
Part 1 General

1.1 Related Sections

- .1 Section 03 10 00 - Concrete Forming and Accessories.
- .2 Section 03 20 00 - Concrete Reinforcing.
- .3 Section 03 48 00 – Precast Concrete Specialties.
- .4 Section 04 05 10 - Common Work Results for Masonry.
- .5 Section 05 50 00 - Metal Fabrications.
- .6 Section 07 11 13 - Bituminous Dampproofing.

1.2 References

- .1 American Society for Testing and Materials (ASTM)
 - .1 ASTM C109/C109M-95, Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2 in. or 50-mm Cube Specimens).
 - .2 ASTM C260-94, Specification for Air-Entraining Admixtures for Concrete.
 - .3 ASTM C309-94, Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
 - .4 ASTM C332-87(1991), Specification for Lightweight Aggregates for Insulating Concrete.
 - .5 ASTM C494-92, Specification for Chemical Admixtures for Concrete.
 - .6 ASTM C827-95a, Test Method for Change in Height at Early Ages of Cylindrical Specimens from Cementitious Mixtures.
 - .7 ASTM C939-94a, Test Method for Flow of Grout for Preplaced-Aggregate Concrete.
 - .8 ASTM D412-92, Test Methods for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers-Tension.
 - .9 ASTM D624-91, Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomer.
 - .10 ASTM D1751-83(1991), Specification for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
 - .11 ASTM D1752-84(1992), Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-37.2-M88, Emulsified Asphalt, Mineral Colloid-Type, Unfilled, for Dampproofing and Waterproofing and for Roof Coatings.
 - .2 CAN/CGSB-51.34-M86, Vapour Barrier, Polyethylene Sheet for Use in Building Construction.
 - .3 CGSB 81-GP-1M-77, Flooring, Conductive and Spark Resistant.

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- .3 Canadian Standards Association (CSA)
 - .1 CAN/CSA-A5-93, Portland Cement.
 - .2 CSA A23.1-04, Concrete Materials and Methods of Concrete Construction.
 - .3 CAN/CSA-A23.2-94, Methods of Test for Concrete.
 - .4 CAN/CSA-A23.5-M86(R1992), Supplementary Cementing Materials.
 - .5 CAN/CSA A363-M88(R1996), Cementitious Hydraulic Slag.

1.3 Certificates

- .1 Submit certificates in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Minimum 4 weeks prior to starting concrete work submit to Contract Administrator manufacturer's test data and certification by qualified independent inspection and testing laboratory that following materials will meet specified requirements:
 - .1 Portland cement.
 - .2 Blended hydraulic cement.
 - .3 Supplementary cementing materials.
 - .4 Grout.
 - .5 Admixtures.
 - .6 Aggregates.
 - .7 Water.
 - .8 Waterstops.
 - .9 Waterstop joints.
 - .10 Joint filler.
- .3 Provide certification that mix proportions selected will produce concrete of quality, yield and strength as specified in concrete mixes, and will comply with CSA A23.1-04.
- .4 Provide certification that plant, equipment, and materials to be used in concrete comply with requirements of CSA A23.1-04.

1.4 Quality Assurance

- .1 Minimum 4 weeks prior to starting concrete work, submit proposed quality control procedures in accordance with Section 01 45 00 - Quality Control for Contract Administrator's approval for following items:
 - .1 Falsework erection.
 - .2 Hot weather concrete.
 - .3 Cold weather concrete.
 - .4 Curing.
 - .5 Finishes.
 - .6 Formwork removal.
 - .7 Joints.

1.5 Waste Management and Disposal

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

- .2 Use trigger operated spray nozzles for water hoses.
- .3 Designate a cleaning area for tools to limit water use and runoff.
- .4 Carefully coordinate the specified concrete work with weather conditions.
- .5 Ensure emptied containers are sealed and stored safely for disposal away from children.
- .6 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 waste in accordance with applicable local, provincial and national regulations.
- .7 Choose least harmful, appropriate cleaning method which will perform adequately.

Part 2 Products

2.1 Materials

- .1 Portland cement ASTM C150 and to CAN/CSA-A5, normal type 10, sulphate resistant type 50.
- .2 Supplementary cementing materials: to CAN/CSA-A23.5.
- .3 Water: to CSA A23.1-04.
- .4 Aggregates: to CSA A23.1-04. Coarse aggregates to be normal density.
- .5 Air entraining admixture: to ASTM C260.
- .6 Chemical admixtures: to ASTM C494. Contract Administrator to approve accelerating or set retarding admixtures during cold and hot weather placing.
- .7 Shrinkage compensating grout: premixed compound consisting of metallic non-metallic aggregate, Portland cement, water reducing and plasticizing agents.
 - .1 Compressive strength: 40 MPa at 28 days.
 - .2 Consistency:
 - .1 Fluid: to ASTM C827. Time of efflux through flow cone (ASTM C939), under 30s.
 - .2 Flowable: to ASTM C827. Flow table, 5 drops in 3s, (ASTM C109, applicable portion) 125 to 145%.
 - .3 Plastic: to ASTM C827. Flow table, 5 drops in 3 s, (ASTM C109, applicable portions) 100 to 125 %.
 - .4 Dry pack to manufacturer's requirements.
 - .3 Net shrinkage at 28 days: maximum 0%.
- .8 Curing compound: to CSA A23.1-04 white and to ASTM C309, Type 1-chlorinated rubber Type 1-D with fugitive dye.

- .9 Premoulded joint fillers:
 - .1 Bituminous impregnated fiber board: to ASTM D1751.
 - .2 Sponge rubber: to ASTM D1752, Type I, flexible firm grade.
- .10 Dovetail anchor slots: minimum 0.6 mm thick galvanized steel with insulation filled slots.
- .11 Polyethylene film: .254 mm thickness to CAN/CGSB-51.34.
- .12 Bitumen: 2.2mm thick fibreglass reinforced, top side thermal fusable plastic, bottom side sanded.
- .13 Concrete Topping:
 - .1 Gymnasium 114 & 114A, Gym Storage 111 Vestibule Area 101, Lobby 102, Corridor 103 and top of Stair Landing 112 & 113: 38mm thickness.
- .14 Expanded Wire Mesh.

2.2 Mixes

- .1 Proportion normal density concrete in accordance with CSA-A23.1-04, Alternative 1 to give following quality and yield for all concrete as indicated.
 - .1 Cement: Type GU Portland cement.
 - .2 Class of exposure: Class C-1 for exposed exterior paving. Class F-1 for exterior beam. Class N for interior concrete. Foundation concrete shall be S-1, 35MPa air entrained with appropriate cement type HS or HSb
 - .3 Nominal size of coarse aggregate: 20 mm.
 - .4 Chemical admixtures: as per ASTM C494

2.3 Preparation

- .1 Obtain Contract Administrator's approval before placing concrete. Provide 24 hours notice prior to placing of concrete.
- .2 Ensure reinforcement and inserts are not disturbed during concrete placement.
- .3 Prior to placing of concrete obtain Contract Administrator's approval of proposed method for protection of concrete during placing and curing in adverse weather.
- .4 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, air temperature and test samples taken.
- .5 Do not place load upon new concrete until authorized by Contract Administrator.

2.4 Construction

- .1 Do cast-in-place concrete work in accordance with CSA-A23.1-04.
- .2 Sleeves and inserts.
 - .1 No sleeves, ducts, pipes or other openings shall pass through joists, beams, column capitals or columns, except where indicated or approved by Contract Administrator.

- .2 Where approved by Contract Administrator, set sleeves, ties, pipe hangers and other inserts and openings as indicated or specified elsewhere. Sleeves and openings greater than 100 x 100 mm not indicated, must be approved by Contract Administrator.
- .3 Do not eliminate or displace reinforcement to accommodate hardware. If inserts cannot be located as specified, obtain approval of modifications from Contract Administrator before placing of concrete.
- .4 Check locations and sizes of sleeves and openings shown on drawings.
- .5 Set special inserts for strength testing as indicated and as required by non-destructive method of testing concrete.
- .3 Anchor bolts.
 - .1 Set anchor bolts to templates under supervision of appropriate trade prior to placing concrete.
 - .2 With approval of Contract Administrator, grout anchor bolts in preformed holes or holes drilled after concrete has set. Formed holes to be minimum 100 mm diameter. Drilled holes to be minimum 25 mm larger in diameter than bolts used to manufacturer's recommendations.
 - .3 Protect anchor bolt holes from water accumulations, snow and ice build-ups.
 - .4 Set bolts and fill holes with shrinkage compensating grout epoxy grout.
 - .5 Locate anchor bolts used in connection with expansion shoes, rollers and rockers with due regard to ambient temperature at time of erection.
- .4 Drainage holes and weep holes:
 - .1 Form weep holes and drainage holes in accordance with Section 03 10 00 - Concrete Forming and Accessories. If wood forms are used, remove them after concrete has set.
 - .2 Install weep hole tubes and drains as indicated.
- .5 Dovetail anchor slots:
 - .1 Install continuous vertical anchor slot to forms where masonry abuts concrete wall or columns.
 - .2 Install continuous vertical anchor slots at 800 mm oc where concrete walls are masonry faced.
- .6 Grout under base plates and machinery using procedures in accordance with manufacturer's recommendations which result in 100 % contact over grouted area.
- .7 Finishing.
 - .1 Finish concrete in accordance with CSA-A23.1-04.
 - .2 Use procedures acceptable to Contract Administrator or those noted in CSA A23.1-04 to remove excess bleed water. Ensure surface is not damaged.
 - .3 Use curing compounds compatible with applied finish on concrete surfaces. Provide written declaration that compounds used are compatible.
 - .4 Provide swirl-trowelled finish unless otherwise indicated.
 - .5 Rub exposed sharp edges of concrete with carborundum to produce 3 mm radius edges unless otherwise indicated.
- .8 Waterstops.

- .1 Install waterstops to provide continuous water seal. Do not distort or pierce waterstop in such a way as to hamper performance. Do not displace reinforcement when installing waterstops. Use equipment to manufacturer's requirements to field splice waterstops. Tie waterstops rigidly in place.
 - .2 Use only straight heat sealed butt joints in field. Use factory welded corners and intersections unless otherwise approved by Contract Administrator.
- .9 Joint fillers.
- .1 Furnish filler for each joint in single piece for depth and width required for joint, unless otherwise authorized by Contract Administrator. 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 isolation and construction expansion joints where indicated. Install joint filler.
 - .3 Use 12 mm thick joint filler to separate slabs-on-grade from vertical surfaces and extend joint filler from bottom of slab to within 12 mm of finished slab surface unless indicated otherwise.
- .10 Dampproof membrane.
- .1 Install dampproof membrane under concrete slabs-on-grade inside building.
 - .2 Lap dampproof membrane minimum 150 mm at joints and seal.
 - .3 Seal punctures in dampproof membrane before placing concrete. Use patching material at least 150 mm larger than puncture and seal.
- .11 Concrete Toppings:
- .1 Gymnasium 114 & 114A, Vestibule Area 101, Lobby 102, Corridor 103 and top of Stair Landing 112 & 113.
 - .2 Featherback topping in Corridor 103 from Lobby 102.
 - .1 Topping mixture to meet following requirements: Monolithic, 51mm thick total depth.
 - .2 In pouring base course, make allowance for monolithic 51mm topping thickness.
 - .3 Apply cement/sand grout to base course in accordance with CSA-A23.1/A23.2.
 - .4 Place monolithic topping in accordance with CSA-A23.1/A23.2 and topping manufacturer's recommendations.
 - .5 Ensure that joints in topping are of same material as those in base course. Also ensure that their locations precisely match those in base course. Provide:
 - .1 Edge strips as indicated in Section 05 50 00 – Metal Fabrications.
 - .2 Expanded mesh fastened to sub-deck.

2.5 Site Tolerance

- .1 Concrete tolerance in accordance with CSA A23.1-04.

2.6 Field Quality Control

- .1 Inspection and testing of concrete and concrete materials will be carried out by a Testing Laboratory designated by Contract Administrator in accordance with CSA A23.1-04 and Section 01 45 00 - Quality Control.
- .2 Engineer will take additional test cylinders during cold weather concreting. Cure cylinders on job site under same conditions as concrete which they represent.
- .3 Non-destructive Methods for Testing Concrete shall be in accordance with CAN/CSA-A23.2.
- .4 Inspection or testing by Engineer will not augment or replace Contractor quality control nor relieve him of his contractual responsibility.

END OF SECTION