THE BID DOCUMENTS, CONDITIONS OF CONTRACT, DRAWINGS AND SPECIFICATIONS ARE HEREBY AMENDED, AS FOLLOWS:

Amendment 1

Designated Substances Surveys

1.1 "2021 Annual Asbestos Containing Materials Inspection and Designated Substances Inspection Report – J.J. O'Neill Catholic School", dated October 8, 2021, by S2S Environmental Inc., and related to the existing school building is issued herewith. Where identified hazardous materials are to be affected by the Work, the recommendations of this report are understood to be requirements of the project.

1.2 "Project Specific Designated Substances Survey – J.J. O'Neill Catholic School", dated March 10, 2023, by S2S Environmental Inc., and related to the RCM classroom addition is issued herewith for information.

Amendment 2

Structural Specifications

2.1 Add the following structural specification sections, issued herewith:

03 30 53 – Cast-in-Place Concrete
03 41 13 – Precest Concrete Hollow Core Planks
05 21 19 – Structural Steel and Open Web Steel Joist Framing
05 31 23 – Steel Roof Decking

END OF ADDENDUM 1

PART 1 – GENERAL

1.1 General Requirements

.1 Also included in this section are clauses for the following items:

Concrete Forming and Accessories
Concrete Reinforcing
Concrete Toppings
Defective Concrete
Finishing of Formed Surfaces
Finishing Treatment of Slab Surfaces (Screeding and Trowelling)
Sealing and Curing
Slabs-on-Grade
Vapour Retarder Membrane for Slabs-on-Grade

.2 Make a thorough examination of the drawings, site, specification and geotechnical report, to determine the intent, extent, materials and conditions of interfacing with other work and to be fully cognizant of the requirements.

.3 Assume full responsibility for the design, for the adequacy and for the safety of all formwork and falsework.

.4 The Contractor shall ensure that no asbestos containing materials are used in connection with the work of this section.

1.2 Reference Standards

.1 Comply with The Building Code Act, as amended, the 2012 Ontario Building Code (OBC) as amended and Regulations and by-laws of other authorities having jurisdiction, including latest amendments thereto; all hereafter referred to as Building Code.

.2 All codes, standard specifications and by-laws referred to in this Specification shall be current editions including all latest revisions, addenda and supplements, unless otherwise noted in the Building Code.

.3 Conform to the following CSA Standards:

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

.2 A23.2 ..... Test Methods and Standard Practices for Concrete.

.3 A23.3 ..... Design of Concrete Structures.

.4 A3000 ..... Cementitious Materials Compendium.

.5 G30.18 ..... Carbon Steel Bars for Concrete Reinforcement.

.6 S269.1 ..... Falsework and Formwork.

.7 W186 ..... Welding of Reinforcing Bars in Concrete Construction.

.4 Conform to the following ASTM Standards:

.1 C94/C94M ..... Standard Specification for Ready-Mixed Concrete.

.2 C309 ..... Standard Specification for Liquid Membrane Forming Compounds for Curing Concrete.

.3 C661 ..... Standard Test Method for Indention Hardness of Elastomeric-Type Sealants by Means of a Durometer.

.4 C1116/C1116M ..... Standard Specification for Fiber Reinforced Concrete.

.5 D1751 ..... Standard Specification for Preformed Expansion Joint Filler for Concrete paving and Structural Construction (Nonextruding and Resilient Bituminous Types).

.6 E1643 ..... Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.

.7 E1745 ..... Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs.

.5 Conform to:

.1 ACI 214R ..... Guide to Evaluation of Strength Test Results of Concrete.

.2 ACI 303R ..... Guide to Cast-in-Place Architectural Concrete Practice.

.6 Conform to SP-66, ACI Detailing Manual - 2004 and the RSIC Reinforcing Steel Manual of Standard Practice.

.7 In the event of conflict between reference standards, codes, drawings and specifications, the Contractor shall request clarification by the Consultant. The Consultant's decision as

to which requirements govern shall be final and binding. Generally the more stringent provision shall govern. No extras to the contract will be approved due to such clarification.

.8 Conform to the Occupational Health and Safety Act, R.S.O. 1990, c. O.1, last amendment.

1.3 Shop Drawings

.1 Provide shop drawings (placing drawings and bar lists) showing dimensions and complete information necessary for fabrication and placing reinforcing steel and accessories.

.2 Submit shop drawings in accordance with directions.

.3 Allow ten (10) working days for the review of shop drawings and supply as many copies for review and distribution as directed. Shop drawings shall be checked in detail by the General Contractor before submission. Drawings which fail to meet this requirement shall be returned marked NOT REVIEWED.

.4 Review of the Shop Drawings is for general conformance with the design concept of the project and general compliance with the information given in the contract documents. The Contractor is responsible for confirming, correlating all quantities and dimensions, and is not relieved of the responsibility for compliance with the intent of the drawings and specifications.

.5 Only shop drawings bearing the review stamps, signed and dated shall be kept at site.

1.4 Source Quality Assurance

.1 Concrete supplied to this project shall meet the "Performance Based Specification" for concrete supply as adopted by the Ready Mix Concrete Association of Ontario.

.2 SUBMITTALS

Brand names, and when requested, manufacturer's data sheets, detail drawings or diagrams of all items which are proposed for use in the concrete mix, or which are to be cast in or attached to the concrete structure or will affect the concrete structure in any way, are to be submitted for review.

These shall include but not be limited to:

.1 A schedule of "Standardized mix designs" which indicates compliance with the Construction Documents. Schedule to include but not be limited to:

.1 Concrete mix for each exposure class and strength to be utilized in the project.

.2 Water/cementitious materials ratio (w/cm).

.3 Air entrainment %, if applicable.

.4 Include "Pump Mixes" if proposed for use.

.5 Brand name and dosage of synthetic fibres.

.6 Brand names of all admixtures to be incorporated into the mixes.

.2 Brand names and, if requested, manufacturers' data sheet of proposed curing compound.

.3 If requested, provide a certified copy of a mill test report of the reinforcing supplied, and samples of reinforcing bars to be used on this project for testing by the appointed Inspection and Testing Company before delivery to the site.

.4 If requested, for unidentified reinforcing steel or reinforcing steel from non-Canadian mills, submit test data from an approved testing company verifying that each size and grade of reinforcing steel meets the Specification requirements. Pay for cost of such testing.

.5 Shop drawings of elevators, showing complete details of proposed connections to the structure, including pockets, inserts and loadings.

.6 Shop drawings of steel and precast concrete stairs showing complete details of connections to the structure including pockets, inserts and loadings. Shop drawings to be stamped by a Licensed Professional Engineer.

.7 Cement finishing of floors shall be by a specialist sub-contractor thoroughly experienced in this type of work and a member in good standing with the Concrete Floor Contractors Association of Ontario (CFCAO). Submit references when requested.

.3 Pre-Construction meetings as specified in this section.

PART 2 - PRODUCTS

2.1 Materials

.1 FORMWORK

.1 Formwork lumber: Plywood and wood formwork materials are to conform to CSA A23.1.

.2 Plywood: Form plywood shall be exterior grade. Plywood shall be resin coated one side (in contact with concrete). Use sound undamaged plywood with clean true edges. Make-up or patching strips between panels shall be kept to a minimum.

.3 Falsework Materials: To conform to CSA S269.1. Materials shall bear grade marks or be accompanied with certificates, test reports or other proof of conformity.

.4 Formwork Release Agent: Shall be a proprietary material which will not stain the concrete or impair the natural bonding or color characteristics of coating intended for use on the concrete.

.5 Form Ties: Removable or "snap off" metal ties, fixed or adjustable lengths, free of devices leaving holes larger than 25 mm [1″] diameter in the concrete surface.

.6 Exposed Surfaces

.1 Form materials for concrete surfaces which require smooth and uniform surfaces for applied finishes or other purposes, shall consist of square edged smooth panels of plywood, metal or plastic. The panels shall be square and made in a true plane, clean, free of holes, surface markings and defects.

.2 REINFORCING AND ACCESSORIES

.1 Reinforcing Bars:

.1 Shall be new deformed "Hi-Bond" bars conforming with CSA G30.18M with a minimum yield stress of 400 MPa [58 ksi]. All bars to have Typical Identification Patterns and standard identification requirements.

.2 Epoxy coating is to conform to the specified standard, applicator is to be certified by RSIC.

.2 Welded Wire Mesh: Unless otherwise approved shall be supplied in flat sheets only.

.3 Chairs, bolsters, bar supports, side wall spacers and bar spacers:

.1 Provide quantity for strength and support of the construction conditions, so that there is no possibility of displacement or deformation of the reinforcement during construction.

.2 Use plastic chairs and/or sidewall spacers for all concrete.

Acceptable Types as supplied by:

Drummond & Reeves
Acrow Richmond
Superior Concrete

.4 Tie Wires: Annealed wire 1.29 mm [0.05″] diameter (No.16 U.S. Standard Gauge), or heavier or an approved proprietary system.

.5 Provide all necessary support bars and spacers in accordance with recommendations of the RSIC Manual.

.3 READY MIX CONCRETE:

.1 Unless otherwise specified, concrete shall be premixed, quality controlled conforming to CSA A23.1 with minimum 28 day compressive strengths as noted on the drawings.

.2 Cement shall be Portland Cement of Canadian manufacture conforming to CSA A3000, Type GU (10).

.3 Supplementary Cementing Materials shall conform to the requirements of CSA A3000.

.4 Aggregates shall be clean, uncoated sand and coarse aggregates from approved sources conforming to CSA A23.1. Nominal size of coarse aggregate shall not exceed 20 mm [3/4″] unless otherwise stated on the structural drawings or specifications.

.5 Water shall be potable from a municipal supply.

.6 Chemical Admixtures, where permitted shall conform to the requirements of CSA A23.1.

.1 Provide an approved water-reducing agent in all concrete.
Acceptable Types:

EUCON WR ..... by Euclid
WRDA 82 ..... by Grace
PLASTOCRETE 161 ..... by Sika
MASTERSET R 100 ..... by BASF
MASTERPOZZOLITH 210..... by BASF

.2 High Range Water Reducing Admixture (Super P)
Acceptable Types:

EUCON 37 ..... by Euclid
WRDA 20 ..... by Grace
SIKAMENT 686 ..... by Sika
MASTERRHEOBUILD 1000 ..... by BASF
MASTERGLENIUM 51 ..... by BASF

.3 Mid-Range Water Reducing Additive where approved for use:
Acceptable Types:

MASTERPOLYHEED 1020 ..... by BASF
EUCON MR ..... by Euclid
DARACEM 55..... by Grace
SIKAMENT 500 ..... by Sika

.4 Air-Entraining Agent:
Acceptable Types:

EUCON AIR MAC6..... by Euclid
DARAX AEA ED ..... by Grace
SIKA AIR ..... by SIKA
MASTERAIR ..... by BASF

.7 Calcium chloride or chloride based admixtures **shall not** be used.

.8 Salt or other chemicals shall not be added to reduce the freezing point of concrete.

.9 All admixtures shall be used in strict accordance with the manufacturers' instructions.

.10 SYNTHETIC FIBRE REINFORCING

.1 Synthetic Fibre Reinforcing to control plastic shrinkage cracking: 100% virgin polypropylene fibres specifically manufactured for concrete reinforcement and containing no reprocessed materials. Fibres to be added at the concrete batching plant at the rate of 0.9 kg/m³ [1.52 lb/yd^3] of concrete for defibrillated fibres and 0.6 kg/m³ [1.01 lb/yd^3] for monofilament fibres, unless otherwise noted, in strict accordance with manufacturer's instructions.

Acceptable Types:

PSI FIBRESTRAND 150..... by Euclid
SIKAFIBER PPF-50 mm ..... by SIKA Canada Inc.
MICROFIBRE ..... by Grace
MASTERFIBER ..... by BASF

.2 Macro Synthetic Fibre Reinforcing where approved for use as a replacement for Welded Wire Mesh or as specified on the drawings. Add

at the batching plant at the rate as specified (min 1.8 kg/m³ [3.03 lb/yd³] of concrete) in strict accordance with the manufacturer's instructions.

Acceptable Products:

TUF-STRAND SF .....by Euclid

.11 Typical Concrete Mixes: See schedule on drawings.

.4 CONSTRUCTION GROUTS: Non-shrink grout unless otherwise noted shall be a premixed non-metallic, non-shrink grout.

Acceptable Types:

EUCO NS OR DRY PACK GROUT .....by Euclid
M-BED STANDARD .....by Sika
MASTERFLOW 555 .....by BASF
CG-86.....by W.R. Meadows
CPD NON-SHRINK GROUT.....by CPD

.5 CURING, SEALING AND/OR CURING/SEALING COMPOUND where approved for use shall conform to ASTM C309.

.1 Acceptable Types:

MASTERKURE CC 300 XS.....by BASF
FLORSEAL WB 25.....by Sika
SUPER DIAMOND CLEAR 350 .....by Euclid
CS-309-30.....by W.R. Meadows
ACRYLIC CURE & SEAL 30%.....by CPD
Compounds must be compatible with applied finishes.

.2 Compound used for Coloured Surface Hardened Finishes shall be:

.1 SUPERDIAMOND (CLEAR) 350 FOR SURFLEX…by Euclid
.2 FLORSEAL WB25 (CLEAR) FOR COLORPLETE…by Sika
.3 MASTERKURE CC 300 XS.....by BASF

.3 Compounds applied at the rates as recommended by the manufacturers.

.6 JOINT SEALANT AND CAULKING COMPOUNDS refer to Division 7.

.7 POST INSTALLED WEDGE (MECHANICAL) AND ADHESIVE ANCHORS FOR CONCRETE

.1 Refer to Post Installed Anchors Specification 05 05 19 [05051].

.8 BONDING AGENT *(if required)*:

ALBITOL CONCENTRATE.....by Sika
INTRALOK.....by W.R. Meadows
SBR LATEX .....by Euclid
CPD CONCENTRATED LATEX ADHESIVE ....by CPD
MASTEREMACO A 660 .....by BASF

.9 PRE-MOULDED JOINT FILLERS: Provide bituminous impregnated fibreboard conforming to ASTM D1751.

Acceptable types:

FIBRE EXPANSION JOINT FILLER ..... by W.R. Meadows
CPD ASPHALT FIBRE EXPANSION JOINT FILLER..... by CPD

.10 JOINT FILLER FOR "SAW-CUT" CONTROL JOINTS: Two component self-leveling sealant, minimum Shore A Durometer hardness of 80 at 20°C [68°F] as conforming to ASTM C661.

Acceptable types:

MASTERSEAL CR 190 .....by BASF
EUCO QWIKJOINT UVR.....by Euclid
LOAD FLEX POLYUREA.....by Sika
REZI-WELD FLEX.....by W.R.Meadows
CIPADAM E-13.....by CPD

.11 VAPOUR RETARDER MEMBRANE FOR SLAB-ON-GRADE

.1 Provide a vapour retarder membrane cover over the prepared base material below slabs-on-grade where noted on the drawings.

.2 Membrane shall have the following properties:

.1 Performance as tested after conditioning (ASTM E1745)

.2 Strength minimum CLASS B (ASTM E1745)

.3 Minimum thickness 0.25 mm [0.01″]

.3 Lap joints minimum 150 mm [6″] and tape with material as recommended by membrane manufacturer.

.4 Acceptable membrane types as manufactured by:

FLORPRUFE 120 .....by Grace

STEGO WRAP.....by Stego Industries
PERMINATOR .....by W.R.Meadows
MOISTOP ULTRA.....by Fortifiber Building Systems

.12 Other materials or products which are not listed herein shall comply with the latest CSA, ASTM, CGSB, or ACI Standards appropriate to those materials.
Refer to **Source Quality Assurance** in **PART 1** of this section.

PART 3 – EXECUTION

3.1 Work by this Section as Supplied by Others

.1 Install anchors and other items to be cast into the concrete as supplied by others.

3.2 Formwork

.1 Formwork design, materials, and erection shall conform with CSA A23.1 including all falsework and ties.

.2 Column and wall footings and caps shall have plywood side forms. The placement of footings directly against neat cut excavations may be approved subject to review and acceptance by the Structural Consultant. Approval to proceed must be given in writing by the Structural Consultant before any concrete is placed.

3.3 Reinforcing Fabrication and Placement

.1 Conform to CSA A23.1.

3.4 Concrete

.1 Mixing, Transportation and placement to conform to CSA A23.1.

.2 Maximum time between adding mix water and complete discharge of concrete into forms shall be 120 minutes. Exemptions to this time frame shall only be permitted with approval by the Structural Consultant when previously approved chemical additives are used.

.3 Approved synthetic fibres to be added to the concrete for slabs where noted on drawings. Refer elsewhere in this section for dosage rates and superplasticizers.

3.5 Cold Weather Conditions

.1 When the air temperature is at or below 5°C [41°F] or when there is a probability of its falling to that limit within 24 hours of placing (as forecast by the nearest weather office).

Conform to the requirements of CSA A23.1 including, but not limited to the following:

.1 Job Preparation.

.2 Concrete Temperature.

.3 Concrete Placing.

.4 Protection Requirements and Methods:

.1 Heated Enclosures.
.2 Protective Covers and Insulation.

.5 Cooling after protection.

.6 Cold-Weather Curing.

.2 All materials and equipment needed for adequate protection and curing shall be on hand and ready for use before concrete placement has started.

3.6 Hot Weather Protection Requirements

.1 Conform to the requirements of CSA A23.1.

3.7 Finishing Treatment of Slab Surfaces (Screeding and Trowelling)

.1 Screeding, Bull Floating, Darbying, Trowelling.

.1 Conform with the requirements of Clause 7.6 of CSA A23.1 and as modified hereinafter.

.2 Bring tops of floors to even level or sloping surfaces as shown on the drawings.

.3 Slabs shall be finished only when bleed water on the slab surface has evaporated.

.4 Machine trowel all floor slabs, except as required by the drawings and/or specifications to Class A Conventional (Smooth) classification.

.5 Surfaces of exterior exposed steps and platforms shall be finished with a wood float and given a "fine broom" finish to the Consultant's satisfaction. (Class A Conventional (Smooth) classification). Refer also to Architect's "Finish Schedule".

.6 Unless otherwise shown or specified, roof slabs shall be finished for waterproofing with a Steel Trowel Finish. (Class A Conventional (Smooth) Classification).

.7 Floors to receive separate finishes shall be screeded to proper elevation, and wood float finished. (Class A Conventional (Smooth) Classification).

.8 Class A Conventional (Smooth) Classification shall be as defined in CSA A23.1 Table 21 and shall be determined by F-number method as defined in Clause 7.6.1.1 unless otherwise directed.

.9 Finished surfaces not conforming to the specified tolerances shall be deemed as **Defective Concrete**. See later in this section.

.2 **Slab-On-Grade**

.1 VAPOUR RETARDER MEMBRANE FOR SLABS-ON-GRADE

.1 For areas specified to receive on under slab membrane:

.1 Ensure that the prepared subgrade is approved by the Geotechnical Consultant.

.2 Level, tamp and/or roll the subgrade as required.

.3 Install the membrane in accordance with manufacturer's instructions and to ASTM E1643.

.4 Unroll membrane with the longest dimension parallel to the direction of the concrete pour.

.5 Lap membrane over footings and seal to foundation walls, columns and column caps etc., and overlap joints 150 mm [6″].

.6 Seal all penetrations (including pipes) and seal as per manufacturer's directions.

.7 Repair damaged areas with membrane patches overlapping damaged areas by 150 mm [6″] and taping all four sides.

.2 READY MIX CONCRETE

.1 Refer to drawings and also to **Materials** in this section.

.2 Synthetic Fibres: Refer to READY MIX CONCRETE earlier in this section.

.3 Superplasticizer

.1 Where shown on the drawings and specifications as slabs to have superplasticizer added to the mix, the approved superplasticizing agent can be added at the site or at the plant subject to the appropriate mix design being submitted for review and approval issued by the consultant. NO WATER IS TO BE ADDED AT SITE.

.2 As an alternative, the specified Mid-Range Water Reducing additive, added at the batching plant, may be approved for use. Subject to the appropriate mix design being submitted for review and approval issued by the Consultant.

.4 Quantities and procedure for admixtures shall be determined and supervised with the assistance of the manufacturer's technical staff.

.3 EXECUTION

.1 Refer to **Field Quality Control** later in this section.

.2 Obtain Geotechnical Consultant's approval of the granular fill before placing the concrete slabs-on-grade.

.4 Provide screeds set to an engineer's level for leveling the surface of floor slabs-on-grade.

.5 Provide keys or dowels at construction joints as detailed on the drawings.

.6 CONTROL JOINTS

.1 Where shown on plans or on Typical Details, provide saw-cut control joints as indicated.

.2 Control joints in slabs-on-grade shall be cut using power driven abrasive or diamond tipped blades.

.3 Cutting shall begin as soon as the concrete surface has hardened sufficiently to resist raveling as the cut is made and before shrinkage cracks form in concrete. Generally, saw-cutting of slabs-on-grade shall be done within the first 24 hours after the slabs are placed. Alternatively, use the Soff-Cut method immediately after finishing the slab.

.4 The depth of control joints shall be one-third (1/3) of the thickness of the slab, with a minimum of 40 mm [1.5″] unless otherwise noted.

.5 Clear saw-cuts of all debris and ensure sides are clean and dry before proceeding.

.6 Mix saw-cut joint filler according to manufacturer's instructions.

.7 Pour filler into joints, flush with adjacent surfaces.

3.8 Finishing of Formed Surfaces

.1 Conform to the requirements of CSA A23.1 Clause 7.9.

.2 Refer to Architectural Finish Schedules and Drawings.

3.9 Sealing and Curing

.1 Apply specified compounds in strict accordance with manufacturer's directions.

.2 All floor slabs and all EXPOSED concrete surfaces, such as walls, beams, columns, etc., are to receive a minimum of one coat of curing and sealing compound unless not compatible with architectural finishes.

.3 CURING

.1 Conform to the requirements of CSA A23.1 including but not limited to the following:

.1 Basic curing period.

.2 Additional curing for durability.

.3 Additional curing for structural safety.

.4 Methods for curing.

.5 Cold weather curing.

.6 Hot weather curing.

.7 Curing for Accelerated Strength Development.

.4 Refer also to **Cold Weather Conditions** and **Hot Weather Protection Requirements,** elsewhere in this section.

3.10 Protection of Slab Surfaces

.1 Fully protect exposed concrete finishes from damage and staining.

.2 Protect all exposed surfaces from dropping plaster, welding debris, paint, dirt or other marring agents, by heavy building paper, tarpaulins or other appropriate means. The surface must be perfectly dirt-free before this protection is placed.

.3 Do not allow any pipe threading or similar machines using oil or other permanently staining liquid on any concrete floor unless set up on large oil-tight and properly constructed metal pans. Plywood sheets or other absorbent materials will not be permitted as a substitute for pans.

3.11 Miscellaneous Items

.1 This section to provide and place concrete, formwork and reinforcing and/or grout fill for all concrete work shown on or implied by the drawings and specifications.

.2 DRY-PACK GROUT: Provide and install specified non-shrink grout as required, in accordance with manufacturer's directions.

.3 REINFORCED MASONRY LINTELS: Where required, provide reinforcing and place concrete in accordance with the Typical Notes and Details on the drawings.

.4 VERTICAL MASONRY WALL REINFORCING BARS: Provide, for installation by the Mason, bars as required by the drawings and typical details.

.5 MASONRY GROUT: Co-ordinate with the Mason for supply and installation of grout. Grout as specified on the drawings.

.6 BONDING AGENT: Provide and install specified agent as required in accordance with manufacturer's directions.

.7 CONCRETE FILL FOR PRECAST SLABS: *(Refer also to Section 03 41 13)*

Co-ordinate placement of forms, reinforcing and concrete as required by the precast hollow core slab supplier.

.8 DRILLED AND SET ANCHORS AND DOWELS:

Provide and install the specified products and materials as required in accordance with manufacturer's directions. Refer also to Post Installed Anchors Specification 05 05 19.

3.12 Toppings

.1 General

.1 Conform to CSA A23.1 and the requirements noted below, unless noted otherwise in the contract documents.

.2 Set screeds and bulkheads rigidly and accurately to prevent displacement during concreting.

.3 Special provisions for bonded and unbonded toppings:

.1 The maximum pour size for bonded and unbonded toppings is to be limited to [100 m^2] 1000[$ft^{2]}$.

.2 Maintain a one to one length to width aspect ratio for all pours, here extent and geometry of topping permits.

.3 Toppings are to be poured in a "checker board" pattern to minimize the effects of shrinkage. Adjacent sections of topping shall be poured no sooner than 3 days after the adjoining section was poured.

.4 Ensure temperature of base course is 10°C (50°F) minimum prior to pouring toppings.

.5 Provide hot and cold weather protection for toppings in accordance with CSA A23.1.

.2 Monolithic Toppings:

.1 Monolithic toppings are constructed by applying a concrete mixture to a "freshly" poured base course that has lost all slump and bleed water, prior to its final set. Alternatively, monolithic toppings can be poured with the main base course to a final thickness equal to the thickness of the base course plus the thickness of the topping.

.2 Where monolithic toppings are specified, place reinforcement and maintain cover requirements based on the thickness of the base slab only. Provide additional layer of reinforcement in monolithic toppings where noted on the contract documents.

.3 Bonded Toppings

.1 Bonded toppings are constructed by applying the topping mixture over a hardened concrete base to which a bonding agent has been applied. By definition, bonded toppings are designed to bond to the concrete base or an existing concrete surface.

.2 Prior to commencing work, arrange for a meeting of all parties associated with the placement of the topping. Presided by the Architect, the meeting shall include, but not be limited to: representative of the Topping Slab Contractor, the General Contractor, the Topping Concrete Supplier, the Flooring Subcontractor, the Bonding Agent Supplier and the Structural Consultant

.3 The meeting shall review Specifications for work included under this section and determine a complete understanding of requirements and responsibilities relative to: work included, storage of handling of materials, materials to be used, installation of materials, sequence and quality control, project staffing, restrictions on areas of pours, and other matters affecting the construction so as to permit compliance with the intent of this section

.4 Materials:

.1 Concrete: Refer to concrete mix schedule on the drawings. (Maximum coarse aggregate to be 10 mm [3/8″]).

.2 Bonding Agent: See elsewhere in this section.

.3 Shrinkage Reducing Additive: Use Eucon SRA or an approved equivalent at the rate of 2% by weight of cementitious materials.

.5 Base Course Finishing and Preparation

.1 Base Course Finishing and Preparation

.1 Base Courses Which Are To Receive Bonded Toppings Are To Be Finished By One Of Two Methods:

1. rough broom finish (very rough finish – amplitude ± 6mm/± ¼").

2. steel trowel finish

.2 When a rough broom finish is provided, the slab surface is to be cleaned by high-pressure water blasting to ensure all laitance, dirt, dust, construction debris and the like are removed prior to application of the

bonding agent. Bonding agent shall be applied in strict accordance with manufacturer's recommendations.

.3 When a steel trowel finish is provided, the slab is to be roughened by means of shot blasting prior to the application of the bonding agent. Ensure all laitance, dirt, dust, construction debris and the like are removed immediately prior to the application of the bonding agent. Employ all necessary means to control dust and debris during shot blasting [scarifying].

.4 Contact the Consultant and the representative of the approved bonding agent supplier for a review and approval of the slab surface preparation prior to application of the bonding agent.

.6 Placing and Finishing Toppings

.1 The bonding agent shall be applied immediately prior to placing topping in strict accordance with the manufacturer's directions. The bond strength between topping and base course shall not be less than [0.90 MPa] [130 psi], per CSA A23.1.

.2 Place and finish toppings in accordance with CSA A23.1

.7 Curing

.1 Continuously wet cure bonded toppings for a minimum of seven days.

.8 Jointing

.1 Bonded toppings do not require special provisions with respect to jointing provided all the provisions noted above are adhered to.

.2 The location of joints in the topping shall match those in the base course.

.4 Unbonded (Loose Laid) Toppings

.1 Unbonded or loose laid toppings are constructed by applying the topping mixture over a bond breaker and hardened concrete base, to which <u>no</u> bonding agent has been applied. By definition, unbonded toppings are specifically designed so as <u>not</u> to bond to the concrete base.

.2 Base course Finishing and Preparation.

.1 Base courses which are to receive unbonded or loose laid toppings are to be finished smooth by means of a steel trowel.

.3 Placing and Finishing Toppings

.1 Place toppings on bond breaker and finish the toppings in accordance with CSA A23.1

.4 Curing

.1 Continuously wet cure unbonded toppings for a minimum of seven days.

.5 Jointing

.1 Unbonded toppings are to be sawcut, as per the typical detail for slabs on grade, at a maximum spacing of 3.0 metres (10 feet) in both directions, unless noted otherwise. for toppings that are to receive hard architectural floor finishes, the jointing shall be laid out in accordance with the architect's requirements and is subject to final approval by the architect.

.5 Cracks in Toppings

.1 All cracks in concrete toppings must be repaired by the Contractor. Extent of repair and method of crack repair must meet the requirements of flooring installation contractor and the Owner.

3.13 Defective Concrete

.1 Concrete not meeting the requirements of the specifications and drawings shall be considered defective concrete.

.2 Defective concrete and concrete not conforming to lines, details, quality and grade specified or as shown on the Drawings shall be modified or replaced at no extra cost to the Owner, and to the satisfaction of the Architect.

.3 Finished lines, dimensions and surfaces shall be correct and true within tolerances specified.

.4 Non-exposed Surfaces: Honeycombing shall be cut out and filled and any fins which interfere with strapping, etc., shall be cut back. Holes left by form separators shall be filled.

.5 Crack Repair: After concrete has cured, examine concrete floor surfaces and repair all cracks. Route out cracks with mechanical router to a minimum depth of 13 mm [1/2″]. Then clean and fill cracks in same manner as control joints.

.6 Use approved curing/sealing compound in strict accordance with manufacturer's recommendations.

3.14 Quality Control

.1 Implement a system of quality control to ensure that the minimum standards specified herein are attained.

.2 Bring to the attention of the Consultant any defects in the work or departures from the Contract Documents which may occur during construction. The Consultant will decide upon corrective action and give recommendations in writing.

.3 The Consultant 's general review during construction and inspection and testing by Independent Inspection and Testing Companies reporting to the Consultant are both

undertaken to inform the Owner of the Contractor's performance and shall in no way augment the Contractor's quality control or relieve the Contractor of contractual responsibility. The contractor is solely responsible for quality control and shall implement its own supervisory and quality control procedures.

.4 Refer to **Source Quality Assurance** included in this section.

.5 If requested, provide a copy of the Concrete Suppliers Certificate confirming that the specified fibre reinforcement at the specified dosage was added to all required concrete delivered to the job site.

3.15 Notification

1. Prior to commencing significant segments of the work, give the Consultant and Independent Inspection and Testing Companies appropriate notification so as to afford them reasonable opportunity to review the work. Failure to meet this requirement may be cause for the Consultant to classify the work as defective. . A minimum notification of 24 hours in advance of placing concrete is required.

3.16 Inspection and Testing

1. The Owner will appoint an Independent Inspection and Testing Companies to make inspections or perform tests as the Consultant directs. The Independent Inspection and Testing Companies shall be responsible only to the Consultant, and shall make only such inspections or tests as the Consultant may direct. The representative of the Inspection and Testing Company shall NOT be required to supervise or instruct the Contractor.

2. The Inspection and Testing Company will conduct inspection and testing services per Specification Section 01 45 23 – *Testing and Inspection Services – General Requirements* and per Specification Section 01 45 23.07 – *Testing and Inspection Services – Cast-in-Place Concrete and Reinforcement.*

3. The following are responsibilities of the contractor regarding the Inspection and Testing Company:

   .1 Co-operate with the representatives of the Inspection and Testing Company.

   .2 Provide the Inspection and Testing Company with a set of construction documents to enable them to understand the scope of their services.

   .3 Provide an insulated storage box according to the specification and drawing supplied by the Inspection and Testing Company.

   .4 Protect test cylinders.

   .5 Keep a record set of drawings upon which shall be marked by the contractor's superintendent, the time and date of pouring of each section of concrete, the date of removal of forms and a daily record of the temperature.

3.17 Defective Materials and Work

.1 Where evidence exists that defective work has occurred or that work has been carried out incorporating defective materials, the Consultant may have tests, inspections or surveys performed, analytical calculations of structural strength, made and the like, in order to help determine whether the work must be corrected or replaced. Tests, inspections or surveys or calculations carried out under these circumstances will be made at the Contractor's expense, regardless of their results, which may be such that, in the Consultant's opinion, the work may be acceptable.

.2 All testing shall be conducted in accordance with the requirements of The Building Code, except where this would, in the Consultant's opinion, cause undue delay or give results not representative of the rejected material in place. In this case, the tests shall be conducted in accordance with the standards given by the Consultant.

.3 Materials or work which fail to meet specified requirements may be rejected by the Consultant whenever found at any time prior to final acceptance of the work regardless of previous inspection. If rejected, defective materials or work shall be promptly removed and replaced or repaired to the satisfaction of the Consultant, at no expense to the Owner.

END OF SECTION 03 30 53

PART 1 – GENERAL

1.1 General Requirements

.1 Make a thorough examination of the drawings, site, specification and soil report, to determine the intent, extent, materials and conditions of interfacing with other work and to be fully cognizant of the requirements.

.2 Assume full responsibility for the design, for the adequacy and for the safety of all formwork and falsework.

.3 The Contractor shall ensure that no asbestos containing materials are used in connection with the work of this section.

1.2 Reference Standards

.1 Comply with The Building Code Act, as amended, the 2012 Ontario Building Code (OBC) as amended and Regulations and by-laws of other authorities having jurisdiction, including latest amendments thereto; all hereafter referred to as Building Code.

.2 All codes, standard specifications and by-laws referred to in this Specification shall be current editions including all latest revisions, addenda and supplements, unless otherwise noted in the Building Code.

.3 Conform to the following CSA Standards:

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

.2 A23.2 ..... Test Methods and Standard Practices for Concrete.

.3 A23.3 ..... Design of Concrete Structures.

.4 A23.4 ..... Precast Concrete - Materials and Construction.

.5 A3000 ..... Cementitious Material Compendium.

.6 G30.18 ..... Carbon Steel Bars for Concrete Reinforcement.

.7 W48 ..... Filler Metals and Allied Materials for Metal Arc Welding.

.8 W186 ..... Welding of Reinforcing Bars in Reinforced Concrete Construction.

.4 In the event of conflict between reference standards, codes, drawings and specifications, the Contractor shall request clarification by the Consultant. The Consultant's decision as to which requirements govern shall be final and binding. Generally the more stringent provision shall govern. No extras to contract will be approved due to such clarification.

1.3 Shop Drawings

.1 Submit shop drawings and design calculations in accordance with directions. Each sheet submitted shall bear the stamp of a Professional Engineer licensed in Ontario.

.2 Submit erection drawings and details showing general arrangement, size, shape, unit identification marks and location of slabs and installation data, such as method and sequence of erection, connection methods, joint and grouting details, camber, apertures and other data necessary to any trade working on or adjacent to installed slabs and which is part of work of the manufacturer.

.3 Shop drawings shall show accommodation for all electrical services, sleeves, etc.

.4 Review of shop drawings shall not relieve the Contractor from the responsibility of seeing that the work is complete, accurate and in conformity with the Architectural and Structural drawings and the Specifications. Shop drawings shall be checked and initialed by the Contractor's staff before being submitted.

.5 Only shop drawings bearing the review stamps shall be kept at site.

1.4 Source Quality Assurance

.1 Manufacturer and erector shall be members in good standing of the Canadian Precast/Prestressed Concrete Institute (CPCI).

.2 Manufacturer and erector of precast elements shall comply with CSA A23.4.

.3 Upon request, provide Consultant with certified copies of quality control tests and inspection related to this project as specified in CSA A23.4.

.4 Upon request, provide Consultant with certified copy of mill test report of reinforcing strands supplied, showing physical and chemical analysis.

1.5 Warranty

.1 The Contractor hereby warrants that the precast elements will not spall or show visible evidence of cracking, except for normal hairline shrinkage cracks, in accordance with GC24, except for five (5) years after completion.

1.6 Design Criteria

.1 Design precast elements to CSA A23.3 and to carry handling stresses.

.2 Design loads in accordance with applicable codes for use and occupancy, wind, temperature and earthquake, and as shown on the structural drawings.

.3 .Design precast planks to the thickness indicated on the drawings, with a maximum design camber under self-weight of 40 mm. Increase the plank thickness as required to achieve a maximum design camber under self-weight of 40 mm.

.4 Design precast slabs to meet a two (2) hour fire resistance rating.

.5 Consider vibration characteristics in accordance with the Ontario Building Code.

.6 If any aspect of the precast hollow core slab construction, proposed by the Contractor for use on this project varies from that shown on the tender drawings and the variation requires the re-design of the base building elements and/or the revision to or addition of materials to accommodate such variance and the Owner, the Architect and the Structural Consultant are in agreement with the proposed variation, then the Contractor requesting the variation shall pay for all costs, including re-design associated with the change.

PART 2 – PRODUCTS

2.1 Materials

.1 Cement aggregates, water, admixtures to conform to CSA A23.1 and CSA A23.4.

.2 Concrete shall have a minimum compressive strength of 30 MPa [4.35 ksi] at transfer, and 40 MPa [5.80 ksi] at 28 days.

.3 The prestress strands shall be uncoated 7-wire cable conforming to ASTM A416/A416M.

.4 Grout Mix: Cement grout of one (1) part type 10 Portland cement, 2 ½ parts sand, and sufficient water for placement and hydration or as specified by the Precast Manufacturer.

.5 Bearing Pads: 3 mm [0.12″] Masonite smooth one side.

.6 Reinforcing Steel shall conform to CSA G30.18.

.7 Anchorages and Couplings: To CSA A23.1.

.8 Embedded Steel: To CSA G40.20/G40.21.

.9 Welding Materials: To CSA W48.

PART 3 – EXECUTION

3.1 Fabrication and Erection

.1 All prestressed hollow core units shall be manufactured using machines castings techniques in a closely controlled manufacturing process.

.2 Erection shall be carried out by experienced precast erectors under supervision of the manufacturer.

.3 Bearing surfaces prepared by others shall be examined and approved by the manufacturer of the prestressed hollow core slabs.

.4 Commencement of erection implies acceptance of the work of other sections which affect the work of this section.

.5 No relief from contractual responsibility will be allowed unless such claim is made in writing prior to commencement of work.

.6 Install 3 mm [0.12″] Masonite pads, smooth side up on bearing ends of masonry.

.7 TOLERANCES

.1 Conform to tolerances specified in CSA A23.4 including but not limited to the following:

.1 Depth (thickness of slabs)

The maximum variation from the specified depth shall be …± 5mm [3/16″]

.2 Length (As shown on reviewed shop drawings)

The maximum variation from the required length shall be:

.1 Lengths up to and including 7.2 m [23′-8″] .....± 12mm (± ½″)

.2 Lengths greater than 7.2 m [23′-8″].....± L/600

Regardless of the variation specified above, the length of bearings of the precast slabs on supporting elements shall not be reduced from the minimum shown on the construction documents.

.3 Squareness and Plumbness

.1 Variation from square or specified angle
at ends of precast slabs..... Max. 1 in 200

.4 Alignment of Longitudinal Edges

.1 The maximum variation in alignment between two adjacent slabs shall be L/600 or 5 mm [3/16″].

.5 Camber

.1 The maximum variation from design camber shall be L/1000, but not greater than 10 mm [3/8″].

.2 The maximum differential camber between adjacent slabs shall be L/1000 but not greater than 12 mm [½″].

.3 Refer to **Topping** paragraph later in this section.

.8 Slabs shall be grouted using a grout mixture as specified by the Precast Manufacturer.

.9 Due care shall be exercised to ensure that joints between the slabs are completely filled.

.10 Install insulation plugs in each cell at exterior conditions.

.11 Caulking of exposed ceiling joints shall be done using material as specified. Caulk joints between underside of the hollow core slabs and the top of the supporting elements, at both end and side conditions. Refer to Architectural Drawings for the locations. Caulking material to be compatible with applied finishes.

.12 The Contractor shall provide suitable surfaces as follows:

.1 A suitable top finish to accept direct application of finished flooring/roofing as specified on Architectural drawings.

.2 Where the undersides of the precast units are exposed and are designated to receive a painted finish, provide a surface which conforms to CSA A23.4. (Standard finish).

.3 The top surfaces to receive a bonded topping are to be scratched (roughened).

.13 Protection: Provide suitable temporary protection/coverings for cells which may be exposed to the elements during construction.

3.2 Topping

.1 Where concrete topping is specified to be provided, refer to Section 03 30 53 – Cast-in-Place Concrete. Topping is bonded and non-composite and shall be placed with top surface flat.

.2 Where no concrete topping is provided and the camber differential exceeds 10 mm [3/8″] the Precast Supplier shall provide a "feathering-out" topping underlayment between the slabs. This "feathering- out" shall be to the satisfaction of the Architect.

3.3 Relation to Other Trades

.1 Provide information to all trades required to fix or suspend ceilings, lighting fixtures, ducts, piping, windows, curtain walls, etc. to precast elements. Information shall show methods and locations acceptable to the precast manufacturer.

.2 Coordinate with trades that are required to run services horizontally in the cells of the precast units.

.3 Holes

.1 Field cutting for holes through precast elements shall be only done with the express approval of the Precast Manufacturer and the Consultant.

.2 Prior to field cutting or drilling of holes through precast slabs, a drawing shall be prepared by the Contractor showing locations and sizes of holes. This drawing is to be reviewed and approved by the Precast Supplier's Engineer. A copy of this Engineer's approval is to be submitted to the Architect and Structural Consultant for review and acceptance before field cutting proceeds.

.4 The precast hollow core supplier shall supply in fill cast-in-place concrete, including formwork, and reinforcing as required for installation by the concrete installer, (co-ordinate with the concrete sub-Contractor as required) or alternatively the precast supplier shall provide precast elements sized to suit the conditions.

3.4 Defective Work

.1 Precast concrete not meeting the requirements of the specifications and drawings shall be considered defective work.

.2 Defective work and work not conforming to lines, details, quality and grade specified as shown on the drawings shall be modified or replaced at no cost to the Owner, and to the satisfaction of the Architect.

.3 Finished lines, dimensions and surfaces shall be correct and true within tolerances specified.

.4 Testing from areas in question, as directed by the Structural Consultant and in accordance with CSA Standard A23.1 and/or load testing of the structural elements in accordance with the requirements of the Structural Consultant shall be done at no cost to the Owner.

.5 REPAIRS:

.1 COSMETIC REPAIRS

.1 Before any steps are taken to repair surface defects they shall first be inspected by the Architect who shall state whether or not repair treatment shall be undertaken.

.2 Should the Architect determine that the defects be too serious for repair, or should repairs prove unacceptable, the effected unit shall be removed from the site and replaced with a new unit at no cost to the Owner.

.2 STRUCTURAL REPAIRS

Repairs of a structural nature shall not be undertaken until the manufacturer's engineer has:

.1 Investigated the structural implications of the defect or damage.

.2 Established the cause of the defect or the damage.

.3 Received approval of the proposed repair procedures from the Structural Consultant.

3.5 Clean-Up

.1 Upon satisfactory completion of the work, clear away from the building and premises all tools, utensils, apparatus, excess or waste materials and debris resulting from the operations, and leave all complete and in a condition acceptable to the Architect.

3.6 QUALITY CONTROL

.1 Implement a system of quality control to ensure that the minimum standards specified herein are attained.

.2 Bring to the attention of the Consultant any defects in the work or departures from the Contract Documents which may occur during construction. The Consultant will decide upon corrective action and give recommendations in writing.

.3 The Consultant 's general review during construction and inspection and testing by Independent Inspection and Testing Companies reporting to the Consultant are both undertaken to inform the Owner of the Contractor's performance and shall in no way augment the Contractor's quality control or relieve the Contractor of contractual responsibility. The contractor is solely responsible for quality control and shall implement its own supervisory and quality control procedures.

.4 Refer to Section 03 30 53**.**

.5 Refer also to **Source Quality Assurance**, in this section.

.6 After completion of the precast slab installation, the precast supplier/engineer shall issue a report signed and sealed by a licensed Professional Engineer certifying that the project was designed, fabricated and installed according to the project contract documents and specifications and the precast shop drawings including **ALL** openings/holes through the slabs.

3.7 NOTIFICATION

1. Prior to commencing significant segments of the work, give the [Consultant] and Independent Inspection and Testing Companies appropriate notification so as to afford them reasonable opportunity to review the work. Failure to meet this requirement may be cause for the [Consultant] to classify the work as defective.

3.8 INSPECTION AND TESTING

1. The Owner may appoint an Independent Inspection and Testing Companies to make inspections or perform tests as the Consultant directs. The Independent Inspection and

Testing Companies shall be responsible only to the Consultant, and shall make only such inspections or tests as the Consultant may direct. The representative of the Inspection and Testing Company shall NOT be required to supervise or instruct the Contractor.

2. Contractor to cooperate with the representative of the Inspection and Testing Company to facilitate the work.

3. The Inspection and Testing Company will conduct inspection and testing services per the following:

   .1 Specification Section 01 45 23 – *Testing and Inspection Services – General Requirements.*

   .2 Specification Section 01 45 23.11 – *Testing and Inspection Services – Precast Concrete Deck*

3.9 DEFECTIVE MATERIALS AND WORK

.1 Where evidence exists that defective work has occurred or that work has been carried out incorporating defective materials, the [Consultant] may have tests, inspections or surveys performed, analytical calculations of structural strength, made and the like, in order to help determine whether the work must be corrected or replaced. Tests, inspections or surveys or calculations carried out under these circumstances will be made at the Contractor's expense, regardless of their results, which may be such that, in the [Consultant]'s opinion, the work may be acceptable.

.2 All testing shall be conducted in accordance with the requirements of The Building Code, except where this would, in the Consultant's opinion, cause undue delay or give results not representative of the rejected material in place. In this case, the tests shall be conducted in accordance with the standards given by the Consultant.

.3 Materials or work which fail to meet specified requirements may be rejected by the Consultant whenever found at any time prior to final acceptance of the work regardless of previous inspection. If rejected, defective materials or work shall be promptly removed and replaced or repaired to the satisfaction of the Consultant, at no expense to the Owner.

END OF SECTION 03 41 13

PART 1 – GENERAL

1.1 General Requirements

.1 The Contractor shall ensure that no asbestos containing materials are used in connection with the work of this section.

1.2 Reference Standards

.1 Comply with The Building Code Act, as amended, the 2012 Ontario Building Code (OBC) as amended and Regulations and by-laws of other authorities having jurisdiction, including latest amendments thereto; all hereafter referred to as Building Code.

.2 All codes, standard specifications and by-laws referred to in this Specification shall be current editions including all latest revisions, addenda and supplements, unless otherwise noted in the Building Code.

.3 Conform to the following CSA Standards:

.1 S16 ..... Design of Steel Structures.

.2 W59 ..... Welded Steel Construction (Metal Arc Welding).

.3 W47.1 ..... Certification of Companies for Fusion Welding of Steel.

.4 G40.20/G40.21 ..... General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.

.5 S136 ..... North American Specification for the Design of Cold-Formed Steel Structural Members.

.4 Conform to the following ASTM Standards:

.1 A108 ..... Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished.

.2 A123/A123M ..... Standard Specification for Zinc (Hot-Dip Galvanized) Coatings for Iron and Steel Products.

.3 A563 ..... Standard Specification for Carbon and Alloy Steel Nuts.

.4 F436/436M..... Standard Specification for Hardened Steel Washers Inch and Metric Dimensions

.5 F1554..... Standard Specification for Anchor Bolts, Steel, 36, 44 and 105 ksi Yield Strength.

.6 F3125/F3125M..... Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions

.5 Conform to:

.1 CISC/CPMA 1-73a..... A Quick-Drying One-Coat Paint for Use on Structural Steel.

.2 CISC/CPMA 2-75 ..... A Quick-Drying Primer for Use on Structural Steel.

.6 In the event of conflict between reference standards, codes, drawings and specifications, the Contractor shall request clarification by the Consultant. The Consultant's decision as to which requirements govern shall be final and binding. Generally the more stringent provision shall govern. No extras to the contract will be approved due to such clarification.

.7 Conform to the Occupational Health and Safety Act, R.S.O. 1990, c. O.1, last amendment.

1.3 Source Quality Assurance

.1 The following is MANDATORY;

.1 The bidding Contractors are advised that their bids may be rejected unless documentation is submitted.

.2 Submission does not mean acceptance. Acceptance shall be in writing issued by the Consultant.

.3 The fabricator and erector shall be a member in good standing of The Canadian Institute of Steel Construction.

.2 Submit two (2) certified copies of mill reports covering chemical and physical properties of steel used in this work.

1.4 Design of Details and Connections

.1 Design details, new connections and open web steel joists by a Licensed Professional Engineer, to requirements of CSA-S16 or CSA-S136 to resist forces, moments and shears indicated on or implied by the drawings.

.2 Unless otherwise noted, beam connections shall be designed for a minimum of 50% of the shear capacity of the beam.

.3 Conform to the Fire Rated Assembly Design specified for the project.

.4 Bolts in the following types of connections are to be **pretensioned** in accordance with the requirements of S16:

.1 Slip-critical connections.

.2 Connections governed by seismic requirements.

.3 Connections for all elements resisting crane loads.

.4 Connections for members directly supporting running machines or other live loads that produce impact or cyclic load.

.5 Connections where bolts are subject to tensile loads.

.6 Connections using oversized or slotted holes unless specifically designed to accommodate moment.

.5 The following types of connections are to be designed as **slip-critical connections**:

.1 Connections where slippage cannot be tolerated, including:

1. All moment connections (unless end plate type moment connections are used.

2. Connections where welds and bolts share in transmitting shear forces at a common faying surface.

.2 Connections that utilise oversized holes.

.3 Connections subject to fatigue or frequent load reversals.

.6 OPEN WEB STEEL JOISTS

.1 Design steel joists and bridging to carry loads indicated or implied by the drawings in accordance with CSA-S16 or CSA-S136. In addition, design joints for any concentrated loads resulting from piping which runs parallel with the joists. Bottom chords shall be designed for a minimum point load of 2 kN at any location, except for bottom chords of joists directly above mechanical, electrical or equipment areas which shall be designed for a minimum point load of 4 kN at any location.

.2 Design joists and anchorages for uplift forces as indicated.

.3 Ensure joists are manufactured to consider load effects due to fabrication, erection and handling.

.4 Limit floor joist deflection due to specified live load to 1/360 of span.

.5 Limit roof joist deflection due to specified live load to 1/300 of span.

.6 For joist spans adjacent to rigid supports (e.g. bearing walls, rigid beams or trusses, or intermediate columns), gradually increase the stiffness of the joists in the vicinity of the rigid support such that the differential live load deflection

between adjacent joists spaced at a distance "S" is within 1/360 of 2*S and 1/300 of 2*S, for floor joists and roof joists, respectively.

.7 Joists which will be permanently exposed shall be neat and uniform in appearance to the approval of the Architect.

1.5 Submissions

.1 Refer also to **Source Quality Assurance**.

.2 Refer also to **Quality Control.**

.3 Prior to submission of SHOP DRAWINGS, submit calculations and sketches for review that bear the stamp and signature of the Licensed Professional Engineer responsible for the design. The following are MANDATORY REQUIREMENTS:

.1 TYPICAL MOMENT CONNECTIONS.

.2 VERTICAL BRACINGS.

.3 COLUMN TO BASE PLATE CONNECTIONS.

.4 BEAM TO COLUMN SHEAR CONNECTIONS.

.5 BEAM TO BEAM CONNECTIONS.

.6 COLUMN TO COLUMN "VERTICAL" AND "FUTURE" CONNECTIONS.

.7 NON-STANDARD CONNECTIONS.

.8 OPEN WEB STEEL JOISTS.

.4 Submitted Shop Drawings shall cross reference to reviewed and approved calculations and sketches.

.5 **Shop Drawings**

.1 Provide erection drawings having a scale no less than the structural framing plans and detail drawings of individual members and complete information necessary for fabrication and erection.

.2 Copies of Structural Framing Plans and Sections utilized as erection drawings are not permitted unless permission is first sought from and granted by the Structural Consultant.

.3 Submit shop drawings for review as directed.

.4 All shop drawings shall bear a Professional Seal and Signature.

.5 OPEN WEB STEEL JOISTS:

.1 Provide layout drawings showing location of open web steel joists, and design calculations for joists, covering each case of joist total loading.

.2 Drawings and calculations must be prepared using **METRIC** units. If both imperial and metric units are shown, only metric units will be reviewed in context of the rubber stamp placed on each drawing.

.3 All steel joists shall be designed by a Professional Engineer experienced in this type of design and all drawings and calculations shall bear a Professional Seal and Signature.

.4 OWSJ shop drawings and calculations submitted for review and **NOT BEARING** the stamp of the Professional Engineer responsible for the OWSJ design, and **NOT ACCOMPANIED** by stamped calculations, will **NOT BE REVIEWED** and will be returned to the Contractor.

.6 Fabrication shall not commence until shop drawings are reviewed.

.7 Allow ten (10) working days for the review of drawings and supply as many copies for review and distribution as directed. Shop drawings shall be checked in detail by the Contractor and shall bear the checker's initials before submission.

.8 Drawings which fail to meet these requirements shall be returned marked **NOT REVIEWED** and must be re-submitted after correction.

.9 The review of shop drawings shall not relieve the Contractor of the responsibility of seeing that this work is complete, accurate and in conformity with the drawings and this specification.

.10 Only shop drawings bearing the review stamps shall be kept at the site.

PART 2 – PRODUCTS

2.1 Materials

.1 MATERIALS

.1 Structural steel sections and plates and all connection angles and plates shall conform to CSA Standard G40.20/G40.21 as follows:

W shapes – Grade 350W.
S shapes – Grade 300W.
HSS Shapes – Grade 350W (Class C unless noted).
Channels, Angles – Grade 350W.
Plates and Rod – Grade 300W.

Note that ASTM A500 grade C HSS columns are NOT an acceptable direct substitution for CSA G40.21.

.2 Welding materials: to conform to CSA Standard W59.

.3 High Strength Fasteners: Bolts, Nuts, and Washers to conform to ASTM F3125/3125M, grade A325.

.4 Anchor Rods: to conform to to ASTM F1554, Grade 36, unless otherwise noted on the drawings

.5 Sag Rods: to conform to CSA G40.20/G40.21.

.6 Strap Anchors: to conform to CSA G40.20/G40.21.

.7 Shear Stud Connectors: to conform to ASTM A108, F_y = 345 MPa [50 ksi].

.8 PAINT:

.1 General Steel: Shop Primer and Field "touch-up" Paint to conform to SSPC-PAINT 20 (Type I)

.2 For exterior exposed steel where surfaces are to be primed provide a Corrosion Resistant and Field "touch-up" Primer as follows:

Acceptable product:

.1 CARBOZINC 11, (Solvent based inorganic zinc)

.2 Colour, 0300 (GREEN) or 0700 (GRAY)

.3 Steel Surface Preparation:
A minimum, non-immersion SSPC-SP6 and obtain a 25 to 75 micrometres [1 – 3 mils] Angular Blast Profile.

.4 Dry Film Thickness:
50 to 75 micrometres [2 – 3 mils] applied by spray (airless or conventional) with constant agitation.

.5 Field Touch-Up:
Areas less than 0.1 m^2 [1 ft^2]: clean (SSPC SP-1) , manually abrade (SSPC SP-2 or SP-3) and touch-up with Carbozinc 859 (organic zinc, SSPC Paint 20, type II).
Areas more than 0.1 m^2 [1 ft^2]: Tape, re-blast to SSPC SP-6 and spray apply Carbozinc 11 (Inorganic Zinc, SSPC Paint 20, Type I).

.3 Where an epoxy paint (SSPC Paint 20) is specified in combination with a zinc-rich primer, provide a compatible epoxy paint as follows:

Acceptable product:

1. CARBOGUARD 890 (Cycloaliphatic Amine Epoxy)

2. Dry Film thickness: 100 to 150 micrometres [4.0-6.0 mils]

.4 For field "touch-up" of galvanized surfaces provide same product as touch-up primer.

.9 GALVANIZING: For connections at all members specified to be galvanized, provide galvanized nuts, bolts, washers, clip angles and plates etc.

PART 3 – EXECUTION

3.1 Fabrication

.1 Fabricate structural steel and joists to CSA S16 and W59, and in accordance with reviewed shop drawings.

.2 Provide drain holes in closed HSS Sections to prevent moisture build-up within the member.

.3 SHEAR STUDS

.1 Install Shear Studs as specified in accordance with CSA W59.

.2 Failure of any studs during bending of the studs to an angle of 30 degrees (towards the nearest column for composite beams) will be cause of rejection of the stud welding, and may require further testing at the consultant's discretion and at the contractor's expense.

.3 A 10% or greater failure rata at the welds of the tested studs will be cause for rejection of all the studs installed by the welder.

.4 Replacement of failed or rejected studs shall be at the contractor's expense.

3.2 Protection

.1 Cleaning Steel

.1 Clean structural steel and joists in accordance with the table below.

.2 Clean surfaces within 50 mm (2") of any field weld location of materials which would prevent proper welding or produce objectionable fumes while welding is being completed.

.2 Painting

.1 Shop paint or galvanize structural steel in accordance with the table below. Refer also **Galvanized Sections** for additional requirements.

.2 Apply coating under cover, on dry surfaces only and when surface and air temperatures are above 5°C [41°F].

.3 Maintain dry conditions and 5°C [41°F] minimum temperature until coating thoroughly dry.

.3 Joints which are to be field welded shall be kept free of primer or other coating that could be detrimental to achieving sound weldment.

.4 FIELD TOUCH-UP for welds, scrapes, etc.

.1 General Interior Surfaces:..... With specified coating

.2 Exterior Exposed Surfaces: .. With specified coating

.3 Galvanized Surfaces:..... GALVAFROID or approved equal

Environment	Structural Member	Preparation	Protection	Remarks
Dry enviroment with structural steel encased in concrete, or masonry, or covered in non-corrosive contact type fire proofing	Structural Steel and joists	SSPC-SP3 Power Tool Cleaning	Leave Unpainted	
Protected (Inside vapour barrier)	Structural Steel not exposed to view	SSPC-SP3 Power Tool Cleaning	CISC/CPMA 1-73a OR [Leave Unpainted]	
	Joists not exposed to view	SSPC-SP2 Hand Tool Cleaning	CISC/CPMA 1-73a or SSPC Paint 15	
	Structural Steel or Joists exposed to view, but not designated as AESS	SSPC-SP7 Brush-Off Blast Cleaning	CISC/CPMA 2-75	.

Unprotected (outside vapour barrier and/or unconditioned space) but **not** exposed to chlorides. *(See note (a))*	Structural Steel	SSPC-SP7 Brush-Off Blast Cleaning + SSPC-SP8 Pickling	Hot Dip Galvanize	Note additional requirements for galvanizing in specification sections.
	Joists	SSPC-SP7 Brush-Off Blast Cleaning + SSPC-SP8 Pickling	Hot Dip Galvanize	Note additional requirements for galvanizing in specification sections.
		OR		
		[SSPC-SP6 Commercial Blast Cleaning]	[Inorganic zinc-rich primer (SSPC Paint 20, type 1)]	
Unprotected (outside vapour barrier and/or unconditioned space) exposed to chlorides.	Structural Steel and Joists	SSPC-SP10 Near White Blast Cleaning	Inorganic zinc-rich primer (SSPC Paint 20, type I) and epoxy paint (SSPC Paint 22)	Provide topcoat SSPC Paint 36, Level 3, when exposed to sunlight
High Humidity (inside vapour barrier)	Structural Steel and Joists	SSPC-SP6 Commercial Blast Cleaning	Inorganic zinc-rich primer (SSPC Paint 20, type I)	
Pool Enclosures	Structural Steel not exposed to view	SSPC-SP10 Near White Blast Cleaning + SSPC-SP8 Pickling	Hot Dip Galvanize	Note additional requirements for galvanizing in specification sections
	Joists not exposed to view	SSPC-SP10 Near White Blast Cleaning + SSPC-SP8 Pickling	Hot Dip Galvanize	Note additional requirements for galvanizing in specification sections
	Structural Steel and Joists exposed to view,but not designated as AESS	SSPC-SP10 Near White Blast Cleaning	Inorganic zinc-rich primer (SSPC Paint 20, type I) and epoxy paint (SSPC Paint 22)	Provide topcoat SSPC Paint 36, Level 3, when exposed to sunlight
Chemical exposures (acidic, alkaline, oxidizing, solvents, etc.)	Structural Steel and Joists	SSPC-SP10 Near White Blast Cleaning	Inorganic zinc-rich primer (SSPC Paint 20, Type I) with chemically resistant finish coat system (SSPC Paint 22) specially chosen to protect primer	

			and base metal against specific chemical agent. (See Note (b))	

Notes:

(a) This includes canopies, outdoor screens, exterior mechanical support framing, shelf angles (including supporting brackets) and lintels in exterior walls.

(b) Submit proposed coating system for approval of consultant prior to application.

3.3 Galvanized Sections

.1 Apply galvanizing to all steel members as noted in clause 3.2.

.2 Fabricate all framing prior to galvanizing providing all required vent holes and cap plates to ensure complete internal and external coverage is required.

.3 Galvanize in accordance with A123/A123M to minimum coating of 610 g/m² [2 oz/ft²].

.4 All bolts, nuts, washers, connector plates, clips, etc. at member connections shall be galvanized.

.5 Galvanize members after shop welding has been completed.

.6 When welding after galvanizing is in place, grind away galvanizing at areas to be welded and touch-up with two coats of coating complying with SSPC PAINT 20, type II.

.7 In cases where galvanized framing is in contact with plain carbon steel locally provide two coats of coating to the plain steel complying with SSPC PAINT 32 where members are in contact.

.8 Where the galvanizing process of members may cause distortion of the structural framing, submit procedures for review by the Consultant and make good to tolerances noted in the contract documents.

.9 For joists, a 25 mm spacing between chord members is recommended. Provide larger spacing as required to suit the specified surface preparation.

.10 Identify at time of tender any splices or additional fabrication requirements due to the size, length or weight constraints imposed by the galvanizing process.

.11 FINISH PAINTING

Where finish painting is specified for galvanized surfaces, the galvanizer is to eliminate any after-galvanizing treatment that would normally be applied to the coating that will adversely affect paint adhesion.

3.4 Joist Bridging & Bottom Chord Roof Bracing

.1 All bridging, bracing and anchorages to be as required by the drawings and CSA S16.

3.5 Joist Bearing Anchorage

.1 Conform to Specification, Typical Details and Notes on drawings unless specifically noted otherwise.

.2 Joists bearing on steel shall be anchored with welds as shown on drawings and typical details. Welds shown are minimum.

.3 Joists bearing on masonry shall be welded to Wall Plates as shown on drawings and typical details. Welds shown are minimum.

.4 It is anticipated, in order to accommodate the roof slopes, (refer to Architectural Plans and Details) that it will be necessary to modify OWSJ shoes and/or to provide steel shims to achieve level and sound bearings. The Contractor is to provide all necessary shims, plates etc. in order to maintain uniform slopes, and sound bearing and anchorage.

.5 Anchors in Masonry for Wall Plates:

.1 Unless otherwise shown provide a minimum:

.1 For Floor Joists:..... Refer to typical details on drawings.

.2 For Roof Joists: ..... Two (2) 20 mm [3/4″] diameter anchor rods by 600 mm [24″] long.

.2 Embed all anchors vertically and grout in solid.

3.6 Bearing/Wall Plates for Beams

.1 Provide a minimum of two (2) anchors, 12 mm [1/2″] diameter by 300 mm [12″] long with 50 mm [2″] hook, for all bearing plates on masonry shall be embedded vertically and grouted in solid unless specifically noted otherwise on the drawings.

.2 Weld beams to plates with a minimum of two (2) 3 mm x 25 mm [3/16″ x 1″] fillet welds unless noted otherwise.

3.7 Relation to Other Trades

.1 Give all necessary directions for setting anchor rods, bearing plates and other members required to be built in with the work of other trades.

.2 Verify the location and condition of all bearing surfaces placed by others. All such surfaces shall be at the elevations called for on the drawings and shall be truly level.

.3 Commencement of erection implies acceptance of the work of other sections which affect the work of this section.

.4 No claim for relief from contractual responsibility or for extras to the contract will be allowed unless such claim is made in writing prior to commencement of the work.

.5 Ensure the proper bearing surface and amount of bearing is available to support steel members including open web steel joists.

.6 Supply materials and all necessary directions for installation of all anchor rods and bearing plates, and also clips, angles and weld plates for steel deck if and as required. Co-ordinate with steel deck supplier for their actual requirements.

.7 Weld approved anchor slots at 600 mm [24″] on center for adjustable masonry anchors, on all steel surfaces to be built into masonry.

.8 Supply and install wall anchors, ceiling extensions, and header supports for trimming openings for all OWSJ.

.9 Provide and reinforce to the approval of the Consultant, openings through beams required by other trades. Obtain approval of the Consultant for location of the holes. The cost for this work shall be paid for by the trade requiring the openings. Reinforce openings to maintain required design strength.

.10 Provide at any time before the drawings are approved, punched holes from 11 mm to 27 mm [0.43″ to 1.1″] diameter for the convenience of other trades as requested by them. Holes shall be placed so as not to cause any appreciable reduction in the strength of such members.

.11 Co-ordinate with the Mechanical and Electrical Drawings and Trades to ensure that there is no interference between ductwork, suspended lighting fixtures and hangers, and the open web steel joists and bridging, or other structural steel members.

.12 Wherever items are suspended from OWSJ, the securement shall be from the top chords of the joists at panel points only. Unless specific permission is given by the Structural Consultant.

.13 Refer to drawings for CONCRETE FILLED COLUMNS.

3.8 Lintels

.1 Generally lintels will be supplied only by this section and be placed by the General Contractor.

.2 Lintels shall conform to the Lintel Schedules, Notes and Typical Details on the Structural drawings.

.3 While every effort has been made to show all lintels which occur in load bearing masonry walls, it is the Contractor's responsibility to ensure that the correct size and quantity of lintels are provided.

.4 Lintels in non-load bearing walls and partitions are generally NOT SHOWN ON THE DRAWINGS. All such lintels shall be provided as required and shall conform to the Notes & Typical Details on the structural drawings.

.5 Refer also to **Galvanizing** earlier in this section.

3.9 Erection

.1 Commencement of erection implies acceptance of the work of other sections which affect the work of this section.

.2 No claim for relief from contractual responsibility or for extras to the contract will be allowed unless such claim is made in writing prior to commencement of the work.

.3 Conform to the requirements of CSA S16.

.4 Provide a competent and experienced supervisor.

.5 Provide all necessary temporary bracing to keep structure safe and plumb. Bracing on structural drawings is for the finished building only.

.6 Report all lack of fit to the Consultant before correction.

.7 Provide and install all necessary packing under open web steel joist shoes. Packing to be of steel so placed as to distribute the joist reaction uniformly on the bearing.

.8 Obtain written approval from the Consultant prior to field cutting or altering structural steel framing or open web steel joists or bridging.

.9 Touch-up shop primer to bolts, welds, burned or scraped surfaces at completion of erection.

.10 Provide proper coordination between the structural steel contractor, the mechanical and electrical contractors to ensure that all required openings through structural steel

members or OWSJ are approved and are clearly detailed on the Shop Drawings before fabrication and erection. (Openings are to be reinforced to maintain the required design strengths.) The costs of such openings and/or for the provision of openings installed in the field, are to be borne by the Contractor or the trade requiring the opening, and are not extra to the Contract.

3.10 Tolerances

.1 Conform to CSA S16 and to the Typical Notes on the drawings.

3.11 Quality Control

.1 Implement a system of quality control to ensure that the minimum standards specified herein are attained.

.2 Bring to the attention of the Consultant any defects in the work or departures from the Contract Documents which may occur during construction. The Consultant will decide upon corrective action and give recommendations in writing.

.3 The Consultant 's general review during construction and inspection and testing by Independent Inspection and Testing Companies reporting to the Consultant are both undertaken to inform the Owner of the Contractor's performance and shall in no way augment the Contractor's quality control or relieve the Contractor of contractual responsibility. The contractor is solely responsible for quality control and shall implement its own supervisory and quality control procedures.

.4 The structural steel fabricators shall be certified by the Canadian Welding Bureau to the requirements of CSA W47.1, division 1 or 2.

.5 Searching visual inspection aided by a magnifying glass shall be carried out regularly on all joints during the course of welding and after completion by the fabricators designated welding supervisor, and also by the inspection company's representative. Emphasis shall be placed upon visual inspection to establish correct "Fit-Up" and "Pre-heating".

.6 All welds are to be stamped with the operator's number or symbols and the fabricator's number assigned by the Canadian Welding bureau with the requirements of CSA Standard W59.

.7 Finished shop work must be inspected and approved before shipping to site and field work must be inspected and approved before the removal of erection equipment from the job.

3.12 Notification

Prior to commencing significant segments of the work, give the Consultant and Independent Inspection and Testing Companies appropriate notification so as to afford them reasonable opportunity to review the work. Failure to meet this requirement may be cause for the Consultant to classify the work as defective. Advise the Inspection and Testing Company at least twenty-four (24) hours in advance of each fabrication and/or erection sequence.

3.13 Inspection and Testing

1. The Owner will appoint an Independent Inspection and Testing Companies to make inspections or perform tests as the Consultant directs. The Independent Inspection and Testing Companies shall be responsible only to the Consultant, and shall make only such inspections or tests as the Consultant may direct. The representative of the Inspection and Testing Company shall NOT be required to supervise or instruct the Contractor.

2. The Inspection and Testing Company will conduct inspection and testing services per the following:

   .1 Specification Section 01 45 23 – *Testing and Inspection Services – General Requirements.*

   .2 Specification Section 01 45 23.12 – *Testing and Inspection Services – Structural Steel*

.3 The following are responsibilities of the contractor regarding the Inspection and Testing Company:

   .1 Co-operate with the representatives of the Inspection and Testing Company.

   .2 Provide the Inspection and Testing Company with a copy of Specification, Structural Drawings and reviewed copies of shop drawings.

   .3 Co-ordinate a program of inspection and testing with the Inspection and Testing Company, and advise the Consultant accordingly.

3.14 Defective Materials and Work

.1 Where evidence exists that defective work has occurred or that work has been carried out incorporating defective materials, the Consultant may have tests, inspections or surveys performed, analytical calculations of structural strength, made and the like, in order to help determine whether the work must be corrected or replaced. Tests, inspections or surveys or calculations carried out under these circumstances will be made at the Contractor's expense, regardless of their results, which may be such that, in the Consultant's opinion, the work may be acceptable.

.2 All testing shall be conducted in accordance with the requirements of The Building Code, except where this would, in the Consultant's opinion, cause undue delay or give results not representative of the rejected material in place. In this case, the tests shall be conducted in accordance with the standards given by the Consultant.

.3 Materials or work which fail to meet specified requirements may be rejected by the Consultant whenever found at any time prior to final acceptance of the work regardless of previous inspection. If rejected, defective materials or work shall be promptly removed and replaced or repaired to the satisfaction of the Consultant, at no expense to the Owner.

END OF SECTION 05 21 19

PART 1 – GENERAL

1.1 General Requirements

.1 The Contractor shall ensure that no asbestos containing materials are used in connection with the work of this section.

1.2 Reference Standards

.1 Comply with The Building Code Act, as amended, the 2012 Ontario Building Code (OBC) as amended and Regulations and by-laws of other authorities having jurisdiction, including latest amendments thereto; all hereafter referred to as Building Code.

.2 All codes, standard specifications and by-laws referred to in this Specification shall be current editions including all latest revisions, addenda and supplements, unless otherwise noted in the Building Code.

.3 Conform to the following CSA Standards:

.1 S136 ..... North American Specification for the Design of Cold Formed Steel Structural Members.

.2 W47.1 ..... Certification of Companies for Fusion Welding of Steel.

.3 W59 ..... Welded Steel Construction (Metal Arc Welding).

.4 Conform to the following ASTM Standards:

.1 A653/A 653M ..... Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.

.5 Conform to the following Canadian Sheet Steel Building Institute Standards:

.1 CSSBI 10M ..... Standard for Steel Roof Deck.

.2 CSSBI B13..... Design of Steel Deck Diaphragms.

.6 Comply with any Fire Rated Assembly Design specified for the project.

.7 In the event of conflict between reference standards, codes, drawings and specifications, the Contractor shall request clarification by the Consultant. The Consultant's decision as to which requirements govern shall be final and binding. Generally the more stringent provision shall govern. No extras to the contract will be approved due to such clarification.

.8 Conform to the Occupational Health and Safety Act, R.S.O. 1990, c. O.1, last amendment.

1.3 Design Requirements

.1 Design steel deck using limit states design in accordance with CSA S136 and CSSBI 10M.

.2 Wherever structural framing permits, steel deck shall be designed and fabricated to span continuously over at least four (4) supports (3 spans).

.3 Provide an adequate increase in thickness of metal to compensate for continuity wherever fewer supports may occur.

.4 Steel deck and connections to steel framing to carry dead, live and other loads including lateral loads, diaphragm action, and uplift as indicated.

.5 Deflection of roof deck under specified live or snow load not to exceed 1/300 of span.

1.4 Shop Drawings

.1 Submit erection drawings in accordance with directions.

.2 Fabrication shall not commence until drawings are reviewed.

.3 Indicate deck plan, profile, dimensions, base steel thickness, metallic coating designation, connections to supports and spacings, projections, openings, reinforcement details and accessories.

.4 Shop drawings are to bear the Seal and Signature of the Licensed Professional Engineer responsible for the design.

.5 When requested submit design calculations complete with Stamp and Signature of the responsible Professional Engineer.

.6 Allow ten (10) working days for the review of shop drawings and supply as many copies for review and distribution as directed. Shop drawings shall be checked in detail by the General Contractor before submission. Drawings which fail to meet this requirement shall be returned marked NOT REVIEWED.

.7 The review of such drawings shall not relieve the Contractor of the responsibility of seeing that this work is complete, accurate and in conformity with the drawings and the specification.

PART 2 – PRODUCTS

2.1 Materials

.1 STEEL SHEET to ASTM A653/A653M (Structural quality) minimum grade 230 MPa [33 ksi] with a base nominal thickness (BNT) as noted on the drawings.

.2 ZINC COATING

.1 Unless otherwise noted, provide a ZF75 (galvanneal) coating as designated by ASTM A653/A653M.

.2 Where specified on drawings as GALVANIZED DECK, provide a Z275 coating as designated by ASTM A653/A653M.

.3 Deck surfaces which are designated for finish painting (Refer to Architectural Drawings & Finish Schedules) shall not receive chemical treatment that will adversely affect paint application.

.3 TYPES OF DECKING:

.1 Roof deck: Shall be single fluted element with ribs of depth as shown on the drawings.

.2 Acoustic deck: shall be single fluted element with ribs of depths shown on the drawings and with perforations on the vertical faces of the flutes, complete with a sound absorbing strip (fiberglass density 17.6 kg/m^3 [1.1 lb. / ft^2]) supplied by the deck fabricator for installation by the roofing contractor.

.3 Pre-finished deck: where designated is to be pre-painted, provide:

.1 Colorite HMP
.2 10000 Series
.3 Metallic Series
.4 Barrier Series
.5 Weather X

Colour to be selected later by the Architect from the manufacturer's standard colour chart.

.4 Deck shall have interlocking side joints between panels.

.4 FASTENERS FOR PRE-FINISHED DECK:

.1 Unless otherwise noted, provide self-drilling or self-tapping corrosion resistant fasteners.

Acceptable type: #14 TEK screws or an approved equivalent.

.5 CLOSURES:

.1 Provide cover plates, edge stiffeners, cell closures and flashings from sheet steel similar to decking with a base nominal thickness of 0.76 mm [0.03″] (22 gauge). (Refer to Architectural Drawings).

.2 Provide and install closures at the top of all walls. Type to match the profile and finish of selected decking.

.6 PRIMER: conform to CAN/CGSB-1.181

.1 Acceptable product: CARBOZINC II by Carboline.

.7 METAL UPSTANDS/CURBS:

.1 Where required by the Architectural Drawings provide and install 1.6 mm [0.063″] (16 gauge) galvanized metal upstands.

PART 3 – EXECUTION

3.1 Preparation

.1 Verify the location and condition of all bearing surfaces placed by others. All such surfaces shall be at the elevation called for on the drawings.

.2 Commencement of erection implies acceptance of the work of other sections, which affect the work of this section.

.3 No claim for relief from contractual responsibility or for extras to the contract will be allowed unless such claim is made in writing prior to commencement of the work.

.4 Protect steel deck during shipping and handling in accordance with CSSBI standards.

.5 The steel deck welder must be certified to CSA W47.1 for fusion welding of steel deck.

3.2 Fabrication & Erection

.1 Conform to CSA S136, CSA W59, CCSBI 10M.

.2 Erect steel decking as indicated to manufacturer's direction and to reviewed shop drawings.

.3 No hangers or brackets supporting mechanical and electrical services, artwork, ceilings, bulkheads, lighting, etc. shall be hung directly from the floor or roof deck. All point loads must be applied directly to structural steel framing unless otherwise shown or approved by structural consultant.

.4 Accurately align the deck and lap at supports. Use 50 mm [2″] minimum lap.

.5 Supply and place steel packing as required to produce an even bearing pressure at supports.

.6 Any material which has been damaged shall be replaced at no expense to the owner.

.7 Provide for ribs to bear on beams parallel to flutes when tops of such beams are at same elevation as deck bearing.

.8 Provide reinforcing stiffeners for unsupported edges of metal deck.

.9 Install 50 x 50 x 6 mm [2″ x 2″ x ¼″] steel angles or formed channels perpendicular to flutes, welded to 2 flutes each side of opening for deck openings from 150 to 450 mm [6″ to 18″] in size. No reinforcement required for openings cut in the deck that are smaller than 150 mm [6″] square.

.10 For deck openings over 450 mm [18″] and for areas of concentrated load, reinforce in accordance with structural framing details.

.11 Install closures and upstands as shown on drawings and reviewed shop drawings.

.12 After alignment and levelling and unless otherwise noted on drawings, the minimum attachment of the deck to the bearing surfaces and the minimum side lap connections between deck units shall be:

.13

.1 For 38 mm deck profiles, connect the first, third, fifth and seventh low corrugations (36/4 configuration), and each support parallel to flute direction at 300 mm [12″] maximum centers. Connections shall be made using either an arc spot weld with 20 mm [3/4″] nominal top diameter, or mechanically fastened using Hilti powder actuated fasteners (X-HSN24, HILTI X-ENP19, or equivalent).

.2 For 76 mm deck profiles, connect the first, third and fifth low corrugations (24/3 configuration), and each support parallel to flute direction at 300 mm [12″] maximum centers. Connections shall be made using either an arc spot weld with 20 mm [3/4″] nominal top diameter, or mechanically fastened using Hilti powder actuated fasteners (X-HSN24, HILTI X-ENP19, or equivalent).

.3 Side laps of adjacent nestable units shall be crimped together at 900 mm [36″] centres, or fastened with Hilti M HWH screws (SLCO1, SLC02, or equivalent) at 900mm [36”] on centre.

.14 Immediately after decking is permanently secured in place, where top and/or bottom surfaces have been burned by welding or where surface coating has been damaged during transit or in erection.

.1 Touch-up galvannealed surfaces with coating complying with SSPC-PAINT 20.

3.3 Quality Control

.1 Implement a system of quality control to ensure that the minimum standards specified herein are attained.

.2 Bring to the attention of the Consultant any defects in the work or departures from the Contract Documents which may occur during construction. The Consultant will decide upon corrective action and give recommendations in writing.

.3 The Consultant 's general review during construction and inspection and testing by Independent Inspection and Testing Companies reporting to the Consultant are both undertaken to inform the Owner of the Contractor's performance and shall in no way augment the Contractor's quality control or relieve the Contractor of contractual responsibility. The contractor is solely responsible for quality control and shall implement its own supervisory and quality control procedures.

3.4 Notification

1. Prior to commencing significant segments of the work, give the [Consultant] and Independent Inspection and Testing Companies appropriate notification so as to afford them reasonable opportunity to review the work. Failure to meet this requirement may be cause for the [Consultant] to classify the work as defective.

3.5 Inspection and Testing

1. The Owner will appoint an Independent Inspection and Testing Companies to make inspections or perform tests as the Consultant directs. The Independent Inspection and Testing Companies shall be responsible only to the Consultant, and shall make only such inspections or tests as the Consultant may direct. The representative of the Inspection and Testing Company shall NOT be required to supervise or instruct the Contractor.

2. The Inspection and Testing Company will conduct inspection and testing services per the following:

   .1 Specification Section 01 45 23 – *Testing and Inspection Services – General Requirements.*

   .2 Specification Section 01 45 23.13 – *Testing and Inspection Services – Steel Deck*

.3 The following are responsibilities of the contractor regarding the Inspection and Testing Company:

   .1 Co-operate with the representatives of the Inspection and Testing Company.

   .2 Provide the Inspection and Testing Company with a copy of Specification, Structural Drawings and reviewed copies of shop drawings.

3.6 Defective Materials and Work

.1 Where evidence exists that defective work has occurred or that work has been carried out incorporating defective materials, the [Consultant] may have tests, inspections or surveys performed, analytical calculations of structural strength, made and the like, in

order to help determine whether the work must be corrected or replaced. Tests, inspections or surveys or calculations carried out under these circumstances will be made at the Contractor's expense, regardless of their results, which may be such that, in the [Consultant]'s opinion, the work may be acceptable.

.2 All testing shall be conducted in accordance with the requirements of The Building Code, except where this would, in the Consultant's opinion, cause undue delay or give results not representative of the rejected material in place. In this case, the tests shall be conducted in accordance with the standards given by the Consultant.

.3 Materials or work which fail to meet specified requirements may be rejected by the Consultant whenever found at any time prior to final acceptance of the work regardless of previous inspection. If rejected, defective materials or work shall be promptly removed and replaced or repaired to the satisfaction of the Consultant, at no expense to the Owner.

END OF SECTION 05 31 23