1 GENERAL

1.01 RELATED SECTIONS

.1 03 32 00 – Concrete Reinforcement

.2 03 33 00 – Cast-in-Place Concrete

1.02 REFERENCES

.1 Canadian Standards Association (CSA)
- .1 CAN/CSA- A23.1-04, Concrete Materials and Methods of Concrete Construction.
- .2 CAN/CSA-O86-14, Engineering Design in Wood
- .3 CAN/CSA O121-08(R2013), Douglas Fir Plywood.
- .4 CAN/CSA S269.1-1975 (R2003), Falsework for Construction Purposes.
- .5 CAN/CSA-S269.3-M92 (R2013), Concrete Formwork.

.2 Ontario Ministry of Municipal Affairs & Housing (MMAH)
- .1 Ontario Building Code (2012)

1.03 DESIGN

.1 Design of concrete formwork and falsework shall be the responsibility of the Contractor.

1.04 SHOP DRAWINGS

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

.2 Indicate method and schedule of construction, materials, arrangement of joints, ties shores and location of embedded parts including waterstops and anchor bolts.

.3 Each shop drawing submitted shall bear the stamp and signature of a qualified Professional Engineer licensed in the Province of Ontario.

.4 At time of submission, Contractor shall notify Consultant in writing of any deviations in shop drawings from requirements of Contract Documents.

.5 Consultant will review and return shop drawings in accordance with an agreed schedule. Review of the shop drawings by the Consultant is intended as an assistance to the Contractor and does not relieve the Contractor of responsibilities for the completeness and accuracy of the work and conformance with the Contract drawings and specifications.

2 PRODUCTS

2.01 MATERIALS

.1 Formwork materials: Use plywood and wood formwork materials to CSA-O121.

.2 Only new formwork shall be used for exposed concrete surfaces.
- .1 Soffit areas (undersides of slabs) to receive sprayed-on textured finishes are to be considered as exposed.

.3 Exposed Round Concrete Columns:

.1 Round, spirally wound laminated fiber forms with seamless plastic liner, treated with release material.

.4 Form ties: Use removable or snap-off metal ties, fixed or adjustable length.

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

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

.5 Form release agent:

.1 Use chemically active release agents containing compounds that react with free lime present in concrete to provide water insoluble soaps, preventing concrete from sticking to forms.

.2 Form release agent shall be non-toxic.

.6 Falsework materials: To CSA S269.1.

1. Falsework must be designed by a Professional Engineer in structural engineering practice in the Province of Ontario.

3 EXECUTION

3.01 FABRICATION AND ERECTION

.1 Verify lines, levels and centres before proceeding with formwork/falsework and ensure dimensions agree with drawings.

.2 Fabricate and erect falsework in accordance with CSA S269.1.

.3 Obtain Engineer's consent before framing openings in slabs, beams, walls or columns not detailed on drawings.

.4 Do not place shores and mud sills on frozen ground. Provide sufficient bearing surface area for proper load distribution.

.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 CAN/CSA-A23.1. No form ties will be allowed for column construction.

.6 Submit details of any openings not indicated on structural drawings for review by structural engineer before framing openings not indicated.

.7 Align form joints and make watertight. Keep form joints to minimum.

.8 Use 20 mm chamfer strips on external corners and/or 20 mm fillets at interior corners of concrete members, joints, unless specified otherwise.

.9 Form chases, slots, openings, drips, recesses, expansion and control joints as indicated.

.10 Build in anchors, sleeves, and other inserts required to accommodate work specified in other sections. Ensure that all anchors and inserts will not protrude beyond surfaces designated to

receive applied finishes, including painting.

.11 Use templates to secure and align anchor bolts in formwork prior to placement of the concrete. Report any interference with reinforcing or other inserts to Engineer prior to the placement of the concrete. Concrete should not be placed until interference issues are resolved in writing by the Engineer.

.12 For walls and shear walls, leave one side of form open for review of reinforcing steel. Close form only after Engineer has reviewed bar placement.

.13 Clean formwork in accordance with CAN/CSA-A23.1 before placing concrete.
- .1 Clean forms of all loose debris and other deleterious materials prior to placement of the concrete.

.14 Finished concrete exhibiting excessive form displacement and/or excessive deflection shall be cause for rejection of the work and its removal and replacement at the Contractor's expense.

3.02 CONSTRUCTION JOINTS

.1 Form construction joints where required and where indicated.
- .1 Construction joints shall conform to CSA A23.1, Clause 7.3.1.
- .2 Construction joint locations to be approved by Engineer in writing prior to performance of work.

.2 Form 2" x 4" bevelled shear keys full length of construction joints, unless detailed otherwise.

3.03 REMOVAL AND RESHORING

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

.2 Consider the location, character of the structure, weather and other conditions influencing the curing of concrete, in determining the time for removal of forms. (Refer to Section 03 33 00 - Cast-In-Place Concrete and CSA-A23.1).

.3 Leave shores in place until concrete has attained sufficient strength to adequately support its own weight together with construction loads likely to be imposed. Minimum periods before removal of formwork to be as follows:
- .1 Vertical Surfaces - minimum 3 days.
- .2 Columns – minimum 3 days.
- .3 Beam soffits, slabs & decks – 28 days, or 3 days when replaced immediately with adequate shoring to standard specified for Falsework AND concrete has reached at least 75% of specified 28 day compressive strength.

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

.5 Provide all necessary reshoring of members where early removal of forms may be required or where members may be subjected to additional loads during construction as required.

.6 Space reshoring in each principal direction at not more than 3m apart.

.7 Take particular care when removing forms to ensure no damage occurs at corners, arises and the like.

.8 To help avoid colour variations in architectural concrete, ensure length of time between concrete placing and form removal is approximately same for each portion of work.

.9 In hot weather, wood forms remaining in place should not be considered adequate for curing but should be removed or loosened so concrete surfaces may be kept moist or coated with curing agent.

.10 In cold weather, defer removal of formwork or insulate formwork, to avoid thermal shock and consequent cracking of concrete surface.

.11 Install tie hole plugs immediately following removal of spreader cones. Install to a snug fit, maximum setback from concrete surface as specified.

.12 When concrete is dry, install temporary polyethylene rope in reglets to prevent contamination of same.

END OF SECTION

1 GENERAL

1.01 REFERENCES

.1 American Society for Testing and Materials (ASTM)
- .1 ASTM A775/A775M- 07b(2014), Specification for Epoxy-Coated Reinforcing Steel Bars.

.2 Canadian Standards Association (CSA)
- .1 CAN/CSA-A23.1-04: Concrete Materials and Methods of Concrete Construction.
- .2 CAN/CSA-A23.3-04: Design of Concrete Structures.
- .3 CSA G30.5-M1983 (R1998), Welded Steel Wire Fabric for Concrete Reinforcement
- .4 CAN/CSA-G30.18-M92 (R2007): Billet-Steel Bars for Concrete Reinforcement.

.3 Reinforcing Steel Institute of Canada (RSIC)
- .1 RSIC Reinforcing Steel Manual of Standard Practice (2004)

.4 Ontario Ministry of Municipal Affairs & Housing (MMAH)
- .1 Ontario Building Code (2012)

1.02 SOURCE QUALITY CONTROL

.1 Inform Consultant of proposed source of material to be supplied.

.2 Upon request, submit certified mill test reports of steel reinforcing bars.

1.03 SUBMITTALS

.1 Submit shop drawings for placement of reinforcement in accordance with General Conditions, at least ten (10) days before fabrication.

.2 Indicate on shop drawings bar-bending details, bar schedule, quantities of reinforcement, sizes, spacings, locations of reinforcement splices, and concrete cover, with identifying code marks to permit correct placement without reference to structural drawings. Indicate sizes, spacings and locations of chairs, spacers and hangers.
- .1 Prepare reinforcement drawings in accordance with RISC Reinforcing Steel Manual of Standard Practice.

.3 Detail lap lengths and development lengths to CSA-A23.3, unless otherwise indicated.

1.04 SUBSTITUTES

.1 Substitute different size bars only if permitted in writing by Consultant.

2 PRODUCTS

2.01 MATERIALS

.1 Reinforcing steel: billet steel deformed bars to CAN/CSA-G30.18, grade 400R.

.2 Welded steel wire fabric: to CSA G30.5. Provide in flat sheets only.

.3 Cold drawn annealed steel wire ties: to CSA G30.3.

.4 Welded steel wire fabric: to CSA G30.5, provide in flat sheets only.

.5 Chairs, bar supports & spacers to CAN/CSA A23.1.
.1 Only concrete blocks and/or plastic chairs are acceptable.

.6 Anchor and dowel bar adhesive shall be hybrid adhesive consisting of methacrylate resin and hardener.
.1 Acceptable products: HIT-HY 200/HIT-RE 500-SD by Hilti Canada Ltd., or approved equivalent.

2.02 FABRICATION

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

.2 Location of reinforcement splices other than those shown on placing drawings only if permitted by Consultant.

2.03 DELIVERY, STORAGE & HANDLING

.1 Ship bar reinforcement in standard bundles, clearly identified in accordance with bar bending details and lists.

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

.3 Do not straighten or re-bend reinforcement in any manner.

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

3 EXECUTION

3.01 FIELD BENDING

.1 Do not field bend or field weld reinforcement except where indicated.
.1 When field bending, bend bars without using heat.
.2 Replace bars that develop cracks or splits.

3.02 PLACING REINFORCEMENT

.1 Place reinforcing steel as indicated on reviewed placing drawings and in accordance with CSA-A23.1.

.2 Ensure cover to reinforcement is maintained during concrete pour.

.3 Clean reinforcing steel bars prior to placing concrete.

.4 Welding of reinforcement will not be permitted.

.5 Splice reinforcement only as shown on the drawings or approved by the Consultant.
- .1 Bar splices shall conform to CSA-A23.3 (Class B), unless noted.
- .2 Lap adjacent sheets of wire fabric to provide an overlap of at least one cross wire spacing plus 50mm, measured between the outermost cross wires of each sheet.

.6 Support reinforcement as follows:
- .1 Beams, walls, and columns - laterally support reinforcement with supports in pairs on opposite faces.
- .2 Do not use supports that will be forced into the supporting formwork or soil by the weight of the reinforcement or other construction loads.
- .3 Separate layers of bars by precast mortar blocks, bars or equally suitable devices. Do not use pebbles, pieces of broken stone or brick, metal pipe or wooden blocks.
- .4 Do not place bars on layers of fresh concrete as the work progresses or install bars during placing of concrete.

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

.8 Where reinforcement is drilled and grouted into existing concrete or bedrock, reinforcement shall be secured using specified adhesive in strict accordance with manufacturer's written instructions. Clean holes before injection of adhesive.
- .1 Unless noted on Construction Drawings or elsewhere in these Specifications, obtain Consultant's approval before drilling and grouting reinforcement.

3.03 FIELD TOUCH-UP

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

3.04 INSPECTION

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

.2 Provide adequate notice of scheduled pours to facilitate inspection of reinforcement (minimum of 48 hours).

END OF SECTION

1 GENERAL

1.01 RELATED SECTIONS

.1 03 31 00 – Concrete Formwork

.2 03 31 00 – Concrete Reinforcing

1.02 REFERENCES

.1 American Society for Testing and Materials (ASTM):
- .1 ASTM C309-11, Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
- .2 ASTM C260/C260M-10a, Specifications for Air-Entraining Admixtures for Concrete
- .3 ASTM C494, Specification for Concrete Admixtures for Concrete.
- .4 ASTM C1017/C1017M-13, Specification for Chemical Admixtures for use in Producing Flowing Concrete.
- .5 ASTM D1751-04(2013), Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)

.2 Canadian Standards Association (CSA)
- .1 CAN/CSA-A3000-13, Cementitious Materials Compendium.
- .2 CAN/CSA-A23.1-04, Concrete Materials and Methods of Concrete Construction.
- .3 CAN/CSA-A23.2-04, Methods of Test for Concrete.
- .4 CSA-A23.3-04, Design of Concrete Structures.

.3 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-19.24-M90, Multicompound, Chemical Curing Sealing Compound.

.4 Ontario Ministry of Municipal Affairs & Housing (MMAH)
- .1 Ontario Building Code (2012)

1.03 SUBMITTALS

.1 Submittals shall be in accordance with Section 01 33 00 and as specified herein:
- .1 Submit mix designs for review at least 10 days in advance of concreting.
- .2 Submit samples of aggregates, water and cement to be used, to an approved testing agency, if requested by the Consultant.
- .3 If changes to the construction sequences and joint locations are proposed, submit schedule of proposed construction joints to the Consultant for review.
- .4 Submit mill certificates for cement and supplementary cementing materials, if requested by Consultant.
- .5 Submit details of proposed product substitutions (if any) with technical data sheets to demonstrate equivalency to product specified before proceeding with the work.

2 PRODUCTS

2.01 MATERIALS

.1 Portland cement: to CAN/CSA-A3001. Type GU or GUb unless indicated otherwise on Contract Drawings.

.2 Blended hydraulic cements: to CAN/CSA A3001-03.

.3 Other cementing materials: to CAN/CSA-A3000 & A23.1.

.4 Liquid Curing/Sealing Compound: Conforming to ASTM C309 Type 1, Class B and CAN/CSA-A23.1-M, water based acrylic curing/sealing compound.
- .1 Acceptable products: Acryseal WB by Conchem Lafarge; Masterseal W by Master Builders Technologies Limited; Florseal W.B. by Sternson; Sealtight Intex by W.R. Meadows of Canada Ltd (or approved equivalent).

.5 Grout: High performance non-shrink cementitious grout.
- .1 Acceptable products: Sika Grout 212 or equivalent, unless noted otherwise.

.6 PVC Waterstop: WR Meadows Sealtight Type 6380 or approved equivalent.

.7 Dovetail anchor channels: minimum 0.024” thick (24 ga.) galvanized steel with insulation filled slots.

.8 Vapour barrier: 10 mil thick polyethylene, to CGSB 51-GP-51M-81.1.

.9 Premoulded joint filler shall be PVC closed cell foam rigid grade (or approved equivalent), or bituminous impregnated fiberboard to ASTM D1751 as indicated on Contract Drawings.

.10 Joint Sealer: Sikaflex 1A with primer (Sika Canada) or approved equivalent.

.11 Bonding Agent: Sikatop Armatec 110 EpoCem or approved equivalent.

.12 Floor hardener: Non-metallic Type ‘R’ premixed as supplied by WR Meadows or approved equivalent.

.13 Sawcut Control Joint Filler: Euco QwikJoint 200 Polyurea floor joint filler or approved equivalent.

2.02 CONCRETE MIXES

.1 Contractor shall be responsible for concrete mix design.

.2 Proportion concrete in accordance with CAN/CSA-A23.1.

.3 Performance characteristics as indicated on Structural Drawings and as follows:

.1 Nominal maximum size of coarse aggregate: to CAN/CSA-A23.1.
.2 Slump: to CAN/CSA-A23.1.
.3 Do not air entrain concrete to receive floor hardener.
.4 Admixtures: to CAN/CSA-A23.1.

.4 Do not change concrete mix without prior revision by Consultant. Should change in material source be proposed, Consultant shall review new mix design.

3 EXECUTION

3.01 GENERAL

.1 All concrete work to be in accordance with CSA A23.1/A23.2.

3.02 INSPECTION

.1 The Consultant may review forms, foundations, reinforcing steel, construction joints, mixing, conveying and placing equipment before concreting.
.1 Provide minimum of 48 hours notice prior to placing concrete.
.2 Inform Consultant of proposed method(s) for protection of concrete during placing and curing of concrete during adverse weather prior to placing of concrete.

3.03 PREPARATION

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

.2 Retighten forms at construction joints.

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

.4 Saturate granular subgrade prior to placing concrete and maintain in damp state until completion of placement operation. Do not place concrete into standing water.

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

.6 Concrete shall not be poured against frozen ground, frozen concrete or into frosted formwork or against any surface at a temperature below $5^{O}C$.

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

.8 Check process, mechanical and electrical drawings for sleeves, inserts, etc.

3.04 SLEEVES AND INSERTS

.1 No sleeves, ducts, pipes or other openings shall pass through beams, column capitals or columns or concentrated wall reinforcing, except where indicated or approved by Consultant in writing.

.2 Where approved by Consultant in writing, set sleeves, ties, pipe hangers and other inserts and openings as indicated or specified elsewhere.

.1 Sleeves and openings greater than 4” x 4” not indicated, must be approved by Consultant.

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

.4 Check locations and sizes of sleeves and openings shown on drawings.

3.05 DOVETAIL ANCHOR SLOTS

.1 Install continuous vertical anchor slot to forms where masonry abuts concrete wall or columns.

.2 Install continuous vertical anchor slots at 32” o.c. where concrete walls are masonry faced.

3.06 ANCHOR BOLTS

.1 Set anchor bolts to templates under supervision of appropriate trade prior to placing concrete.

.2 Protect anchor bolt holes from water accumulations, snow and ice build-ups.

3.07 WATERSTOPS

.1 Install waterstops in all construction joints in exterior walls below grade (whether explicitly indicated on Structural Drawings or not).

.2 Install waterstops in accordance with manufacturer’s recommendations to provide continuous seal.

.3 Make straight heat sealed butt joints. All joints to be free of gaps. Ensure ribs run continuously over welded joints.

.4 Do not displace reinforcement when installing.

.5 Tie waterstop to reinforcing cage to prevent deformation during pour.

3.08 VAPOUR BARRIER

.1 Install vapour barrier under concrete slabs on grade inside building.

.2 Lap vapour barrier 6” minimum at joints and seal. Carry up walls to top of slab.

.3 Seal punctures in vapour barrier before placing concrete. Use patching material at least 6” larger than puncture and seal.

3.09 PLACING OF CONCRETE

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

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

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

ahead of a pour.

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

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

.6 Do not insert reinforcement into fresh concrete.

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

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

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

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

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

.12 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, air temperature and test samples taken.

.13 Do not place load upon new concrete until adequate strength has been attained.

3.10 PLACING GROUT

.1 Grout under base and bearing plates using procedures in accordance with manufacturer's written recommendations that result in 100% contact over grouted area.

3.11 COLD WEATHER

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

.2 Calcium chloride to 2% may not be used.

.3 Withdraw protection and heat gradually so that air temperature around the concrete does not drop more than 15°C per day.

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

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

.6 Frozen concrete will be rejected.

3.12 HOT WEATHER

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

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

.3 The concrete temperature at the time of placing in hot weather shall not exceed those

specified in CSA-A23.1. In the event that this limit is exceeded the concrete operations shall be suspended until the constituent materials of concrete are cooled.

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

3.13 JOINTS

.1 Construction, and/or control joints shall be provided where required and as shown on the plans or according to CSA-A23.1. Control joints should be spaced at maximum 6 metres or less unless otherwise indicated.

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

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

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

.5 Place beams, girders, brackets, column capitals and haunches monolithically with the floor system, unless otherwise approved by the Consultant.

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

3.14 SAWCUT CONTROL JOINTS – SLAB-ON-GRADE

.1 Saw-cut control joints in slab-on-grade as soon has concrete has sufficiently set to avoid ravelling the edges.
  .1 Control joint locations must be coordinated with the tilt-up concrete contractor.
  .2 Control joints to be evenly spaced at maximum 6.0m centres, aligned with columns wherever practical.
  .3 Fill saw-cuts with specified joint sealer/filler in accordance with manufacturers written recommendations.

3.15 FIELD QUALITY CONTROL

.1 Inspection and testing of concrete and concrete materials shall be carried out by an independent Certified Testing Laboratory in accordance with CAN/CSA-A23.1 and A23.2.
  .1 Frequency of tests and number of test cylinders shall be in accordance with CSA A23.2 requirements or as directed by the Engineer or its Site Representative.

.2 Contractor shall provide and maintain adequate facilities for safe storage and proper curing of concrete test specimens on the project site for the initial curing period.
  .1 Adequate facilities shall include a protected, designated area with provision for a continuous power supply to comply with CSA Test Method A23.2-3C.

.3 Concrete Testing Laboratory will be retained and paid for by the Owner.

.4 Consultant may request additional cylinders. Cure cylinders on job site under same conditions as concrete which they represent.

.5 Inspection and/or testing by Consultant will not augment or replace Contractor Quality Control, nor relieve him of contractual responsibilities.

.6 For concrete fails to meet the specification requirements, procedures as outlined in Clause 4.4.6.7 of CSA23.1 shall be followed.

3.16 FINISHING

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

.2 Steel trowel concrete slabs to be left exposed or to receive resilient flooring or carpeting.

.3 Other concrete slabs to be screeded off to true lines and levels shown and left ready to receive finish. Depress slabs where required.

.4 Where floor drains occur, floors to be level around walls and have a minimum 5mm per metre uniform pitch to drains, unless indicated otherwise.

.5 Exterior walkways, driveways or landings, shall receive a broomed non-slip surface.

.6 Co-ordinate with equipment suppliers regarding additional requirements for tolerances on floor level finishes etc.

.7 Ordinary surface finish (formed surfaces):
- .1 Use on concrete surfaces not exposed to view in the completed structure.
- .2 Chip off fins and irregular projections.
- .3 Patch honeycomb and fill tie holes with mortar containing approved bonding agent. Mix according to manufacturer's directions.

.8 Plain floor finish (not exposed):
- .1 Roll or tamp concrete to force coarse aggregate into concrete mix, then screed.
- .2 Strike off the compacted concrete to required cross-section and elevation, keeping a slight excess of concrete in front of the screed at all times.
- .3 Float surface with wood or metal float or with power finishing machine and bring surface to true elevation.
- .4 Steel trowel to smooth and even surface.
- .5 Obtain a uniform surface by floating as necessary. If floating is not completed before excess water appears at the surface, remove this water before continuing with floating.
- .6 Follow with second steel trowelling to produce smooth burnished surface to within 3mm tolerance when measured in any direction using 10’ straight edge.
- .7 Do not overwork the concrete surface. Float only enough to obtain a dense uniform surface.
- .8 Sprinkling of dry cement or dry cement and sand mixture over concrete surfaces is not acceptable.
- .9 Apply curing compound in accordance with manufacturer's instructions. Do not use curing compound when slab is to receive bonded finish. Damp curing or other approved method shall then be employed.

.9 Exposed Floor Finish:

.1 Finish concrete floors as specified above for plain floor finish (Clauses .1 to .8.8), and apply floor hardener in accordance with manufacturer's recommendations.
.2 Apply approved curing/sealing compound to manufacturer's instructions.
.3 Sawcut crack-control joints in slabs on grade in accordance with Clause 3.14.
.4 After curing/sealing and when concrete is dry, seal control joints and joints at junction with vertical surfaces with sealing compound.
.5 Clean surfaces and apply second coat curing/sealing compound before handing building over to Owner.

.10 Broomed finish (exterior exposed surfaces):
.1 After completion of subsection .8 above, broom to produce a non-slip surface with regular corrugations not more than 3 mm deep.

3.17 FLOOR HARDENER

.1 Apply non-metallic floor hardener to floor slab where indicated in strict accordance with manufacturer's recommendations.
.1 Steel trowel to an even plane surface free from surface marks or voids, avoiding overworking but ensuring that the cement paste is completely wet out for a monolithic surface.

3.18 CURING & SEALING

.1 Cure and protect concrete in accordance with CSA-A23.1. Wet cure fresh concrete when the weather condition and/or the site condition are suitable for this application.

.2 All concrete floor slabs are to be treated with specified curing/sealing compound, except where bond is required by subsequent pours or topping.

3.19 CONSTRUCTION TOLERANCES

.1 Acceptable construction tolerances shall be in accordance with CSA A23.1 Clause 6.4.

3.20 FORM REMOVAL

.1 Refer to Section 03 31 00.

3.21 PATCHING & FINISHING OF HARDENED CONCRETE

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

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

3.22 EQUIPMENT BASES

.1 Install all equipment bases and pads and curbs where shown on the structural and or mechanical and electrical drawings.

3.23 BOLLARDS

.1 Fill bollards and pipe guards shown on drawings with concrete.

3.24 HOUSE KEEPING PADS

.1 Install all house keeping pads and all mechanical bases as required including pad for washing machines. Refer to drawings for locations and sizes.

3.25 CONCRETE SPECIALTIES

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

.2 Included are joint fillers, fiberboard, sealant, waterstop and bond breakers, etc.

END OF SECTION

PART 1 - GENERAL

1.1 Related Sections

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

1.2 References

.1 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-25.20-95, Surface Sealer for Floors.

.2 CAN/CGSB-25.20-95, Surface Sealer for Floors.

.2 Canadian Standards Association (CSA)

.1 CSA-A23.1-09, Concrete Materials and Methods of Concrete Construction.

1.3 Performance Requirements

.1 Product quality and quality of work in accordance with Division 1.

.2 Submit written declaration that components used are compatible and will not adversely affect finished flooring products and their installation adhesives.

.3 Provide mock-ups of Architectural Concrete elements as outlined as well as mock-ups of landscape concrete at planters.

1.4 Product Data

.1 Submit product data in accordance with Division 1.

.2 Submit WHMIS MSDS - Material Safety Data Sheets in accordance with Division 2. WHMIS MSDS acceptable to Labour Canada and Health and Welfare Canada for concrete floor treatment materials. Indicate VOC content.

.3 Include application instructions for concrete floor treatments.

1.5 Environmental Requirements

.1 Temporary lighting:

.1 Minimum 1200 W light source, placed 2.5 m (8’-0”) above floor surface, for each 40 sq m (430 ft2) of floor being treated.

.2 Electrical power:

.1 Provide sufficient electrical power to operate equipment normally used during construction.

.3 Work area:

.1 Make the work area water tight protected against rain and detrimental weather conditions.

.4 Temperature:

.1 Maintain ambient temperature of not less than 10°C from 7 days before installation to at least 48 hours after completion of work and maintain relative humidity not higher than 40% during same period.

.5 Moisture:

.1 Ensure concrete substrate is within moisture limits prescribed by finish manufacturer.

.6 Safety:

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

PART 2 - PRODUCTS

2.1 Chemical Hardeners

.1 Type 1 - Sodium silicate.

.2 Water: potable.

2.2 Sealing Compounds

.1 Surface sealer: to CAN/CGSB-25.20, Type 2 - water based, clear.

.2 Surface sealers may not be manufactured or formulated with aromatic solvents formaldehyde halogenated solvents mercury lead cadmium hexavelant chromium and their compounds.

2.3 Curing Compounds

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

2.4 Concrete Stains

.1 Select low VOC, water-based concrete stains.

2.5 Mixes

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

2.6 Sealants

.1 EUCO QWIKJOINT 200 (The Euclid Chemical Company) or similar equivalent approved.

2.7 Carborundum Strips

.1 Extruded Aluminum Self Anchoring Anit-Slip Strip: CT-22/34A (K.N. Crowder MFG. Inc.) or similar equivalent approved.

.2 Epoxy/Sand Mix: Sika Dur 30 epoxy and black silica sand or similar equivalent approved.

PART 3 - GENERAL

3.1 Finishing

.1 Formed Concrete Surfaces

.1 After removal of fins, replace or treat honeycombing or defects in exposed concrete surfaces according to CSA A23.1 for Formed Surfaces. Refer honeycombed areas to the Consultant for designation as structural or non-structural, and repair according to CAN3 Specifications

.2 Bring the surfaces of all exposed interior and exterior concrete to a smooth rubbed finish not later than 5-6 hours after removal of forms and in accordance with the requirements of CSA A23.1.

.3 The producing of smooth surfaces by means of cement plaster will not be permitted unless otherwise specified or scheduled.

.2 Concrete Floors:

.1 Leave slabs reasonably level or sloped to drains, ready for finishing.

.2 Refer to Item 4.2 for finishing.

.3 Architecturally Exposed Concrete:

.1 Remove fins, ravelings, and loose material, all surface defects over 12 mm (1/2 inch) in diameter or more than 12 mm (1/2 inch) deep, shall be repaired. Holes left by removal of form ties shall be reamed and filled. Defects more than 12 mm (1/2 inch) in diameter shall be cut back to sound concrete, but in all cases at least 25 mm (1 inch) deep.

.2 The surfaces designated as Architectural Concrete, as per Architect, shall be given a grout-cleaned finish as described, as approved by the Consultants and after all required curing, cleaning, and repairs have been completed. Surfaces to be grout-cleaned shall be moist cured for the required period of time before application of the grout-cleaned finish. Grout-cleaning shall be delayed until near the end of construction on all surfaces not to be painted in order to achieve uniformity of appearance and reduce the chance of discoloring caused by subsequent construction operations. The temperature of the air adjacent to the surface shall be not less than 5^0C (40^0F) for 24 hours prior to and 72 hours following the application of the finish. The finish for any area shall be completed in the same day, and the limits of a finished area shall be made at natural breaks in the finished surface. The surface to receive grout-cleaned finish shall be thoroughly wetted to prevent absorption of water from the grout but shall have no free water present. The surface shall then be coated with grout. The grout shall be applied as soon as the surface of the concrete approaches surface dryness and shall be vigorously and thoroughly rubbed over the area with clean burlap pads, cork floats or stones, so as to fill all voids. The grout shall be composed of one part portland cement as used on the project, to two parts by volume of well-graded sand passing a 600-µm (No. 30) sieve mixed with water to the consistency of thick paint. White portland cement shall be used for all or part of the cement as approved by the Consultants to give the desired finish color. The applied coating shall be uniform, completely filling all pits, air bubbles, and surface voids. While the grout is still plastic, remove all excess grout by working the surface with a rubber float, burlap pad, or other means. Then, after the surface whitens from drying (about 30 minutes at normal temperature) rub vigorously with clean burlap pads. Immediately after rubbing is completed, the finished surface shall be continuously moist cured for 72 hours. Burlap pads used for this operation shall be burlap stretched tightly around a board to prevent dishing the mortar in the voids.

.3 Surfaces listed as Architectural Concrete shall have surface defects repaired as follows: defective areas, voids, and honeycombs smaller than 10 000 square mm (16 square inches) in area and less than 13 mm (1/2 inch) deep and bug holes exceeding 13 mm (1/2 inch) in diameter shall be chipped and filled with dry-packed mortar. Holes left by removal of tie rods shall be reamed and filled with dry-packed mortar. Defective and unsound concrete areas larger than described shall be rejected or made good to the Consultants satisfaction.

.4 Contractor to provide mock-ups of Architectural Concrete Elements, as per Division 01. Mock-up to be removed provided requirements of Division 01 have been met and mock-up does not form part of structure of building.

a. Concrete column designated as Architectural Concrete to have same diameter and reinforcement as specified column and to be a minimum of 1800 mm high. Contractor to supply engineered foundation or other required support for mock-up.

b. Concrete wall designated as Architectural Concrete to have mock-up in location determined by Architect.

.5 Finish for exposed concrete shall match the approved prototype sample wall and is to have uniform colour and texture throughout.

.4 Finish types for walls, columns, and other vertical elements are as follows:

Type 1 – Concrete Exposed with Surface Coatings: Sack rubbed finish, interior - all interior surfaces and any and all exposed rectangular concrete columns noted to be painted or to have applied coatings as noted on finish schedule.

Type 2 – Concrete Exposed in the Finished Work: Use high density overlay formwork or patterned formwork as detailed on the drawings. Repair imperfections only after consultation with the Architect. For exposed walls in stairwells with patterned finish, refer to architectural drawings and specifications for formwork patterns and tie layouts.

Type 3 – Concrete Not Exposed in the Finished Work: As formed finish. Fill all surface imperfections (voids & honeycombing) as directed on site by Consultant. Patching material to be approved by Consultant prior to application.

.5 Concrete not exposed in the finished work e.g. exterior concrete below grade, concealed ceiling spaces and wall surfaces to be finished to CAN/CSA-A23.1-M00.

.6 Refer to CSA A23.1, Clause 24 for descriptions of above finishes.

PART 4 - EXECUTION

4.1 Examination

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

4.2 Workmanship

.1 Steel trowel concrete slabs to be left exposed or to receive resilient flooring or carpeting. For concrete containing air entrainment float/trowel slab in accordance with A23.1 (09).

.2 Other concrete slabs to be screeded off to true lines and levels shown and left ready to receive finish. Depress slabs where required.

.3 Where floor drains occur, floors to be level around walls and have a minimum 6mm in 1m (1/4” in 30”) uniform pitch to drains, unless indicated otherwise.

.4 Co-ordinate with equipment suppliers regarding additional requirements for tolerances on floor level finishes etc.

.5 Plain Floor Finish (unexposed)

.1 Roll or tamp concrete to force coarse aggregate into concrete mix, then screed.

.2 Float surface with wood or metal float or with power finishing machine and bring surface to true elevation.

.3 Steel trowel to smooth and even surface. For concrete containing air entrainment float/trowel slab in accordance with A23.1 (09).

.4 Unless otherwise noted, follow with second steel trowelling to produce smooth burnished surface to within 6mm tolerance when measured in any direction using 3 m (10') straight edge. Do not over trowel.

a. For floor areas to receive ceramic tile, produce fine broom finished surface to within 3 mm (0.12") tolerance when measured in any direction using 3,000 mm (10') straight edge and not more than 1.5mm (0.06") in 305mm (12") when measured from high points.

b. For floor areas to receive ceramic tiles that are 300 x 600 mm (12"x24") in size, produce fine broom finished surface to within 1.5 mm (0.06") in 600 mm (24") tolerance when measured in any direction from the high points in the surface.

c. For floor areas to receive epoxy terrazzo flooring or resilient floor finishes, produce fine broom finished surface to within 3 mm (0.12") tolerance when measured in any direction using 3,000 mm (10') straight edge and not more than 1.5mm (0.06") in 305mm (12") when measured from high points.

d. For any floor areas that are to support working equipment/procedure rooms/other floor level sensitive elements, floor flatness to be in accordance with architectural requirements and equipment manufacturer's data where these requirements exceed the tolerances outlined in this specification/construction documents. All equipment requirements/room data sheets to be coordinated prior to placement of concrete.

.5 Sprinkling of dry cement or dry cement and sand mixture over concrete surfaces is not acceptable.

.6 Apply curing compound in accordance with manufacturer's instructions. Do not use curing compound when slab is to receive bonded finish. Damp curing or other approved method shall then be employed.

.7 After curing and when concrete is dry, seal control joints and joints at junction with vertical surfaces with sealing compound.

.6 Floor Finish (exposed)

.1 Finish concrete floors as per Paragraph 4.2, Clauses .1 to .5, and apply floor hardener, non-metallic aggregate at a rate of 5 kg/m2 (1lb / ft2) to manufacturer's instructions.

.2 Apply approved curing/sealing compound to manufacturer's instructions.

.3 After curing/sealing and when concrete is dry, seal control joints and joints at junction with vertical surfaces with sealing compound.

.4 Clean surfaces and apply second coat curing/sealing compound before handing building over to Owner.

.7 Saw cut Joints (Slabs-on-Grade):

.1 Saw cut control joints and construction joints in slab where shown, in straight lines.

.2 Perform saw cutting 12 to 24 hours after concrete has been placed, depending on when saw can be run over concrete surface without leaving tread marks, when concrete can be sawn without dislodging aggregate and before uncontrolled shrinkage has occurred. Do not postpone sawing operations beyond these time limitations.

.3 Spray water on saw blade at all times during sawing. Grind edges of sawcuts to eliminate burrs; do not grind to bevel or chamfer joint edges.

.4 After sawing and grinding, clean joints with a jet of water, and blowout with compressed air. Broom clean residue caused by sawing operation. Seal with joint filler.

.5 When cleaned joints are dry and prior to traffic being allowed over the area, install temporary polyethylene rope in such joints to prevent contamination of same.

4.3 Application

.1 Curing/Sealing:

.1 Liquid Compound Curing/Sealing: Apply compound after saw cutting operations have been completed to all horizontal concrete surfaces, at a rate recommended by compound manufacturer. Clean concrete floor of laitance, tire marks, oil, grease, etc. to the satisfaction of the Consultant prior to applying sealing compound.

.2 Water Curing: Water cure slabs where so designated. Do not use curing/sealing compound. Water down entire area and cover with polyethylene sheets for a minimum of 7 Days. Sheet coverage to include exposed edges. Provide suitable weights to prevent blow-off or displacement of sheets. Remove cover after minimum 7 consecutive Days. Allow to air dry until concrete has developed design strength.

.2 Anchor Bolt Protection:

.1 Adequately protect unburied portion of anchor bolts set in concrete, including nuts and washers from rusting, corrosion and damage by a heavy coating of specified coating material; wrap in a manner to exclude moisture.

.2 Clean surfaces to be protected to bare steel followed by the specified protection system.

.3 Grouting: Grout column base plates and miscellaneous work to be grouted in accordance with grout manufacturer's printed directions. Form around bases, place grout in a manner, which will ensure positive bearing of the full area of the steel plate on top of the supporting surface. Thoroughly compact, leaving no voids.

.4 Sealants:

.1 Sealant At V-Joints: Prime, prepare substrate and apply sealant full joint depth in accordance with manufacturer's printed directions. Tool to a smooth semi-concave finish. Exclude joints in surfaces to receive waterproofing treatment.

.2 Sealant at Saw cut Joints/Reglets/Isolation Joints: Do not fill saw cut joints and isolation joints sooner than 30 days after concrete pours. Comply with curing and saw cutting requirements as specified herein. Execute joint sealing as specified herein during cool, dry ambient conditions when slab is in a contracted state to minimize future joint separation at sealant filled joints.

.1 Application:

.1 Remove temporary polyethylene rope from joints or reglets. Clean joints and blow clean with compressed air.

.2 Fill sawn joints in concrete slabs full depth with saw cut joint sealant in accordance with manufacturer's printed directions.

.3 Caulk over isolation joints and reglets with specified sealant per manufacturer's instructions.

.4 Comply with application and substrate temperature requirements. Mask floor to edge of joints and fill joint with sealant. After initial set, prime sealant surface and refill joints with sealant as required to produce slightly convex joint surface.

END OF SECTION

PART 1 - GENERAL

1.1 Section Includes

.1 Materials and installation for concrete floor hardeners, slip resistant coatings, and sheet curing materials.

1.2 Related Sections

.1 Section 03 10 00 - Concrete Formwork.

.2 Section 03 35 00 – Concrete Finishings

1.3 References

.1 Health Canada - Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS).

1.4 Submittals

.1 Submit product data in accordance with Division 1.

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

.3 Submit WHMIS MSDS - Material Safety Data Sheets in accordance with Division 2.

.1 WHMIS MSDS acceptable to Human Resources Development Canada-Labour and Health Canada for concrete floor hardeners.

.2 Indicate VOC content.

PART 2 - PRODUCTS

2.1 Floor Hardener

.1 Non-metallic hardener: premixed, dry shake surface hardener, abrasion resistant.

2.2 Slip Resistant Abrasive Aggregate

.1 Emery aggregate: crushed emery, minimum 50 % aluminum oxide.

.2 Homogeneous aluminum oxide, minimum 95%.

.3 Ferric oxide, minimum 25%.

.4 Silicon carbide.

PART 3 - EXECUTION

3.1 Examination

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

3.2 Hardening

.1 Apply floor hardener aggregate at rate of 5 kg/m2 (1lb per sq. ft.) in accordance with manufacturer's written instructions.

.2 Apply slip resistant coating on floor surfaces as scheduled. Apply in strict accordance with manufacturer's written instructions.

.3 Do not use hardener aggregate in concrete with air entrainment included in the concrete mix design.

3.3 Protection

.1 Protect finished installation until floor treatment has completely cured.

END OF SECTION

1 GENERAL

1.01 REFERENCES

.1 American Society for Testing and Materials International, (ASTM)
- .1 ASTM A 307-14, Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength
- .2 ASTM A 325M-14, Specification for High-Strength Bolts for Structural Steel Joints

.2 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB 85.10-99, Protective Coatings for Metals

.3 Canadian Institute of Steel Construction (CISC)
- .1 CISC/CPMA 1-73b, Quick-Drying, One-Coat Paint for Use on Structural Steel
- .2 CISC/CPMA 2-75, Quick-Drying, Primer for use on Structural Steel
- .3 CISC Code of Standard Practice for Structural Steel

.4 Canadian Standards Association (CSA International)
- .1 CAN/CSA G40.20-13/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel
- .2 CAN/CSA G164-M92(R2003), Hot Dip Galvanizing of Irregularly Shaped Articles
- .3 CAN/CSA S16-09, Limit States Design of Steel Structures
- .4 CAN/CSA S136-12, Cold Formed Steel Structural Members
- .5 CSA S136.12, Commentary on CSA Standard S136
- .6 CSA W47.1-09(R2014), Certification of Companies for Fusion Welding of Steel Structures
- .7 CSA W48-14, Filler Metals and Allied Materials for Metal Arc Welding
- .8 CSA W55.3-08(R2013), Resistance Welding Qualification Code for Fabricators of Structural Members Used in Buildings
- .9 CSA W59-13, Welded Steel Construction (Metal Arc Welding)

.5 Master Painters Institute
- .1 MPI-INT 5.1-98, Structural Steel and Metal Fabrications
- .2 MPI-EXT 5.1-98, Structural Steel and Metal Fabrications

.6 Ontario Ministry of Municipal Affairs & Housing (MMAH)
- .1 Ontario Building Code (2012)

.7 The Society for Protective Coatings (SSPC)
- .1 SSPC SP-6/NACE No. 3-00, Commercial Blast Cleaning

1.02 DESIGN REQUIREMENTS

.1 Contractor is responsible for design and engineering of details and connections in accordance with requirements of CAN/CSA-S16 and CAN/CSA-S136 (with CSA-S136.1) to resist forces, moments, shears and allow for movements indicated.

.2 Shear connections:
- .1 Select framed beam shear connections from an industry accepted publication such as "Handbook of the Canadian Institute of Steel Construction" when connection for shear only (standard connection) is required.

.2 When shears are not indicated: Select or design connections to support reaction from maximum uniformly distributed load that can be safely supported by beam in bending, provided no point loads act on beam.

.3 Seismic Force Resisting Systems:

.1 Connections forming part of the seismic force resisting system(s) – including but not limited to diaphragm chords, braces, beams column and their connections – shall be designed to resist forces and moments associated with the seismic design loads as indicated on Structural Drawings. Seismic design loads shall be amplified by Rd and combined with other load cases in accordance with the Ontario Building Code and CSA S16.

.4 Submit drawings and design calculations stamped and signed by qualified professional engineer licensed in Province of Ontario.

.5 Perform welding in accordance with CSA W59-M1989 (R2001).

1.03 SHOP DRAWINGS

.1 Submit shop drawings including fabrication and erection documents and materials list in accordance with Division 1.

.1 Verify site conditions and dimensions on site before shop drawing preparation. Show all on shop drawings.

.2 Shop drawings must be original. Reproduction of Engineer's design drawings is not acceptable.

.2 Erection drawings: indicate details and information necessary for assembly and erection purposes including:

.1 Description of methods.
.2 Sequence of erection.
.3 Type of equipment used in erection.
.4 Temporary bracings.
.5 Connections.

.3 Ensure Fabricator drawings showing designed assemblies, components and connections are stamped and signed by qualified professional engineer licensed in the province of Ontario, Canada.

1.04 QUALITY ASSURANCE

.1 Upon request, submit 5 copies of mill test reports 4 weeks prior to fabrication of structural steel.

.1 Mill test reports to show chemical and physical properties and other details of steel to be incorporated in project.

.2 Provide mill test reports certified by metallurgists qualified to practice in province of Ontario, Canada.

.3 Provide structural steel Fabricator's affidavit stating that materials and products used in fabrication conform to applicable material and products standards specified and indicated.

2 PRODUCTS

2.01 MATERIALS

.1 Structural steel: to CAN/CSA-G40.20/G40.21, Grade 350W.

.2 HSS Sections: to CAN/CSA-G40.21, Type 350W (Class C) or ASTM A500.

.3 Anchor bolts: to CAN/CSA-G40.20/G40.21, Grade 300W (A307) (unless otherwise noted on drawings).

.4 Bolts, nuts and washers: to ASTM A325M.

.5 Welding materials: to CSA W59 and certified by Canadian Welding Bureau.

.6 Shop paint primer: to CISC/CPMA 2.

.7 Hot dip galvanizing: galvanize steel, where indicated, to CAN/CSA-G164, minimum zinc coating of 600g/m².

2.02 ADHESIVE ANCHORING SYSTEM

.1 Adhesive:
- .1 Adhesive anchoring system shall be injectable hybrid adhesive consisting of methacrylate resin and hardener.
- .2 Injectable adhesive shall be resistant to creep under sustained load conditions.
- .3 Acceptable products: HIT HY 150 or HIT-ICE by Hilti Canada Ltd., or approved equivalent. Submit details of proposed product(s) for review prior to use. Provide sufficient technical information as required to demonstrate equivalency with performance

.2 Anchor Rods:
- .1 Threaded rods furnished with a chamfered end or chisel point, to ISO 898 Class 5.8. Nuts and washers to be compatible.
- .2 Fasteners exposed to exterior conditions to be zinc coated.
- .3 Acceptable product: Hilti standard HAS-E rods.

.3 Mesh Screen Tube:
- .1 For hollow base materials a cylindrical mesh screen tube shall be used in accordance with manufacturer's recommendations.

2.03 FABRICATION

.1 Fabricate structural steel in accordance with CAN/CSA-S16 and CAN/CSA-S136 and in accordance with reviewed shop drawings.

.2 Continuously seal members by intermittent welds and plastic filler, unless otherwise indicated. Grind smooth.

.3 Provide holes in top and bottom flanges for attachment of wood nailers, as required.

.4 Hot dip galvanize after fabrication where required.

2.04 SHOP PAINTING

.1 Clean, prepare surfaces and shop prime structural steel in accordance with CAN/CSA-S16 and CAN/CSA-S136.

.2 Clean members, remove loose mill scale, rust, oil, dirt and other foreign matter. Prepare surface according to SSPC-SP-6.

.3 Apply one coat of primer in shop to steel surfaces to achieve minimum dry film thickness of 0.065 to 0.080 mils, except:

- .1 Interior Steel: Concealed:
  - .1 Surface preparation: to SSPC SP 3-89.
  - .2 Primer: One coat iron oxide type: to CAN/CGSB-1.40-M89 (or equivalent).
- .2 Interior and Exterior Steel: Exposed
  - .1 Surface preparation: to SSPC SP 6-89 commercial blast cleaning using mechanical shot blast techniques. Hand cleaning not permitted.
  - .2 Primer: One coat applied in accordance with architectural finish schedules.
- .3 Loose Lintels: Hot dipped galvanized.

.4 Apply paint under cover, on dry surfaces when surface and air temperatures are above 5 degrees C.

.5 Maintain dry condition and 5 degrees C minimum temperature until paint is thoroughly dry.

.6 Strip paint from bolts, nuts, sharp edges and corners before prime coat is dry.

3 EXECUTION

3.01 GENERAL

.1 Structural steel work: in accordance with CAN/CSA-S16 and CAN/CSA-S136.

.2 Welding: in accordance with CSA W59

.3 Companies to be certified under Division 1 or 2.1 of CSA W47.1 for fusion welding of steel structures and/or CSA W55.3 for resistance welding of structural components.

3.02 CONNECTION TO EXISTING WORK

.1 Verify dimensions and condition of existing work, report discrepancies and potential problem areas to Consultant for direction before commencing fabrication.

3.03 MARKING

.1 Mark materials in accordance with CAN/CSA G40.20/G40.21. Do not use die stamping. If steel is to be left in unpainted condition, place marking at locations not visible from exterior after erection.

.2 Match marking: shop mark bearing assemblies and splices for fit and match.

3.04 ERECTION

.1 Check anchor bolt layout before erection. Arrange for discrepancies.

.2 Erect structural steel, as indicated and in accordance with CAN/CSA-S16, CAN/CSA-S136 and the Ontario Building Code in accordance with reviewed erection drawings.

.3 Field cutting or altering structural members: to approval of Consultant in writing.

.4 Clean with mechanical brush and touch up shop primer to bolts, rivets, welds and burned or scratched surfaces at completion of erection.

.5 Continuously seal members by continuous welds where indicated. Grind smooth.

.6 Use erection techniques and equipment that will not mark or abrade surfaces of exposed structural steel.

3.05 FIELD QUALITY CONTROL

.1 Inspection and testing of materials and workmanship will be carried out by testing laboratory designated by Consultant.

.2 Provide safe access and working areas for testing on site, as required by testing agency and as authorized by Engineer.

.3 Submit test reports to Consultant within 1 week of completion of inspection.

.4 Owner will pay costs of tests as specified in Division 1.

3.06 FIELD PAINTING

.1 Paint in accordance with Architectural Specifications.

3.07 GALVANIZING TOUCH-UP

.1 Touch up galvanized surfaces damaged during transportation, handling, storage, and erection and as a result of work of other sections.

.2 Touch up in accordance with ASTM A780.

.3 Clean damaged surfaces with stiff wire brush to remove rust, loose and cracked coatings.

.4 Clean welds, bolted connections and abraded areas.

.5 Apply galvanizing repair materials to match hot dip coating weight and appearance.

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

.1 05 12 00 – Structural Steel

.2 05 41 00 – Structural Metal Stud Framing

1.2 REFERENCES

.1 Use current version of all references, except where indicated otherwise.

.2 American Society for Testing and Materials (ASTM):
  .1 A653/A653M: Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

.3 Canadian Standards Association (CSA):
  .1 CSA-S16: Limit States Design of Steel Structures
  .2 CSA-S136: North American Specification for the Design of Cold-Formed Steel Structural Members
  .3 CSA W47.1: Certification of Companies for Fusion Welding of Steel
  .4 CSA W55.3: Resistance Welding Qualification Code for Fabricators of Structural Members Used in Buildings.
  .5 CSA W59: Welded Steel Construction, (Metal Arc Welding).

.4 Canadian Sheet Steel Building Institute (CSSBI):
  .1 CSSBI 10M: Standard for Steel Roof Deck.
  .2 CSSBI 12M: Standard for Composite Steel Deck.

1.3 SUBMITTALS

.1 Submit technical details of proposed product substitutions (if any) for review including technical data sheets to demonstrate equivalency prior to proceeding with the work.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Zinc-iron Alloy (ZF) coated steel sheet: to ASTM A653/A653M structural quality Grade A, with ZF75 coating, for interior surfaces not exposed to weather, finish.

.2 Zinc (Z) coated steel sheet: to ASTM A653/A653M structural quality Grade A, with ZF75, coating, regular spangle surface, chemically treated for unpainted finish, not chemically treated for paint finish, for interior surfaces or exterior surfaces exposed to weather.

2.2 ROOF DECK

.1 Steel deck sheets with interlocking side laps.

.2 Steel according to ASTM A653M SS Grade 230, yield strength of 230MPa.

.3 Profile depth: 38mm

.4 Minimum nominal thickness (gauge) as indicated on Structural Drawings.

.5 Acceptable material: Canam P-3615 or approved equivalent.

2.3 FORM DECK

.1 Steel deck sheets with overlapping side laps.

.2 Steel according to ASTM A653M, minimum yield strength of 410MPa.

.3 Profile depth: 14mm

.4 Minimum nominal thickness (gauge) as indicated on Structural Drawings.

.5 Acceptable material: Canam P-3012 or approved equivalent.

2.4 COMPOSITE FLOOR DECK

.1 Steel deck sheets with interlocking side laps.

.2 Steel according to ASTM A653M SS Grade 230, yield strength of 230MPa.

.3 Profile depth: 38mm

.4 Minimum nominal thickness (gauge) as indicated on Structural Drawings.

.5 Acceptable material: Canam P-3615 COMPOSITE or approved equivalent.

2.5 ACCESSORIES

.1 Provide all edge strips, pour stops, cell closures, cover plates or closure strips necessary to complete the work in accordance with manufacturer's recommendations.

.2 Use steel sheet with minimum base steel thickness and metallic coating to match adjacent deck material.

.3 Primer: zinc rich, ready mix to CAN/CGSB-1.181.

.4 Mechanical fasteners or welds are acceptable for accessory attachments.

PART 3EXECUTION

3.1 GENERAL

.1 Design, detail, fabricate and erect in accordance with CAN/CSA-S136 and CSSBI 10M.

.2 All welding to be in accordance with CSA W59, except where specified otherwise.

.3 Welding companies to be certified under Division 1 or 2.1 of CSA W47.1 for fusion welding of steel decks and/or CSA W55.3 for resistance welding.

3.2 ERECTION

.1 Erect steel deck in accordance with CAN/CSA S136 and CSSBI 10M except as specified otherwise.

.2 Lap ends: to 150 mm minimum, or as recommended by deck manufacturer.

.3 Deck must be continuous over a minimum of three spans (i.e. four supports).

.4 Deck connections shall be as indicated on Structural Drawings.

.5 Provide continuous L76x76x6.4 supporting decking edges unless noted otherwise.

.6 Immediately after deck is permanently secured in place, touch up metallic coated top surface with compatible primer where burned by welding.

.7 Prior to concrete placement, steel deck to be free of soil, debris, standing water, loose mil scale and other foreign matter.

3.3 CLOSURES

.1 Install closures in accordance with details, as indicated, to ensure effective closures against weather, thermal and acoustic effects.

.2 For details not indicated, follow manufacturer's recommendations.

3.4 OPENINGS AND AREAS OF CONCENTRATED LOADS:

.1 No reinforcement required for openings cut in deck that are smaller than 150 mm square.

.2 Frame deck openings with any one dimension between 150 to 300 mm as recommended by manufacturer, except as otherwise indicated.

.3 Framed openings: For any deck openings with any one dimension greater than 300 mm and for areas of concentrated load, reinforce with C100x8 channels on 4 sides unless otherwise indicated in the structural drawings.

.4 Connections

.1 Install connections in accordance with CSSBI recommendations.

END OF SECTION