

Wharf Construction**Marie Joseph Wharf****Guysborough County, Nova Scotia****Project No. R.076162.001**PART 1 - GENERAL

- 1.1 Related Work .1 Refer to other Specification Sections for related information.
- .2 Section 01 33 00 - Submissions / Shop Drawings.
- .3 Section 05 31 00 - Steel Deck.
- 1.2 Reference Standards .1 Do concrete formwork and falsework in accordance with CSA standard A23.1, Concrete Materials and Methods of Concrete Construction, except where stricter standards specify otherwise.
- .2 CSA S269.1, Falsework for Construction Purposes
- .3 CSA S269, Concrete Formwork.
- 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 - Submissions / Shop Drawings, at least four (4) weeks prior to erection.
- .2 All shop drawings shall be stamped and signed by a Professional Engineer registered in the Province of Nova Scotia.
- .3 Clearly indicate method and schedule of construction, materials, arrangement of joints, ties, shores, liners and locations of temporary embedded parts.
- .4 Comply with CSA S269.1 for falsework drawings.
- .2 Product Data/Samples:
- .1 Provide product data and samples for form ties.

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Concrete Formwork and Falsework

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- .3 Provide submissions in accordance with Section 01 33 00 - Submissions / Shop Drawings.

1.4 Measurement
for Payment

- .1 This item shall not be measured separately but shall be considered incidental to the Work in accordance with Section 01 29 00 - Project Particulars and Measurement.

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 70s and 110s Saybolt Universal, 15 to 14 mm²/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 diameter in concrete surface. When forms are removed, no metal shall be embedded less than 75 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 are consistent 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 shall be permitted only when approved by the *Departmental Representative*.

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Concrete Formwork and Falsework

- .4 Construct falsework in accordance with CSA S269.1.
- .5 Align form joints and make watertight. Keep form joints to a minimum.
- .6 Use 25 mm chamfer strips on external corners, unless noted or shown otherwise.
- .7 Clean formwork in accordance with CSA A23.1, before placing concrete.
- .8 Leave formwork in place for a minimum of seven days, unless otherwise directed by the *Departmental Representative*.
- .9 Re-use of formwork and falsework shall be subject to the requirements of CSA A23.1.
- .10 All holes from form ties and rods shall be plugged with mortar to the requirements of CSA A23.1. When forms are removed, no metal shall be embedded less than 75 mm from the surface of the concrete.
- .11 Build in anchors, sleeves and other inserts required to accommodate work specified in other sections.
- .12 Steel deck forms shall not be removed.

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Concrete Reinforcement

PART 1 - GENERAL

- 1.1 Related Work .1 Refer to other Specification Sections for related information.
- .2 Section 01 33 00 - Submissions / Shop Drawings.
- 1.2 Reference Standards .1 Do concrete reinforcement work in accordance with CSA standard A23.1, Concrete Materials and Methods of Concrete Construction, except where stricter standards specify otherwise.
- .2 Reinforcing Steel Manual of Standard Practice by Reinforcing Steel Institute of Ontario.
- .3 CSA G30.18, Billet-Steel Bars for Concrete Reinforcement.
- .4 CSA G30.3, Cold-Drawn Steel Wire for Concrete Reinforcement.
- 1.3 Source Sampling .1 Upon request, provide *Departmental Representative* with certified copy of mill test of steel supplied showing physical and chemical analysis not less than 2 weeks prior to commencement of work.
- 1.4 Submissions .1 Shop Drawings:
- .1 Clearly indicate bar sizes, spacing, location and quantities of reinforcement, reinforcement support bars, mesh, chairs, spacers, hangers, etc., with identifying code marks to permit correct placement without reference to structural drawings; to Reinforcing Steel Manual of Standard Practice.
- .2 Detail placement of reinforcing where special conditions occur.
- .3 Design and detail lap lengths and bar development lengths to CSA standard

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A23.1, unless otherwise specified on drawings.

.2 Product Data/Samples:

.1 Provide product data for supports and spacers.

.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 - Submissions / Shop Drawings.

1.5 Storage

.1 Store reinforcing steel on racks or sills that will permit easy access for identification and handling and prevent material from becoming coated with material which would adversely affect bond.

.2 Do not store reinforcing steel in direct contact with the ground.

1.6 Measurement for Payment

.1 This item shall not be measured separately but shall be considered incidental to the Work in accordance with Section 01 29 00 - Project Particulars and Measurement.

PART 2 - PRODUCTS

2.1 Materials

.1 Reinforcing steel: To CSA G30.18, billet steel grade 400 deformed bars.

.2 Wire ties: To CSA G30.3 plain, cold drawn, annealed steel wire.

.3 Spacers: PVC, fabricated to suit site dimensions.

2.2 Reinforcing Steel Fabrication

.1 Fabricate reinforcing to CSA standard A23.1.

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- .2 Fabrication tolerances for reinforcing steel shall meet the requirements of the Reinforcing Steel Manual of Standard Practice.
 - .3 Obtain *Departmental Representative's* acceptance for locations of reinforcement splices other than shown on reinforcing placing drawings.
 - .4 Ship bundles of bar reinforcement, clearly identified in accordance with bar list.
 - .5 Do not weld reinforcing steel.

PART 3 - EXECUTION3.1 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 Ensure cover to reinforcement is maintained during the concrete pour.
- .4 Do not weld reinforcing steel.
- .5 During installation and carrying out of work, Contractor shall ensure construction loads on steel deck do not overload capacity of steel deck.

3.2 Field Bending

- .1 Do not field bend reinforcement except where indicated or authorized by the *Departmental Representative*.
- .2 When authorized, bend reinforcement without heat, by applying slow and steady pressure.

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Concrete Reinforcement

- .3 Replace bars which develop cracks or splits.
- 3.3 Cleaning .1 Clean reinforcing in accordance with CSA A23.1, before placing concrete.
- 3.4 Inspection .1 Do not place concrete until *Departmental Representative* has inspected and accepted placement of reinforcement.
- 3.5 Surface Conditions .1 Reinforcement, at time concrete is placed, shall be free of mud, oil or other coatings that may adversely affect bonding capacity.
- .2 Reinforcement with rust, mill scale, or combination of both may 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 the applicable CSA Standards.

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PART 1 - GENERAL

- 1.1 Related Work .1 Refer to other Specification Sections for related information on aggregates, form work and false work, steel deck forms, concrete reinforcement, paint, miscellaneous items, etc.
- .2 Section 01 33 00 - Submissions / Shop Drawings.
- 1.2 Reference Standards .1 Do structural concrete work in accordance with CSA A23.1, Concrete Materials and Methods of Concrete Construction, except where stricter standards specify otherwise.
- .2 CSA A5/A8/A362, Portland Cement/ Masonry Cement/ Blended Hydraulic Cement.
- .3 CSA A23.5, Supplementary Cementing Materials.
- .4 ASTM C494, 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 miscellaneous items.
- .3 Submit placement drawings for reinforcing steel.
- .2 Product Data/Samples:
- .1 Provide technical data and/or samples for curing compounds (winter/summer/green/white/red), evaporation retardant and finishing aids, grouts, etc.
- .2 Submit concrete mix design.

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- .3 Certificates:
 - .1 Minimum four 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 shall meet specified requirements:
 - .1 Portland cement.
 - .2 Admixtures.
 - .3 Aggregates.
 - .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 shall produce concrete of specified quality and yield and that strength shall comply with CSA A23.1.
 - .4 Provide certification that concrete will not include alkali reactivity aggregates.
- .4 Methodology:
 - .1 Submit methodology for the following, if used:
 - .1 Cold weather concreting.
 - .2 Hot weather concreting.
 - .3 Concrete placement operations, including placing underwater and tremie concrete.
 - .4 Concrete deck finishing operations.
 - .5 Supporting reinforcing steel.
- .5 Test Results:
 - .1 Provide design mix tests results.
 - .2 Provide mill test certificates for reinforcing steel.

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- 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 Upon request, at least 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 the following information:
1. Name of ready-mix batch plant.
 2. Serial number of ticket.
 3. Date and truck number.
 4. Project identification.
 5. Class of concrete 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 Heating of water, aggregates and concrete and providing cold weather protection shall not be measured but shall be considered incidental to the work.

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- .2 Cooling of concrete and providing hot weather protection shall not be measured but shall be considered incidental to the work.
 - .3 Supply of anchor bolts, washers and nuts shall not be measured but shall be considered incidental to the work.
 - .4 Bolt grouting shall not be measured but shall be considered incidental to the work.
 - .5 Supply and installation of rigid PVC drains and conduits/sleeves, curing compounds and other compounds shall be considered incidental to the work.
 - .6 Cast-in-place concrete shall be measured in accordance with Section 01 29 00 - Project Particulars and Measurement.

PART 2 - PRODUCTS2.1 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.
 - .2 Chemical admixtures: To CSA A23.5 and ASTM C494.
 - .3 Pozzolanic mineral admixtures: To CSA A23.5.
- .5 Non-shrink grout: Premixed compound consisting of non-metallic aggregate, Portland cement, and water reducing and plasticizing agents, of pouring consistency, capable of developing compressive strength of 50 MPa at 28 days.

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- .6 Curing compound: To ASTM-C309 and CSA A23.1 type 1, 1D, or 2.
- .7 Premoulded joint fillers: Bituminous impregnated fibre board to ASTM D1751, non-extruding resilient type.
- .8 Joint sealer: Self-levelling, two component sealant capable of remaining resilient over temperatures ranging from -25°C to 35°C. Material shall be capable of an elongation of 300%, have tensile recovery of 90% to ASTM D412, have hardness of 25-35 Shore A and have high bond strength to concrete.
- 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) shall be in accordance with Alternative 1 of Table 11 in CSA A23.1 and comply with additional requirements of CSA A23.1, Section 15, for concrete placed near sea water.
- .2 Use concrete mix designed to produce air entrained concrete meeting the following requirements:
- .1 Cement to be normal Portland cement, Type 10.
 - .2 Minimum compressive strength at 28 days to be 35 MPA.
 - .3 Exposure Class C-1.
 - .4 Maximum aggregate size to CSA A23.1, table 2, Group 1, 20 mm sieve size.
 - .5 Minimum cement content 390 kg/m³.
 - .6 Air content 6% to 8%.
 - .7 Maximum water/cement ratio of 0.40.
 - .8 Slump at time and point of discharge to be 50 mm to 100 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. The use of such admixtures and the increase in slump to

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- be approved by the *Departmental Representative* prior to implementation in the work.
- .9 Modify concrete mix to the approval of the *Departmental Representative* to accommodate pumping.
- .10 Admixtures to the approval of the *Departmental Representative* and the recommendation of the manufacturer. Admixtures must be dispersed separately into mixing water.
- .11 Wet cure concrete for 7 days total at 10°C or more and for the time necessary to attain 70% of the specified strength. If using silica fume in concrete, additional curing procedures shall be used and cure time shall be extended, as necessary.
- .3 Do not use calcium chloride or compounds containing calcium chloride in the mix.
- .4 Weigh aggregates, cement, water and admixtures separately when batching. Inspect and test scales for accuracy, as required. Accuracy to be such that successive quantities can be measured to within one percent of desired amounts. Upon request, test certificates shall be submitted to *Departmental Representative*.
- .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 satisfaction 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.
- .7 Provide certification from independent testing and inspection company that mix

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proportions selected shall 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 the *Departmental Representative's* approval before placing concrete. Provide 48 hours' notice of intended placement.
- .2 Place, consolidate, finish, cure and protect concrete to CSA A23.1, except where specified otherwise.
- .3 Prior to placing concrete, obtain the *Departmental Representative's* approval of proposed method for protection of concrete during placing and curing in adverse weather.
- .4 For concrete exposed to seawater environment comply with additional requirements of CSA A23.1, Section 15, except where specified otherwise.
- .5 Do not commence placing concrete until the *Departmental Representative* has inspected/reviewed forms, inserts, dowels, reinforcing steel, joints; conveying, spreading, consolidation, finishing, curing and protective methods.
- .6 Ensure that reinforcement and anchorage are not disturbed during placement of concrete.
- .7 Maintain accurate records of placed concrete items to indicate date, location of pour, quality, air temperature and test samples taken.
- .8 During placement of concrete and carrying out of work, Contractor shall ensure that

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construction loads on steel deck do not overload capacity of steel deck.

- .9 Do not place load(s) upon completed concrete deck until the *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 shall be stamped by a Professional Engineer registered in the Province of Nova Scotia.

3.2 Reinforcing Steel .1 Place new reinforcing steel according to Section 03 20 00 - Concrete Reinforcement.

- .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 formwork to allow adequately for proper placement and consolidation while conforming with shape and dimensions shown on plans.

- .3 Formwork design shall 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 shall show formwork details and illustrate dimensions, method of placing of concrete, connections and support.

- .5 Strip formwork after minimum of 7 days. This condition will be waived if the forms are left permanently in place, where approved by the *Departmental Representative*.

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- .6 Steel deck forms shall not be removed.
- 3.4 Placement of Concrete
- .1 Place and consolidate concrete to CSA A23.1.
- .2 Concrete shall be placed in areas that are completely clean, free from water, ice, debris, and all unsuitable materials. Contractor shall permit the *Departmental Representative* to review the prepared substrate prior to placement of concrete.
- .3 All concrete shall be placed within 1.5 hours of initial mixing. If 1.5 hours is insufficient, the Contractor shall provide a set retarder sufficient in quantity to allow for proper placement of concrete.
- .4 If permitted by *Departmental Representative*, pump concrete to the 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 shall be deposited in all cases as neatly as practicable, directly in its final position, and shall not be caused to flow in a manner to permit or cause segregation.
- .6 Each layer of concrete shall be vibrated and tamped with an appropriate vibrator as allowed by the *Departmental Representative*. Concrete must be compacted to the maximum practicable density (by vibration), free of

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air pockets and until it is in complete contact with the reinforcement and formwork. Concrete shall not be vibrated to the extent that may cause segregation.

- .7 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 100 mm 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 100 mm in diameter. Drilled and epoxied or grouted holes to be minimum 25 mm 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.

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**3.6 Protection and
Curing**

- .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 Contractor shall 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

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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 Shall be constructed to withstand wind and snow loads.
- .2 Shall be reasonably air tight.
- .3 Housing shall provide sufficient space between the concrete and the enclosure to permit free circulation of warmed air.
- .4 Heat shall be supplied 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 Contractor shall 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.

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- .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.
- 3.7 Finishing
- .1 Finish concrete in accordance with CSA A23.1.
- .2 Grind off fins, nibs and other raised protuberances with an approved hand stone, to provide a smooth finish, flush and uniform with existing surfaces.
- .3 All concrete shall be durable and impermeable and all concrete areas shall be true to line and shape.
- .4 When concrete has hardened sufficiently, provide deck surface with a uniform finish, free from porous spots, irregularities, depressions, small pockets, rough spots, honeycombing or any other defects, using a power float leaving a rough spiral finish with one pass of the float.
- .5 Following use of power float provide coarse broom finish using steel wire or stiff, coarse, fibre broom. Broom strokes to be in direction transverse to the length of the wharf deck, or as directed by *Departmental Representative*. Brooming shall be delayed until concrete is sufficiently hard to retain ridges.
- .6 Rub exposed sharp edges of concrete with carborundum to produce 3 mm radius edges unless otherwise detailed or indicated.
- .7 Wood floating and broom finishing shall be done from transverse bridges of rigid

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construction free from wobbles and springing under use, unless other methods have been submitted and accepted by the *Departmental Representative*.

- 3.8 Joint Fillers .1 Furnish filler for each joint in single piece for depth and width required for joint, unless otherwise authorized by the *Departmental Representative*. When more than one piece is required for a joint, fasten abutting ends and hold securely to shape by stapling or other positive fastening.
- .2 Locate and form separation joint and install joint filler at existing construction joints where damaged as a result of the work and other locations where directed on site by the *Departmental Representative*.
- .3 Unless indicated otherwise, use 25 mm thick joint filler to separate deck slabs and extend joint filler from bottom of slab to within 25 mm of finished concrete surface.
- 3.9 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 costs of tests as specified in Section 01 45 00 - Testing Laboratory Services.
- .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 Inspection of finished concrete shall be done from transverse bridges of rigid construction free from wobbles and springing

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under use, unless other methods have been submitted and accepted by the *Departmental Representative*.

- .5 If tests do not meet requirements of the *Departmental Representative*, take such measures as indicated in CSA A23.1 and CSA A23.2 to test.
- .6 Arrange and pay for inspection and testing when necessary for production control to meet requirements.
- .7 Inspection and testing by *Departmental Representative* shall not augment Contractor's quality control or Contractual responsibility.
- .8 Additional testing required due to defective materials or failed tests shall be at Contractor's cost.

3.10 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, Contractor shall repair or remove and replace defective work as directed by *Departmental Representative*, at Contractor's cost.
- .3 If necessary, the Contractor shall take corrective measures as directed by the *Departmental Representative* to prevent the occurrence of further defective concrete.