

**Part 1            General**

**1.1                REFERENCES**

- .1 Canadian Standards Association (CSA International)
  - .1 CSA-A23.1-04/A23.2-04, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
  - .2 CSA-O86S1-05, Supplement No. 1 to CAN/CSA-O86-01, Engineering Design in Wood.
  - .3 CSA O121-M1978(R2003), Douglas Fir Plywood.
  - .4 CSA O151-04, Canadian Softwood Plywood.
  - .5 CSA O153-M1980(R2003), Poplar Plywood.
  - .6 CAN/CSA-O325.0-92(R2003), Construction Sheathing.
  - .7 CSA O437 Series-93(R2006), Standards for OSB and Waferboard.
  - .8 CSA S269.1-1975(R2003), Falsework for Construction Purposes.
  - .9 CAN/CSA-S269.3-M92(R2003), Concrete Formwork, National Standard of Canada
- .2 Underwriters' Laboratories of Canada (ULC)
  - .1 CAN/ULC-S701-05, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.

**1.2                SUBMITTALS**

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit shop drawings for formwork and falsework.
- .3 Submit WHMIS MSDS - Material Safety Data Sheets in accordance with Section Section 02 81 01 - Hazardous Materials.
- .4 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.
- .5 Indicate formwork design data: permissible rate of concrete placement, and temperature of concrete, in forms.
- .6 Indicate sequence of erection and removal of formwork/falsework as directed by Contract Administrator.
- .7 When slip forming and flying forms are used, submit details of equipment and procedures for review by Contract Administrator.

**Part 2 General**

**2.1 LEED REQUIREMENTS**

- .1 See Section 01 35 21 - LEED Requirements.
- .2 LEED Submittals: Submit LEED supporting documentation in accordance with Section 01 35 21 - LEED Requirements.
- .3 Waste Management and Disposal: Dispose of packaging and waste materials in appropriate on-site bins for recycling and disposal in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .4 FSC Certified Wood: (Separate Price). Supply a minimum of 50% (by cost) of wood-based materials that are produced from FSC sources in accordance with LEED Materials and Resources Credit MR 7 – Certified Wood.

**Part 3 Products**

**3.1 GENERAL**

- .1 See the Structural Drawings for further information.
- .2 In any situation where the specifications do not agree with the specifications or intent of the Structural Drawings or the Geotechnical Report:
  - .1 The Structural Drawings and Geotechnical Report shall govern.
  - .2 The Consultant must be alerted, whom will then confirm requirements.

**3.2 MATERIALS**

- .1 Formwork materials:
  - .1 For concrete without special architectural features, use wood and wood product formwork materials to CSA-O121 CAN/CSA-O86 CSA O437 Series CSA-O153.
  - .2 For concrete with special architectural features, use formwork materials to CSA-A23.1/A23.2.
  - .3 Rigid insulation board: to CAN/ULC-S701.
- .2 Pan forms: as indicated.
- .3 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 diameter in concrete surface.
  - .2 For Architectural concrete, use snap ties complete with plastic cones and light grey concrete plugs.
- .4 Form liner:

- .1 Plywood: medium density overlay Douglas Fir to CSA O121.
- .5 Form release agent: non-toxic, biodegradable, low VOC.
- .6 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 mm<sup>2</sup>/s at 40 degrees C, flashpoint minimum 150 degrees C, open cup.
- .7 Falsework materials: to CSA-S269.1.
- .8 Sealant: to Section 07 92 00 - Joint Sealing.

## **Part 4 Execution**

### **4.1 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.
- .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 CSA-A23.1/A23.2.
- .8 Align form joints and make watertight.
  - .1 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 as directed.
  - .1 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.

.1 Ensure that anchors and inserts will not protrude beyond surfaces designated to receive applied finishes, including painting.

Clean formwork in accordance with CSA-A23.1/A23.2, before placing concrete.

.14 When slip forming and flying forms are used, submit details as indicated in PART 1 - SUBMITTALS.

.15 Re-use formwork and falsework subject to requirements of CSA-A23.1/A23.2.

#### **4.2 SCHEDULE**

.1 Architectural finish required:

.1 Stairway S 01.

.2 Circulation B 01.

**END OF SECTION**

**Part 1 General**

**1.1 PRICE AND PAYMENT PROCEDURES**

.1 Measurement and Payment:

.1 No measurement will be made under this Section.

.1 Include reinforcement costs in items of concrete work in Section 03 30 00 - Cast-In-Place Concrete.

**1.2 REFERENCES**

.1 American Concrete Institute (ACI)

.1 SP-66-04, ACI Detailing Manual 2004.

.1 ACI 315-99, Details and Detailing of Concrete Reinforcement.

.2 ACI 315R-04, Manual of Engineering and Placing Drawings for Reinforced Concrete Structures.

.2 ASTM International

.1 ASTM A82/A82M-07, Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.

.2 ASTM A143/A143M-07, Standard Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement.

.3 ASTM A185/A185M-07, Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.

.4 ASTM A775/A775M-07b, Standard Specification for Epoxy-Coated Reinforcing Steel Bars.

.3 CSA International

.1 CSA-A23.1-09/A23.2-09, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.

.2 CSA-A23.3-04, Design of Concrete Structures.

.3 CSA-G30.18-09, Carbon Steel Bars for Concrete Reinforcement.

.4 CSA-G40.20/G40.21-04(R2009), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.

.5 CAN/CSA-G164-M92(R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.

.6 CSA W186-M1990(R2007), Welding of Reinforcing Bars in Reinforced Concrete Construction.

.4 Reinforcing Steel Institute of Canada (RSIC)

.1 RSIC-2004, Reinforcing Steel Manual of Standard Practice.

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

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

- .2 Prepare reinforcement drawings in accordance with RSIC Manual of Standard Practice and ACI 315.
- .3 Shop Drawings:
  - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Manitoba, Canada.
    - .1 Indicate placing of reinforcement and:
      - .1 Bar bending details.
      - .2 Lists.
      - .3 Quantities of reinforcement.
      - .4 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.
      - .5 Indicate sizes, spacings and locations of chairs, spacers and hangers.
    - .2 Detail lap lengths and bar development lengths to CSA-A23.3, unless otherwise indicated.
  - .4 When Chromate solution is used as replacement for galvanizing non-prestressed reinforcement, provide product description for review by Contract Administrator prior to its use.

#### 1.4 QUALITY ASSURANCE

- .1 Submit in accordance with Section 01 45 00 - Quality Control and as described in PART 2 - SOURCE QUALITY CONTROL.
  - .1 Mill Test Report: provide Contract Administrator with certified copy of mill test report of reinforcing steel, minimum 4 weeks prior to beginning reinforcing work.
  - .2 Submit in writing to Contract Administrator proposed source of reinforcement material to be supplied.

#### 1.5 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: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials off ground, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Replace defective or damaged materials with new.

#### 1.6 LEED REQUIREMENTS

- .1 See Section 01 35 21 - LEED Requirements.

- .2 LEED Submittals: Submit LEED supporting documentation in accordance with Section 01 35 21 - LEED Requirements.
- .3 Waste Management and Disposal: Dispose of packaging and waste materials in appropriate on-site bins for recycling and disposal in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .4 Recycled Content: Supply building materials with recycled materials (post consumer plus ½ post-industrial content) in accordance with LEED Materials and Resources Credits MR 4.1 & 4.2 – Recycled Content.
- .5 Regional Materials: Supply building materials that are regionally extracted, harvested, or recovered within 800km of the project location when shipped by truck, or within 2400km of the project location when shipped by rail, in accordance with LEED Materials and Resources Credit MR 5.1 & 5.2 – Regional Materials.

## **Part 2 Products**

### **2.1 GENERAL**

- .1 See the Structural Drawings for further information.
- .2 In any situation where the specifications do not agree with the specifications or intent of the Structural Drawings or the Geotechnical Report:
  - .1 The Structural Drawings and Geotechnical Report shall govern.
  - .2 The Consultant must be alerted, whom will then confirm requirements.

### **2.2 MATERIALS**

- .1 Recycled Content: Steel to contain 35% recycled material. (Post consumer plus ½ post-industrial content.)
- .2 Regional Materials: Steel to meet Regional Materials requirements.
- .3 Substitute different size bars only if permitted in writing by Contract Administrator.
- .4 Reinforcing steel: as indicated on drawings.
- .5 Cold-drawn annealed steel wire ties: to ASTM A82/A82M.
- .6 Deformed steel wire for concrete reinforcement: to ASTM A82/A82M.
- .7 Welded steel wire fabric: to ASTM A185/A185M.
  - .1 Provide in flat sheets only.
- .8 Welded deformed steel wire fabric: to ASTM A82/A82M.
  - .1 Provide in flat sheets only.
- .9 Epoxy Coating of non-prestressed reinforcement: to ASTM A775/A775M.

- .10 Galvanizing of non-prestressed reinforcement: to CAN/CSA-G164, minimum zinc coating 610 g/m<sup>2</sup>.
  - .1 Protect galvanized reinforcing steel with chromate treatment to prevent reaction with Portland cement paste.
  - .2 If chromate treatment is carried out immediately after galvanizing, soak steel in aqueous solution containing minimum 0.2% by weight sodium dichromate or 0.2% chromic acid.
    - .1 Temperature of solution equal to or greater than 32 degrees and galvanized steels immersed for minimum 20 seconds.
  - .3 If galvanized steels are at ambient temperature, add sulphuric acid as bonding agent at concentration of 0.5% to 1%.
    - .1 In this case, no restriction applies to temperature of solution.
  - .4 Chromate solution sold for this purpose may replace solution described above, provided it is of equivalent effectiveness.
    - .1 Provide product description as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.
- .11 Chairs, bolsters, bar supports, spacers: to CSA-A23.1/A23.2.
- .12 Mechanical splices: subject to approval of Contract Administrator.
- .13 Plain round bars: to CSA-G40.20/G40.21.

## 2.3 FABRICATION

- .1 Fabricate reinforcing steel in accordance with CSA-A23.1/A23.2 ACI 315 and Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada.
  - .1 ACI 315R unless indicated otherwise.
- .2 Obtain Contract Administrator's written 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.
  - .1 Ship epoxy coated bars in accordance with ASTM A775A/A775M.

## 2.4 SOURCE QUALITY CONTROL

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



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**Part 3 Execution**

**3.1 PREPARATION**

- .1 Galvanizing to include chromate treatment.
  - .1 Duration of treatment to be 1 hour per 25 mm of bar diameter.
- .2 Conduct bending tests to verify galvanized bar fragility in accordance with ASTM A143/A143M.

**3.2 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 slow and steady pressure.
- .3 Replace bars, which develop cracks or splits.

**3.3 PLACING REINFORCEMENT**

- .1 Place reinforcing steel as indicated on placing drawings and in accordance with CSA-A23.1/A23.2.
- .2 Use plain round bars as slip dowels in concrete.
  - .1 Paint portion of dowel intended to move within hardened concrete with one coat of asphalt paint.
  - .2 When paint is dry, apply 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.

**3.4 FIELD TOUCH-UP**

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

**3.5 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.

**END OF SECTION**

**Part 1            General**

**1.1                PRICE AND PAYMENT PROCEDURES**

.1            Measurement and Payment:

- .1            Cast-in-place concrete in superstructure will not be measured but will be paid for as a fixed price item.
- .2            Supply and installation of anchor bolts, nuts and washers and bolt grouting will not be measured but considered incidental to work.

**1.2                REFERENCES**

.1            Abbreviations and Acronyms:

- .1            Cement: hydraulic cement or blended hydraulic cement (XXb - where b denotes blended).

- .1            Type GU or GUb - General use cement.
- .2            Type MS or MSb - Moderate sulphate-resistant cement.
- .3            Type MH or MHb - Moderate heat of hydration cement.
- .4            Type HE or Heb - High early-strength cement.
- .5            Type LH or LHb - Low heat of hydration cement.
- .6            Type HS or HSb - High sulphate-resistant cement.

.2            Fly ash:

- .1            Type F - with CaO content less than 8%.
- .2            Type CI - with CaO content ranging from 8 to 20%.
- .3            Type CH - with CaO greater than 20%.

.3            GGBFS - Ground, granulated blast-furnace slag.

.2            Reference Standards:

.1            ASTM International

- .1            ASTM C260-06, Standard Specification for Air-Entraining Admixtures for Concrete.
- .2            ASTM C309-07, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
- .3            ASTM C494/C494M-08a, Standard Specification for Chemical Admixtures for Concrete.
- .4            ASTM C1017/C1017M-07, Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
- .5            ASTM D412-06ae1, Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension.
- .6            ASTM D624-00(2007), Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomer.
- .7            ASTM D1751-04, Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).

- .8 ASTM D1752-04a, Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC 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(R1988), Vapour Barrier, Polyethylene Sheet for Use in Building Construction.
- .3 Canada Green Building Council (CaGBC)
  - .1 LEED Canada-NC Version 1.0-2004, LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Package For New Construction and Major Renovations (including Addendum 2007).
  - .2 LEED Canada-CI Version 1.0-2007, LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Guide For Commercial Interiors.
- .4 CSA International
  - .1 CSA A23.1/A23.2-2004, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
  - .2 CSA A283-06, Qualification Code for Concrete Testing Laboratories.
  - .3 CSA A3000-08, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).

### **1.3 ADMINISTRATIVE REQUIREMENTS**

- .1 Pre-installation Meetings: Convene pre-installation meeting one week prior to beginning concrete works.
  - .1 Ensure key personnel, site supervisor, Contract Administrator attend.
    - .1 Verify project requirements.

### **1.4 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Provide testing results and reports for review by Contract Administrator and do not proceed without written approval when deviations from mix design or parameters are found.
- .3 Concrete pours: provide accurate records of poured concrete items indicating date and location of pour, quality, air temperature and test samples taken as described in PART 3 - FIELD QUALITY CONTROL.
- .4 Concrete hauling time: provide for review by Contract Administrator deviations exceeding maximum allowable time of 120 minutes for concrete to be delivered to site of Work and discharged after batching.
- .5 Provide two copies of WHMIS MSDS in accordance with Section 01 35 43 - Environmental Procedures.

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**1.5 QUALITY ASSURANCE**

- .1 Quality Assurance: in accordance with Section 01 45 00 - Quality Control.
- .2 Provide Contract Administrator, minimum 4 weeks prior to starting concrete work, with valid and recognized certificate from plant delivering concrete.
  - .1 Provide test data and certification by qualified independent inspection and testing laboratory that materials and mix designs used in concrete mixture will meet specified requirements.
- .3 Minimum 4 weeks prior to starting concrete work, provide proposed quality control procedures for review by Contract Administrator on following items:
  - .1 Falsework erection.
  - .2 Hot weather concrete.
  - .3 Cold weather concrete.
  - .4 Curing.
  - .5 Finishes.
  - .6 Formwork removal.
  - .7 Joints.

**1.6 DELIVERY, STORAGE AND HANDLING**

- .1 Delivery and Acceptance Requirements:
  - .1 Concrete hauling time: deliver to site of Work and discharged within 120 minutes maximum after batching.
    - .1 Do not modify maximum time limit without receipt of prior written agreement from Contract Administrator and concrete producer as described in CSA A23.1/A23.2.
    - .2 Deviations to be submitted for review by Contract Administrator.
  - .2 Concrete delivery: ensure continuous concrete delivery from plant meets CSA A23.1/A23.2.

**1.7 LEED REQUIREMENTS**

- .1 See Section 01 35 21 - LEED Requirements.
- .2 LEED Submittals: Submit LEED supporting documentation in accordance with Section 01 35 21 - LEED Requirements.
- .3 Waste Management and Disposal: Dispose of packaging and waste materials in appropriate on-site bins for recycling and disposal in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .4 Recycled Content: Supply building materials with recycled materials (post consumer plus ½ post-industrial content) in accordance with LEED Materials and Resources Credits MR 4.1 & 4.2 – Recycled Content.
- .5 Regional Materials: Supply building materials that are regionally extracted, harvested, or recovered within 800km of the project location when shipped by truck, or within 2400km of

the project location when shipped by rail, in accordance with LEED Materials and Resources Credit MR 5.1 & 5.2 – Regional Materials.

- .6 Indoor Environmental Quality Credit EQ 4 – Low - Emitting Materials.
  - .1 LEED Indoor Environmental Quality Credit EQ 4.1 – Low-Emitting Materials: Adhesives and Sealants.
    - .1 Low VOC complying with SCAQMD Rule #1168, Latest edition.

## **Part 2 Products**

### **2.1 GENERAL**

- .1 See the Structural Drawings for further information.
- .2 In any situation where the specifications do not agree with the specifications or intent of the Structural Drawings or the Geotechnical Report:
  - .1 The Structural Drawings and Geotechnical Report shall govern.
  - .2 The Consultant must be alerted, whom will then confirm requirements.

### **2.2 DESIGN CRITERIA**

- .1 To CSA A23.1/A23.2 and as per Structural Drawings.

### **2.3 MATERIALS**

- .1 Supplementary cementing materials: to CSA A3001.
  - .1 Portland Cement Reduction  $\geq 30\%$ .
- .2 Regional Materials: Concrete to meet Regional Materials requirements.
- .3 Cement: to CSA A3001 and as indicated in Structural Drawings.
- .4 Water: to CSA A23.1.
- .5 Aggregates: to CSA A23.1/A23.2.
- .6 Admixtures:
  - .1 Air entraining admixture: to ASTM C260.
  - .2 Chemical admixture: to ASTM C494 ASTM C1017. 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 to CSA A23.1/A23.2.
  - .1 Compressive strength: 40 MPa at 28 days.
  - .2 Net shrinkage at 28 days: maximum 0 %.
- .8 Curing compound: to CSA A23.1/A23.2 white.

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- .9 Premoulded joint fillers:
    - .1 Bituminous impregnated fiber board: to ASTM D1751.
    - .2 Sponge rubber: to ASTM D1752, Type I, flexible firm grade.
  - .10 Dampproof membrane and Dampproofing: See Section 07 11 13 – Bituminous Dampproofing and Waterproofing.
  - .11 Polyethylene film: 0.254 mm (10mil) thickness to CAN/CGSB-51.34.

## **2.4 MIXES**

- .1 Concrete mix as indicated on Structural Drawings.
  - .1 Concrete mix to CSA A23.1.
  - .2 Co-ordinate construction methods to suit Contract Administrator concrete mix proportions and parameters.
  - .3 Identify and report immediately to Contract Administrator when concrete mix design and parameters pose anticipated problems or deficiencies related to construction.

## **Part 3 Execution**

### **3.1 PREPARATION**

- .1 Obtain Contract Administrator's written approval before placing concrete.
  - .1 Provide 24 hours minimum notice prior to placing of concrete.
- .2 Place concrete reinforcing in accordance with Section 03 20 00 - Concrete Reinforcing.
- .3 During concreting operations:
  - .1 Development of cold joints not allowed.
  - .2 Ensure concrete delivery and handling facilitates placing with minimum of re-handling, and without damage to existing structure or Work.
- .4 Pumping of concrete only permitted with prior approval of Contract Administrator.
- .5 Ensure reinforcement and inserts are not disturbed during concrete placement.
- .6 Prior to placing of concrete obtain Contract Administrator's approval of proposed method for protection of concrete during placing and curing in adverse weather.
- .7 Protect previous Work from staining.
- .8 Clean and remove stains prior to application for concrete finishes.
- .9 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, air temperature and test samples taken.
- .1 In locations where new concrete is dowelled to existing work, drill holes in existing concrete.

.1 Place steel dowels and pack solidly with shrinkage compensating grout/epoxy grout to anchor and hold dowels in positions as indicated.

.2 Do not place load upon new concrete until authorized by Contract Administrator.

### **3.2 INSTALLATION/APPLICATION**

.1 Do cast-in-place concrete work to CSA A23.1/A23.2.

.2 Sleeves and inserts:

.1 Do not permit penetrations, sleeves, ducts, pipes or other openings to 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.

.3 Sleeves and openings greater than 100 x 100 mm not indicated, must be reviewed by Contract Administrator.

.4 Do not eliminate or displace reinforcement to accommodate hardware. If inserts cannot be located as specified, obtain written approval of modifications from Contract Administrator before placing of concrete.

.5 Confirm locations and sizes of sleeves and openings shown on drawings.

.6 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 in co-ordination with appropriate trade prior to placing concrete.

.2 Grout anchor bolts in preformed holes or holes drilled after concrete has set only after receipt of written approval from Contract Administrator.

.1 Formed holes: 100 mm minimum diameter.

.2 Drilled holes: to manufacturers' 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 Finishing and curing:

.1 Finish concrete to CSA A23.1/A23.2.

.2 Architectural smooth finish required:

.1 Stairway S 01.

.2 Circulation B 01.



- .3 Use procedures as reviewed by Contract Administrator or those noted in CSA A23.1/A23.2 to remove excess bleed water. Ensure surface is not damaged.
- .4 Use curing compounds compatible with applied finish on concrete surfaces. Provide written declaration that compounds used are compatible.
- .5 Rub exposed sharp edges of concrete with carborundum to produce 3 mm minimum radius edges unless otherwise indicated.
- .6 Waterstops:
  - .1 Install waterstops to provide continuous water seal.
  - .2 Do not distort or pierce waterstop in way as to hamper performance.
  - .3 Do not displace reinforcement when installing waterstops.
  - .4 Use equipment to manufacturer's requirements to field splice waterstops.
  - .5 Tie waterstops rigidly in place.
  - .6 Use only straight heat sealed butt joints in field.
  - .7 Use factory welded corners and intersections unless otherwise approved by Contract Administrator.
- .7 Joint fillers:
  - .1 Furnish filler for each joint in single piece for depth and width required for joint, unless otherwise authorized by Contract Administrator.
  - .2 When more than one piece is required for joint, fasten abutting ends and hold securely to shape by stapling or other positive fastening.
  - .3 Locate and form construction/expansion joints as indicated.
  - .4 Install joint filler.
  - .5 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.
- .8 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.
  - .4 Use patching material at least 150 mm larger than puncture and seal.

### **3.3 SURFACE TOLERANCE**

- .1 Concrete tolerance to CSA A23.1.

### **3.4 FIELD QUALITY CONTROL**

- .1 Site tests: conduct tests as follows in accordance with Section 01 45 00 - Quality Control and submit report as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.
  - .1 Concrete pours.
  - .2 Slump.
  - .3 Air content.

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- .4 Compressive strength at 7 and 28 days.
  - .5 Air and concrete temperature.
  - .2 Inspection and testing of concrete and concrete materials will be carried out by testing laboratory designated by Contract Administrator for review to CSA A23.1/A23.2.
    - .1 Ensure testing laboratory is certified to CSA A283.
  - .3 Ensure test results are distributed for discussion at pre-pouring concrete meeting between testing laboratory and Contract Administrator.
  - .4 Contract Administrator will pay for costs of tests as specified in Section 01 29 83 - Payment Procedures for Testing Laboratory Services.
  - .5 Contract Administrator will take additional test cylinders during cold weather concreting. Cure cylinders on job site under same conditions as concrete which they represent.
  - .6 Non-Destructive Methods for Testing Concrete: to CSA A23.1/A23.2.
  - .7 Inspection or testing by Consultant will not augment or replace Contractor quality control nor relieve Contractor of his contractual responsibility.

**3.5 CLEANING**

- .1 Clean in accordance with Section 01 74 11 - Cleaning.

**END OF SECTION**

**Part 1 General**

**1.1 SECTION INCLUDES**

- .1 Application of water-soluble, inorganic hardening, sealing and dust-proofing product for treatment of uncovered concrete floor surfaces.

**1.2 REFERENCES**

- .1 Health Canada - Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (MSDS).
- .2 Corps of Engineers Specification: CECS 03300 4-79
- .3 ACI 308: Standard Specification for Curing Concrete

**1.3 QUALITY ASSURANCE**

- .1 Applicator: Experience in application of similar systems and products on projects of similar size and scope.
  - .1 Successful completion of a minimum of 3 projects of similar size and complexity to specified Work.
- .2 Manufacturer Qualifications: Company shall be ISO 9001:2000 Certified.
- .3 Manufacturer: Minimum 15 years of experience in manufacturing of surface hardener.

**1.4 SUBMITTALS**

- .1 Submit product data in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Include application instructions for concrete hardener.
- .3 Submit WHMIS MSDS - Material Safety Data Sheets in accordance with Section 02 81 01 - Hazardous Materials.
  - .1 WHMIS MSDS acceptable to Human Resources Development Canada-Labour and Health Canada for concrete floor hardeners.
  - .2 Indicate VOC content.

**1.5 DELIVERY, STORAGE AND HANDLING**

- .1 Comply with manufacturer's ordering instructions and lead-time requirements to avoid construction delays.
- .2 Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- .3 Store tightly sealed materials off ground and away from moisture, direct sunlight, extreme heat, and freezing temperatures.

- .4 Store in unopened packaging in clean, dry environment protected from sunlight at 40 degrees F (4 degrees C) to 85 degrees F (29 degrees C). Prevent material from freezing.

## 1.6 ENVIRONMENTAL REQUIREMENTS

- .1 Temporary lighting
  - .1 Minimum 1200 W light source, placed 2.5 m above floor surface, for each 40 m<sup>2</sup> of floor being finished.
- .2 Electrical power
  - .1 Sufficient electrical power to operate equipment normally used during construction.
- .3 Work area
  - .1 Do not place surface hardener in areas without roof cover.
- .4 Temperature
  - .1 Allow surfaces to attain temperature and conditions specified by manufacturer before proceeding with surface hardener application.
  - .2 Ensure that substrate surface and ambient air temperature are minimum of 35 degrees F (minus 7 degrees C) and rising at application time and remain above 35 degrees F (minus 7 degrees C) for at least 24 hours after application. Ensure that frost or frozen surfaces are thawed and dry.
- .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 Ventilate area of work as required by manufacturer's instructions.

## 1.7 LEED REQUIREMENTS

- .1 See Section 01 35 21 - LEED Requirements.
- .2 LEED Submittals: Submit LEED supporting documentation in accordance with Section 01 35 21 - LEED Requirements.
- .3 Waste Management and Disposal: Dispose of packaging and waste materials in appropriate on-site bins for recycling and disposal in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .4 Indoor Environmental Quality Credit EQ 4 – Low - Emitting Materials.
  - .1 LEED Indoor Environmental Quality Credit EQ 4.1 – Low-Emitting Materials: Adhesives and Sealants.
    - .1 Low VOC complying with SCAQMD Rule #1168, Latest edition.

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**Part 2 Products**

**2.1 FLOOR HARDENER**

- .1 Materials: Water soluble sealer/densifier, that when applied in accordance with manufacturers application recommendations will produce a dense surface resistant to abrasion, moisture, tire marking and provides added gloss to the floor finish.
  - .1 VOC Content: None
  - .2 Color: Clear.
  - .3 Acceptable Product: Kure N Harden<sup>®</sup> by BASF Building Systems or approved equivalent in accordance with B6 Substitutes.

**Part 3 Execution**

**3.1 EXAMINATION**

- .1 Verify that slab surfaces are ready to receive Work.

**3.2 SURFACE PREPARATION:**

- .1 New Concrete: Properly finish freshly placed concrete surfaces. Surface is ready for application when it is damp but not wet and when it can no longer be marred by foot traffic.
- .2 Existing (cured) Concrete: Thoroughly repair and clean existing concrete surfaces before application. Ensure surfaces are clean, dry, and free of dust, oil, grease, sealers, and other surface contaminants that might inhibit penetration of treatment.

**3.3 APPLICATION**

- .1 Kure N Harden<sup>®</sup> is not a curing compound (film forming product), but should fully saturate the concrete surface for best results. Follow manufacturer's application recommendations. Acquire and review most current manufacturers published data. Including MSDS and warranty.
- .2 New Concrete: Green concrete immediate application.
  - .1 Apply undiluted Kure N Harden<sup>®</sup> to finished, damp concrete surface with low pressure sprayer after all surface water has evaporated and the surface will not be marred or damaged by application procedures. Keep the treated surface area wet with product for thirty (30) minutes by spraying additional product and/or brooming excess material from low areas. Do not allow dry spots to occur. Prevent any drying of surface for twenty (20) - thirty (30) minutes.
  - .2 As Kure N Harden<sup>®</sup> begins to penetrate and react, mist the surface lightly with clean water and brush, broom or power scrub with non-aggressive brush or pad into surface to aid penetration/reaction.
  - .3 After thirty (30) minutes, depending on temperature and humidity, Kure N Harden<sup>®</sup> will begin to gel. Keep all treated surfaces moist, and continue brushing/scrubbing action for 5-15 minutes. At this stage, the surface can be slippery. Use caution.

- .4 Flush the surface with water and squeegee the surface to remove excess material and all impurities present on the surface. Rinse with generous amounts of water to enhance product performance. Finish with a damp mop.
  - .5 DO NOT allow Kure N Harden<sup>®</sup> residue to dry on the surface. Any product allowed to dry on the surface may cause white residue that can be difficult to remove.
- .3 Existing Concrete (Cured)
- .1 For best results, apply to concrete cured seven (7) days or longer.
  - .2 Assure surface is clean and free of contaminants (waxes, curing membrane, oil, etc).
  - .3 Apply undiluted Kure N Harden<sup>®</sup> to saturation level by sprayer, broom or squeegee.
  - .4 Keep the treated surface area wet with product for thirty (30) minutes by spraying additional product and/or brooming excess material from low areas.
  - .5 Do not allow dry spots to occur. Prevent any drying of surface for twenty (20)-thirty (30) minutes. Use brooms or floor scrubber with non-aggressive pad or brushes to aid in penetration.
  - .6 After twenty (20)-thirty (30) minutes, depending on temperature and humidity, Kure N Harden<sup>®</sup> will begin to gel. Keep all treated surfaces moist, and continue brushing/scrubbing action for 5-15 minutes. At this stage, the surface can be slippery. Use caution.
  - .7 Flush the surface with water and squeegee the surface to remove excess material and all impurities present on the surface. Rinse with generous amounts of water to enhance product performance. Finish with a damp mop.
  - .8 DO NOT allow Kure N Harden<sup>®</sup> residue to dry on the surface. Any product allowed to dry on the surface may cause white residue that can be difficult to remove.
- .4 Drying Time
- .1 Kure N Harden<sup>®</sup> penetrates in approximately thirty (30) –sixty (60) minutes depending on temperature and humidity. Allow each application to penetrate thoroughly before proceeding with additional applications.
  - .2 Allow twenty-four hours after application before opening to wheeled traffic.
  - .3 Following drying, gloss development can be enhanced by buffing and or additional floor scrubbing.

### 3.4 CLEANING

- .1 Clean tools immediately after use with clean water. .
- .2 Clean up and properly dispose of debris remaining on Project site related to application.
- .3 Remove temporary coverings and protection from adjacent Work areas.

**END OF SECTION**

**Part 1            General**

**1.1                SECTION INCLUDES**

- .1            Materials and installation for precast concrete 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.

**1.3                MEASUREMENT PROCEDURES**

- .1            Measure supply and installation of precast parking curbs in 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 Preplaced-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.

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**1.5 LEED REQUIREMENTS**

- .1 See Section 01 35 21 - LEED Requirements.
- .2 LEED Submittals: Submit LEED supporting documentation in accordance with Section 01 35 21 - LEED Requirements.
- .3 Waste Management and Disposal: Dispose of packaging and waste materials in appropriate on-site bins for recycling and disposal in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .4 Resource Reuse: Salvage and reuse existing deconstructed materials in accordance with LEED Materials and Resources Credit MR 3.1 & 3.2 – Resource Reuse.
- .5 Regional Materials: Supply building materials that are regionally extracted, harvested, or recovered within 800km of the project location when shipped by truck, or within 2400km of the project location when shipped by rail, in accordance with LEED Materials and Resources Credit MR 5.1 & 5.2 – Regional Materials.

**Part 2 Products**

**2.1 GENERAL**

- .1 Precast Concrete to meet Regional Materials requirements.

**2.2 PEBBLESTONE SNUFFER**

- .1 Barkman Precast Pebblestone Snuffer or approved equal.
  - .1 18” square by 24” high.

**2.3 SPLASHPADS.**

- .1 Barkman Concrete PreCast Splashpads or approved equal:
  - .1 96” Splashpad: 96” long by 24” wide by 6” high.
  - .2 51” Splashpad: 51” long by 14 ½” wide by 5” high.
  - .3 Location and quantity as indicated in drawings.
    - .1 Installation at sod locations: Provide splashpads with 4” galvanized angle iron by Barkman Concrete. Angle iron to have two holes to accept splashpad mounting pins (by splashpad manufacturer). Angle iron to be mounted flush to grade beam finish. Attach angle iron to recessed galvanized HSS spacers (supplied by miscellaneous metals) as per drawings.
    - .2 Installation at concrete pad locations: Drill two holes in concrete pad to accept two anchor pins underneath Barkman Concrete splashpad. (Anchor pins by splashpad manufacturer.)
  - .4 Shipped by truck within 800km or rail within 2400km distance from project location.



**Part 3 Execution**

**3.1 INSTALLATION**

- .1 Install splashpads as per manufacturer instructions and in accordance with drawings.
- .2 Replace damaged and defective units as directed by Contract Administrator.

**END OF SECTION**