

Part 1 General

1.1 Related Sections

- .1 Section 03 20 00 – Concrete Reinforcing.
- .2 Section 03 30 00 – Cast-in-Place Concrete.
- .3 Section 03 48 00 – Pre-cast Concrete Specialties.
- .4 Section 07 92 10 - Joint Sealing.

1.2 References

- .1 Canadian Standards Association (CSA)
 - .1 CAN/CSA-A23.1-94, Concrete Materials and Methods of Concrete Construction.
 - .2 CAN/CSA-O86.1-94, Engineering Design in Wood (Limit States Design).
 - .3 CSA O121-M1978, Douglas Fir Plywood.
 - .4 CSA O151-M1978, Canadian Softwood Plywood.
 - .5 CSA O153-M1980, Poplar Plywood.
 - .6 CAN3-O188.0-M78, Standard Test Methods for Mat-Formed Wood Particleboards and Waferboard.
 - .7 CSA O437 Series-93, Standards for OSB and Waferboard.
 - .8 CSA S269.1-1975, Falsework for Construction Purposes.
 - .9 CAN/CSA-S269.3-M92, Concrete Formwork.

1.3 Shop Drawings

- .1 Submit shop drawings for formwork and falsework in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Indicate method and schedule of construction, shoring, stripping and re-shoring procedures, materials, arrangement of joints, special architectural exposed finishes, ties, liners, and locations of temporary embedded parts. Comply with CSA S269.1, for falsework drawings Comply with CAN/CSA-S269.3 for formwork drawings.
- .3 Indicate formwork design data, such as permissible rate of concrete placement, and temperature of concrete, in forms.
- .4 Indicate sequence of erection and removal of formwork/falsework as directed by Contract Administrator.
- .5 Each shop drawing submission shall bear stamp and signature of qualified professional Engineer registered or licensed in Provinces of Manitoba, Canada.

1.4 Waste Management and Disposal

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal and the Waste Reduction Workplan.
- .2 Place materials defined as hazardous or toxic waste in designated containers.
- .3 Ensure emptied containers are sealed and stored safely for disposal away from children.
- .4 Use sealers, form release and stripping agents that are non-toxic, biodegradable and have zero or low VOC's.

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 CAN/CSA-O86.1.
- .2 Form ties:
 - .1 For concrete not designated 'Architectural', use removable or snap-off metal ties, fixed or adjustable length, free of devices leaving holes larger than 25 mm dia. in concrete surface.
 - .2 For 'Architectural' concrete, use snap ties complete with plastic cones and light grey concrete plugs.
- .3 Form liner:
 - .1 Plywood: Douglas Fir to CSA O121 Canadian Softwood Plywood to CSA O151 Poplar to CSA O153, square edge, 19 mm thick.
- .4 Form release agent: non-toxic, biodegradable, low VOC,
- .5 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 40EC, flashpoint minimum 150EC, open cup.
- .6 Falsework materials: to CSA-S269.1.
- .7 Sealant: to Section 07 92 10 - Joint Sealing.

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 Obtain Contract Administrator's approval for use of earth forms framing openings not indicated on drawings.
- .3 Hand trim sides and bottoms and remove loose earth from earth forms before placing concrete.
- .4 Fabricate and erect falsework in accordance with CSA S269.1 and COFI Exterior Plywood for Concrete Formwork.
- .5 Do not place shores and mud sills on frozen ground.
- .6 Provide site drainage to prevent washout of soil supporting mud sills and shores.
- .7 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 CAN/CSA-A23.1.
- .8 Align form joints and make watertight. Keep form joints to minimum.
- .9 Locate horizontal form joints for exposed columns 2400 mm above finished floor elevation.
- .10 Use 25 mm chamfer strips on external corners and/or 25 mm fillets at interior corners, joints, unless specified otherwise.
- .11 Form chases, slots, openings, drips, recesses, expansion and control joints as indicated.
- .12 Construct forms for architectural concrete, and place ties as indicated and/or as directed. Joint pattern not necessarily based on using standard size panels or maximum permissible spacing of ties.
- .13 Build in anchors, sleeves, and other inserts required to accommodate Work specified in other sections. Assure that all anchors and inserts will not protrude beyond surfaces designated to receive applied finishes, including painting.
- .14 Clean formwork in accordance with CAN/CSA-A23.1, before placing concrete.
- .15 If slip forming and flying forms are used, submit details of equipment and procedures for Contract Administrator's approval.

3.2 Removal and Reshoring

- .1 Leave formwork in place for following minimum periods of time after placing concrete.
 - .1 3 days for walls and sides of beams.
 - .2 7 days for columns.
 - .3 14 days for beam soffits, slabs, decks and other structural members, or 7 days when replaced immediately with adequate shoring to standard specified for falsework.
 - .4 3 days for footings and abutments.

- .2 Remove formwork when concrete has reached 75 % of its design strength or minimum period noted above, whichever comes later, and replace immediately with adequate reshoring.
- .3 Provide all necessary reshoring of members where early removal of forms may be required or where members may be subjected to additional loads during construction as required.
- .4 Space reshoring in each principal direction at not more than 3000 mm apart.
- .5 Re-use formwork and falsework subject to requirements of CAN/CSA-A23.1.

END OF SECTION

Part 1 General

1.1 Related Sections

- .1 Section 03 10 00 – Concrete Forming and Accessories.
- .2 Section 03 30 00 - Cast-in-Place Concrete.
- .3 Section 03 48 00 – Pre-cast Concrete Specialities.

1.2 Measurement Procedures

- .1 No measurement will be made under this section. Include costs in items of concrete work for which reinforcement is required.

1.3 References

- .1 American Concrete Institute (ACI)
 - .1 ACI 315R-80, Manual of Engineering and Placing Drawings for Reinforced Concrete Structure.
- .2 American National Standards Institute/American Concrete Institute (ANSI/ACI)
 - .1 ANSI/ACI 315-80, Details and Detailing of Concrete Reinforcement.
- .3 American Society for Testing and Materials (ASTM)
 - .1 ASTM A 775/A 775M- 91c, Specification for Epoxy-Coated Reinforcing Steel Bars.
- .4 Canadian Standards Association (CSA)
 - .1 CAN/CSA-A23.1-94, Concrete Materials and Methods of Concrete Construction.
 - .2 CAN3-A23.3-94, Design of Concrete Structures for Buildings.
 - .3 CSA G30.3-M1983(R1991), Cold Drawn Steel Wire for Concrete Reinforcement.
 - .4 CSA G30.5-M1983(R1991), Welded Steel Wire Fabric for Concrete Reinforcement.
 - .5 CSA G30.14-M1983(R1991), Deformed Steel Wire for Concrete Reinforcement.
 - .6 CSA G30.15-M1983(R1991), Welded Deformed Steel Wire Fabric for Concrete Reinforcement.
 - .7 CAN/CSA-G30.18-M92, Billet-Steel Bars for Concrete Reinforcement.
 - .8 CAN/CSA-G40.21-M92, Structural Quality Steels.
 - .9 CAN/CSA-G164-M92, Hot Dip Galvanizing of Irregularly Shaped Articles.
 - .10 CSA W186-M1990, Welding of Reinforcing Bars in Reinforced Concrete Construction.

1.4 Shop Drawings

- .1 Submit shop drawings including placing of reinforcement in accordance with Section 01 33 00- Submittal Procedures.

- .2 Indicate on shop drawings, bar bending details, lists, quantities of reinforcement, sizes, spacings, locations of reinforcement and mechanical splices if approved by Contract Administrator, with identifying code marks to permit correct placement without reference to structural drawings. Indicate sizes, spacings and locations of chairs, spacers and hangers. Prepare reinforcement drawings in accordance with Reinforcing Steel Manual of Standard Practice - by Reinforcing Steel Institute of Canada.
- .3 Detail lap lengths and bar development lengths to CAN3-A23.3, unless otherwise indicated. Provide type tension lap splices where indicated.

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.

Part 2 Products

2.1 Materials

- .1 Substitute different size bars only if permitted in writing by Contract Administrator.
- .2 Reinforcing steel: billet steel, grade 400, deformed bars to CAN/CSA-G30.18, unless indicated otherwise.
- .3 Cold-drawn annealed steel wire ties: to CSA G30.3.
- .4 Welded steel wire fabric: to CSA G30.5. Provide in flat sheets only.
- .5 Epoxy coating of non-prestressed reinforcement: to ASTM A 775/A 775M.
- .6 Chairs, bolsters, bar supports, spacers: to CAN/CSA-A23.1.
- .7 Mechanical splices: subject to approval of Contract Administrator.
- .8 Plain round bars: to CAN/CSA-G40.21.

2.2 Fabrication

- .1 Fabricate reinforcing steel in accordance with CAN/CSA-A23.1, ANSI/ACI 315, and Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada. ACI 315R, Manual of Engineering and Placing Drawings for Reinforced Concrete Structures unless indicated otherwise.
- .2 Obtain Contract Administrator's approval for locations of reinforcement splices other than those shown on placing drawings.
- .3 Upon approval of Contract Administrator, weld reinforcement in accordance with CSA W186.
- .4 Ship bundles of bar reinforcement, clearly identified in accordance with bar bending details and lists.

2.3 Source Quality Control

- .1 Upon request, provide Contract Administrator with certified copy of mill test report of reinforcing steel, showing physical and chemical analysis, minimum 4 weeks prior to commencing reinforcing work.
- .2 Upon request inform Contract Administrator of proposed source of material to be supplied.

Part 3 Execution

3.1 Field Bending

- .1 Do not field bend or field weld reinforcement except where indicated or authorized by Contract Administrator.
- .2 When field bending is authorized, bend without heat, applying a slow and steady pressure.
- .3 Replace bars which develop cracks or splits.

3.2 Placing Reinforcement

- .1 Place reinforcing steel as indicated on reviewed placing drawings and in accordance with CAN/CSA-A23.1.
- .2 Use plain round bars as slip dowels in concrete. Paint portion of dowel intended to move within hardened concrete with one coat of asphalt paint. When paint is dry, apply a thick even film of mineral lubricating grease.
- .3 Prior to placing concrete, obtain Contract Administrator's approval of reinforcing material and placement.
- .4 Ensure cover to reinforcement is maintained during concrete pour.
- .5 Protect epoxy and paint coated portions of bars with covering during transportation and handling.

3.3 Field Touch-up

- .1 Touch up damaged and cut ends of epoxy coated or galvanized reinforcing steel with compatible finish to provide continuous coating.

END OF SECTION

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.
- .3 Canadian Standards Association (CSA)
 - .1 CAN/CSA-A5-93, Portland Cement.
 - .2 CAN/CSA-A23.1-94, 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 CAN/CSA-A23.1.
- .4 Provide certification that plant, equipment, and materials to be used in concrete comply with requirements of CAN/CSA-A23.1.

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 CAN/CSA-A23.1.
- .4 Aggregates: to CAN/CSA-A23.1. 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 CAN/CSA-A23.1 white and to ASTM C309, Type 1-chlorinated rubber Type1-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 fireglass reinforced, top side thermal fusable plastic, bottom side sanded.
- .13 Concrete Topping:
 - .1 Gymnasium 114 & 114A, Vestibule Area 101, Lobby 102, Corridor 103 and top of Stair Landing 112 & 113: 51mm thickness.
- .14 Expanded Wire Mesh.

2.2 Mixes

- .1 Proportion normal low semi-low high density concrete in accordance with CAN/CSA-A23.1, Alternative 1 to give following quality and yield for all concrete as indicated.
 - .1 Cement: Type 10 Portland cement.
 - .2 Minimum compressive strength at 28 days: 25 MPa or as shown on the drawings.
 - .3 Class of exposure: Class A for exposed exterior paving. Class C for exterior beam. Class D for interior concrete.
 - .4 Nominal size of coarse aggregate: 20 mm.
 - .5 Slump at time and point of discharge: 80 to 110 mm.
 - .6 Air content: In accordance with table 10 of CSA A23.1-94 or as shown on the drawings
 - .7 Chemical admixtures: following admixtures in accordance with clause 6 of CSA A 23.1-94.

2.3 Preparation

- .1 Obtain Contract Administrator's approval before placing concrete. Provide 24 hours notice prior to placing of concrete.
- .2 Pumping of concrete is permitted only after approval of equipment and mix.
- .3 Ensure reinforcement and inserts are not disturbed during concrete placement.
- .4 Prior to placing of concrete obtain Contract Administrator's approval of proposed method for protection of concrete during placing and curing in adverse weather.

- .5 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, air temperature and test samples taken.
- .6 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 CAN/CSA-A23.1.
- .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.

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- .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 CAN/CSA-A23.1.
 - .2 Use procedures acceptable to Contract Administrator or those noted in CAN/CSA-A23.1 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.
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- .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 CAN/CSA-A23.1.

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 CAN/CSA-A23.1 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

Part 1 General

1.1 RELATED SECTIONS

- .1 Section [03 30 00] - [Cast-in-Place Concrete] .

1.2 REFERENCES

- .1 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-25.20- [95] , Surface Sealer for Floors.
- .2 Canadian Standards Association (CSA)
 - .1 CSA-A23.1- [94] , Concrete Materials and Methods of Concrete Construction.

1.3 PERFORMANCE REQUIREMENTS

- .1 Product quality and quality of work in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Submit written declaration that components used are compatible and will not adversely affect finished flooring products and their installation adhesives.

1.4 PRODUCT DATA

- .1 Submit product data in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit WHMIS MSDS - Material Safety Data Sheets in accordance with Section [02 61 33 - Hazardous Materials]. WHMIS MSDS acceptable to Labour Canada and Health and Welfare Canada for concrete floor treatment materials. Indicate VOC content.
- .3 Include application instructions for concrete floor treatments .

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] and the Waste Reduction Workplan.
- .2 Place materials defined as hazardous or toxic waste in designated containers.
- .3 Ensure emptied containers are sealed and stored safely for disposal away from children.
- .4 Use chemical hardeners that are non-toxic,biodegradable and have zero or low VOC=s .
- .5 Dispose of surplus chemical and finishing materials in accordance with federal, provincial and municipal regulations.
- .6 Dispose of waste from stripping of floors in a manner that will not have unfavourable effects on the environment.

1.6 ENVIRONMENTAL REQUIREMENTS

- .1 Temporary lighting:
 - .1 Minimum 1200 W light source, placed 2.5 m above floor surface, for each 40 sq m of floor being treated.
- .2 Electrical power:
 - .1 Provide sufficient electrical power to operate equipment normally used during construction.
- .3 Work area:
 - .1 Make the work area water tight protected against rain and detrimental weather conditions.
- .4 Temperature:
 - .1 Maintain ambient temperature of not less than 10 °C from [7] days before installation to at least 48 hours after completion of work and maintain relative humidity not higher than 40% during same period.
- .5 Moisture:
 - .1 Ensure concrete substrate is within moisture limits prescribed by flooring manufacturer.
- .6 Safety:
 - .1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials.
- .7 Ventilation:
 - .1 Engineer will arrange for ventilation system to be operated during installation of concrete floor treatment materials. Ventilate area of work as directed by Engineer by use of approved portable supply and exhaust fans.
 - .2 Ventilate enclosed spaces in accordance with Section 01 51 00 - Temporary Utilities.
 - .3 Provide continuous ventilation during and after coating application.

Part 2 Products

2.1 CHEMICAL HARDENERS

- .1 [Type 1 - Sodium silicate] [Type 2 - Magnesium fluosilicate] [Type 2 - Zinc fluosilicate blend] .
- .2 Water: potable.

2.2 SEALING COMPOUNDS

- .1 Surface sealer: to CAN/CGSB-25.20, Type 1 - solvent-based , clear colour .

- .2 Surface sealer: acrylic carnuba wax.
- .3 Surface sealers may not be manufactured or formulated with aromatic solvents formaldehyde halogenated solvents mercury lead cadmium hexavalent chromium and their compounds .

2.3 CURING COMPOUNDS

- .1 Select low VOC, water-based, organic-solvent free curing compounds.

2.4 MIXES

- .1 Mixing, ratios and application in accordance with manufacturer's instructions.

Part 3 Execution

3.1 EXAMINATION

- .1 Verify that slab surfaces are ready to receive work and elevations are as indicated on shop drawings .

3.2 PREPARATION OF EXISTING SLAB

- .1 Rub exposed sharp edges of concrete with carborundum to produce 3 mm radiused edges [unless otherwise indicated] .
- .2 Saw cut control joints to CSA-A23.1, 24 hours maximum after placing of concrete.
- .3 Use [strong solvent] [mechanical stripping] to remove chlorinated rubber or existing surface coatings.
- .4 Use [protective clothing] [eye protection] [respiratory equipment] during stripping of chlorinated rubber or existing surface coatings.

3.3 APPLICATION

- .1 After floor treatment is dry, seal control joints and joints at junction with vertical surfaces with sealant.
- .2 Apply floor treatment in accordance with Sealer manufacturer's written instructions.
- .3 Clean overspray. Clean sealant from adjacent surfaces.

3.4 PROTECTION

- .1 Protect finished installation in accordance with manufacturer's instructions.

3.5 SCHEDULE

- .1 Table

Surface Sealer

Surface Sealer

[CAN/CGSB-25.20, Type 1 - waterbased]

END OF SECTION

Part 1 General

1.1 Section Includes

- .1 Materials and installation for precast concrete splashpads, paving stones and parking curbs.

1.2 Related Sections

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .3 Section 03 20 00 - Concrete Reinforcing.
- .4 Section 06 05 73 – Wood Treatment.

1.3 Measurement Procedures

- .1 Measure supply and installation of precast units of each type and size installed.

1.4 References

- .1 American Society for Testing and Materials International, (ASTM)
 - .1 ASTM C109/C109M-02, Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2 in. or 50 mm Cube Specimens).
 - .2 ASTM C330-02a, Standard Specification for Lightweight Aggregates for Structural Concrete.
 - .3 ASTM C260-01, Standard Specification for Air-Entraining Admixtures for Concrete.
 - .4 ASTM C494/C494M-99ae1, Standard Specification for Chemical Admixtures for Concrete.
 - .5 ASTM C827-01a, Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mixtures.
 - .6 ASTM C939-97, Standard Test Method for Flow of Grout for Placed-Aggregate Concrete (Flow Cone Method).
- .2 Canadian Standards Association (CSA)/CSA International
 - .1 CAN/CSA-A3000-98(April 2001), Cementitious Materials Compendium (Consists of A5-98, A8-98, A23.5-98, A362-98, A363-98, A456.1-98, A456.2-98, A456.3-98).
 - .1 CAN/CSA-A5-98, Portland Cement.
 - .2 CAN/CSA-A23.5-98, Supplementary Cementing Materials.
 - .2 CAN/CSA-A23.1/A23.2-00(August 2001), Concrete Materials and Methods of Concrete Construction/Methods of Test for Concrete.

- .3 CAN/CSA-A23.4/A251-00(July 2002), Precast Concrete - Materials and Construction/Qualification Code for Architectural and Structural Precast Concrete Products.
- .4 CAN/CSA-G30.18-M92(R1998), Billet-Steel Bars for Concrete Reinforcement.

1.5 Waste Management and Disposal

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard, packaging material in appropriate on-site bins for recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .4 Divert unused concrete materials from landfill to local quarry approved by Contract Administrator.
- .5 Divert unused aggregate materials from landfill to local quarry approved by Contract Administrator.
- .6 Dispose of unused chemical admixtures at official hazardous material collections site approved by Contract Administrator.
- .7 Do not dispose of unused chemical admixtures into sewer system, into streams, lakes, onto ground or in any other location where it will pose health or environmental hazard.
- .8 Fold up metal banding, flatten and place in designated area for recycling.

Part 2 Products

2.1 Materials

- .1 Portland cement ASTM C150 and to CAN/CSA-A5, normal type 50, sulphate resistant type 50.
- .2 Water: to CAN/CSA-A23.1/A23.2.
- .3 Aggregates: to CAN/CSA-A23.1/A23.2.
 - .1 Coarse aggregates to be normal high density.
 - .2 Low density aggregate for lightweight concrete: to ASTM C330.
- .4 Air entraining admixture: to ASTM C260.
- .5 Chemical admixtures: to ASTM C494/C494M. Use of accelerating or set retarding admixtures for cold and hot weather placing to approval of Contract Administrator.
- .6 Supplementary cementing materials: to CAN/CSA-A23.5.

- .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 30 s.
 - .2 Flowable: to ASTM C827. Flow table, 5 drops in 3 s, ASTM C109/C109M, applicable portion 125 to 145%.
 - .3 Plastic: to ASTM C827. Flow table, 5 drops in 3 s, ASTM C109/C109M, applicable portions 100 to 125%.
 - .4 Dry pack: to manufacturer's requirements.
 - .3 Net shrinkage at 28 days: maximum 0%.
- .8 Reinforcing steel: to Section 03 20 00 - Concrete Reinforcing.

2.2 Fabrication

- .1 Paving blocks
 - .2 Fabricate: to CAN/CSA-A23.4/A251, Splash pads: 450 x 1220 x 50 mm edge.
 - .1 Acceptable Product:
 - .1 45-40020, 24" Natural, by Barkman Concrete.
 - .2 64 x 64mm angle supports – Refer to Section 05 50 00 – Metal Fabrications.
 - .3 Approved equal.
 - .2 Install as per manufactures written instructions and to Architectural Drawings.
 - .3 Parking Curbs.
 - .1 Acceptable Product:
 - .1 43-30000 Bumper curb, by Barkman Concrete.
 - .2 Approved equal.
 - .3 Hardware (zinc dichromate coated) as recommended by manufacturer.
 - .2 Install as per manufactures written instructions and to Architectural Drawings.
- .4 Fabricate to: Paving stone: Interlocking Pavers
 - .1 210 x 210 x 60mm.
 - .2 105 x 210 x 60mm.
 - .3 Pattern: as selected from available configurations.
 - .4 Acceptable Product:
 - .1 20-30 Holland Series, Sierra Grey.
 - .2 Other colour as selected from available colours.
 - .3 Approved equal.
 - .4 Hardware (zinc dichromate coated) as recommended by manufacturer.
 - .5 Install as per manufacturer's written instructions and to Architectural Drawings.

Part 3 Execution

3.1 Installation

- .1 Install splash pads at every downspout/ rain water leader and as indicated on the Drawings. Refer to Drawing 9/ A – 2.

- .2 Install paving stones as indicated on Drawings.
 - .1 100mm on 200mm compacted gavel and 50mm levelling sand.
 - .2 See manufacture's instructions.

- .3 Install benches as indicated.
 - .1 All cedar components to receive two coats of base and one coat of finish as recommended by manufacture.
 - .2 Upkeep and maintenance instructions to be provided by manufacturer.

- .4 Replace damaged and defective units as directed by Contract Administrator.

END OF SECTION