DIVISION 03

CONCRETE

Part 1 General

1.1 DESCRIPTION OF WORK

.1 This section specifies requirements for concrete formwork, falsework and their accessories for concrete construction.

.2 The Work includes design, construction, erection and removal of concrete formwork, falsework and accessories.

1.2 RELATED WORK

.1 Concrete Reinforcement - Section 03 20 00

.2 Cast-In-Place Concrete - Section 03 30 00

1.3 REFERENCE STANDARDS (THE MOST RECENT VERSIONS)

.1 Concrete Materials and Methods of Concrete Construction - CSA-A23.1

.2 Methods of Test for Concrete - CSA-A23.2.

.3 ACI Detailing Manual - ACI 315

.4 Falsework for Construction Purposes - CSA-S269.1.

1.4 DESIGN

.1 Design of concrete formwork and falsework are the responsibility of the Contractor.

1.5 SUBMITTALS

.1 Submittals shall be in accordance with Section 01 33 00 Submittals.

.2 Submit shop drawings of proposed formwork and/or falsework for review if requested.

.3 Show material sizes and grades, and spacing of members.

.4 Indicate rate and sequence of concrete placing used in design of formwork.

.5 Shop drawings shall bear the stamp of a qualified Professional Engineer registered in Manitoba.

.6 Submit for review shoring and reshoring provisions, and removal schedules.

.7 Submit for review proposed curing procedures.

.8 Submit for review proposed hoarding and heating methods for cold weather concreting.

Part 2 Products

2.1 FORMS

.1 Use material of suitable strength and quality to produce the specified surface finish.

.2 Use forms which are watertight, unwarped, non-absorbent and non-staining.

.3 Formwork lumber: Plywood and wood formwork materials to CAN/CSA-A23.1 latest edition.

.4 False work materials: To S269.1, Table 1- Materials shall bear grade marks, or be accompanied with certificates, test reports or other proof of conformity.

2.2 FORM TIES

.1 Use only ties with ends removable to a distance of not less than 38 mm from the face of the finished concrete.

.2 Form ties with a removable cone cast in the concrete shall produce a cone hole not more than 25 mm in diameter.

.3 Through bolts shall not be acceptable.

2.3 FORM RELEASE AGENT

.1 Chemically reactive release agents containing compounds that react with freelime present in condition to provide water insoluble soaps, preventing set of film of concrete in contact with form.

Part 3 Execution

3.1 INSPECTION

.1 Notify the Contract Administrator to permit inspection of formwork at least 72 hours before concreting. Inspection by Contract Administrator of formwork shall be for conformance to project specifications, but not for structural strength and stability, which is the sole responsibility of the Contractor.

3.2 CONSTRUCTION AND CONTRACTION JOINT LAYOUTS

.1 Construction and contraction joints shall be constructed where required as shown on the plans, as specified and/or according to CSA-A23.1. The Contractor shall prepare and submit for approval, a location diagram and proposed details for all planned construction joints, and for layout of construction and contraction joints in slabs on grade, sidewalks and other concrete paved areas.

.2 Construction joints shall be approved by the Contract Administrator.

.3 Clean all construction joint surfaces which will be inaccessible after the erection of formwork.

.4 Construct falsework to CSA S269.1.

3.3 FORMS

.1 Assemble and erect in accordance with the formwork design.

.2 Allow for deflection of the formwork due to the weight of concrete.

.3 Make all form joints watertight.

.4 Make form surfaces smooth and flat.

.5 Clean forms properly before assembling in position, and as necessary before concreting.

.6 Oil or coat forms before assembly in final position.

.7 Provide 20 mm chamfer at all exposed exterior corners with interior angle of 120 degrees or less.

.8 Provide access for cleaning prior to concreting.

.9 Do not use temporary removable spacers or blocks to support reinforcement or other items unless approved by the Contract Administrator.

.10 Finished concrete exhibiting evidence of excessive form displacement, and/or excessive deflection shall be cause for rejection of the work and its removal and replacement at the Contractors own expense.

.11 Obtain Contract Administrator's approval before framing openings not indicated on drawings.

3.4 TOLERANCES

.1 Construct formwork to maintain the tolerances of concrete work in Clause 10 of CSA-A23.1.

.2 Provide cambers to beam and slab forms as indicated on the drawings, as directed, or in accordance with the following:

.1 Beams - 5 mm per 3000 mm of span

.2 Slabs - 8 mm per 3000 mm of span

3.5 PLACING OF CONCRETE

.1 Make a final inspection and ensure that forms are satisfactory and no deleterious materials are present inside the area to be concreted.

.2 Observe forms during concreting operations and correct any displacement of the form.

3.6 FORM REMOVAL

.1 Remove forms so that no damage occurs to the concrete.

.2 Consider the location, character of the structure, weather and other conditions influencing the curing of concrete, in determining the time for removal of forms. (Refer to Section 03300 - Cast-In-Place Concrete and CSA-A23.1).

.3 Leave shores in place until concrete has attained sufficient strength to adequately support its own weight together with construction loads likely to be imposed.

.4 In accordance with clause 3.6.3, leave formwork in place for the following minimum periods of time after placing concrete:

- .1 3 days for walls
- .2 3 days for columns
- .3 14 days for beam soffits, slabs, decks and other structural members or at least until concrete has attained 2/3 of the specified 28 day strength, or to the Contract Administrators approval.

.5 Re-use of formwork and falsework subject to requirements of CSA-A23.1.

END OF SECTION

Part 1 General

1.1 DESCRIPTION OF WORK

.1 This section specifies requirements for the supply, fabrication and placing of reinforcing steel, including necessary supports, spacers, and related accessories.

1.2 RELATED WORK

.1 Concrete Forming and Accessories - Section 03 10 00

.2 Cast-In-Place Concrete - Section 03 30 00

1.3 REFERENCE STANDARDS

.1 Concrete Materials and Methods of Concrete Construction CSA-A23.1.

.2 Billet-Steel Bars for Concrete Reinforcement - CSA-G30.18.

.3 Welded Steel Wire Fabric for Concrete Reinforcement - ASTM A185 / A185M-07.

.4 ACI Detailing Manual - ACI 315.

.5 CRSI Manual of Standard Practice.

1.4 SUBMITTALS

.1 Submit shop drawings in accordance with Section 01 33 00 - Submittals, at least 14 days before fabrication.

.2 Submit bending schedules and placing drawings.

.3 Show bar size, spacing, location and quantities to permit correct placement without reference to structural drawings.

.4 Provide details to show placement of reinforcing where special conditions occur.

.5 Details shall be in accordance with ACI 315.

.6 Submit certificates and mill tests for the material supplied as requested by the Contract Administrator.

.7 Design and detail lap lengths and bar development lengths to CSA A23.3 09, Unless otherwise indicated.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

.1 Ship bar reinforcement in standard bundles, easily identifiable and marked in accordance with the bar lists.

.2 Store reinforcement to prevent deterioration or contamination by dirt, detrimental rust, loose scale, paint, oil or other foreign substances that will destroy or reduce bond.

.3 Do not straighten or rebend reinforcement in any manner.

.4 Do not use bars kinked or bent by improper handling or storage.

Part 2 Products

2.1 REINFORCING STEEL

.1 Reinforcing steel to meet CSA-G30.18 as shown on drawings. Steel grade to be 400 MPa.

.2 Welded steel wire fabric to ASTM A185 / A185M-07, provide in flat sheets only.

.3 Chairs, Bolsters, Bar Supports, Spacers

.4 Provide adequate support of reinforcement (according to CRSI Manual of Standard Practice).

.5 For exposed or architectural concrete surfaces use accessories which are plastic coated, stainless steel or as indicated on the drawings.

.6 Precast concrete block supports must be equal in strength and quality to the concrete in the structure.

.7 Chairs, bolster bar supports and spacers shall have sufficient strength to support the reinforcing under normal construction conditions. Brick shall not be used for bar supports.

2.2 FABRICATION

.1 Fabricate reinforcing steel from bar sizes and grades indicated within the following tolerances:

.2 Sheared length: plus or minus 25 mm.

.3 Stirrups, ties: plus or minus 13 mm.

.4 Location of bends: plus or minus 25 mm.

.5 Unless otherwise indicated, fabricate in accordance with CSA-A23.1.

.6 Obtain Contract Administrator’s approval for location of reinforcing splices other than as shown on reinforcing steel placing drawings.

Part 3 Execution

3.1 INSPECTION

.1 Notify Contract Administrator to permit inspection after placement is completed. Reinforcing for all concrete pours shall be inspected after placing and prior to concreting.

.2 Provide adequate notice of scheduled pours to facilitate inspection of reinforcement (minimum of 72 hours).

3.2 PLACING OF REINFORCEMENT

.1 Place reinforcement as shown on the reviewed shop drawings and in accordance with CSA-A23.1.

.2 Support reinforcement in position as follows:

.1 Beams, walls, and columns - laterally support reinforcement with supports in pairs on opposite faces.

.2 Do not use supports which will be forced into the supporting formwork or soil by the weight of the reinforcement or other construction loads.

.3 Separate layers of bars by precast mortar blocks, bars or equally suitable devices. Do not use pebbles, pieces of broken stone or brick, metal pipe or wooden blocks.

.4 Do not place bars on layers of fresh concrete as the work progresses or install bars during placing of concrete.

.3 Provide concrete cover as detailed on the drawings.

3.3 WELDING OF REINFORCEMENT

.1 Welding of reinforcing bars is not permitted.

3.4 SPLICING OF REINFORCEMENT

.1 Splice bars only as shown on the drawings or approved by the Contract Administrator.

.2 Bar splices shall conform to CSA3-A23.3, Type B, unless noted.

.3 Lap adjacent sheets of wire fabric to provide an overlap of at least one cross wire spacing plus 50 mm, measured between outermost cross wires of each sheet.

3.5 DETAILS

.1 Corner Bars: Install corners bars in walls and beams to match the larger size of normal reinforcement unless otherwise noted on the drawings.

.2 Openings in slabs or walls: Unless otherwise noted on drawings, install 2 additional 20 M bars on all sides of every opening, one near each concrete face or the number of bars intercepted, divided equally between the two sides, whichever is greater. Bars to extend one lap length past each side of the opening.

END OF SECTION

Part 1 General

1.1 DESCRIPTION

.1 This section specifies requirements for concrete joint materials including ribbed waterstop and joint filler.

1.2 RELATED WORK

.1 Concrete Formwork - Section 03 10 00

.2 Concrete Reinforcement – Section 03 20 00

.3 Cast-In-Place Concrete - Section 03 30 00

1.3 REFERENCE STANDARDS

.1 Concrete Materials and Methods of Concrete Construction CSA-A23.1.

.2 Falsework for Construction Purposes – CSA-S269.1.

1.4 SUBMITTALS

.1 Submit shop drawings in accordance with Section 01 33 00 – Submittal Procedures.

.2 Show material sizes and installation methods.

.3 Submit samples of waterstop and joint filler to be used.

.4 Submit documentation indicating Contractor’s experience in installing products and acceptance by the manufacturer that the Contractor has retained a certified installer.

Part 2 Products

2.1 MATERIALS

.1 Ribbed waterstops: extruded PVC with shop welded corner and intersecting pieces.

.1 Wirestop waterstop, type CR-6316 (152 mm width, 4.8 mm thickness) manufactured by the Paul Murphy Plastics, Vinylex RB6316A Hog Rings or approved equal in accordance with B7.

.2 Expandable Waterstop: Volclay RX or approved equal in accordance with B7.

.2 Joint Fillers:

.1 13 mm thick bituminous impregnated fibre board; to ASTM D1751-73 (1978): Flexcell or approved equal in accordance with B7.

.2 Vapour barrier; 0.38 mm (15 mil) thick, clear polyethylene film.

Part 3 Execution

3.1 WATERSTOPS

.1 Install waterstops to provide continuous water seal. Do not distort or pierce waterstop 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 Only straight heat sealed butt joints permitted in field. Use factory welded corners and intersections.

3.2 JOINT FILLERS

.1 Use 13 mm thick joint filler to separate slabs and beams from existing vertical surfaces and extend joint filler from bottom of slab and beams to finished slab surfaces unless indicated otherwise.

3.3 VAPOUR BARRIER

.1 Install vapour barrier under slabs on fill.

.2 Lap joints 150 mm and seal.

END OF SECTION

Part 1 General

1.1 DESCRIPTION OF WORK

.1 This section specifies requirements for design and preparation of the concrete mix, handling, placing, finishing and curing of cast-in-place concrete.

1.2 RELATED WORK

.1 Concrete Forming and Accessories– Section 03 10 00

.2 Concrete Reinforcement – Section 03 20 00

1.3 REFERENCE STANDARDS (THE MOST RECENT VERSIONS)

.1 Canadian Standards Association (CSA):

.1 CSA A23.1, Concrete Materials and Methods of Concrete Construction.

.2 CSA A23.2, Methods of Test for Concrete.

.3 CSA A23.3, Design of Concrete Structures.

.4 ACI 350, Code Requirements for Environmental Engineering Concrete Structures.

.5 CAN/CSA-A3000, Cementitious Materials Compendium.

.6 CSA A266.2, Chemical Admixtures for Concrete.

.2 ASTM International (ASTM):

.1 ASTM C260/C260M, Standard Specification for Air-Entraining Admixtures for Concrete.

.2 ASTM C494/C494M, Standard Specification for Chemical Admixtures for Concrete.

.3 ASTM C1017/C1017M, Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.

.4 ASTM-C94, Standard Specification for Ready-Mixed Concrete

.3 Have available onsite one copy of CSA-A23.1 and CSA-A23.2. These shall form the basis for acceptable standards of concrete practice and methods.

1.4 SUBMITTALS

.1 Mix Design Statement

.1 For each type of concrete used, the Contractor shall provide the Contract Administrator with a Mix Design Performance Record, certifying the constituent materials and mix proportions that will be used in the Portland Cement Concrete. The Contractor shall include, in the certification, the following information:

.1 List the product name and source of all proposed constituent materials of the concrete including cement, coarse aggregate, fine aggregate, water, water reducing agent, and air entraining admixture. A statement is required indicating that the constituent materials proposed for each mix

design are compatible with each other, thereby providing concrete with good long-term durability capabilities.

.2 Supply recent records of each mix design for concrete quality control tests including slump, total air content, and 7 and 28-day compressive strengths. The Contractor shall supply reasonable evidence that the mix designs submitted will produce concrete with the specified strength, workability and yield.

.3 When previously satisfactory strength data on the proposed mix is not available, the Contract Administrator may request the preparation of field trial batches in order that the concrete be tested prior to construction. Such field trial batches shall be carried out in similar conditions and using similar equipment, batching, and mixing procedures as will be used in the actual construction. The number of trial batches required shall be determined by the Contract Administrator and shall depend on the class of concrete materials.

.4 Supply recent test information, on coarse aggregates of water absorption and abrasion.

.5 Supply recent information, if available on aggregate alkali-silica reactivity.

.6 Supply recent information on tests performed on Portland Cement, fly ash and silica fume.

.7 Supply any other information deemed applicable.

.2 The Contractor shall perform the following test and submit the results to the Contract Administrator prior to the start of construction.

.1 Determine the gradation of fine and coarse aggregates in accordance with CSA Test Method A23.2-2A. Results shall be within acceptable limits specified herein.

.2 The Contractor shall submit test data showing that the Contractor's proportioning and mixing equipment, procedures and concrete mix constituent materials are capable of producing a satisfactory air-void system in the hardened concrete. Prior to Site mobilization, the Contractor shall prepare and cast representative test specimens of each type of concrete using the same proportioning and mixing equipment and procedures, and the same concrete admixtures as will be employed for the supply and placement of each type of structural concrete.

.3 The cost for batching, casting, and testing trial batch specimens shall be incidental to the Supply and Placement of Structural Concrete. No measurement or separate payment will be made for this work.

.4 The Mix Design Statement shall be submitted to the Contract Administrator at least twenty-one (21) days prior to the delivery of any concrete to the Site. Once accepted by the Contract Administrator, all concrete shall be supplied in accordance with this Statement, which shall be called the Job Mix Formula.

.5 No changes in the job mix formula will be permitted without following the above procedure.

1.5 QUALITY CONTROL TESTING

.1 The Contractor shall retain and pay for the services of an independent testing agency for testing as follows. The Independent Testing Agency shall be approved by the Contract Administrator.

.2 Allow for casual labour and expenses in conjunction with testing.

.3 Concrete Cylinder tests:

.1 At least one set of 3 cylinders will be made for each days concreting or for each 50 cubic metres of concrete placed, for each type of concrete mix.

.2 Cylinders shall be taken at the point of deposit of the concrete.

.3 For each test slump and air content will be taken and 3 standard cylinders will be prepared and cured under laboratory conditions.

.4 One cylinder from each test will be broken at 7 days and the remaining cylinders at 28 days.

.5 When temperatures are below 5°C additional field cured cylinders will be prepared to verify that adequate strength is attained.

.4 Test results shall be delivered directly from the test laboratory to the Contract Administrator and to the Contractor.

.5 Test reports shall include:

.1 project name

.2 date and time of sampling

.3 supplier, truck and departure time

.4 specified strength and admixtures

.5 cement type

.6 exact location in structure

.7 slump and air content

.8 maximum aggregate size

.9 test strength and age at time of test

.10 date cylinder received by lab

.11 testing technician identification

.12 weather and temperature information.

.6 If any tests reveal concrete not meeting Specifications, the Contract Administrator may enforce one or more remedial procedures such as:

.1 change in mix design

.2 change in concrete supplier

.3 additional testing by coring or impact hammer

.4 replacement of work

.5 other procedures as necessary

.7 The costs of remedial work to bring concrete to meet specifications shall be borne by the Contractor.

.8 Refer to Section 01 45 00 - Quality Control.

1.6 QUALITY ASSURANCE TESTING

.1 The City of Winnipeg may retain and pay for the services of an independent testing agency for additional testing for quality assurance for the City of Winnipeg's purposes.

1.7 PRODUCT DELIVERY, STORAGE AND HANDLING

.1 Store all material in accordance with CSA-A23.1, Storage of Materials, except as otherwise noted.

.2 Store each shipment of cement separately to provide access to identification and inspection of each shipment.

.3 Clean stockpile areas of foreign materials.

.4 Do not use stockpiled material within 150 mm of the ground surface if the stockpile is placed directly on the ground.

Part 2 Products

2.1 CEMENT

.1 Conform to CSA-A3000 Portland Cement.

.2 Type to be as specified on the drawings.

2.2 WATER

.1 Potable.

2.3 FINE AND COARSE AGGREGATES

.1 Conforming to CSA-A23.1.

2.4 AIR-ENTRAINING ADMIXTURES

.1 Air entrainment to ASTM C260/C260M.

.2 No other air entraining mixture shall be used regardless of the type of cement selected, unless approved by the Contract Administrator.

2.5 CHEMICAL ADMIXTURES

.1 Conforming to ASTMC494/C494M AND ASTM C1017/1017M.

.2 Use only as approved by the Contract Administrator.

2.6 VAPOUR BARRIER

.1 0.15 mm polyethylene with 150 mm laps taped and sealed, where shown on the drawings.

2.7 POZZOLANIC MINERAL ADMIXTURES

.1 Conforming to CSA-A3000.

.2 Use only as approved by the Contract Administrator.

2.8 FLYASH

.1 Flyash may be used as detailed on the drawings.

2.9 CONCRETE CURING COMPOUND

.1 Chlorinated rubber type compound conforming to CSA-A23.1, Type 1.

.2 On coloured floors, wax-free curing and sealing compound "Floor Coat" as manufactured by Master Builders Co. Ltd., or approved equal in accordance with B7.

.3 Where topping or waterproofing is to be applied, ensure adequate surface preparation of the concrete for proper bonding. (Clause 21, CSA-A23.1)

2.10 EXPANDING GROUT

.1 Premixed non-shrink, non-metallic aggregate, developing minimum compressive strength of 35 MPa at 28 days.

.2 Use only as shown on the drawings or approved by the Contract Administrator.

2.11 CONCRETE MIX REQUIREMENTS

.1 Concrete mix requirements shall be as shown on the drawings.

2.12 SLURRY COAT

.1 Slurry coat mix to be 2 parts sand, 1 part cement and 1 part water.

2.13 MIXING

.1 Ready-mixed concrete:

.1 Mix premixed or Transit-mixed concrete according to CSA-A23.1 and to ASTM-C94.

.2 Ensure that the concrete supplier has sufficient plant capacity and transporting apparatus to provide delivery so that the interval between successive loads does not exceed 15 minutes.

.2 Site-Mixed Concrete shall be in accordance with CSA-A23.1.

Part 3 Execution

3.1 INSPECTION

.1 The Contract Administrator will inspect forms, foundations, reinforcing steel, construction joints, mixing, conveying and placing equipment before concreting.

3.2 PREPARATION

.1 Do not place concrete on soil that has been softened by mechanical disturbance or moisture.

.2 Retighten forms at construction joints.

.3 Roughen, thoroughly remove foreign matter and laitance, and saturate the hardened concrete at construction joints with water prior to concreting.

.4 Make suitable arrangements to prevent damage to fresh concrete by adverse weather conditions, such as rain, wind or extreme temperatures.

.5 Concrete shall not be poured against frozen ground, frozen concrete or into frosted formwork.

.6 Prepare all sleeves and ducts to be cast into concrete at the same time as the concrete formwork to ensure that correct assembly and fit is obtained.

.7 Check architectural, mechanical and electrical drawings for sleeves, inserts, etc.

.8 Set sleeves, ties, anchor bolts, pipe hangers and other inserts and openings in concrete floors and walls as required.

3.3 INSERTS

.1 Set hatch and sump frames, pipe, sleeves, ties, anchor bolts, pipe hangers and other inserts, openings and sleeves, in concrete floors and walls as required by other trades. Sleeves, openings, etc., greater than 100 x 100 mm not indicated on structural drawings must be approved by the Contract Administrator.

.2 No sleeves, ducts, pipes or other openings shall pass through beams except where expressly detailed on structural drawings or approved by the Contract Administrator.

.3 Do no eliminate or displace reinforcement to accommodate hardware. If inserts cannot be located as specified, obtain approval of all modifications from the Contract Administrator before placing of concrete.

.4 Check locations and sizes of sleeves, openings, etc., shown on structural drawings with architectural miscellaneous, mechanical and electrical drawings.

3.4 PLACING OF CONCRETE

.1 According to CSA-A23.1, and as specified herein.

.2 All formwork shall be cleaned of all debris, loose material, snow and ice immediately prior to pouring.

.3 Ensure proper placement and support of reinforcement and embedded material immediately ahead of a pour.

.4 Do not temporarily displace reinforcement for convenience in placing concrete.

.5 Do not use wood or other temporary spreaders or spacers.

.6 Do not insert reinforcement into fresh concrete.

.7 Confine concrete in a suitable vertical drop pipe to within 1.0 m or less of the concrete in place.

.8 Set screeds accurately for level surfaces or to maintain cambers as required.

.9 Ensure that concrete is adequately consolidated in the forms.

.10 Place concrete in such a manner that the concrete in the form is still plastic and can be integrated with fresh concrete.

.11 To prevent segregation, deposit concrete in approximately horizontal layers of 300 to 450 mm thickness, as near as possible to its final position.

3.5 COLD WEATHER REQUIREMENTS

.1 When the air temperature is at or below 5°C, or when there is a possibility of it falling to that limit within 24 hours of placing, the requirements according to CSA-A23.1 shall be met.

.2 Withdraw protection and heating gradually so that air temperature around the concrete does not drop more than 15 Celsius degrees per day.

.3 Concrete shall be protected from alternate freezing and thawing for 14 days.

.4 Provide enclosures for heating such that air circulation is maintained.

.5 Frozen concrete will be rejected.

.6 Fresh concrete should not be exposed to any combustion gases.

3.6 HOT WEATHER CONCRETE WORK

.1 Hot weather shall be considered to be an air temperature in the shade, of 23°C or greater.

.2 Hot weather methods shall conform to CSA-A23.1.

.3 The concrete temperature at the time of placing in hot weather shall not exceed those specified in CSA-A23.1. In the event that this limit is exceeded the concrete operations shall be suspended until the constituent materials of concrete are cooled.

.4 Retarding admixtures shall be used only if approved by the Contract Administrator prior to use in the concrete.

.5 The use of ice may be required to lower the temperature of concrete for large pours.

3.7 JOINTS

.1 Construction, and/or control joints shall be provided where required and as shown on the plans or according to CSA-A23.1.

.2 Carefully finish all face edges exposed to view true to line and elevation. Apply a neat cement paste or approved bonding agent to the hardened concrete immediately in advance of the fresh concrete.

.3 At water tight horizontal joints, apply the first layer of new concrete above the joint with an excess of mortar, obtained by omitting 20 to 50 percent of coarse aggregate from the normal mix.

.4 Make all construction, or control joints in accordance with details shown on the drawings, layout to be submitted by Contractor for approval by Contract Administrator.

.5 Allow at least 2 hours after placing concrete in supporting columns or walls before placing in beams, girders or slabs above.

.6 Place beams monolithically with the floor system, unless otherwise approved by the Contract Administrator.

.7 See typical details on the drawings for isolation joints at columns, and other locations.

.8 Construction joint layouts shown on the drawings take precedence over above requirements.

3.8 FINISHING

.1 To CSA-A23.1 and as specified herein:

.2 Reservoir wall and base slab finish

.1 Use on concrete surfaces not exposed to view in the completed structure.

.2 Chip off fins and irregular projections.

.3 Patch honeycomb and fill tie holes with mortar containing approved bonding agent. Mix according to manufacturer's directions.

.3 Floated surface finish.

.1 Strike off the compacted concrete to the cross section and elevation shown on the drawings. Keep a slight excess of concrete in front of the screed at all times.

.2 Obtain a uniform surface by floating as necessary. If floating is not completed before excess water appears at the surface, remove this water before continuing with floating.

.3 Add or remove concrete during floating as required to obtain a surface with no more than 3 mm deviation from the required surface in any 3 metre length.

.4 Do not overwork the concrete surface. Float only enough to obtain a dense uniform surface.

.4 Broomed finish. (Exterior slabs on grade)

.1 After completion of Article 3.8.3 (d), broom to produce a non-slip surface with regular corrugations not more than 3 mm deep.

.5 Troweled finish. (Main floor finish)

.1 After completion of Article 3.8.3 (d), trowel to produce a dense smooth finish.

.2 Steel trowel in accordance with CSA A23.1 Class A.

.3 Follow with second steel troweling to produce smooth burnished surface.

.4 Do not sprinkle dry cement and sand mixture over concrete surfaces.

.5 Apply curing compound to manufacturer's instructions except on concrete to receive protective coating.

.6 Workmanship for Floor Slabs

.1 Steel trowel concrete slabs to be left exposed.

.2 Where floor drains occur, floors shall be level around walls and have a minimum 1% uniform pitch to drains, unless indicated otherwise on drawings.

.3 Concrete which is to receive protective coating shall be cleaned free of dirt, oil, loose material and laitance.

.4 Concrete slabs to receive protective coating to be screeded off to true lines and levels shown and left ready to receive finish.

.7 Areas which are exterior walkways, driveways or landings, shall receive a broomed non-slip surface.

3.9 CURING

.1 Curing shall be according to CSA-A23.1 and as specified herein.

.2 Prevent loss of moisture from concrete surfaces for at least seven days after concreting.

.3 Protect formed surfaces as follows, subject to approval by the Contract Administrator.

.1 Leave forms in place and keep concrete wet by pouring water between concrete and forms.

.4 Maintain concrete temperatures as recommended according to CSA-A23.1.

3.10 FORM REMOVAL

.1 Forms shall not be removed until removal operations will cause no damage to concrete surfaces.

.2 Beam and slab soffit forms shall not be removed until sufficient strength has been attained for support of the applied dead and live loads and to minimize deflections.

.3 See Clause 11 CSA-A23.1 for specific requirements.

3.11 PATCHING AND FINISHING OF HARDENED CONCRETE

.1 Patching, if required and if allowed, shall be done immediately after stripping.

.2 Methods of patching and repair shall be submitted to the Contract Administrator and accepted before repair work is started.

.3 All form ties shall be cut back a minimum of 25 mm and all tie holes shall be neatly patched and rubbed down.

3.12 DAMP PROOFING AND WATERPROOFING

.1 Preparation of concrete surfaces for damp proofing and waterproofing shall conform to CSA-A23.1.

.2 Application shall conform to manufacturer's recommendations.

3.13 CONCRETE SPECIALTIES

.1 Provide and install all concrete specialties as shown on the drawing and/or as necessary to complete the concrete work.

.2 Included are fibreboard expansion joint covers, water stop and bond breakers.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 03 30 00 - Cast-in-Place Concrete: concrete placing and finishing.

.2 Section 03 36 10 - Concrete Floor Hardening - Dry Shake.

1.2 REFERENCES

.1 American Society for Testing and Materials (ASTM)
- .1 ASTM C 309, Specification for Liquid Membrane-Forming Compounds for Curing Concrete.

.2 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-25.20, Surface Sealer for Floors.

.3 Canadian Standards Association (CSA)
- .1 CSA-A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.

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 that they will not adversely affect finished flooring products and their installation adhesives.

1.4 SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product data: manufacture's product data sheets identifying material, performance characteristics, surface preparation, installation instructions.

.3 Submit WHMIS MSDS - Material Safety Data Sheets. WHMIS MSDS acceptable to Labour Canada and Health and Welfare Canada for concrete floor treatment materials. Indicate VOC content.

.4 Ventilation:
- .1 Contractor will arrange for ventilation system to be operated during installation of sealers.
- .2 Ventilate area of work as directed by Contractor by use of approved portable supply and exhaust fans.
- .3 Ventilate enclosed spaces in accordance with Section 01 51 00 - Temporary Utilities.
- .4 Provide continuous ventilation during and after coating application.

Part 2 Products

2.1 MATERIALS

.1 Surface sealer: acrylic polymer water emulsion type, clear, to CAN/CGSB-25.20, Type 2 or ASTM-C309, Type 1.
- .1 Acceptable material:
  - .1 CPD Acrylic Floor Sealer (Water Emulsion)

.2 W.R. Meadows Sealtight Vocomp-20
.3 Sika Florseal WB 25.
.4 Sonneborne Kure-N-Seal WB

2.2 MIXES

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

Part 3 Execution

3.1 EXAMINATION

.1 Verify that substrate surfaces are ready to receive work.

3.2 PREPARATION OF EXISTING SLAB

.1 Rub exposed sharp edges of concrete with carborundum to produce 3 mm 1/8" radiused edges unless otherwise indicated.

.2 Saw cut control joints to CSA-A23.1/A23.2, 24 hours maximum after placing of concrete.

.3 Remove surface materials before application of floor treatment (dust, dirt, curing compounds, dirt, grease, oil, etc.)

.4 Use strong solvent to remove chlorinated rubber or existing surface coatings.

.5 Use protective clothing eye protection respiratory equipment during stripping of chlorinated rubber or existing surface coatings.

3.3 APPLICATION

.1 Ensure compatibility of floor treatment materials with adhesives of finished flooring materials and other bonded toppings or coatings prior to application.

.2 Apply floor treatment in accordance with 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.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Curing and finishing concrete: Section 03 30 00.

1.2 PRODUCT DATA

.1 Submit product data in accordance with Section 01 33 00 - Submittals.

.2 Include application instructions for concrete hardener, curing compound and slip resistant coating.

1.3 ENVIRONMENTAL REQUIREMENTS

.1 Ensure work area is protected against rain and detrimental weather conditions.

.2 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. Maintain substrate temperature at 10°C minimum.

.3 Moisture: ensure concrete substrate is within moisture limits prescribed by manufacturer.

.4 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials.

.5 Ventilation

.1 Provide continuous ventilation during and after coating application.

.2 Ventilate enclosed spaces as required.

Part 2 Products

2.1 MATERIALS

.1 Non-metallic hardener (plain): premixed, dry shake surface hardener.

.1 Acceptable material: None

.2 Non-metallic hardener (coloured): premixed, dry shake surface hardener, colour as selected by the City.

.1 Acceptable material: Sika Colorplete or approved equal in accordance with B7.

Part 3 Execution

3.1 EXAMINATION

.1 Verify that surfaces are ready to receive work.

3.2 APPLICATION

.1 Apply hardener in strict accordance with manufacturer's written instructions.

.2 Protect finished installation until floor treatment has cured.

.3 Apply the sealer coat as per manufacturer recommendations.

END OF SECTION