

specs

1. GENERAL

1.1. RELATED REQUIREMENTS

- .1 Section 03 20 00 – Concrete Reinforcing
- .2 Section 03 30 00 – Cast-in-Place Concrete
- .3 Section 03 35 00 – Concrete Finishing
- .4 Section 03 41 13 – Precast Concrete Hollow Core Planks

1.2. 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 CAN/CSA-O325.0-92(R2003), Construction Sheathing.
 - .6 CSA O437 Series-93(R2006), Standards for OSB and Waferboard.
 - .7 CSA S269.1-1975(R2003), Falsework for Construction Purposes.
 - .8 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.
- .3 Canada Green Building Council (CaGBC)
 - .1 LEED Canada NC 2009, LEED: Green Building Rating System Reference Package for New Construction and Major Renovations (including Addendum).

1.3. ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit shop drawings for formwork and falsework.
 - .1 Submit drawings stamped and signed by Professional Engineer registered or licensed in the Province of Manitoba, Canada.
- .3 Submit WHMIS MSDS – Material Safety Data Sheets in accordance with Section 01 35 20 – LEED Sustainable Requirements and Section 01 74 19 – Waste Management and Disposal.
- .4 Co-ordinate submittal requirements and provide submittals required by Section 01 35 20 – LEED Sustainable Requirements.
- .5 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.
- .6 Indicate formwork design data: permissible rate of concrete placement, and temperature of concrete, in forms.
- .7 Indicate sequence of erection and removal of formwork/falsework as directed by Contract Administrator.

1.4. DELIVERY, STORAGE AND HANDLING

- .1 Store and manage hazardous materials in accordance with Section 01 35 20 – LEED Sustainable Requirements.
- .2 Waste Management & Disposal:
 - .1 Separate wood materials, plastic materials and waste materials for reuse and/or recycling in accordance with Section 01 35 20 – LEED Sustainable Requirements

- and Section 01 74 19 – Waste Management and Disposal.
- .2 Place materials defined as hazardous or toxic in designated containers.
- .3 Divert unused form release material from landfill to an official hazardous material collections site as approved by the Contract Administrator.

1.5. MATERIALS

- .1 Materials and resources in accordance with Section 01 35 20 – LEED Sustainable Requirements.
- .2 Do verification requirements in accordance with Section 01 35 20 – LEED Sustainable Requirements.
- .3 Formwork materials:
 - .1 For concrete without special architectural features, use wood and wood product formwork materials to CSA-O121: Douglas Fir species; good one side grade; sound undamaged sheets with clean, true edges.
 - .2 For architectural concrete feature walls, use Medium Density Overlay panel formwork materials to CSA-A23.1/A23.2.
 - .3 Rigid insulation board: to CAN/ULC-S701 .
- .4 Pan forms: steel of size and profile as indicated.
- .5 Preformed Steel Forms: minimum 16 gauge matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished surfaces.
- .6 Void Forms: Moisture resistant treated paper faces, biodegradable, structurally sufficient to support weight of wet concrete mix until initial set; thickness as specified in Drawings.
- .7 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 1-inch diameter in concrete surface.
 - .2 For Architectural concrete, use snap ties complete with 1" \varnothing plastic cones and no concrete plugs. Refer to drawings for form tie pattern and spacing.
- .8 Form release agent: non-toxic, colourless mineral oil which will not stain concrete, or absorb moisture or impair natural bonding or colour characteristics of coating intended for use on concrete.
- .9 Form stripping agent: non-toxic, colourless mineral oil, free of kerosene, with viscosity between 70 and 110s Saybolt Universal at 40 degrees C, flashpoint minimum 150 degrees C, open cup.
- .10 Falsework materials: to CSA-S269.1.
- .11 Flashing Reglets: Galvanized steel, 22 gauge thick, longest possible lengths, with alignment splines for joints, foam filled, release tape sealed slots, anchors for securing to concrete formwork.
- .12 Waterstops: Rubber, minimum 1,750 psi tensile strength, minimum 50 degrees F to plus 175 degrees F working temperature range, 8" wide, maximum possible lengths, ribbed profile, preformed corner sections heat welded jointing.

2. EXECUTION

2.1. EXAMINATION

- .1 Verify lines, levels and centres before proceeding with formwork.
- .2 Ensure that dimensions agree with drawings.

2.2. FABRICATION AND ERECTION

- .1 Fabricate and erect falsework in accordance with CSA S269.1
- .2 Refer to architectural drawings for concrete members requiring architectural exposed

finishes.

- .3 Do not place shores and mud sills on frozen ground.
- .4 Provide site drainage to prevent washout of soil supporting mudsills and shores.
- .5 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.
- .6 Align form joints and make watertight.
 - .1 Keep form joints to minimum.
 - .2 Caulk or gasket form joints to maintain seal under vibration.
- .7 Locate horizontal form joints for exposed columns 96" above finished floor elevation.
- .8 Form chases, slots, openings, drips, recesses, expansion and control joints as indicated.
- .9 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.
- .10 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.

2.3. APPLICATION – FORM RELEASE AGENT

- .1 Apply form release agent on formwork in accordance with manufacturer's recommendations.
- .2 Apply prior to placement of reinforcing steel, anchoring devices and embedded items.
- .3 Do not apply form release agent where concrete surfaces will receive special finished, which are effected by agent. Soak inside surfaces of untreated forms with clean water. Keep surfaces coated prior to placement of concrete.

2.4. INSERTS, EMBEDDED PARTS AND OPENINGS

- .1 Provide formed openings where required for items to be embedded into passing through concrete work.
- .2 Locate and set in place items that will be cast directly into concrete.
- .3 Coordinate with work of other sections in forming and placing openings, slots, reglets, recesses, sleeves, bolts, anchors, other inserts and components of other Work.
- .4 Install accessories in accordance with manufacturer's written instructions, straight, level and plumb. Ensure items are not disturbed during concrete placement.
- .5 Install waterstops in accordance with manufacturer's written instructions continuous without displacing reinforcement. Heat seal joints watertight.
- .6 Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection. Locate openings at bottom of forms to allow flushing water to drain.
- .7 Close temporary openings with tight fitting panels, flush with inside face of forms and neatly fitted so joints will not be apparent in exposed concrete surfaces.

2.5. FORM CLEANING

- .1 New forms to be washed with a cement paste prior to being used for the first time, dissolving sugars in the wood that can cause discoloration of concrete.
- .2 Clean forms as erection proceeds, to remove foreign matter within forms.
- .3 Clean formed cavities of debris prior to placing concrete.
- .4 Flush with water or use compressed air to remove remaining foreign matter. Ensure that water and debris drain to exterior through clean-out ports.
- .5 During cold weather, remove ice and snow from within forms. Do not use de-icing salts. Do not use water to clean out forms, unless formwork and concrete construction proceed within heated enclosure, Use compressed air or other means to remove foreign matter.

2.6. FORMWORK TOLERANCES

- .1 Construct formwork to maintain tolerances in accordance with standards listed on Structural Drawings
- .2 Camber slabs and beams as per structural requirements.

2.7. FORMWORK QUALITY CONTROL

- .1 Section 01 45 00: Quality Control
- .2 Inspect erected formwork, shoring, and bracing to ensure that work is in accordance with formwork design, and that supports, fastenings, wedges, ties and items are secure.
- .3 Re-use of formwork subject to requirements of CSA-A23.1/A23.2 and standards listed on Structural Drawings. Do not patch formwork.

2.8. FORM REMOVAL AND RESHORING

- .1 Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads.
- .2 Loosen forms carefully. Do not wedge pry bars, hammers, or tools against finish concrete surfaces scheduled for exposure to view.
- .3 Store removed forms in manner that surfaces to be in contact with fresh concrete will not be damaged. Discard damaged forms.
- .4 Leave formwork in place for following minimum periods of time after placing concrete:
 - .1 Walls, columns, and beam sides: Concrete curing temperature of:
 - .1 21 degrees C – 35 degrees C = 2 days
 - .2 16 degrees C – 21 degrees C = 3 days
 - .3 10 degrees C – 16 degrees C = 4 days
 - .2 Beams, soffits, slabs, decks and other structural members: Concrete curing temperature of:
 - .1 21 degrees C – 35 degrees C = 14 days
 - .2 16 degrees C – 21 degrees C = 17 days
 - .3 10 degrees C – 16 degrees C = 21 days
- .5 Remove formwork when concrete has reached 75 % of its design strength or minimum period noted above, whichever comes later, and replace immediately with adequate reshoring.
- .6 Provide necessary reshoring of members where early removal of forms may be required or where members may be subjected to additional loads during construction as required.
- .7 Space reshoring in each principal direction at not more than 10' apart.
- .8 Re-use formwork and falsework subject to requirements of CSA-A23.1/A23.2.

END OF SECTION.

1. GENERAL

1.1. RELATED REQUIREMENTS

- .1 Section 03 10 00 – Concrete Forming & Accessories
- .2 Section 03 30 00 – Cast-in-Place Concrete
- .3 Section 03 35 00 – Concrete Finishing
- .4 Section 03 41 13 – Precast Concrete Hollow Core Planks

1.2. 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.

1.3. REFERENCES

- .1 American Concrete Institute (ACI)
 - .1 SP-66-04, ACI Detailing Manual 2004.
- .2 ASTM International
 - .1 ASTM A 82/A 82M-07, Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
 - .2 ASTM A 143/A 143M-07, Standard Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement.
 - .3 ASTM A 185/A 185M-07, Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
 - .4 ASTM A 775/A 775M-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 CAN/CSA-A23.3-04(R2010), 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.
- .5 Canada Green Building Council (CaGBC)
 - .1 LEED Canada NC 2009, LEED: Green Building Rating System Reference Package for New Construction and Major Renovations (including Addendum).

1.4. ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Co-ordinate submittal requirements and provide submittals required by Section 01 35 20 – LEED Sustainable Requirements.
- .3 Prepare reinforcement drawings in accordance with RSIC Manual of Standard Practice and SP-66.
- .4 Shop Drawings:
 - .1 Submit drawings stamped and signed by Professional Engineer registered or licensed in the Province of Manitoba, Canada.

- .1 Indicate placing of reinforcement and:
 - .1 Bar bending details.
 - .2 Lists.
 - .3 Quantities of reinforcement.
 - .4 Sizes, spacing, 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 CAN/CSA-A23.3, unless otherwise noted.

1.5. QUALITY ASSURANCE

- .1 Perform Work in accordance with CSA-A23.1/A23.2 standards listed on Structural Drawings.
- .2 Submit in accordance with Section 01 45 00 - Quality Control and as described in PART 2 - SOURCE QUALITY CONTROL.
 - .1 Mill Test Report: upon request, provide Contract Administrator with certified copy of mill test report of reinforcing steel, minimum 4 weeks prior to beginning reinforcing work.
 - .2 Upon request submit in writing Contract Administrator proposed source of reinforcement material to be supplied.

1.6. 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 indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Replace defective or damaged materials with new.
- .4 Develop Construction Waste Management Plan and Waste Reduction Workplan related to Work in this Section and in accordance with Section 01 35 20 LEED Sustainable Requirements.

2. PRODUCTS

2.1. MATERIALS

- .1 Substitute different bar sizes only if permitted in writing by Contract Administrator.
- .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 CSA-G30.18.
- .4 Cold-drawn annealed steel wire ties: to ASTM A 82/A 82M.
- .5 Deformed steel wire for concrete reinforcement: to ASTM A 82/A 82M.
- .6 Welded steel wire fabric: provide in flat sheets only to ASTM A185/A185M.
- .7 Welded deformed steel wire fabric: provide in flat sheets only to ASTM A82/A82M.
- .8 Epoxy Coating of non-prestressed reinforcement: to ASTM A 775/A 775M.
- .9 Galvanizing of non-prestressed reinforcement: to CAN/CSA-G164, minimum zinc coating 610 g/m².
 - .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.
- .10 Chairs, bolsters, bar supports, spacers: sized and shaped for strength and support of reinforcement during concrete placement conditions including load bearing pad on bottom to prevent vapour barrier puncture to CSA-A23.1/A23.2.
- .11 Mechanical splices: subject to approval of Contract Administrator.
- .12 Plain round bars: to CSA-G40.20/G40.21.

2.2. FABRICATION

- .1 Fabricate reinforcing steel in accordance with CSA-A23.1/A23.2 and Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada.
- .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.

2.3. 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.

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 A 143/A 143M.

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 structural drawings and 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 Ensure cover to reinforcement is maintained during concrete pour.
- .4 Do not displace or damage vapour barrier.
- .5 Accommodate placement of formed openings.
- .6 Prior to placing concrete, obtain Contract Administrator approval of reinforcing material and placement.

3.4. 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 Separate wood materials, plastic materials and waste materials for reuse and/or recycling in accordance with Section 01 35 20 – LEED Sustainable Requirements and Section 01 74 19 – Waste Management and Disposal.

END OF SECTION.

1. GENERAL

1.1. RELATED REQUIREMENTS

- .1 Section 03 10 00 – Concrete Forming and Accessories
- .2 Section 03 20 00 – Concrete Reinforcing
- .3 Section 03 35 00 – Concrete Finishing
- .4 Section 03 53 00 – Concrete Topping
- .5 Section 06 10 00 – Rough Carpentry
- .6 Section 07 21 13 – Board Insulation
- .7 Section 07 26 00 – Vapour Retarders
- .8 Section 07 92 00 – Joint Sealants
- .9 Section 31 23 10 – Excavation, Trenching & Backfilling
- .10 Section 32 16 15 – Concrete Walks, Curbs & Gutters
- .11 Section 33 46 13 – Foundation Drainage

1.2. REFERENCES

- .1 ASTM International
 - .1 ASTM A 185/A 185M-[07], Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
 - .2 ASTM D 1751-[04], Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non extruding and Resilient Bituminous Types).
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-19.24-[M90], Multicomponent, Chemical-Curing Sealing Compound.
- .3 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 A3000-[08], Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
 - .3 CAN/CSA-G30.18-[M92(R2002)], Billet-Steel Bars for Concrete Reinforcement.
- .4 Canada Green Building Council (CaGBC)
 - .1 LEED Canada NC 2009, LEED: Green Building Rating System Reference Package for New Construction and Major Renovations (including Addendum).

1.3. ADMINISTRATIVE REQUIREMENTS

- .1 Pre-installation Meetings: in accordance with Section 01 32 16 - Construction Progress Schedules, convene pre-installation meeting one week prior to beginning concrete works.
 - .1 Ensure key personnel, site supervisor, Contract Administrator, specialty contractor - finishing, forming, concrete producer and testing laboratories attend.
 - .1 Verify project requirements.

1.4. ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Shop Drawings:
 - .1 Submit placing drawings prepared in accordance with plans to clearly show size, shape, location and necessary details of reinforcing.
- .3 At least 4 weeks prior to beginning Work, provide Contract Administrator with Product Data Sheets of materials proposed for use as follows: curing compound, each type of joint filler, each type of waterstops, each type of supplementary cementing material, each type of blended hydraulic cement, each admixture and each fine and coarse aggregate.
- .4 Provide testing, inspection results and reports for review by Contract Administrator and do

not proceed without written approval when deviations from mix design or parameters are found.

- .5 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.
- .6 Sustainable Design Submittals:
 - .1 Submittals: in accordance with Section 01 35 20 – LEED Sustainable Requirements.
- .7 Provide two copies of WHMIS MSDS in accordance with Section 01 35 20 – LEED Sustainable Requirements and Section 01 74 19 – Waste Management and Disposal.

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 Test and Evaluation Reports:
 - .1 Provide certified test reports in accordance with Section 01 29 83 – Payment Procedures and Testing Laboratory Services.
 - .2 Test reports to certify compliance of concrete with specified performance characteristics and physical properties.
- .4 Perform Work in accordance with standards listed on Structural Drawings.
- .5 Acquire cement and aggregate from same source for all work.
- .6 Minimum 4 weeks prior to starting concrete work, provide proposed quality control procedures for review by Contract Administrator on following items: falsework erection, hot weather concrete, cold weather concrete, curing, finishes, formwork removal and joints.
- .7 Quality Control Plan: provide written report to Contract Administrator verifying compliance that concrete in place meets performance requirements of concrete as established in Part 2 – Products.
- .8 Sustainability Standards Certification:
- .9 Construction Waste Management: Develop Construction Waste Management Plan and Waste Reduction Workplan related to Work of this section and in accordance with Section 01 35 20 - LEED Sustainable Requirements.

1.6. MOCK-UP

- .1 Construct mock-up for Architectural concrete using same procedures, equipment, and materials that will be used for production of cast-in-place architectural concrete, including curing procedures.
 - .1 West wall to be constructed as mockup.
 - .2 For walls, include vertical, horizontal, and rustication joints. Demonstrate methods of repair, curing, aggregate exposure, finishing, sealers, and coating. Construct mockup to include a minimum of two lifts having heights planned for placement of architectural concrete.
- .2 Upon direction of Contract Administrator provide a simulated repair area to determine an acceptable repair procedure. Repair procedure shall be suitable to provide an acceptable color and texture match. Maintain and protect the mock-up until final acceptance of Architectural concrete.
- .3 Obtain Contract Administrator's approval of mockup before proceeding with remainder of Work.
- .4 Approved mockup to be incorporated into the Work.
- .5 Upon completion of architectural concrete, final acceptance is based upon matching the

architectural cast-in-place concrete with the accepted field mock-up. Defective Work, including repair areas not accepted, shall be removed and replaced.

1.7. 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
- .2 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding and packaging materials in accordance with Section 01 35 20 – LEED Sustainable Requirements and Section 01 74 19 – Waste Management and Disposal.

2. PRODUCTS

2.1. DESIGN CRITERIA

- .1 Performance: to CSA A23.1/A23.2, and as described in Mixes of Part 2 – Products.

2.2. PERFORMANCE CRITERIA

- .1 Quality Control Plan: ensure concrete supplier meets performance criteria of concrete as established by Contract Administrator and provide verification of compliance as described in Part 1 - Quality Assurance.

2.3. MATERIALS

- .1 Portland Cement: to CSA A3001, Type GU (general use) or HS (high sulphate-resistant) as specified on the drawings. White Portland Cement to be used for exposed cast-in-place walls as indicated on the drawings.
 - .1 Recycled Content: in accordance with Section 01 35 20 – LEED Sustainable Requirements.
- .2 Supplementary cementing materials: to CSA A3001.
- .3 Aggregates: to CSA A23.1/A23.2
- .4 Water: to CSA A23.1.
- .5 Admixtures:
 - .1 Air Entrainment: to ASTM C260.
 - .2 Chemical Admixtures: to ASTM C494 and ASTM C1017. Contract Administrator to approve accelerating or set retarding admixtures during cold weather and hot weather placing.
- .6 Shrinkage compensating grout: premixed compound consisting of non-metallic aggregate, Portland cement, water reducing and plasticizing agents to CSA A23.1/A23.2
 - .1 Compressive strength: 17 MPa at 48 hours and 58 MPa at 28 days
- .7 Non premixed dry pack grout: composition of non-metallic aggregate, Portland cement with sufficient water for mixture to retain its shape when made into ball by hand and capable of developing compressive strength of 56 MPa at 28 days.
- .8 Curing compound: to CSA A23.1/A23.2
- .9 Mechanical waterstops: ribbed extruded PVC of sizes indicated with prewelded corner and intersecting pieces: tensile strength and elongation to ASTM D412 with tear resistance to ASTM D624.
- .10 Premoulded joint filler: bituminous impregnated fiber board to ASTM D1751.

- .11 Weep hole tubes: galvanized steel.
- .12 Polyethylene film: 0.15mm thickness to CAN/CGSB-51.34

2.4. **CONCRETE MIX**

- .1 Performance Method for specifying concrete: to meet Contract Administrator performance criteria to CSA A23.1/A23.2
 - .1 Ensure concrete supplier meets performance criteria for the concrete mixes specified on the drawings and provide verification of compliance as in Quality Control Plan.
 - .2 Provide quality management plan to ensure verification of concrete quality to specified performance.
 - .3 Concrete supplier's certification: both batch plant and materials meet CSA A23.1 requirements.

3. **EXECUTION**

3.1. **PREPARATION**

- .1 Obtain Contract Administrator's written approval before placing concrete.
 - .1 Provide 24 hours minimum notice prior to placement.
- .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 Ensure reinforcement and inserts are not disturbed during concrete placement.
- .5 Prior to placing of concrete obtain Contract Administrator's approval of proposed method for protection of concrete during placing and curing in adverse weather.
- .6 Protect previous Work from staining.
- .7 Clean and remove stains prior to application of concrete finishes.
- .8 Verify all dimensions, locations, openings, embedments and anchor, seat, plate locations required on drawings.
- .9 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, air temperature and test samples taken.
- .10 Do not place load upon new concrete until authorized by Contract Administrator.

3.2. **INSTALLATION/APPLICATION**

- .1 Do cast-in-place concrete work in accordance with CSA A23.1/A23.2.
- .2 Sleeves and inserts:
 - .1 Where approved by Contract Administrator, set sleeves, ties, pipe hangers and other inserts and openings as indicated or specified elsewhere.
 - .2 Confirm locations and sizes of sleeves and openings shown on drawings.
 - .3 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 concrete.
 - .4 Sleeves and openings greater than 4" x 4" not indicated, must be reviewed by Contract Administrator.
 - .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 in co-ordination with appropriate trade and reviewed shop drawings prior to placing concrete.
 - .2 Protect anchor bolt holes from water accumulations and snow and ice build-ups.

- .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 after concrete has set.
 - .2 Install weep hole tubes and drains as indicated
- .5 Grout under base plates using procedures in accordance with manufacturer's recommendations that result in 100% contact over grouted area.
- .6 Place concrete in its final position as soon as possible after mixing and must be placed within 2 hours after water has been added to dry materials. Do not use any concrete after more than 2 hours or having a partial set before placing.
- .7 Install vapour retarder under interior slabs on grade. Lap joints minimum 12" and seal watertight by sealant applied between overlapping edges and ends.
- .8 Separate slabs on grade from vertical surfaces with ½" thick joint filler. Extend joint filler from bottom of slab to within ½" of finished slab surface.

3.3. FINISHING AND CURING

- .1 Finish concrete floor to CSA A23.1/A23.2. Class A.
- .2 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.
- .3 Use curing compounds compatible with applied finish on concrete surfaces. Provide written declaration that compounds used are compatible.
- .4 Rub exposed sharp edges of concrete with carborundum to produce 3mm minimum radius edges unless otherwise indicated.
- .5 Formed surfaces exposed to view: light sanded finish in accordance with CSA A23.1/A23.2. Mockup area to be tested on Mockup wall as directed by Contract Administrator for approval before finishing remaining surface of work.

3.4. 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 isolation, construction and expansion joints as indicated.
- .4 Install joint filler.
- .5 Use 12mm thick joint filler to separate slabs-on-grade from vertical surfaces and extend joint filler from bottom of slab to within 12mm of finished slab surface unless otherwise indicated.

3.5. WATERSTOPS

- .1 Install waterstops to provide continuous water seal.
- .2 Do not distort or pierce waterstop in any manner 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.

3.6. SURFACE TOLERANCE

- .1 Concrete tolerance to CSA A23.1 Straightedge Method for Class A floor finish.

3.7. FIELD QUALITY CONTROL

- .1 Site tests: conduct test as follows and in accordance with Section 01 45 00 – Quality

Control and submit report as described in Part 1 – Action and Informational Submittals.

- .1 Concrete pours, slump, air content, compressive strength at (7 and 28) or (7 and 56) days as specified in the mix design and air and concrete temperature.
- .2 Inspection and testing of concrete and concrete materials will be carried out by an independent testing laboratory approved by the Contract Administrator.
 - .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 Pay for costs of test as specified in Section 01 29 83 – Payment Procedures and Laboratory Testing.
- .5 Contractor to take additional test cylinders during cold weather concreting. Cure cylinders on job site under same conditions as concrete in which they represent.
- .6 Non-Destructive Methods for Testing Concrete: to CSA A23.1/A23.2
- .7 Inspection or testing by Contract Administrator will not augment or replace Contractor quality control nor relieve Contractor of his contractual responsibility.
- .8 Type, quantity and frequency of testing to be in accordance with CAN/CSA A23.1/A23/2
- .9 Allow Contract Administrator to inspect concrete surfaces immediately upon removal of forms. Excessive honeycomb or embedded debris in concrete is not acceptable. Notify Contract Administrator immediately upon discovery.

3.8. CLEANING

- .1 Clean in accordance with Section 01 74 11 - Cleaning.
- .2 Waste Management: Separate wood materials, plastic materials and waste materials for reuse and/or recycling in accordance with Section 01 35 20 – LEED Sustainable Requirements and Section 01 74 19 – Waste Management and Disposal.
 - .1 Divert unused concrete materials from landfill to local facility after receipt of written approval from Contract Administrator.
 - .2 Provide appropriate area on job site where concrete trucks can be safely washed.
 - .3 Divert admixtures and additive materials from landfill to approved official hazardous material collections site as approved by Contract Administrator.
 - .4 Do not dispose of unused admixtures and additive materials into sewer systems, into lakes, streams, onto ground or in other location where it will pose health or environmental hazard.
 - .5 Prevent admixtures and additive materials from entering drinking water supplies or streams.
 - .6 Using appropriate safety precautions, collect liquid or solidify liquid with inert, noncombustible material and remove for disposal.
 - .7 Dispose of waste in accordance with applicable local, Provincial and National regulations.

3.9. DEFECTIVE CONCRETE

- .1 Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances or specified requirements.
- .2 Repair or replacement of defective concrete will be determined by the Contract Administrator, based on the specifications and the above guidelines.
- .3 Modify or replace concrete not conforming to lines, detail and elevations indicated on drawings.
- .4 Do not patch, fill, touch-up, repair or replace exposed concrete except under express direction of Contract Administrator for each individual area.

END OF SECTION.

1. GENERAL

1.1. RELATED REQUIREMENTS

- .1 Section 03 10 00 – Concrete Forming
- .2 Section 03 30 00 – Cast-in-Place Concrete
- .3 Section 03 53 00 – Concrete Topping

1.2. REFERENCES

- .1 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-25.20-95, Surface Sealer for Floors.
- .2 CSA International
 - .1 CAN/CSA-A23.1-09/A23.2-09, Concrete Materials and Methods of Concrete Construction//Methods of Test for Concrete.
- .3 Canada Green Building Council (CaGBC)
 - .1 LEED Canada NC 2009, LEED: Green Building Rating System Reference Package for New Construction and Major Renovations (including Addendum).

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 compounds used are compatible and will not adversely affect finished flooring products and their installation adhesives.

1.4. PRODUCT DATA

- .1 Submit product data in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Include application instructions for concrete floor treatment.
- .3 Co-ordinate submittal requirements and provide submittals required by Section 01 35 20 – LEED Sustainable Requirements.

1.5. WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 19 – Waste Management and Disposal.
- .2 Place materials in defined hazardous or toxic waste in designated containers.
- .3 Ensure emptied containers are sealed and stored safely for disposal away from public.
- .4 Use chemical hardener that are no-toxic, biodegradable and have zero or low VOC's.
- .5 Dispose of surplus chemical and finishing materials in accordance with Federal, Provincial and Municipal regulations.
- .6 Dispose of waste from stripping of floor in a manner that will not have unfavorable effect on the environment.

1.6. ENVIRONMENTAL REQUIREMENTS

- .1 Temporary lighting:
 - .1 Minimum 1200 W light source, placed 2.5 m above floor surface, for each 40 sq m of floor being treated.
- .2 Electrical power:
 - .1 Provide sufficient electrical power to operate equipment normally used during construction.
- .3 Work area:
 - .1 Make 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.
- .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 enclosed spaces in accordance with Section 01 51 00 - Temporary Utilities.
 - .2 Provide continuous ventilation during and after coating application.

1.7. 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

2.1. MATERIALS

- .1 Water: potable.
- .2 Hardener: Two step process used to harden and seal newly poured concrete floors. Hardener is a dry, granular mixture of Portland Cement and non-metallic hardening agents used for concrete floors exposed to abrasive and light to medium traffic.
 - .1 Standard of Acceptance:
 - .1 CPD Floor Hardener Pre-Mix (premium)
- .3 Sealant: Water based acrylic curing, sealing, and dustproofing compound; solution of chemically active hardening agents; clear.
 - .1 Standard of Acceptance:
 - .1 CPD Acrylic Cure and Seal WB
- .4 Joint sealants to Section 07 92 00 – Joint Sealants.

2.2. MIXES

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

3. EXECUTION

3.1. EXAMINATION

- .1 Verify existing conditions before starting Work.
- .2 Ensure surfaces are clean, dry and free of contaminants.
- .3 Ensure new concrete has cured minimum 28 days.
- .4 Ensure ambient temperature is minimum 10 degrees Celsius and substrate temperature is minimum 4 degrees Celsius.
- .5 Apply sealer only after the disappearance of all surface moisture.
- .6 Do not apply material if rain is predicted within six hours after application to exterior surfaces.

3.2. PREPARATION

- .1 Surfaces must be clean, dry, and free of all loose dirt, oil, wax, sealer, curing and parting compounds, and other foreign matter. Clean substrate surfaces to manufacturer's written instructions.
- .2 Acid wash or shot-blast steel trowelled surfaces, or surface harder installed floors.

- .3 Perform application on minimum 9 square feet test section; obtain approval of test section from Contract Administrator before proceeding with application.
- .4 Saw cut control joints to CSA A23.1, maximum 24 hours after placing concrete.

3.3. APPLICATION

- .1 After floor treatment is dry, seal control joints and joints at junction with vertical surfaces with sealant.
- .2 Apply floor treatment in accordance with Sealer manufacturer's written instructions.
- .3 Finish concrete floor surfaces in accordance with CAN3-A23.1M.
- .4 Clean over spray. Clean sealant from adjacent surfaces.
- .5 Uniformly spread, screed and float concrete. Do not use grate tampers or mesh rollers. Do not spread concrete by vibration.
- .6 Apply hardener on concrete floor surfaces that do not receive additional flooring material in accordance with manufacturers written instructions.
- .7 Apply sealer on floor surfaces to receive hardener. Apply in accordance to manufacturers written instructions.
- .8 Interior floor slabs to be left exposed to receive floor covering requiring smooth surface: initial finishing operations followed by final finishing comprising mechanical floating and steel trowelling as specified in CSA A23.1/A23.2 to produce hard, smooth, dense trowelled surface free from blemishes.
- .9 Floor slabs to receive mortar bed for ceramic tile: screed to correct grade to provide broomed texture.
- .10 In areas with floor drains maintain floor elevation at walls; pitch surfaces uniformly to drains at 1:100 nominal slope.
- .11 Equipment pads: provide smooth trowelled surface.
- .12 Pavements, walks, curbs and exposed site concrete:
 - .1 Screed to plane surfaces and use aluminum floats.
 - .2 Provide round edges and joint spacing using standard tools.
 - .3 Trowel smooth to provide lightly brushed non-slip finish perpendicular to the direction of travel.

3.4. 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.

3.5. PROTECTION

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

END OF SECTION.

1. GENERAL

1.1. RELATED REQUIREMENTS

- .1 Section 03 30 00 – Cast-in-Place Concrete
- .2 Section 03 53 00 – Concrete Topping
- .3 Section 07 92 00 – Joint Sealants

1.2. REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM A 185/A 185M-[05a], Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
 - .2 ASTM A 775/A 775M-[04a], Standard Specification for Epoxy-Coated Reinforcing Steel Bars.
 - .3 ASTM C 260-[01], Standard Specification for Air-Entraining Admixtures for Concrete.
- .2 Canadian Construction Documents Committee (CCDC)
 - .1 CCDC 2-[2008], Stipulated Price Contract.
- .3 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-1.40-[97], Anticorrosive Structural Steel Alkyd Primer.
 - .2 CAN/CGSB-1.181-[99], Ready Mixed Organic Zinc-Rich Coating.
- .4 Canadian Standards Association (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-A23.3-[04], Design of Concrete Structures.
 - .3 CSA-A23.4-[05], Precast Concrete - Materials and Construction.
 - .4 CAN/CSA-A3000-[03], Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
 - .1 CSA-A3001-[03], Cementitious Materials for Use in Concrete.
 - .5 CAN/CSA-G30.18-[M92(R2002)], Billet-Steel Bars for Concrete Reinforcement.
 - .6 CSA-W47.1-[03], Certification of Companies for Fusion Welding for Steel.
 - .7 CAN/CSA W48-[01(R2006)], Filler Metals and Allied Materials for Metal Arc Welding (Developed in co-operation with the Canadian Welding Bureau).
 - .8 CSA-W59-[03], Welded Steel Construction (Metal Arc Welding) (Metric version).
 - .9 CSA-W186-[M1990(R2002)], Welding of Reinforcing Bars in Reinforced Concrete Construction.
- .5 The Master Painters Institute (MPI) - Architectural Painting Specification Manual (ASM) - [February 2004]
 - .1 MPI # 18, Organic Zinc Rich Primer.
 - .2 MPI # 23, Oil Alkyd Primer.
- .6 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC-S701-[05], Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.
- .7 Canada Green Building Council (CaGBC)
 - .1 LEED Canada NC 2009, LEED: Green Building Rating System Reference Package for New Construction and Major Renovations (including Addendum).

1.3. DESIGN REQUIREMENTS

- .1 Design precast elements to CSA-A23.3 and CSA-A23.4 to carry handling stresses.
- .2 Design precast elements to carry loads specified by Contract Administrator as indicated on Structural Drawings and in accordance with applicable codes.
- .3 Design connections/attachments of precast elements to load/forces specified by Contract Administrator.

- .4 Provide detailed calculations and design drawings for typical precast elements and connections as described in PART 1 - SUBMITTALS.

1.4. PERFORMANCE REQUIREMENTS

- .1 Tolerance of precast elements to CSA-A23.4.

1.5. ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit WHMIS MSDS - Material Safety Data Sheets.
- .3 Co-ordinate submittal requirements and provide submittals required by Section 01 35 20 – LEED Sustainable Requirements.
- .4 Submit shop drawings in accordance with CSA-A23.3 and CSA-A23.4 and include following items:
 - .1 Design calculations for items designed by manufacturer.
 - .2 Details of prestressed and non-prestressed members, reinforcement and their connections.
 - .3 Camber.
 - .4 Finishing schedules.
 - .5 Methods of handling and erection.
 - .6 Openings, sleeves, insert and related reinforcement.
- .5 Submit 2 copies of detailed calculations and design drawings for typical precast elements and connections for review by Contract Administrator two weeks prior to manufacture.
- .6 Shop Drawings: submit drawings stamped and signed by qualified professional Engineer registered or licensed in the Province of Manitoba in Canada.
- .7 Submit samples in accordance with Section 01 33 00 - Submittal Procedures and provide sample and sample number of each finish to be used on project to Contract Administrator.
- .8 Supplier shall include in contract price allowance for final inspection and a sealed letter certifying that installation meets suppliers design assumptions and installation requirements.

1.6. QUALITY ASSURANCE

- .1 Quality Control Plan: submit written report, as described in PART 3 - VERIFICATION, to Contract Administrator verifying compliance that concrete provided meets performance requirements of concrete as established in PART 2 - PRODUCTS.

1.7. QUALIFICATIONS

- .1 Fabricate and erect precast concrete elements by manufacturing plant certified in appropriate categories according to CSA-A23.4 with minimum 15 years experience.
- .2 Precast concrete manufacturer to be certified in accordance with CSA's certification procedures for precast concrete plants prior to submitting tender and to specifically verify as part of tender that plant is currently certified in appropriate categories, Structural, Prestressed, Hollow-Core.
- .3 Only precast elements fabricated in such certified plants to be acceptable to Contract Administrator and plant certification to be maintained for duration of fabrication, erection until warranty expires.
- .4 Welding companies certified to CSA-W47.1.

1.8. DELIVERY, STORAGE AND HANDLING

- .1 Section 01 61 00: Transport, handle, store and protect products.
- .2 Deliver, handle and store precast/prestressed units according to manufacturer's instructions.
- .3 Protect unit corners from contacting earth to prevent from staining.
- .4 Separate waste materials for reuse and recycling.

1.9. PROJECT CONDITIONS

- .1 Coordinate the Work of framing components associated with the Work of this section.

2. PRODUCTS

2.1. MATERIALS

- .1 Supplementary cementing materials: as per Structural Drawings.
- .2 Water: to CSA-A23.1/A23.2.
- .3 Reinforcing steel: to CAN/CSA-G30.18.
- .4 Prestressing steel tendons and bars: to CAN/CSA-S6.
- .5 Hardware and miscellaneous materials: to CSA-A23.1/A23.2.
- .6 Forms: to CSA-A23.4.
- .7 Anchors and supports: to CAN/CSA-G40.21 Type 300 W primed after fabrication.
- .8 Welding materials: to CSA W48.
- .9 Welding electrodes: to CSA W48 certified by Canadian Welding Bureau.
- .10 Steel primer: to CAN/CGSB-1.40, zinc rich alkyd type.
- .11 Bearing pads: neoprene, 1/8" thick, smooth both sides.
- .12 Air entrainment admixtures: to ASTM C 260.
- .13 Shims: plastic.
- .14 Weephole tubes: purpose made plastic.
- .15 Insulation: extruded polystyrene to CAN/ULC-S701.

2.2. MIXES

- .1 Concrete:
 - .1 Performance Method for specifying concrete: to meet Contract Administrator performance criteria in accordance with CAN/CSA-A23.1/A23.2 as per Structural Drawings.
- .2 Grout:
 - .1 Cement grout: 1 part cement, 3 parts sand, sufficient water for placement and hydration.
 - .2 Minimum compressive strength: 40 MPa.
 - .3 Shrinkage compensating grout: to Section 03 30 00 - Cast-in-Place Concrete.

2.3. MANUFACTURED UNITS

- .1 Manufacture units in accordance with CSA-A23.4.
- .2 Mark each precast unit to correspond to identification mark on shop drawings for location with date cast on part of unit not be exposed.
- .3 Provide hardware suitable for handling elements.
- .4 Provide 2" thick insulation at each cell end of floor units of hollow core design.
- .5 Design tendons and anchorages and install post tensioning ducts in accordance with CSA-A23.3.

2.4. FINISHES

- .1 Finish units to commercial grade to CSA-A23.4.
- .2 Cure members under identical conditions to develop required concrete quality and minimize appearance blemishes such as non-uniformity staining or surface cracking.
- .3 Ensure exposed-to-view finish surfaces are uniform in colour and appearance.
- .4 Any exposed corners of beams and columns shall have 1" chamfer.
- .5 Support Devices:
 - .1 Clean surfaces of rust, scale, grease and foreign matter.
 - .2 Prime paint in one coat, except surfaces in direct contact with concrete or that, which require field welding.
 - .3 Galvanize surfaces after fabrication to 2.0 oz./sq. ft. in accordance with CSA G164.

2.5. SOURCE QUALITY CONTROL

- .1 Provide Contract Administrator with certified copies of quality control tests related to this project as specified in CSA-A23.4.
- .2 Take 3 concrete test cylinders for every 75 cu. yd. of concrete placed.
- .3 Inspect prestressed concrete tendons in accordance with CSA-G279.
- .4 Precast plants should keep complete records of quality control program, supply source of concrete material, steel reinforcement, prestressing steel and provide to Contract Administrator for review upon request.

3. EXECUTION

3.1. EXAMINATION

- .1 Verify existing conditions prior to beginning work.
- .2 Verify that site conditions are ready to receive work and field measurements are as shown on shop drawings.
- .3 Verify that building structure, anchors, devices and openings are ready to receive work of this section.

3.2. PREPARATION

- .1 Prepare support equipment for the erection procedure, temporary bracing and induced loads during erection.
- .2 Maintain temporary bracing in place until final support is provided.

3.3. ERECTION

- .1 Do precast concrete work in accordance with CSA-A23.4 CSA-A23.3 and CAN/CSA-S6.
- .2 Do welding in accordance with CSA-W59, for welding to steel structures and CSA-W186, for welding of reinforcement.
- .3 Erect precast elements within allowable tolerances as specified.
- .4 Set elevations and alignment between units to within allowable tolerances before connecting units.
- .5 Grout underside of unit bearing plates with shrinkage compensating grout.
- .6 Fasten precast units in place as indicated on approved shop drawings.
- .7 Secure with bolts using lockwashers or tack-weld nut to bolt.
- .8 Uniformly tighten bolted connections with torque indicated.
- .9 Do not weld or secure bearing plates at sliding joints.
- .10 Install precast concrete closures between stems of flanged units where indicated.
- .11 Use grout to align elevations of surfaces at joints. Slope grout not more than 1:12.
- .12 Clean field welds with wire brush and touch-up shop primer with primer, galvanized finish with zinc-rich primer.
- .13 Do not make cutouts without approval of Contract Administrator.
 - .1 Form openings or carefully saw cut, do not punch openings
 - .2 Locate openings less than 6" wide in sections of plank between reinforcing bars.
 - .3 Frame openings larger than 6" wide with structural steel headers.
- .14 Drill 5/8" diameter drain holes in low end of every exterior exposed hollow core plank as per CSA S413 Clause 7.8.4.

3.4. ERECTION TOLERANCES

- .1 Erect members level and plumb within allowable tolerances.
- .2 Maximum Variation from Plane or Location Indicated on Drawings: 1/4"/10'-0" and 3/8" in 100'-0", non-cumulative.
- .3 Maximum Offset from True Alignment Between Members: 1/4"
- .4 Maximum Variation from Dimensions Indicated on Reviewed Shop Drawings: plus or minus

1/8"

- .5 Exposed Joint Dimension: 3/8" plus or minus 1/4"
- .6 When members cannot be adjusted to conform to design or tolerance criteria, cease work and advise Contract Administrator. Execute modifications as directed.

3.5. VERIFICATION

- .1 Quality Control Plan: ensure concrete supplier meets performance criteria of concrete as established in Part 2 - Products, by Contract Administrator and provide verification of compliance as described in PART 1 - QUALITY ASSURANCE.

3.6. REPLACEMENT AND REPAIR

- .1 Replace broken, cracked, warped planks and planks exceeding allowable tolerances.
- .2 Plank having defects, not affecting serviceability of deck, may be repaired with epoxy grout of approved by Contract Administrator.

3.7. CLEANING

- .1 Use cleaning methods as reviewed by Contract Administrator before cleaning soiled precast concrete surfaces.

END OF SECTION.

1. GENERAL

1.1. RELATED REQUIREMENTS

- .1 Section 03 10 00 – Concrete Forming
- .2 Section 03 30 00 – Cast-in-Place Concrete
- .3 Section 03 35 00 – Concrete Finishing

1.2. REFERENCES

- .1 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-25.20-95, Surface Sealer for Floors.
- .2 CSA International
 - .1 CAN/CSA-A23.1-09/A23.2-09, Concrete Materials and Methods of Concrete Construction//Methods of Test for Concrete.
- .3 Canada Green Building Council (CaGBC)
 - .1 LEED Canada NC 2009, LEED: Green Building Rating System Reference Package for New Construction and Major Renovations (including Addendum).

1.3. ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Shop Drawings:
 - .1 Provide drawings that indicate the locations of all joint in concrete slabs, including construction joints, expansion joints, isolation joints, weakened plane joints and contraction joints. Coordinate with the requirements specified in Section 03 10 00 – Concrete Forming.
- .3 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 - 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[s].
- .4 Co-ordinate submittal requirements and provide submittals required by Section 01 35 20 – LEED Sustainable Requirements.

1.4. 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° C from 7 days before installation to at least 48 hours after completion of work and maintain relative humidity not higher than 40% during same period.
- .5 Moisture:

- .1 Ensure concrete substrate is within moisture limits prescribed by flooring manufacturer.
- .6 Safety:
 - .1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials.
- .7 Ventilation:
 - .1 Ventilate enclosed spaces in accordance with Section 01 51 00 - Temporary Utilities.
 - .2 Provide continuous ventilation during and after coating application.

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:
 - .1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

2. PRODUCTS

2.1. 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.

2.2. CONCRETE HARDENER & DUSTPROOFER

- .1 Chemical clear liquid hardener, which produces a dense, hard, dustproof concrete surface, manufactured specifically for the intended purpose.

2.3. SEALING COMPOUNDS

- .1 Surface sealer: to CAN/CGSB-25.20, Type 2 - water based, clear.
- .2 Sealants: maximum VOC limit 250 g/L
- .3 Surface sealer: acrylic carnuba wax
- .4 Surface sealers are not manufactured or formulated with aromatic solvents, formaldehyde, mercury, lead, hexavalent chromium and their compounds.

2.4. CURING MATERIALS

- .1 Refer to Section 03 35 00 Concrete Finishing for requirements.
- .2 Provide for damp curing only. Curing compound will not be permitted on floors to receive concrete hardener and dustproofers.

2.5. MIXES

- .1 Cement to be normal type 10.
- .2 Concrete strength at 28 days to be 25MPa.
- .3 Minimum fly ash content 10%, maximum 15%.
- .4 Maximum coarse aggregate size 10mm.
- .5 Maximum slump 50mm +/- 20mm.
- .6 Mixing ratios in accordance with manufacturer's written instructions.

3. EXECUTION

3.1. EXAMINATION

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

3.2. PREPARATION

- .1 At a minimum 48 hours prior to placement, notify Contract Administrator of the intention to deliver and place concrete.
- .2 Before placing concrete, broom clean structural slab surfaces and install bond breaker membrane where indicated.

3.3. APPLICATION

- .1 Apply concrete finishing floor hardener in accordance with manufacturers written instructions.
- .2 After floor treatment is dry, seal control joints and joints at junction with vertical surfaces with sealant.
- .3 Apply floor treatment in accordance with sealer manufacturers written instructions.
- .4 Clean over spray. Clean sealant from adjacent surfaces.

3.4. 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.

3.5. PROTECTION

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

END OF SECTION.