fasteners, Set Epoxy by Simpson Strong Tie, Hilti HY-200.

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 5 in CSA A23.1. Comply with additional requirements of CSA A23.1, clause 4.1.1.5 for concrete exposed to sea water or sea water spray.
 - .1 For concrete in general wharf construction:
 - .1 Use concrete mix designed to produce air entrained concrete meeting the following requirements:
 - .2 Cement to be normal Portland cement, Type GU.
 - .3 Minimum compressive strength at 28 days: 35 MPa.
 - .4 Exposure: Class C-1.

- .5 Maximum aggregate size to CSA A23.1 table 11, Group 1, 20 mm size.
 - .6 Minimum cement content 390 kg/m³.
 - .7 Air content: 6 to 8%.
 - .8 Maximum water/cement ratio to be 0.40.
 - .9 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:
- .1 Use concrete mix designed to produce air entrained concrete meeting the following requirements.
 - .1 Cement to be normal Portland Cement Type GU.
 - .2 Exposure Class: C-1.
 - .3 Compressive strength at 28 days: 35MPa.
 - .4 Maximum aggregate size to CSA A23.1, Table 11, Group I, 10mm size.
 - .5 Slump to be 190mm \pm 40mm.
 - .6 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.
 - .1 Fiber Length: 38mm.
 - .2 Dosage: 2.0kg/m³.
 - .3 Modify concrete mix to the approval of the Departmental Representative to accommodate pumping.

- .4 Admixtures to the approval of the Departmental Representative and the recommendation of the manufacturer. Admixtures must be dispersed separately into mixing water.
- .5 Do not use calcium chloride or compounds containing calcium chloride.
- .6 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.
- .7 Where seven day strength is less than 70% of specified 28 day strength, provide additional protection and curing, and make changes to mix proportions to the satisfaction of the Departmental Representative.
- .8 Provide certification that plant, equipment and all materials to be used in concrete comply with the requirements of CSA A23.1.
- .9 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.
- .10 Add micro fibers to concrete according to manufacturer's recommendations.
- .11 Use plasticizer to increase slump and workability.
- .12 Departmental Representative to review fiber mixing procedures and mix design.

PART 3 – EXECUTION

3.1 General

- .1 Obtain Departmental Representative's approval before placing concrete. Provide 24 hours notice of intended placement. Place concrete 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 Ensure that reinforcement and anchorage are not disturbed during placing.
- .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.
- .10 Clean pile surface with high pressure water jets, mechanical scrapers and other means prior to placement of concrete jackets.
- .11 Location of construction joints and sequence of placing to be determined by professional engineer

registered in the Province of Nova Scotia and submitted to Departmental Representative for review prior to commencing construction.

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 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 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 Place concrete in areas that are completely clean, free from water, ice, debris, and all unsuitable materials. Permit the Departmental Representative to review the prepared substrate prior to placement of concrete.
 - .3 Place all concrete within 1.5 hours of initial mixing. If 1.5 hours is insufficient, provide a set retarder sufficient in quantity to allow for proper placement.
 - .4 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.
 - .5 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.
 - .6 Vibrate and tamp each layer of concrete 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.
 - .7 Fiber reinforced concrete jackets to be placed in dry forms.
 - .8 Concrete with a temperature less than 10°C or greater than 30°C at the time of delivery or placement shall not be used.
-

3.5 Inserts

- .1 Set galvanized sleeves and other inserts and openings as indicated or specified elsewhere. Sleeves and openings greater than 100 x 100mm not indicated on the structural drawings must be approved by the 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 Any galvanized items embedded in concrete shall 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 agreement, grout anchor bolts in pre-formed holes or holes drilled after concrete has set. Formed holes to be at least 100mm in diameter. Drilled and epoxied or grouted holes to be minimum 25mm larger in diameter than bolts used, unless indicated otherwise by manufacturer's recommendations.
 - .3 Protect anchor bolt holes from water accumulations.
 - .4 Set bolts and fill holes with non-shrink grout.

3.6 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.

3.7 Protection
and Curing

- .4 Provide coarse broom finish 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.
- .1 Provide protection and curing in accordance with CSA A23.1.
- .2 Protect concrete with windproof shelter(s) to allow free circulation of inside air around fresh concrete. Do not let walls of shelter touch formwork. Provide sufficient space in shelters for removal of formwork.
- .3 Keep concrete surfaces continuously moist during concrete curing and protection stage and allow concrete to dry gradually before removal of protection.
- .4 Protect freshly deposited concrete from premature drying and excessively hot and cold temperatures and shall maintain concrete without drying at a relatively constant temperature for the period of time necessary for hydration of the cement and proper hardening of the concrete. Freshly deposited concrete shall be protected from the harmful effects of sunshine, drying winds, cold and hot weather, running or surface water, mechanical shock, vandalism, etc.
- .5 When the air temperature is at or below 10°C or when there is a probability of falling below 10°C within 24 hours of placing, as forecast by the nearest official meteorological office, all materials and equipment needed for adequate protection and curing during cold weather shall be on hand and ready for use before concrete placement is started. Extent of such preparation shall be in accordance

with the requirements of CSA A23.1 and to the approval of the Departmental Representative.

- .6 When placing concrete during cold weather, adequate protection of concrete shall be provided for the duration of the curing and protection period as defined in CSA A23.1, clause 7.4.1. Protection shall be provided by means of heated enclosures, coverings, insulation, or a suitable combination of these methods.
- .7 Enclosures:
 - .1 Construct to withstand wind and snow loads.
 - .2 Make reasonably air tight.
 - .3 Housing to provide sufficient space between the concrete and the enclosure to permit free circulation of warmed air.
 - .4 Supply heat to the enclosure by live steam, forced hot air, stationary heaters or other heaters of various types. Exhaust fumes shall be exhausted from enclosures and there shall be no build-up of exhaust fumes within heated enclosures.
- .8 Take extreme care with curing methods during cold or hot weather concreting and shall supply approved equipment in order to maintain inside air within the following temperatures.
 - .1 For initial 3 consecutive days at not less than 10°C and not more than 25°C, at surfaces.
 - .2 Wet cure concrete for additional 4 consecutive days at not less than 10°C and not more than 35°C for the time necessary to attain 70% of the specified strength.
 - .3 Maintain temperature of concrete as close as possible to suggested minimum temperature of 10°C during the curing period.
 - .4 If using silica fume in concrete, additional curing procedures shall be used and cure time shall be extended, as necessary.
 - .5 Reduce temperature near end of curing period at rate not exceeding 20°C per day.
 - .6 No salt or other chemical shall be used to lower the freezing point of the concrete as a

substitute for the specific curing and protection.

.7 Do not overheat concrete.

3.8 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 41 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. Additional testing required due to defective materials or failed test shall be at Contractor's cost.
- .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.

3.9 Defective Work

- .1 Concrete is defective when:
 - .1 It fails to meet any requirement of this specification.
 - .2 The concrete contains honeycombing or embedded debris.
 - .3 The 28-day strength in any area is less than 95% of specified minimum.
 - .4 Concrete test results fail any other aspect/test of CSA A23.1.

- .2 If concrete is found to not meet these specifications or code requirements, repair or remove and replace defective work as directed by Departmental Representative, at no additional cost to the Contract.
- .3 If necessary, take corrective measures as directed by the Departmental Representative to prevent the occurrence of further defective concrete.

-- END OF SECTION --