

## **1 General**

### **1.01 RELATED REQUIREMENTS**

- .1 Section 03 20 00 - Reinforcing Steel
- .2 Section 03 30 00 - Cast-In-Place Concrete

### **1.02 REFERENCES**

- .1 CSA-A23.1, Concrete Materials and Methods of Concrete Construction.
- .2 CSA-A23.2, Methods of Test and Standard Practices for Concrete.
- .3 CSA-A23.3, Design of Concrete Structures
- .4 CSA-O86, Engineering Design in Wood.
- .5 CSA O121, Douglas Fir Plywood.
- .6 CSA O151, Canadian Softwood Plywood.
- .7 CSA O153, Poplar Plywood.
- .8 CSA O437, CSA Standards for OSB and Waferboard.
- .9 CSA S269.1, Falsework for Construction Purposes.
- .10 CSA S269.2, Access Scaffolding for Construction Purposes
- .11 CSA-S269.3, Concrete Formwork.

### **1.03 SHOP DRAWINGS**

- .1 All formwork must be designed by a Professional Engineer Licensed in the Province of Construction. Upon request of the Departmental Representative, the Professional Engineer must supply written confirmation that all formwork has been designed to support all appropriate loads and in accordance with applicable standards.
- .2 Indicate on shop drawings; size and location of all openings, foundation wall step dimensions, elevations,

design data, permissible rate of concrete placement and any proprietary equipment information applicable to stability.

## **2 Products**

### **2.01 MATERIALS**

- .1 For concrete without special architectural features, use wood and wood product formwork materials to CSA-O121, CSA-O86, CSA O437 Series and CSA-O153.
- .2 For concrete with special architectural features, use formwork materials to CSA-A23.1.
- .3 Form ties:
  - .1 Where form ties penetrate the thermal envelope of the building (including sandwich foundation walls), use thermally non-conductive form ties.
  - .2 Where form ties do not penetrate the thermal envelope of the building, metallic ties are acceptable.
  - .3 For concrete not designated 'Architectural', use ties, fixed or adjustable length, free of devices leaving holes larger than 25 mm diameter in concrete surface.
  - .4 For Architectural concrete, use ties complete with plastic cones and light grey concrete plugs
- .4 Form release agent:
  - .1 Chemically active, non-staining, release agents containing compounds that react with free lime in concrete resulting in water insoluble soaps. Non-toxic, biodegradable, low VOC.
- .5 Form stripping agent:
  - .1 Colourless, non-staining, mineral oil, non-toxic, biodegradable, low VOC, free of kerosene, with viscosity between 70 and 110 s Saybolt Universal at 40 degrees C, and having a minimum flashpoint of 150 degrees C. Form release agents must be compatible with waterproofing systems where applicable.
- .6 Falsework materials: to CSA-S269.1.

## **3 Execution**

### **3.01 FABRICATION AND ERECTION**

- .1 Verify lines, levels and centres before proceeding with formwork/falsework and ensure dimensions agree with drawings.
- .2 Obtain Departmental Representative's approval for use of earth forms and for 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.
- .5 Refer to architectural drawings for concrete members requiring architectural exposed finishes.
- .6 Do not place shores and mud sills on frozen ground.
- .7 Provide site drainage to prevent washout of soil supporting mud sills and shores.
- .8 Fabricate and erect formwork in accordance with CSA-S269.3 to produce finished concrete conforming to shape, dimensions, locations and levels indicated within tolerances required by CSA-A23.1.
- .9 Align form joints and make watertight. Keep form joints to minimum.
- .10 Locate horizontal form joints in exposed columns and walls 2400 mm above finished floor elevation.
- .11 Use 25 mm chamfer strips on exterior corners and 25 mm fillets at interior corners unless specified otherwise.
- .12 Form all chases, slots, openings, drips, recesses, expansion and control joints. Also form pockets in concrete walls for cladding anchorage as required.
- .13 Build in anchors, inserts, sleeves, miscellaneous frames, flashing reglets, weather bars, holes, and other inserts required to accommodate work of other sections. This

includes all embedded items as required to support cladding elements and structural steel framing support. Assure that all anchors and inserts will not protrude beyond surfaces designated to receive applied finishes.

- .14 Clean formwork in accordance with CSA-A23.1, before placing concrete.
- .15 Construct forms for surfaces to receive membrane type waterproofing with taped joints and edges of plywood backed to prevent separation
- .16 Construction Joints:
  - .1 Form construction joints where required and as approved by the Departmental Representative.
  - .2 Costs of additional reinforcing steel resulting from splicing reinforcing bars, etc. as required to form construction joints in walls, slabs, etc. will be at the expense of the formwork contractor.
- .17 Holes cast into concrete during construction:
  - .1 Install all sleeves, ducts, pipes, and other openings.
  - .2 No sleeves, ducts, pipes or other openings shall pass through beams or column except where indicated or approved by the Departmental Representative.
  - .3 Ensure that where sleeves or pipes pass through slabs and walls they are fabricated of PVC, cast iron or galvanized steel. Sleeves shall not be spaced closer than three diameters on centre from adjacent sleeves unless approved by the Departmental Representative.
  - .4 Where approved by the Departmental Representative, set sleeves and openings as indicated or specified elsewhere. Provided they are shown on structural drawings, sleeves, pipes or openings, that are not greater than 450 mm square, or 450 mm in diameter, may pass through walls and slabs provided that no more than two reinforcing bars are interrupted and additional reinforcing steel is incorporated as per details on structural drawings. Contact Departmental Representative before installing any openings greater than 150 mm x 150 mm or 150 mm diameter that are not shown on structural drawings.

- .5 Check locations and sizes of sleeves and openings shown on drawings.

### **3.02 REMOVAL AND RESHORING**

- .1 Leave formwork in place for following minimum periods of time after placing concrete:
  - .1 3 days for walls
  - .2 2 days for footings and abutments.
- .2 Be responsible for the safety of the structure, both before and after removal of the forms, until concrete has reached its specified 28 day strength.
- .3 Strip formwork only when no damage will result from the stripping.
- .4 Take care in removing plywood forms. Do not jerk them loose or use metal pinch bars, but use wood wedges and gradually force the panels loose. Leave plywood forms in place as long as possible and until other adjacent formwork is stripped to permit maximum shrinkage away from concrete and to protect surfaces. Take particular care to prevent damage to external corners of concrete.
- .5 Re-use formwork and falsework subject to requirements of CSA-A23.1.
- .6 Movement and displacement of formwork during construction, variations in excess of specified tolerances, and marked and disfigured surfaces that cannot be repaired by methods acceptable to the Departmental Representative will be considered defective Work performed by the Section.
- .7 Reconstruct defective formwork and replace concrete and reinforcement placed in defective formwork at no additional cost to the Department.

### **3.03 QUALITY OF FORMWORK**

- .1 Particular attention must be paid to the quality of all concrete exposed to view upon completion of the project including retaining walls. In exposed surfaces, form ties

must be minimal, regular and neat and be plugged properly upon removal of formwork.

.2 For the above-mentioned elements the following special precautions must be taken:

- .1 All plywood form panels should be new at the start of this project.
- .2 Concrete shall be smooth form finish as described in CSA A23.1
- .3 Take special care in vibrating concrete in these elements.
- .4 All joints in formwork, both horizontally and vertically must be aligned.
- .5 Any concrete falling short of these requirements shall be removed and replaced at the formwork contractor's expense.

**END OF SECTION**

## **1 GENERAL**

### **1.01 RELATED REQUIREMENTS**

- .1 Section 03 10 00 - Concrete Formwork
- .2 Section 03 30 00 - Cast-In-Place Concrete

### **1.02 REFERENCES**

- .1 CSA-A23.1, Concrete Materials and Methods of Concrete Construction.
- .2 CSA-A23.2, Methods of Test and Standard Practices for Concrete.
- .3 CSA-A23.3, Design of Concrete Structures
- .4 CSA-G30.18, Billet-Steel Bars for Concrete Reinforcement.
- .5 CSA-G40.21, Structural Quality Steels.
- .6 ASTM A123M, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
- .7 CSA-G164, Hot Dip Galvanizing of Irregularly Shaped Articles
- .8 CSA W186, Welding of Reinforcing Bars in Reinforced Concrete Construction.
- .9 ASTM A-185, Standard Specification for Steel Welded Wire Reinforcement, Plain for Concrete
- .10 ASTM A-775M, Standard Specification for Epoxy Coated Reinforcing Steel Bars
- .11 RSIC, Reinforcing Steel Manual of Standard Practice

### **1.03 SHOP DRAWINGS**

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

- .2 Indicate on shop drawings, bar bending details, lists, quantities of reinforcement, sizes, spacings, locations of reinforcement and mechanical splices if approved by Departmental Representative, with identifying code marks to permit correct placement without reference to structural drawings. 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 CSA A23.3, unless otherwise indicated. Provide Type B tension lap splices to CSA A23.3 unless otherwise indicated.

## **2 PRODUCTS**

### **2.01 MATERIALS**

- .1 Substitute different size bars only if permitted by Departmental Representative.
- .2 Reinforcing steel: billet steel, grade 400, deformed bars to CSA-G30.18, unless indicated otherwise.
- .3 Reinforcing steel: weldable low alloy steel deformed bars to CAN/CSA-G30.18.
- .4 Welded steel wire fabric: to ASTM A185M. Provide in flat sheets only.
- .5 Chairs, bolsters, bar supports, spacers to CSA-A23.1.
- .6 Mechanical splices: subject to approval of Departmental Representative.
- .7 Plain round bars: to CSA-G40.21.

### **2.02 FABRICATION**

- .1 Fabricate reinforcing steel in accordance with CSA-A23.1 and Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada unless indicated otherwise.



- .2 Obtain Departmental Representative's approval for locations of reinforcement splices other than those shown on placing drawings.
- .3 Upon approval of Departmental Representative, weld reinforcement in accordance with CSA W186.
- .4 Ship bundles of bar reinforcement, clearly identified in accordance with bar bending details and lists.

### **2.03 SOURCE QUALITY CONTROL**

- .1 Upon request, provide Departmental Representative with certified copy of mill test report of reinforcing steel, showing physical and chemical analysis, prior to commencing reinforcing work.

## **3 EXECUTION**

### **3.01 FIELD BENDING**

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

### **3.02 PLACING REINFORCEMENT**

- .1 Place reinforcing steel as indicated on reviewed placing drawings and in accordance with 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 Departmental Representative's approval of reinforcing material and placement. Give Departmental Representative 24 hours notice.

- .4 Use chairs to support all reinforcing steel to ensure proper positioning and that cover to reinforcement is maintained during concrete pour. Chairs must also be used to support reinforcing steel in slabs on grade and footings.

### **3.03 FIELD TOUCH-UP**

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

**END OF SECTION**

## **1 General**

### **1.01 RELATED REQUIREMENTS**

- .1 Section 03 10 00 - Concrete Formwork
- .2 Section 03 20 00 - Reinforcing Steel

### **1.02 REFERENCES**

- .1 CSA-A23.1, Concrete Materials and Methods of Concrete Construction.
- .2 CSA-A23.2, Methods of Test and Standard Practices for Concrete.
- .3 CSA-A23.3, Design of Concrete Structures
- .4 CSA-A3000, Cementitious Materials Compendium.
- .5 ASTM C260, Specification for Air-Entraining Admixtures for Concrete.
- .6 ASTM C494, Specification for Chemical Admixtures for Concrete.
- .7 CAN/CGSB-37.2, Emulsified Asphalt, Mineral Colloid-Type, Unfilled, for Dampproofing and Waterproofing and for Roof Coatings.
- .8 CAN/CGSB-51.34, Vapour Barrier, Polyethylene Sheet for Use in Building Construction.
- .9 ASTM C939, Test Method for Flow of Grout for Preplaced-Aggregate Concrete
- .10 ASTM D412, Test Methods for Vulcanized Rubber and Thermoplastic Elastomers - Tension
- .11 ASTM D624, Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomer

- .12 ASTM D1653, Test Methods for Water Vapour Transmission of Organic Coating Films
- .13 ASTM D1751, Specification for Preformed Expansion Joint Fillers
- .14 ASTM D2240, Test Method for Rubber Property-Durometer Hardness
- .15 ASTM C309, Specification for Liquid Membrane-Forming Compounds for Curing Concrete
- .16 ASTM C578, Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation

### **1.03 CERTIFICATES**

- .1 Submit certificates in accordance with Section 01 00 00.
- .2 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.
- .3 Provide certification that plant, equipment, and materials to be used in concrete comply with requirements of CSA-A23.1. Ready-mix Plant must be a member of the Atlantic Provinces Ready Mixed Concrete Association and must hold a current "Certificate of Ready Mixed Concrete Production Facilities" as issued by the Association.

## **2 PRODUCTS**

### **2.01 MATERIALS**

- .1 Portland cement with fly ash replacement: to CSA-3000.
- .2 Supplementary cementing materials: to CSA-A3000.
- .3 Water: to CSA-A23.1.

- .4 Aggregates: to CSA-A23.1. Coarse aggregates to be normal density.
- .5 Air entraining admixture: to ASTM C260.
- .6 Chemical admixtures: to ASTM C494. Departmental Representative to approve accelerating or set retarding admixtures during cold and hot weather placing.
- .7 Concrete retarders: to ASTM C494 low VOC, solvent free.
- .8 Shrinkage compensating grout: premixed compound consisting of aggregate, cement, water reducing and plasticizing agents. Compressive strength: 55 MPa at 28 days.
- .9 Premoulded joint materials:
  - .1 Bituminous impregnated fiber board: to ASTM D1751.
- .10 Weep hole tubes: plastic.
- .11 Dampproof membrane:
  - .1 10 mil polyethylene film to CAN/CGSB-51.34
- .12 Dampproofing:
  - .1 Emulsified asphalt, mineral colloid type, unfilled: to CAN/CGSB-37.2.
- .13 Control Joint Filler:
  - .1 Two component, quick setting, semi-rigid, solvent free, self leveling, polyurea; Minimum tensile strength of 4.5 MPa; minimum elongation of 200% as per ASTM D412, and a minimum Shore A Hardness of 85 as per ASTM D2240.
- .14 Curing and Sealing Compound:
  - .1 Shall be an acrylic emulsion and water based curing compound, clear in colour. Product shall meet the requirements of ASTM C 309 and shall

have a maximum VOC content of 300 grams per litre.

.15 Surface Hardener:

- .1 Shall be mineral, non-metallic, shake applied. Minimum hardness shall be 6.5-7 on Mohs scale. Minimum compressive strength at 28 days shall be 50 MPa.

.16 Cast in Place Insulation System

- .1 Extruded polystyrene rigid board insulation having physical properties defined by ASTM C578 Type IV
- .2 High-strength, polymer locking retainers designed to position the fiber connector within the sheets of insulation.
- .3 Structurally non-composite, thermally non-conductive Wythe connectors.

**2.02 CONCRETE MIXES**

- .1 Proportion normal density concrete in accordance with CSA-A23.1, Alternative 1 to give the following properties for all concrete:
  - .1 Type GU Portland cement.
  - .2 Minimum compressive strength at 28 days: Refer to structural drawings
  - .3 Nominal size of coarse aggregate: 20 mm.
  - .4 Slump at time and point of discharge: 100 mm maximum.
  - .5 Air content: as per Table 4 of CSA Standard A23.1
  - .6 Chemical admixtures: in accordance with CSA - A3000.
  - .7 Replace 20% of cement by mass with fly ash in accordance with CAN/CSA-A23.5. If floor hardener is to be used in slabs, contact supplier of hardener regarding compatibility between hardener and fly ash and adjust fly ash content as necessary.
  - .8 Class of exposure shall be to Table 1 of CSA A23.1

- .9 Concrete Mix design to meet requirements of Table 2 in CSA A23.1 for appropriate class of exposure
- .10 All concrete to meet requirements of Tables 1 through 4 of CSA A23.1.

### **3 EXECUTION**

#### **3.01 PREPARATION**

- .1 Obtain Departmental Representative'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 Departmental Representative'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 In locations where new concrete is dowelled to existing work, drill holes in existing concrete. Place steel dowels of deformed steel reinforcing bars and pack solidly with epoxy grout to anchor and hold dowels in positions as indicated.
- .7 Do not place load upon new concrete until authorized by Departmental Representative.

#### **3.02 CONSTRUCTION**

- .1 Do cast-in-place concrete work in accordance with CSA-A23.1/ A23.2.
- .2 Holes, sleeves and inserts cast in during construction.

- .1 No sleeves, ducts, pipes or other openings shall pass through beams or columns except where indicated or approved by Departmental Representative.
  - .2 Where approved by Departmental Representative, set sleeves, ties, pipe hangers and other inserts and openings as indicated or specified. Sleeves, pipes or openings, that are not greater than 150 mm square, or 450 mm in diameter, may pass through walls and slabs provided that no more than two reinforcing bars are interrupted and additional reinforcing steel is incorporated as per details on structural drawings. Contact Departmental Representative before installing any openings greater than 150 mm square or 150 mm diameter that are not shown on drawings.
  - .3 Do not eliminate or displace reinforcement to accommodate hardware. If inserts cannot be located as specified, obtain approval of modifications from Departmental Representative 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 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 Install weep hole tubes and drains as indicated.
- .5 Grout under base plates and machinery using procedures in accordance with manufacturer's recommendations which result in 100 % contact over grouted area.



- .6 Finishing and Curing:
  - .1 Finish concrete in accordance with CSA-A23.1. Provide steel trowel finish for floor slabs unless noted otherwise. Coordinate finish with architect prior to casting slab.
  - .2 Use procedures acceptable to Departmental Representative or those noted in CSA-A23.1 to remove excess bleed water. Ensure surface is not damaged.
  - .3 Use curing compounds compatible with applied finish on concrete surfaces.
- .7 Provide depressions to accommodate flooring as required.
- .8 Rub exposed sharp edges of concrete with carborundum to produce 3 mm radius edges unless otherwise indicated.
- .9 Cast in Place Insulation System:
  - .1 Set formwork in accordance with section 03 10 00.
  - .2 Before installation of the insulation sheets in the forms, tape the individual sheets together. Install the tape on both sides of the insulation. Apply the tape only to clean, dry surfaces.
  - .3 Install the insulation assembly in the form.
  - .4 Install the connectors per manufactures' literature.
  - .5 Place the reinforcing for the remaining concrete layer and the ties to the connectors as required. Verify that the insulation is properly located in the form and close the form.
  - .6 During concrete placement, use accepted practice for concrete mix design and placement procedures for thin wall sections. If multiple walls intersect, start the concrete placement at the insulated walls. Ensure that the concrete is placed on both sides of the insulation with a maximum differential head of approximately 300 mm.

- .7 In installations with form-liners, maintain a positive differential head on the liner side to push the insulation and the connectors away from the liner.
- .10 Toppings.
  - .1 In pouring base course, make allowance for overlay toppings as necessary and applicable.
  - .2 Place toppings over hardened base course in accordance with CSA-A23.1 and topping manufacturer's recommendations.
  - .3 Follow instructions by Departmental Representative in case conflicting requirements arise between CSA-A23.1 and manufacturer's recommendations.
  - .4 Ensure that joints in topping are at the same locations as those in base course. Provide dividers, edge strips and reinforcing mesh as indicated.
- .11 Joints
  - .1 Construction Joints - Walls and Structural Slabs:
    - .1 In general, incorporate either horizontal or vertical construction joints, in accordance with CSA-A23.1.
    - .2 Immediately before next pour, clean construction joint and brush with grout of neat cement.
    - .3 Run reinforcement through construction joints unless noted otherwise.
    - .4 Construction Joints to be keyed unless noted otherwise.
  - .2 Construction Joints - Slabs on Grade:
    - .1 In general, incorporate construction joints, in accordance with CSA-A23.1.
    - .2 Immediately before next pour, clean construction joint and brush with grout of neat cement.
    - .3 Do not continue reinforcing thru Construction Joint. At slab mid-depth,

provide 13 mm diameter plain dowels, greased one side, at 600 mm centres. If drawings note different assembly, drawings will govern.

- .4 Construction Joints to be keyed.
- .3 Slab on Grade Isolation Joints:
  - .1 Do not install isolation joints in structural slabs.
  - .2 Isolation joints around all columns to form a square or round panel. Square isolation joints shall be orientated so all corners of the square align with slab control joints. If drawings note different assemblies, drawings will govern.
  - .3 Install 13 mm thick premoulded joint filler where slab on grade meets vertical surfaces. Install joint filler to within 13 mm of top of slab where sealer is indicated.
- .4 Slab on Grade Control Joints/Saw cuts:
  - .1 Discontinue reinforcing at saw cut location by stopping reinforcing 75 mm from each side of saw cut location.
  - .2 Saw 3 mm wide control joints into top surface of concrete slab. Depth of saw cut shall be between  $1/3^{\text{rd}}$  and  $1/4^{\text{th}}$  of total slab thickness. Do not saw-cut suspended slabs on metal deck.
  - .3 Locate control joints as indicated on structural drawings. Maximum spacing of control joints in each direction shall be 30 times the slab thickness. If drawings note different spacing, drawings will govern.
  - .4 Align control joints with columns when possible. Provide control joints in two directions at all inside corners.
  - .5 Timing of cutting control joints is crucial. Cut joints as soon as possible after casting slab. Timing of cutting control joints after casting of slab will vary as weather conditions, concrete mixes, etc. change.

- .6 Completely clean out saw-cut joints of dirt, oil, grease, and similar contaminants. Mask floor surfaces at joints while filling. Follow recommendations of joint filler manufacturer and fill all saw-cut joints with joint filler as specified.
- .12 Under-slab polyethylene film:
  - .1 Install polyethylene film under concrete slabs-on-grade inside building.
  - .2 Lap polyethylene film a minimum 150 mm at joints and seal.
  - .3 Seal punctures in polyethylene film before placing concrete. Use patching material at least 150 mm larger than puncture and seal.
- .13 Curing and Sealing Compound:
  - .1 Install in accordance with the manufacturers recommendations. Ensure compatibility with flooring adhesives. Remove as required prior to using flooring adhesives.
- .14 Surface Hardener:
  - .1 Install in accordance with manufacturers recommendations. Refer to manufacturer for application rates. Do not apply on concrete containing more than 3% air.

### **3.03 SURFACE TOLERANCE**

- .1 Concrete flatwork tolerance in accordance with CSA-A23.1 F-number method. Overall numbers for floor flatness and levelness ( $F_F$  and  $F_L$ ) to meet requirements of Table 21 in CSA A23.1 for appropriate class of use.

### **3.04 FIELD QUALITY CONTROL**

- .1 Inspection and testing of concrete and concrete materials will be carried out by a Testing Laboratory designated by Owner in accordance with CSA-A23.1 and CSA-A23.2.
- .2 Owner will pay for costs of tests.

- .3 Testing Laboratory will take additional test cylinders during cold weather concreting. Cure cylinders on job site under same conditions as concrete which they represent.
- .4 Non-destructive Methods for Testing Concrete shall be in accordance with CSA-A23.2.
- .5 Inspection or testing will not augment or replace Contractor quality control nor relieve him of his contractual responsibility.

**END OF SECTION**

## **1 GENERAL**

### **1.01 RELATED REQUIREMENTS**

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

### **1.02 REFERENCES**

- .1 ASTM International (ASTM)
  - .1 ASTM C1315-11, Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete.
  - .2 ASTM D1751-04(2013)e1, Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types).
  - .3 ASTM D1752-04a(2013), Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.
  - .4 ASTM F2659-10(2015), Standard Guide for Preliminary Evaluation of Comparative Moisture Condition of Concrete, Gypsum Cement and Other Floor Slabs and Screeds Using a Non-Destructive Electronic Moisture Meter.
- .2 CSA Group (CSA)
  - .1 CAN/CSA A23.1-14/A23.2-14, Concrete materials and methods of concrete construction / Test methods and standard practices for concrete, Includes Update No. 1 (2015).

### **1.03 ACTION AND INFORMATION SUBMITTALS**

- .1 Submit submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Provide manufacturer's printed product literature and data sheets for concrete finishes and include product characteristics, performance criteria, physical size, finish and limitations.

- .1 Provide two copies of WHMIS MSDS in accordance with Section 01 35 29.06 - Health and Safety Requirements. WHMIS MSDS acceptable to Labour Canada and Health and Welfare Canada for concrete floor treatment materials. Indicate VOC content in g/L.
- .2 Include application instructions for concrete floor treatment.

#### **1.04 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 work area water tight protected against rain and detrimental weather conditions.
- .4 Temperature:
  - .1 Maintain ambient temperature of not less than 10 degrees 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 before proceeding with any flooring applications.
- .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 Ventilate area of work by use of approved portable supply and exhaust fans as required to prevent humidity damage to other parts of the Work.

- .2 Ventilate enclosed spaces in accordance with Section 01 51 00 - Temporary Utilities.
- .3 Provide continuous ventilation during and after coating application.

#### **1.05 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements:
  - .1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

### **2 PRODUCTS**

#### **2.01 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.
- .3 Concrete slab finish: CSA A23.1 Class C Slab Finishing.

#### **2.02 SEALING COMPOUNDS**

- .1 Surface sealer: to CAN/CGSB 25.20, Type 2 water-based, clear, commercial grade sealer.
  - .1 Surface sealers manufactured or formulated with aromatic solvents, formaldehyde, halogenated solvents, mercury, lead, hexavalent chromium and their compounds are not acceptable.
  - .2 Surface sealer shall be compatible with the hardener and shall be manufactured by hardener manufacturer.
  - .3 Surface sealer shall have less than 100g/l of VOC in accordance with SCAQMD Rule #1113.

#### **2.03 HARDENERS**

- .1 Liquid Chemical Sealer and Hardener, Type: 1 Sodium silicate, permanent penetrating sealer and hardener, having the following minimum properties:



- .1 Liquid applied, water based, chemically reactive.
- .2 Non-toxic, non-flammable, and anti-dusting have low or no VOC.
- .3 Colour: colourless.
- .4 Compressive strength, to ASTM C39: 38% or greater increase at 28 days compared to untreated samples.
- .5 Impact Resistance, to ASTM C805: 13% or greater increase in impact resistance compared to untreated samples.
- .6 Coefficient of Friction, to ASTM C1028: Dry: 0.86 or better; Wet: 0.69 or better.
- .7 Abrasion Resistance, to ASTM C779: at least 32% increase in 30 minutes compared to untreated samples.

#### **2.04 CURING COMPOUNDS**

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

#### **2.05 MIXES**

- .1 Mixing ratios in accordance with manufacturer's written instructions.

#### **2.06 ACCESSORIES**

- .1 Cement, grey cement, colouring material, aggregates, water admixture: to CSA A23.4 and CSA A23.1. Supplementary cementing materials: to CSA A3000. Use same brands and source of cement and aggregate for entire project to ensure uniformity of colouration and other mix characteristics.
- .2 Joint Filler Strips:
  - .1 Floor Isolation Joints: to ASTM D1751, bituminous impregnated fibreboard, or to ASTM D1752, cork or self-expanding cork, 13 mm thick minimum.
  - .2 Edge Joint Filler: ASTM D1751, bituminous impregnated fibreboard, 13 mm thick minimum.
- .3 Control Joints, to Section 07 92 00 - Joint Sealants, Control joint sealant: two-component, epoxy-urethane, self-levelling, load-bearing sealant for saw cut or preformed control joints.

### **3 EXECUTION**

#### **3.01 GENERAL**

- .1 Comply with the requirements of Section 03 30 00 - Cast-in-Place Concrete.

#### **3.02 EXAMINATION**

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

#### **3.03 FINISHING FORMED SURFACES**

- .1 Unspecified Finish: Provide following finishes as applicable when finish of formed surfaces is not specifically indicated:
- .2 Unexposed Surfaces:
  - .1 Rough form finish for concrete not exposed to view.
  - .2 Smooth form finish for concrete to receive membrane waterproofing.
- .3 Exposed Surfaces:
  - .1 Smooth form finish for concrete surfaces exposed to view.
- .4 Rough Form Finish: Leave surfaces with texture imparted by forms; patch tie holes and defects; remove fins longer than 6 mm high.
- .5 Smooth Form Finish: Coordinate as necessary to secure form construction using smooth, hard, uniform surfaces with number of seams kept to a minimum, uniformly spaced in an orderly pattern; patch tie holes and defects; completely remove fins.

#### **3.04 FINISHING SLABS**

- .1 Finish floors and slabs in accordance with CSA A23.1 recommendations for screeding, re-straightening, and finishing operations for concrete surfaces; do not wet concrete surfaces.
- .2 Float (Initial) Finishing:

- .1 Consolidate surface with power driven floats or by hand floating if area is small or inaccessible to power driven floats.
  - .2 Re-straighten, cut down high spots, and fill low spots.
  - .3 Repeat float passes and re straightening until surface is left with a uniform, smooth, granular texture.
  - .4 Apply float finishing to surfaces receiving trowel finishing.
- .3 Trowel (Final) Finishing:
- .1 Commence trowel finishing after all bleed water has disappeared and when the concrete has stiffened sufficiently to prevent the working of excess mortar to the surface.
  - .2 Apply first trowelling and consolidate concrete by hand or power driven trowel after applying float finishing; continue trowelling passes and re-straighten until surface is free of trowel marks and uniform in texture and appearance; repair or smooth any surface defects that would telegraph through applied coatings or floor covering.
  - .3 Apply a trowel finishing to surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin film finish coating system.
  - .4 Finish surfaces to the tolerances required for CSA A23.1 Class C Slab Finish.
- .4 Curing:
- .1 cure to Section 03 30 00 - Cast-in-Place Concrete requirements.

### **3.05 LIQUID APPLIED FLOOR HARDENER**

- .1 Apply liquid floor hardener in accordance with manufacturer's written instructions after initial floating.
- .2 Cure concrete in accordance with manufacturer's recommended instructions.

### **3.06 LIQUID APPLIED FLOOR SEALER AND JOINT SEALANTS**

- .1 Seal horizontal control joints, and joints at junction of floor with vertical surfaces, with Control Joint Filler.

- .2 Apply concrete floor sealer in accordance with sealer manufacturer's printed instructions and technical datasheets.
- .3 Mask as required. Clean overspray. Clean sealant from adjacent surfaces.

### **3.07 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

### **3.089 PROTECTION**

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

**END OF SECTION**