

Part 1 General

1.1 REFERENCE STANDARDS

- .1 Canadian Standards Association (CSA International)
  - .1 CSA-A23.1-19/A23.2-19, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
  - .2 CSA O121-17, Douglas Fir Plywood.
  - .3 CSA S269.1-16 Falsework for Construction Purposes.
  - .4 CAN/CSA-S269.3-M92(R2003), Concrete Formwork, National Standard of Canada

1.2 DELIVERY, STORAGE AND HANDLING

- .2 Waste Management and Disposal:
  - .1 Separate waste materials for recycling and/or reuse in accordance with Section 01 74 19 – Construction and Demolition Waste Management.

1.3 Products

1.4 MATERIALS

- .3 Formwork materials:
  - .1 For concrete without special architectural features, use wood and wood product formwork materials to CSA-O121.
  - .2 For concrete with special architectural features, use formwork materials to CSA-A23.1/A23.2.
- .4 Tubular column forms: round, internally treated with release material.
- .5 Form ties:
  - .1 For concrete not designated 'Architectural', use removable or snap-off metal ties, fixed or adjustable length, free of devices leaving holes larger than 25 mm diameter in concrete surface.
  - .2 For Architectural concrete, use snap ties complete with plastic cones and light grey concrete plugs.
- .6 Form release agent: non-toxic
- .7 Form stripping agent: colourless mineral oil, non-toxic, free of kerosene
- .8 Falsework materials: to CSA-S269.1.
- .9 Sealant: to Section 07 92 00 - Joint Sealers.

1.5 Execution

FABRICATION AND ERECTION

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

- .11 Obtain Consultant's approval for use of earth forms framing openings not indicated on drawings.
- .12 Hand trim sides and bottoms and remove loose earth from earth forms before placing concrete.
- .13 Fabricate and erect falsework in accordance with CSA S269.1.
- .14 Refer to architectural drawings for concrete members requiring architectural exposed finishes.
- .15 Do not place shores and mud sills on frozen ground.
- .16 Provide site drainage to prevent washout of soil supporting mud sills and shores.
- .17 Fabricate and erect formwork in accordance with CAN/CSA-S269.3 to produce finished concrete conforming to shape, dimensions, locations and levels indicated within tolerances required by CSA-A23.1/A23.2.
- .18 Align form joints and make watertight.
  - .1 Keep form joints to minimum.
- .19 Use 20 mm chamfer strips on external corners and/or 20 mm fillets at interior corners, joints, unless specified otherwise.
- .20 Form chases, slots, openings, drips, recesses, expansion and control joints as indicated.
- .21 Construct forms for architectural concrete, and place ties as directed and/or as indicated.
  - .1 Joint pattern not necessarily based on using standard size panels or maximum permissible spacing of ties.
- .22 Build in anchors, sleeves, and other inserts required to accommodate Work specified in other sections.
  - .1 Ensure that anchors and inserts will not protrude beyond surfaces designated to receive applied finishes, including painting.
- .23 Clean formwork in accordance with CSA-A23.1/A23.2, before placing concrete.

#### REMOVAL AND RESHORING

- .24 Leave formwork in place for following minimum periods of time after placing concrete.
  - .1 Walls and columns; concrete curing temperatures of:
    - .1 21°C-35°C = 2 days
    - .2 16°C-21°C = 3 days
    - .3 10°C-16°C = 4 days
  - .2 Beam soffits, slabs, decks, and other structural members; concrete curing temperatures of:
    - .1 21°C-35°C = 14 days
    - .2 16°C-21°C = 17 days
    - .3 10°C-16°C = 21 days

- .3 Remove formwork when concrete has reached 75% of its design strength or minimum period noted above, whichever comes later, and replace immediately with adequate reshoring.
- .25 Provide all necessary reshoring of members where early removal of forms may be required or where members may be subjected to additional loads during construction as required.
- .26 Space reshoring in each principal direction at no more than 1500mm apart.
- .27 Re-use formwork and falsework subject to requirements of CAN/CSA-A23.1.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .1 American Concrete Institute (ACI)
  - .1 SP-66-04, ACI Detailing Manual 2004.
- .2 American National Standards Institute/American Concrete Institute (ANSI/ACI)
  - .1 ANSI/ACI 315, Details and Detailing of Concrete Reinforcement
- .3 CSA International
  - .1 CAN/CSA-A23.1-09/A23.2-19, Concrete Materials and Methods of Concrete Construction
  - .2 CAN3-A23.3-19 Design of Concrete Structures
  - .3 CSA G30.15-M1983(R1998), Welded Deformed Steel Wire Fabric for Concrete Reinforcement
  - .4 CSA G30.5-M1983(R1998), Welded Steel Wire Fabric for Concrete Reinforcement
  - .5 CAN/CSA-G30.18-09, Carbon Steel Bars for Concrete Reinforcement
  - .6 CSA W186- M1990(R2007), Welding of Reinforcing Bars in Reinforced Concrete Construction
- .4 Reinforcing Steel Institute of Canada (RSIC)
  - .1 RSIC-2004, Reinforcing Steel Manual of Standard Practice.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Prepare reinforcement drawings in accordance with RSIC Manual of Standard Practice and SP-66.
- .3 Indicate on shop drawings, bar bending details, lists, quantities of reinforcement, sizes, spacings, locations of reinforcement and mechanical splices if approved by Consultant with identifying code marks to permit correct placement without reference to structural drawings. Prepare reinforcement drawings in accordance with ANSI/ACI 315 and SP66 ACI Detailing Manual.
- .4 Detail lap lengths and bar development lengths to CAN/CSA-A23.3.

1.3 QUALITY ASSURANCE

- .1 Submit in accordance with Section 01 45 00 - Quality Control and as described in PART 2 - SOURCE QUALITY CONTROL.
  - .1 Mill Test Report: upon request, provide Consultant with certified copy of mill test report of reinforcing steel.
  - .2 Upon request, submit in writing to Consultant proposed source of reinforcement material to be supplied.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials off ground in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Replace defective or damaged materials with new.

Part 2 Products

2.1 MATERIALS

- .1 Substitute different size bars only if permitted in writing by Consultant.
- .2 Reinforcing steel: billet steel, grade 400, deformed bars to CSA-G30.18, unless indicated otherwise.
- .3 Reinforcing steel: weldable low alloy steel deformed bars to CSA-G30.18.
- .4 Welded steel wire reinforcement: to CSA G30.5.
  - .1 Provide in flat sheets only.
- .5 Welded deformed steel wire reinforcement: to CSA G30.15.
  - .1 Provide in flat sheets only.
- .6 Chairs, bolsters, bar supports, spacers: to CSA-A23.1/A23.2.
- .7 Mechanical splices: subject to approval of Consultant.

2.2 FABRICATION

- .1 Fabricate reinforcing steel in accordance with Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada, SP-66, CSA-A23.1/A23.2.
- .2 Obtain Consultant's written approval for locations of reinforcement splices other than those shown on placing drawings.
- .3 Upon approval of Consultant, weld reinforcement in accordance with CSA W186.
- .4 Ship bundles of bar reinforcement, clearly identified in accordance with bar bending details and lists.

2.3 SOURCE QUALITY CONTROL

- .1 Upon request, provide Consultant with certified copy of mill test report of reinforcing steel, showing physical and chemical analysis.
- .2 Upon request, inform Consultant of proposed source of material to be supplied.

Part 3          Execution

3.1              FIELD BENDING

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

3.2              PLACING REINFORCEMENT

- .1      Place reinforcing steel as indicated on placing drawings and in accordance with CSA-A23.1/A23.2.
- .2      Prior to placing concrete, obtain Consultant's approval of reinforcing material and placement.
- .3      Ensure cover to reinforcement is maintained during concrete pour.

3.3              CLEANING

- .1      Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
  - .1          Leave Work area clean at end of each day.
- .2      Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

.1 ASTM International

- .1 ASTM C260/C260M-10a, Standard Specification for Air-Entraining Admixtures for Concrete.
- .2 ASTM C494/C494M-10a, Standard Specification for Chemical Admixtures for Concrete.
- .3 ASTM D624-00(2012), Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers
- .4 ASTM D638-14, Standard Test Method for Tensile Properties of Plastics
- .5 ASTM D1751-18, Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types)
- .6 ASTM E1155-20, Standard Test Method for Determining FF Floor Flatness and FL Floor Levelness Numbers

.2 CSA International

- .1 CAN/CSA-A3001-18, Cementitious Materials for Use in Concrete
- .2 CAN/CSA-A23.1/A23.2-19, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete
- .3 CAN/CSA-A266.5-M1981, Guidelines for the Use of Superplasticizing Admixtures in Concrete
- .4 CAN/CSAA266.6-M85, Superplasticizing Admixtures for Concrete

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

1.3 QUALITY ASSURANCE

- .1 Quality Assurance: in accordance with Section 01 45 00 - Quality Control.
- .2 Provide Consultant, minimum 4 weeks prior to starting concrete work, with valid and recognized certificate from plant delivering concrete.

- .1 Provide test data and certification by qualified independent inspection and testing laboratory that materials and mix designs used in concrete mixture will meet specified requirements.

#### 1.4 DELIVERY, STORAGE AND HANDLING

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

#### Part 2 Products

##### 2.1 MATERIALS

- .1 Portland Cement: to CSA A3001
- .2 Water: to CSA A23.1.
- .3 Aggregates: to CSA A23.1/A23.2.
- .4 Admixtures:
  - .1 Air entraining admixture: to ASTM C260.
  - .2 Chemical admixture: to ASTM C494. Consultant to approve accelerating or set retarding admixtures during cold and hot weather placing.
  - .3 Superplasticizing admixtures: to CSA-A266.5, CSA-A266.6
- .5 Concrete retarders: to ASTM C494 water based, low VOC, solvent free. Do not allow moisture of any kind to come in contact with the retarder film.
- .6 Non shrink grout: composition of non-metallic aggregate Portland cement with sufficient water for mixture to retain its shape when made into ball by hand and capable of developing compressive strength of 50 MPa at 28 days.
- .7 Curing compound: to ASTM C309, CSA A23.1/A23.2, white, water-based, and compatible with applied finishes.
- .8 Waterstops: flat ribbed extruded PVC, 152mm long
  - .1 Tensile strength: to ASTM D638, minimum 2000 psi
  - .2 Elongation: to ASTM D638, minimum 350%
  - .3 Tear resistance: to ASTM D624, minimum 300 lb/in
- .9 Premoulded joint fillers:
  - .1 Bituminous impregnated fibre board: to ASTM D1751.
- .10 Weep hole tubes: plastic.



2.2 MIXES

- .1 Refer to Structural Drawings for concrete mix design requirements.

Part 3 Execution

3.1 PREPARATION

- .1 Obtain Consultant's written approval before placing concrete.
  - .1 Provide 72 hours minimum notice prior to placing of concrete.
- .2 Place concrete reinforcing in accordance with Section 03 20 00 - Concrete Reinforcing.
- .3 During concreting operations:
  - .1 Development of cold joints not allowed.
  - .2 Ensure concrete delivery and handling facilitates placing with minimum of re-handling, and without damage to existing structure or Work.
- .4 Pumping of concrete is permitted only after approval of equipment and mix.
- .5 Ensure reinforcement and inserts are not disturbed during concrete placement.
- .6 Prior to placing of concrete obtain Consultant's approval of proposed method for protection of concrete during placing and curing in adverse weather.
- .7 Protect previous Work from staining.
- .8 Clean and remove stains prior to application for concrete finishes.
- .9 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, air temperature and test samples taken.
- .10 In locations where new concrete is dowelled to existing work, drill holes in existing concrete.
  - .1 Place steel dowels of deformed steel reinforcing bars and pack solidly with epoxy grout to anchor and hold dowels in positions as indicated.
- .11 Do not place load upon new concrete until authorized by Consultant.

3.2 COLD WEATHER CONCRETE

- .1 The following are minimum requirements for protecting concrete during and after placement in freezing weather. Except as noted below, concrete curing and protection to be in accordance with CAN/CSA-A23.1-19.
- .2 Before any concrete is placed, all ice, snow and frost shall be completely removed from all formwork, reinforcing and other surfaces shall be raised above 10°C for 24 hours minimum prior to concreting. Where concrete work is to come in contact with the earth, the surfaces of the earth shall be completely free of frost when the concrete is placed thereon.
- .3 Concrete aggregates and water shall be heated to not over 80°C. Concrete shall not be less than 10°C nor more than 30°C in temperature when deposited. Concrete when

placed during freezing weather (or if freezing is anticipated during curing period) shall be fully enclosed and the temperature of same maintained at not less than 5°C for an additional 7 days. Contractor shall provide adequate heating to attain the specified concrete strengths required prior to stripping or to provide a concrete mix which will meet the specified stripping strengths under reduced curing temperatures.

- .4 All protecting covering shall be kept clear of the concrete and form surfaces to permit full circulation of air and shall be maintained intact for at least 24 hours after the artificial heat is discontinued.
- .5 Heating enclosures shall be strong and windproof, but well ventilated, and heating units so located as to prevent local overheating, drying of the concrete, or damage from combustion gases. Only Herman Nelson heat exchange, fuel oil type heaters will be acceptable for slabs and flat areas. Units must be vented outside the building. No direct fired units will be acceptable.

### 3.3 HOT WEATHER CONCRETE

- .1 Concreting operations during hot weather in accordance with CAN/CSA-A23.1.
- .2 Exercise particular care to prevent surface crazing of floor slabs due to combined high temperature and drying winds.
- .3 Use of water reducing-retarding chemical admixture in concrete mix may be required at Consultant's discretion.

### 3.4 INSTALLATION/APPLICATION

- .1 Do cast-in-place concrete work to CSA A23.1/A23.2.
- .2 Sleeves and inserts:
  - .1 Do not permit penetrations, sleeves, ducts, pipes or other openings to pass through joists, beams, column capitals or columns, except where indicated or approved by Consultant.
  - .2 Where approved by Consultant, set sleeves, ties, pipe hangers and other inserts and openings as indicated or specified elsewhere.
  - .3 Sleeves and openings greater than 100 x 100 mm not indicated must be reviewed by Consultant.
  - .4 Do not eliminate or displace reinforcement to accommodate hardware. If inserts cannot be located as specified, obtain written approval of modifications from Consultant before placing of concrete.
  - .5 Confirm locations and sizes of sleeves and openings shown on drawings.
- .3 Anchor bolts:
  - .1 Set anchor bolts to templates in co-ordination with appropriate trade prior to placing concrete.
  - .2 Grout anchor bolts in preformed holes or holes drilled after concrete has set only after receipt of written approval from Consultant.
  - .3 Protect anchor bolt holes from water accumulations, snow and ice build-ups.

- .4 Set bolts and fill holes with shrinkage compensating grout.
- .5 Locate anchor bolts used in connection with expansion shoes, rollers and rockers with due regard to ambient temperature at time of erection.
- .4 Drainage holes and weep holes:
  - .1 Form weep holes and drainage holes in accordance with Section 03 10 00 - Concrete Forming and Accessories. If wood forms are used, remove them after concrete has set.
  - .2 Install weep hole tubes and drains as indicated.
- .5 Grout under base plates using procedures in accordance with manufacturer's recommendations which result in 100 % contact over grouted area.
- .6 Finishing and curing:
  - .1 Finish concrete to CSA A23.1/A23.2.
  - .2 Use procedures as reviewed by Consultant or those noted in CSA A23.1/A23.2 to remove excess bleed water. Ensure surface is not damaged.
  - .3 Use curing compounds compatible with applied finish on concrete surfaces.
  - .4 Finish concrete floor to CSA A23.1/A23.2.
  - .5 Concrete floor to have finish hardness equal to or greater than Mohs hardness in accordance with CSA A23.1/A23.2.
  - .6 Provide swirl-trowelled finish unless otherwise indicated
  - .7 Rub exposed sharp edges of concrete with carborundum to produce 3 mm minimum radius edges unless otherwise indicated.
- .7 Waterstops:
  - .1 Install waterstops to provide continuous water seal.
  - .2 Do not distort or pierce waterstop in way as to hamper performance.
  - .3 Do not displace reinforcement when installing waterstops.
  - .4 Use equipment to manufacturer's requirements to field splice waterstops.
  - .5 Tie waterstops rigidly in place.
  - .6 Use only straight heat sealed butt joints in field.
  - .7 Use factory welded corners and intersections unless otherwise approved by Consultant.
- .8 Joint fillers:
  - .1 Furnish filler for each joint in single piece for depth and width required for joint, unless otherwise authorized by Consultant.
  - .2 When more than one piece is required for joint, fasten abutting ends and hold securely to shape by stapling or other positive fastening.
  - .3 Locate and form expansion, isolation and construction joints as indicated.
  - .4 Install joint filler.

- .5 Use 12 mm thick joint filler to separate slabs-on-grade from vertical surfaces and extend joint filler from bottom of slab to within 12 mm of finished slab surface unless indicated otherwise.

### 3.5 SURFACE TOLERANCE

- .1 Concrete tolerance to CSA A23.1
  - .1 Concrete slabs on grade: FF = 35, FL = 25
  - .2 Polished concrete floors: FF = 40, FL = 30
  - .3 Structural concrete slabs: FF = 35, FL = 25

### 3.6 FIELD QUALITY CONTROL

- .1 Site tests: conduct tests as follows and in accordance with Section 01 45 00 - Quality Control and submit report as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.
  - .1 Concrete pours.
  - .2 Slump.
  - .3 Air content.
  - .4 Compressive strength at 7 and 28 days.
  - .5 Air and concrete temperature.
- .2 Inspection and testing of concrete and concrete materials will be carried out by testing laboratory approved by Consultant for review to CSA A23.1/A23.2.
  - .1 Ensure testing laboratory is certified to CSA A283.
- .3 Costs of tests to be paid by Cash Allowance.
- .4 Take three test cylinders from each 100 cubic meters of concrete placed or for each day of concrete placement if the latter is less than 100 cubic meters. Testing shall be as follows:
  - .1 One - 7 day laboratory cured test.
  - .2 Two - 28 day laboratory cured tests.
- .5 Take additional test cylinders during cold weather concreting. Cure cylinders on job site under same conditions as concrete which they represent.
- .6 Non-Destructive Methods for Testing Concrete: to CSA A23.1/A23.2.
- .7 Inspection or testing by Consultant will not augment or replace Contractor quality control nor relieve Contractor of his contractual responsibility.
- .8 Any defective concrete shall be removed and replaced with a good quality concrete as specified. The cost of removal and replacement of concrete shall be borne and paid by the General Contractor and not by the Consultant.

### 3.7 CLEANING

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

END OF SECTION

**Part 1** GENERAL

**1.1** REFERENCE STANDARDS

- .1 ASTM International (ASTM):
  - .1 ASTM E336-11, Standard Test Method for Measurement of Airborne Sound Attenuation Between Rooms in Buildings
- .2 CSA Group (CSA):
  - .1 CAN/CSA-A165 Series-04(R2009), CSA Standards on Concrete Masonry Units consists: A165.1, A165.2, A165.3
  - .2 CAN/CSA-A371-04(R2009), Masonry Construction for Buildings
  - .3 CSA S304.1-04(R2010), Design of Masonry Structures
- .3 National Research Council Canada (NRC):
  - .1 National Building Code of Canada 2015 (NBC)
- .4 South Coast Air Quality Management District (SCAQMD):
  - .1 SCAQMD Rule 1168-05, Adhesive and Sealant Applications
- .5 ULC Standards (ULC):
  - .1 CAN/ULC-S101-07(R2010), Standard Methods of Fire Endurance Tests of Building Construction and Materials

**1.2** ACTION AND INFORMATIONAL SUBMITTALS

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

**1.3** QUALITY ASSURANCE

- .8 Test Reports: submit certified test reports including sand gradation tests in accordance with CAN/CSA-A179 showing compliance with specified performance characteristics and physical properties.
- .9 Certificates: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

**1.4** DELIVERY, STORAGE, AND HANDLING

- .10 Deliver, store and handle materials in accordance with Section with manufacturer's written instructions.
- .11 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
  - .1 Offload concrete unit masonry packages using equipment that will not damage the surfaces.
  - .2 Do not use brick tongs to move or handle masonry.

- .12 Storage and Handling Requirements:
  - .1 Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Do not double stack cubes of concrete unit masonry.
  - .3 Cover masonry units with non-staining waterproof membrane covering.
  - .4 Allow air circulation around units.
  - .5 Installation of wet or stained masonry units is prohibited.
  - .6 Keep concrete unit masonry in individual cardboard packaging provided by manufacturer until units are ready to be installed.
  - .7 Store and protect concrete unit masonry from nicks, scratches, and blemishes.
  - .8 Replace defective or damaged materials with new.

### **1.5 MATERIALS**

- .13 Standard concrete block units Type: to CAN/CSA-A165 Series ( CAN/CSA-A165.1).
  - .1 Classification: H/15/A/M.
  - .2 Dimensions Nominal: 150 and 200mm wide x 200 mm high x 400 mm long.
  - .3 Special shapes: provide square units for exposed corners. Provide purpose-made shapes for lintels, beams and bond beams. Provide additional special shapes as indicated.

### **1.6 REINFORCEMENT**

- .14 Reinforcement in accordance with structural drawings.

### **1.7 CONNECTORS**

- .15 Connectors in accordance with structural drawings.

### **1.8 MORTAR MIXES**

- .16 Mortar and mortar mixes in accordance with structural drawings.

### **1.9 GROUT MIXES**

- .17 Grout and grout mixes in accordance with structural drawings.

### **1.10 TOLERANCES**

- .18 Tolerances for standard concrete unit masonry tolerances in accordance with CAN/CSA-A165.1, supplemented as follows:
  - .1 Maximum variation between units within specific job lot not to exceed 2 mm.
  - .2 No parallel edge length, width or height dimension for individual unit to differ by more than 2 mm.
  - .3 Out of square tolerance not to exceed 2 mm.
- .19 Tolerances for architectural concrete masonry units in accordance with CAN/CSA-A165.1, supplemented as follows:
  - .1 Maximum variation in length or height between units within specific job lot for specified dimension not to exceed 2 mm.

- .2 No parallel edge length, width or height dimension for individual unit to differ by more than 2 mm.
- .3 Out of square tolerance not to exceed 2 mm.
- .4 Maximum variation in width between units within specific job lot for specified dimension not to exceed 2 mm.

## **Part 2** EXECUTION

### **2.1** EXAMINATION

- .20 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for concrete unit masonry installation in accordance with manufacturer's written instructions.
  - .1 Visually inspect substrate in presence of Consultant.
  - .2 Inform Consultant of unacceptable conditions immediately upon discovery.
  - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Consultant.

### **2.2** PREPARATION

- .21 Protect adjacent finished materials from damage due to masonry work.

### **2.3** INSTALLATION

- .22 Concrete block units:
  - .1 Bond: running.
  - .2 Coursing height: 200 mm for one block and one joint.
  - .3 Jointing: concave where exposed or where paint or other finish coating is specified.
- .23 Architectural concrete unit masonry:
  - .1 Bond: running.
  - .2 Coursing height: 200 mm for one block and one joint.
  - .3 Jointing: concave where exposed or where paint or finish coating is specified.

### **2.4** REINFORCEMENT

- .24 Install reinforcing in accordance with structural drawings

### **2.5** CONNECTORS

- .25 Install connectors in accordance with structural drawings.

### **2.6** MORTAR PLACEMENT

- .26 Place mortar in accordance with structural drawings.

### **2.7** GROUT PLACEMENT

- .27 Place grout in accordance with structural drawings.



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**2.8 CONSTRUCTION**

- .28 Cull out masonry units, in accordance with CAN/CSA-A165 and approved range of colour samples, with chips, cracks, broken corners, excessive colour and texture variation.
- .29 Build in miscellaneous items such as bearing plates, steel angles, bolts, anchors, inserts, sleeves and conduits.
- .30 Construct masonry walls using running bond unless otherwise noted.
- .31 Build around frames previously set and braced. Fill behind hollow frames within masonry walls with mortar or grout and embed anchors.
- .32 Fit masonry closely against electrical and plumbing outlets so collars, plates and covers overlap and conceal cuts.
- .33 Install movement joints and keep free of mortar where indicated.
- .34 Hollow Units: spread mortar setting bed from outside edge of face shells. Gauge amount of mortar on top and end of unit to create full joints, equivalent to shell thickness. Avoid excess mortar.
- .35 Solid Units: apply mortar over entire vertical and horizontal surfaces. Avoid bridging of airspace between brick veneer and backup wall with mortar.
- .36 Ensure compacted head joints. Use full or face-shell joint as indicated.
- .37 Tamp units firmly into place.
- .38 Do not adjust masonry units after mortar has set. Where resetting of masonry is required, remove, clean and reset units in new mortar.
- .39 Tool exposed joints concave weathered/raked for interior work; strike concealed joints flush.
- .40 After mortar has achieved initial set up, tool joints.
- .41 Do not interrupt bond below or above openings.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .1 ASTM International Inc.
  - .1 ASTM A36/A36M-08, Standard Specification for Carbon Structural Steel.
  - .2 ASTM A307-07b, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
  - .3 ASTM A325M-08, Standard Specification for Structural Bolts, Steel, Heat Treated 830 MPa Minimum Tensile Strength..
- .2 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-85.10-99, Protective Coatings for Metals.
- .3 Canadian Institute of Steel Construction (CISC)/Canadian Paint Manufacturers Association (CPMA).
  - .1 Handbook of the Canadian Institute of Steel Construction.
  - .2 CISC/CPMA Standard 2-75, Quick-Drying Primer for use on Structural Steel.
- .4 Canadian Standards Association (CSA International)
  - .1 CSA G40.20/G40.21-04, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
  - .2 CAN/CSA-G164-M92(R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.
  - .3 CAN/CSA-S16-19, Limit States Design of Steel Structures.
  - .4 CAN/CSA-S136-16, North American Specifications for the Design of Cold Formed Steel Structural Members.
  - .5 CSA W47.1-03, Certification of Companies for Fusion Welding of Steel.
  - .6 CSA W48-06, Filler Metals and Allied Materials for Metal Arc Welding.
  - .7 CSA W55.3-1965(R2003), Resistance Welding Qualification Code for Fabricators of Structural Members Used in Buildings.
  - .8 CSA W59-03, Welded Steel Construction (Metal Arc Welding).
- .5 Master Painters Institute
  - .1 MPI-INT 5.1-08, Structural Steel and Metal Fabrications.
  - .2 MPI-EXT 5.1-08, Structural Steel and Metal Fabrications.
- .6 The Society for Protective Coatings (SSPC) and National Association of Corrosion Engineers (NACE) International
  - .1 NACE No. 3/SSPC SP-6-06, Commercial Blast Cleaning.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Shop Drawings:

- .1 Submit drawings stamped and signed by professional engineer registered or licensed in Manitoba Canada.
- .3 Erection drawings:
  - .1 Submit erection drawings indicating details and information necessary for assembly and erection purposes including:
    - .1 Description of methods.
    - .2 Sequence of erection.
    - .3 Type of equipment used in erection.
    - .4 Temporary bracings.
- .4 Fabrication drawings:
  - .1 Submit fabrication drawings showing designed assemblies, components and connections are stamped and signed by qualified professional engineer licensed in the Manitoba, Canada.
- .5 Fabricator Reports:
  - .1 Provide structural steel fabricator's affidavit stating that materials and products used in fabrication conform to applicable material and products standards specified and indicated.
- .6 Architecturally Exposed Structural Steel (AESS):
  - .1 Provide erection drawings clearly indicating which members are considered as AESS members.
  - .2 Indicate welds by standard CWB symbols, distinguishing between shop and field welds, and show size, length and type of each weld. Identify grinding, finish and profile of welds as defined herein.
  - .3 Indicate type, finish of bolts. Indicate which side of the connection bolt heads should be placed.
  - .4 Indicate any special tolerances and erection requirements.
- 1.3 DELIVERY, STORAGE AND HANDLING
  - .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
  - .2 Deliver materials in manufacturer's original, undamaged containers with identification labels intact.
  - .3 For AESS members: Erect finished pieces using softened slings or other methods such that they are not damaged. Provide padding as required to protect while rigging and aligning member's frames. Weld tabs for temporary bracing and safety cabling only at points concealed from view in the completed structure or where approved by the Consultant.

Part 2 Products

2.1 DESIGN REQUIREMENTS

- .1 Design details and connections in accordance with requirements of CAN/CSA-S16 to resist forces, moments, shears and allow for movements indicated.
- .2 Shear connections:
  - .1 Select framed beam shear connections from an industry accepted publication such as "Handbook of the Canadian Institute of Steel Construction" when connection for shear only (standard connection) is required.
  - .2 Select or design connections to support reaction from maximum uniformly distributed load that can be safely supported by beam in bending, provided no point loads act on beam, when shears are not indicated.
- .3 For composite construction select or design minimum end connection to resist reaction resulting from factored movement resistance as tabulated in the "Handbook of the Canadian Institute of Steel Construction" assuming 100% shear connection with depth of steel deck and/or slab shown on drawings.
- .4 Submit sketches and design calculations stamped and signed by qualified professional engineer licensed in Manitoba, Canada for non-standard connections.

2.2 MATERIALS

- .1 Structural steel: to CSA-G40.20/G40.21 350W, except as noted below:
  - .1 Plate, channel and angle: to CSA-G40.20/G40.21 300W
  - .2 Webs, flanges, stiffeners and end plates for frames: minimum yield strength of 350 MPa
  - .3 Bracing, purlin and girt clips, tie rods, base plates: weldable steel, minimum yield strength of 300 MPa
  - .4 Anchor rods: to CAN/CSA-G40.20/G40.21, 300W
- .2 Bolts, nuts and washers: to ASTM A325.
- .3 Welding materials: to CSA W48 Series, CSA W59 and certified by Canadian Welding Bureau.
- .4 Shop paint primer: to CISC/CPMA2-75 solvent reducible alkyd, grey. Confirm primer compatibility with total system. Refer to Section 09 91 23 – Interior Painting.
- .5 Hot dip galvanizing: galvanize steel, where indicated, to CAN/CSA-G164, minimum zinc coating of 600 g/m<sup>2</sup>.
- .6 Shear studs: to CSA W59, Appendix H.

2.3 FABRICATION

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

- .2 Install shear studs in accordance with CSA W59.
- .3 Continuously seal members by continuous welds. Grind smooth.
- .4 Welds to develop full strength of connecting members.
- .5 Beams continuous over columns to have one web stiffener each side of beam web centered over column; stiffener thickness to match beam web, unless otherwise shown on drawings.
- .6 Architecturally Exposed Structural Steel (AESS):
  - .1 Fabricate and assemble AESS in the shop to the greatest extent possible. Locate field joints in AESS assemblies at concealed locations or as approved by the Consultant.
  - .2 Bolted connections: provide bolt type and finish as specified and place bolt heads as indicated on the approved shop drawings.
  - .3 Welded connections: appearance and quality of welds shall be consistent with the category. Assemble and weld built-up section by methods that will maintain alignment of members to the tolerances specified.
  - .4 The Consultant shall review the AESS members in place and determine acceptability. Advise Consultant on schedule for AESS work.

#### 2.4 SHOP PAINTING

- .1 Clean, prepare surfaces and shop prime structural steel in accordance with CAN/CSA-S16.
- .2 Clean members, remove loose mill scale, rust, oil, dirt and foreign matter. Prepare surface according to NACE No. 3/SSPC-SP-6 for all exposed structural steel. All other steel to be prepared to SSPC-SP-3.
- .3 Apply one coat of primer in shop to steel surfaces to achieve minimum dry film thickness of 0.065mm to 0.08mm.
- .4 Do not paint:
  - .1 Surfaces to be encased in concrete.
  - .2 Surfaces to receive field installed stud shear connections.
  - .3 Surfaces and edges to be field welded.
  - .4 Faying surfaces of slip-critical connections.
  - .5 Below grade surfaces in contact with soil.
- .5 Apply paint under cover, on dry surfaces when surface and air temperatures are above 5 degrees C.
- .6 Maintain dry condition and 5 degrees C minimum temperature until paint is thoroughly dry.
- .7 Strip paint from bolts, nuts, sharp edges and corners before prime coat is dry.

Part 3 Execution

3.1 APPLICATION

- .1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 GENERAL

- .1 Structural steel work: in accordance with CAN/CSA-S16.
- .2 Welding: in accordance with CSA W59.
- .3 Companies to be certified under Division 1 or 2.1 of CSA W47.1 for fusion welding of steel structures and/or CSA W55.3 for resistance welding of structural components.
- .4 Architecturally Exposed Structural Steel (AESS):
  - .1 The erector shall check all AESS members upon delivery for twist, kinks, gouges, or other imperfections which might result in rejection of the appearance of the member.
  - .2 Provide connections for temporary shoring, bracing and supports only where noted on the approved shop drawings. Temporary connections shall be made at locations not exposed to view in the final structure or as approved by the Consultant. Handle, lift and align pieces using padded slings and/or other protection required to maintain the appearance of the AESS through erection.

3.3 CONNECTION TO EXISTING WORK

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

3.4 MARKING

- .1 Mark materials in accordance with CSA G40.20/G40.21. Do not use die stamping. When steel is to be left in unpainted condition, place marking at locations not visible from exterior after erection.
- .2 Match marking: shop mark bearing assemblies and splices for fit and match.

3.5 ERECTION

- .1 Erect structural steel, as indicated and in accordance with CAN/CSA-S16 and in accordance with reviewed erection drawings.
- .2 Field cutting or altering structural members: to approval of Consultant.
- .3 Clean with mechanical brush and touch up shop primer to bolts, rivets, welds and burned or scratched surfaces at completion of erection.
- .4 Continuously seal members by continuous welds where indicated. Grind smooth.
- .5 Architecturally Exposed Structural Steel (AESS):

- .1 Bolt head placement: All bolt heads shall be placed as indicated in the structural drawings. Where not indicated, the bolt heads shall be placed to one side.
- .2 Removal of field connection aids: Run-out tabs, erection bolts and other steel members added to connections to allow for alignment, fit up and welding in the field shall be removed from the structure. Welds at run-out tabs shall be removed to match adjacent surfaces and ground smooth. Holes for erection bolts shall be welded and ground smooth where specified.
- .3 Filling of connection access holes: Filling shall be executed with proper procedures to match architectural profile, where specified.
- .4 Field welding: Weld profile, quality and finish shall be consistent with Category and approved prior to fabrication.

### 3.6 FIELD QUALITY CONTROL

- .1 Inspection and testing of materials and workmanship will be carried out by testing laboratory approved by Consultant.
- .2 Provide safe access and working areas for testing on site, as required by testing agency.
- .3 Submit test reports to Consultant.
- .4 Costs of tests to be paid by Contractor.
- .5 Test shear studs in accordance with CSA W59.

### 3.7 FIELD PAINTING

- .1 Paint in accordance with Section 09 91 00 –Painting.
  - .1 Touch up damaged surfaces and surfaces without shop coat with primer to NACE No.3/SSPC-SP-6 except as specified otherwise. Apply in accordance: MPI Architectural Painting Specification Manual.

### 3.8 CLEANING

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

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .1 ASTM International
  - .1 ASTM A653/A653M-09a, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
  - .2 ASTM A792/A792M-09a, Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
- .2 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Coating.
- .3 CSA International
  - .1 CSA C22.2 No.79-1978(R2008), Cellular Metal and Cellular Concrete Floor Raceways and Fittings.
  - .2 CSA S16-09, Design of Steel Structures.
  - .3 CSA S136-07, North American Specification for the Design of Cold Formed Steel Structural Members.
  - .4 CSA W47.1-19, Certification of Companies for Fusion Welding of Steel Structures.
  - .5 CSA W55.3-08, Certification of Companies for Resistance Welding of Steel and Aluminum.
  - .6 CSA W59-03(R2008), Welded Steel Construction, (Metal Arc Welding).
- .4 Canadian Sheet Steel Building Institute (CSSBI)
  - .1 CSSBI 10M-08, Standard for Steel Roof Deck.
  - .2 CSSBI 12M-08, Standard for Composite Steel Deck.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for steel decking and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
  - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Manitoba, Canada.
  - .2 Submit design calculations if requested by Consultant.
  - .3 Indicate deck plan, profile, dimensions, base steel thickness, metallic coating designation, connections to supports and spacings, projections, openings, reinforcement details and accessories.



- .4 Indicate details of temporary shoring of steel deck, such as location, time and duration of placement and removal of shoring for concrete fill decks.

### 1.3 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect decking from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.

## Part 2 Products

### 2.1 DESIGN CRITERIA

- .1 Design steel deck using limit states design to CSSBI 12M, CSA S136, CSSBI 10M.
- .2 Steel deck and connections to steel framing to carry dead, live and other loads including lateral loads, diaphragm action, composite deck action, and uplift as indicated.
- .3 Deflection under specified live load not to exceed 1/240 of span, except that when plaster or gypsum board ceilings are hung directly from deck, live load deflection not to exceed 1/360 of span.
- .4 Where vibration effects are to be controlled as indicated, dynamic characteristics of decking system to be designed to be in accordance with CSA S16.

### 2.2 MATERIALS

- .1 For interior surfaces not exposed to weather:
  - .1 Zinc-Iron Alloy (ZF) coated steel sheet: to ASTM A653/A653M, structural quality, Grade 230, 0.76 mm minimum base steel thickness.
    - .1 For unpainted decks: with ZF75 zinc coating suitable for unpainted finish, and chemically treated (passivated).
    - .2 For painted decks: with ZF75 wiped coat zinc-iron alloy coating suitable for finish painting (not passivated).
- .2 For exterior surfaces exposed to weather:
  - .1 Zinc (Z) coated steel sheet to ASTM A 653/A653M structural quality Grade 230, with Z275 coating, regular spangle extra smooth surface, chemically treated for unpainted finish, not chemically treated for paint finish, 0.76 mm minimum base steel thickness.

- .3 Acoustic insulation: fibrous glass 17.5 kg/m<sup>3</sup> density profiled to suit deck flutes, where indicated, supplied to site for installation by roofing contractor.
- .4 Acoustic closures: closed cell foam rubber, profiled to deck corrugations, 25mm thick.
- .5 Closures: in accordance with manufacturer's recommendations.
- .6 Cover plates, cell closures and flashings: steel sheet with minimum base steel thickness of 0.76 mm minimum. Metallic coating same as deck material.
- .7 Primer: zinc rich, ready mix to CAN/CGSB-1.181.
- .8 Caulking: to Section 07 92 00 - Joint Sealers.
- .9 Shear studs: to CSA W59.

## 2.3 TYPES OF DECKING

- .1 Steel roof deck: steel thickness and deck depth as indicated on the drawings, non-cellular, interlocking side laps.
- .2 Acoustic steel deck where indicated: steel thickness and deck depth as indicated on the drawings, non-cellular, perforated on vertical face of flutes, interlocking side laps.
- .3 Composite steel deck where indicated: steel thickness and deck depth as indicated on the drawings, non-cellular upright inverted embossed fluted profile, and interlocking side laps.

## Part 3 Execution

### 3.1 INSTALLATION

- .1 Structural steel work: in accordance with CSSBI 12M, CSA S136, CSSBI 10M.
- .2 Welding: in accordance with CSA W59, except where specified otherwise.
- .3 Companies to be certified under Division 1 or 2.1 of CSA W47.1 for fusion welding of steel and/or CSA W55.3 for resistance welding.

### 3.2 ERECTION

- .1 Erect steel deck as indicated and in accordance with CSSBI 10M, CSSBI 12M, CSA S136 and in accordance with reviewed and approved erection drawings.
- .2 Lap ends: to 50 mm minimum.
- .3 Weld and test stud shear connectors through steel deck to steel joists/beams below in accordance with CSA W59.
- .4 Immediately after deck is permanently secured in place, touch up metallic coated top surface with compatible primer where burned by welding.
- .5 Prior to concrete placement, steel deck to be free of soil, debris, standing water, loose mil scale and other foreign matter.

- .6 Temporary shoring, if required, to be designed to support construction loads, wet concrete and other construction equipment. Do not remove temporary shoring until concrete attains 75% of its specified 28 day compression strength.
- .7 Place and support reinforcing steel as indicated.
- 3.3 CLOSURES
  - .1 Install closures in accordance with approved details.
- 3.4 OPENINGS AND AREAS OF CONCENTRATED LOADS
  - .1 No reinforcement required for openings cut in deck which are smaller than 150 mm square.
  - .2 Frame deck openings with any one dimension between 150 to 300 mm as recommended by manufacturer, except as otherwise indicated.
  - .3 For deck openings with any one dimension greater than 300 mm and for areas of concentrated load, reinforce in accordance with structural framing details, except as otherwise indicated.
- 3.5 CONNECTIONS
  - .1 Install connections in accordance with CSSBI recommendations and as indicated in Structural Drawings.
- 3.6 CLEANING
  - .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
    - .1 Leave Work area clean at end of each day.
- 3.7 PROTECTION
  - .1 Protect installed products and components from damage during construction.
  - .2 Repair damage to adjacent materials caused by steel decking installation.

END OF SECTION

**Part 1** GENERAL**1.1** REFERENCE STANDARDS

- .1 ASTM International (ASTM):
  - .1 ASTM A123/A123M-17, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
  - .2 ASTM A307-21, Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength
  - .3 ASTM A653/A653M-18, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
  - .4 ASTM A792/A792M-10, Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process
  - .5 ASTM F3125/F3125M-22, Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength
- .2 Canadian General Standards Board (CGSB):
  - .1 CAN/CGSB-1.181-99, Ready—Mixed Organic Zinc—Rich Coating
- .3 CSA Group (CSA):
  - .1 CSA W47.1:19, Certification of Companies for Fusion Welding of Steel
  - .2 CSA W55.3-08, Certification of Companies for Resistance Welding of Steel and Aluminum
  - .3 CSA W59-18, Welded Steel Construction
  - .4 CSA S136-16, North American Specification for the Design of Cold-Formed Steel Structural Members
  - .5 CSA S304-14, Design of masonry structures
- .4 Canadian Sheet Steel Building Institute (CSSBI):
  - .1 CSSBI 51-06, Lightweight Steel Framing Design Manual with errata #1 and #2
  - .2 CSSBI Technical Bulletin Vol. 7, No. 2 September 2011, Standard Thicknesses for Canadian Lightweight Steel Framing Applications
- .5 National Research Council of Canada (NRC):
  - .1 National Building Code of Canada (NBC), 2020
- .6 The Master Painters Institute (MPI):
  - .1 Architectural Painting Specification Manual, current edition
- .7 ULC Standards (ULC):
  - .1 CAN/ULC-S101-14, Standard Method of Fire Endurance Tests of Building Construction and Materials

**1.2** ACTION AND INFORMATIONAL SUBMITTALS

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

- .9 Product Data:
  - .1 Submit manufacturer's instructions, product literature, and data sheets for structural metal stud framing. Include product characteristics, performance criteria, physical sizes, metallic coatings, and limitations.
  - .2 Submit Workplace Hazardous Materials Information System (WHMIS), Safety Data Sheets (SDS).
- .10 Shop Drawings: Submit shop drawings prepared by the delegated design engineer bearing their stamp and signature.
  - .1 Indicate design loads, member sizes, materials, design thickness exclusive of coatings, coating specifications, connection and bracing details, screw sizes and spacing, and anchors.
  - .2 Indicate member and connection locations, dimensions, openings, and connections related work.
  - .3 Include erection diagrams and critical installation procedures as required.
  - .4 Indicate welds with welding symbols as defined in CSA W59.

### **1.3 QUALITY ASSURANCE**

- .11 Qualifications:
  - .1 Welders: Companies certified to CSA W47.1 for fusion welding and CSA W55.3 for resistance welding.
  - .2 Licensed Professional: Delegated design engineer, licensed or registered professional engineer in the province of the Work, who is not the Consultant.
- .12 Test Reports: When requested, submit certified test reports showing compliance with specified performance characteristics and physical properties.
- .13 Certificates: When requested, submit manufacturer's product certificates certifying materials comply with specified performance characteristics and criteria and physical requirements.

### **1.4 DELIVERY, STORAGE, AND HANDLING**

- .14 Protect steel studs during transportation, site storage, and installation from corrosion and deformation.
- .15 Storage and Handling Requirements:
  - .1 Store materials indoors in a clean and dry area, and in accordance with manufacturer's recommendations.
  - .2 If storing outdoors is unavoidable, loosely cover members above ground with non-plastic sheets with allowances to naturally ventilate. Slope materials to drain.
  - .3 Carefully handle and protect galvanized materials to prevent damage to zinc coating. Isolate galvanized materials from bare steel, copper, brass, plaster, mortar, pressure preservative treated wood, and recently poured concrete.
  - .4 Handle and lift prefabricated panels in a way that prevents premanent distortion to any member or collateral material.
  - .5 Replace defective or damaged materials with new ones.

**Part 2** PRODUCTS

**2.1** DESIGN CRITERIA

- .16 Retain a professional engineer to design the wind bearing steel stud wall systems.
- .17 Design systems based on Limit States Design principles using factored loads and resistances.
- .18 Loads and load factors in accordance with the NBC. For wind load calculations, base the reference velocity pressure (q) on a 1 in 50 probability of being exceeded in any one year.
- .19 Design in accordance with CSSBI 51 and errata as modified by requirements of this Section including using editions of Reference Standards indicated in Part 1 of this Section.
- .20 Determine resistances and resistance factors in accordance with the NBC and CSA S136.
- .21 Conform to the requirements of fire rated assemblies indicated on Drawings which have been tested in accordance with CAN/ULC-S101.
- .22 Indicate dimensions of wall stud depth on Drawings. Design wall stud steel thicknesses as required by the Design Criteria. Use greater or lesser stud depths if approved by the Consultant.
- .23 Space wall studs at a maximum of 406 mm on centre (o.c.), unless a smaller spacing distance on centre is required by the Design Criteria.
- .24 Conform to the design thicknesses in the following table for wall studs, unless a thicker dimension is required by the Design Criteria.

Wall Stud Depth	Minimum Base Steel Thickness Exclusive of Coating	Design Thickness Exclusive of Coating
92 mm	0.836 mm	0.879 mm
102 mm	0.836 mm	0.879 mm
152 mm	0.836 mm	0.879 mm
203 mm	1.087 mm	1.146 mm

- .25 The minimum thickness for the bridging channel shall be 1.087 mm, unless a thicker bridging channel design thickness is required by the Design Criteria.
- .26 The minimum thickness for clip angles shall be 1.367 mm, unless a thicker clip angle thickness is required by the Design Criteria.
- .27 Maximum flexural deflections under specified wind loads shall conform to the following:
  - .1 Wall studs supporting masonry veneer shall meet the requirements of CSA S304 with stud deflections limited to L/360.

- .2 Wall studs supporting other finishes with stud deflections limited to  $L/360$ .
- .28 Design connections to accommodate vertical deflection movement of the building structure, frame shortening, and vertical tolerances without imposing axial loads onto the structural metal stud framing. Leave a minimum 12 mm gap.
- .29 Limit free play in structural metal stud framing connections perpendicular to the plane of the framing to  $\pm 0.5$  mm relative to the building structure.
- .30 Design components and assemblies to accommodate specified erection tolerances of the building structure.
- .31 Design bridging to prevent member rotation and member translation perpendicular to the minor axis. Allow for secondary stress effects due to torsion between lines of bridging. Collateral sheathing may be used to help restrain member rotation and translation perpendicular to the minor axis. Design bridging at a maximum of 1524 mm o.c. Design spacing of bridging at equal intervals over the span length of the member. Closer spacings may be required to satisfy structural requirements.
- .32 Design anchorage and splice details for bridging.
- .33 Design for local loading due to anchorage of cladding and interior wall mounted fixtures where indicated on Drawings.
- .34 Design connections between wind bearing steel stud members with bolts, welding, or sheet metal screws.
- .35 Design head, sill, and jamb members and connections to frame openings larger than 400 mm in any dimension.
- .36 Design anchor top and bottom track to the building structure at a maximum spacing of 813 mm o.c. Closer spacings may be required to satisfy structural requirements.

## **2.2 MATERIALS**

- .37 Steel: To CSA S136, fabricated from ASTM A653/A653M, Grade 340 steel.
  - .1 Zinc coated steel sheet: Quality to ASTM A653/A653M, with Z275 coating.
  - .2 Aluminum-zinc alloy-coated steel sheet: Quality to ASTM A792/A792M, with AZM180 coating.

## **2.3 METAL FRAMING**

- .38 Steel studs: To CSA S136, fabricated from metallic coated steel, depth as indicated.
  - .1 Minimum steel thickness: Meeting Design Criteria.
- .39 Steel Stud Designations: Colour code to CSSBI Technical Bulletin Vol.7, No. 2.
- .40 Stud tracks: Fabricated from same material and finish as steel studs, depth to suit.
  - .1 Bottom track: Single piece
  - .2 Top track: 2-piece telescoping
- .41 Bridging: Meeting Design Criteria
- .42 Angle clips: Meeting Design Criteria

- .43 Tension straps and accessories: As indicated in shop drawings

## **2.4 ACCESSORIES**

- .44 Welding Materials: To CSA W59 and certified by the Canadian Welding Bureau.
- .45 Welding Electrodes: Minimum 490 MPa tensile strength series.
- .46 Screws: Low profile head, self-tapping sheet metal screws, minimum 0.008-mm thick zinc coating. Other coatings with equal or better protection will be considered. Cover Sheet metal screws with low profile heads with sheathing materials.
- .47 Concrete Anchors: Concrete expansion anchors or other suitable drilled type fasteners, minimum 0.008-mm-thick zinc coating. Other coatings with equal or better protection will be considered.
- .48 Bolts, nuts, washers: To ASTM A307 or ASTM F3125/F3125M. Hot-dipped galvanized to ASTM A123/A123M, 600 g/m<sup>2</sup> zinc coating.
- .49 Touch-up Paint: Zinc-rich, to CAN/CGSB-1.181.
- .50 Powder actuated fasteners: Minimum 0.008-mm thick zinc coating. Other coatings with equal or better protection will be considered.

## **2.5 SOURCE QUALITY CONTROL**

- .51 When requested, submit mill reports describing material properties.

## **Part 3 EXECUTION**

### **3.1 EXAMINATION**

- .52 Verification of Conditions: Verify conditions of substrates previously installed are acceptable for structural metal stud framing.
  - .1 Inspect substrates and building structure floor flatness, and levelness. Inspect vertical structural members to ensure they are true and plumb.
  - .2 Proceed with installation only after unacceptable conditions are remedied.

### **3.2 ERECTION**

- .53 Erect structural metal stud framing to reviewed shop drawings and CSA S136.
- .54 Perform welding in accordance with CSA W59.
- .55 Erect components to requirements of reviewed shop drawings.
- .56 Anchor tracks securely to structure at a maximum of 800 mm o.c., unless lesser spacing is indicated on shop drawings.
- .57 Erect studs plumb, aligned, and securely attached with a minimum of 2 screws,. Penetration of sheet metal screws beyond joined materials shall be not less than three exposed threads.
- .58 Seat studs into bottom tracks and single piece top track.



- .59 Install a minimum 50-mm telescoping track at top of walls where required to accommodate vertical deflection.
  - .1 Nest top track into deflection channel a minimum of 30 mm and maximum of 40 mm.
  - .2 Do not fasten tracks together.
  - .3 Stagger joints of top tracks.
- .60 Install studs at a maximum of 50 mm from abutting walls, openings, and each side of corners and terminations with dissimilar materials.
- .61 Brace steel studs with horizontal internal bridging at a maximum 1200 mm.
  - .1 Fasten bridging to steel clips fastened to steel studs with screws or by welding.
- .62 Frame openings in stud walls to adequately carry loads by using additional framing members and bracing as detailed on shop drawings.
- .63 Cutouts: Maximum size of cutouts for services as follows:

Member Depth	Across Member Depth	Along Member Length	On Centre Spacing
92 mm	Max. 40 mm	Max. 105 mm	Min. 600 mm
102 mm	Max. 40 mm	Max. 105 mm	Min. 600 mm
152 mm	Max. 65 mm	max. 115 mm	Min. 600 mm

- .1 Limit distance from centre line of last unreinforced cutout to end of member to a maximum of 300 mm.
- .64 Tolerances:
  - .1 Plumb: Maximum 1/500th of member length
  - .2 Camber: Maximum 1/1000th of member length
  - .3 Spacing: Maximum +/- 3 mm from design spacing
  - .4 Gap between end of stud and track web: Maximum 4 mm

### **3.3 SITE QUALITY CONTROL**

- .65 Site Tests and Inspections: Structural metal stud framing delegated design engineer responsible for shop drawings to perform the following:
  - .1 Periodically inspect structural metal stud framing work at Project site, including inspection of welded and screwed system connections; connections to primary building structural elements; review member sizes, locations, steel thicknesses, coating thicknesses; erection tolerances; and framing members cut or altered at the Project site.
  - .2 Review mill test reports.
  - .3 Submit report(s) and a confirmation letter signed and sealed, as described in QUALITY ASSURANCE in Part 1 of this Section.

.66 Non-Conforming Work: Replace members with localized damage.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 General Notes on Structural Drawings shall form part and be equal to the Specifications.

1.2 REFERENCE STANDARDS

.1 ASTM International

- .1 ASTM A36/A36M-08, Standard Specification for Carbon Structural Steel.
- .2 ASTM A47/A47M-99(2009), Standard Specification for Ferritic Malleable Iron Castings.
- .3 ASTM A123/A123M-09, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- .4 ASTM A307-10, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
- .5 ASTM A653/A653M-11, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

.2 CSA International

- .1 CSA B111-1974(R2003), Wire Nails, Spikes and Staples.
- .2 CSA G40.20/G40.21-04(R2009), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
- .3 CAN/CSA O80 Series-08, Wood Preservation.
- .4 CSA O86 Consolidation-19, Engineering Design in Wood.
- .5 CSA O112.10-08, Evaluation of Adhesives for Structural Wood Products (Limited Moisture Exposure).
- .6 CAN/CSA-O122-16, Structural Glued-Laminated Timber.
- .7 CSA O177-06(R2011), Qualification Code for Manufacturer's of Structural Glued-Laminated Timber.
- .8 CSA S16-19, Design of Steel Structures.
- .9 CSA W47.1-09, Certification of Companies for Fusion Welding of Steel Structures.
- .10 CAN/CSA-Z809-08, Sustainable Forest Management.

.3 Forest Stewardship Council (FSC)

- .1 FSC-STD-01-001-2004, FSC Principle and Criteria for Forest Stewardship.

.4 Green Seal Environmental Standards (GS)

- .1 GS-11-11, Paints and Coatings.

.5 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

- .1 Material Safety Data Sheets (MSDS).

- .6 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI.  
Source Specific Standards
  - .1 SCAQMD Rule 1113-A2011, Architectural Coatings.
- .7 Sustainable Forestry Initiative (SFI)
  - .1 SFI-2010-2014 Standard.
- .8 The Master Painters Institute (MPI)
  - .1 Architectural Painting Specification Manual.
  - .2 MPI #79 Primer, Alkyd, Anti-Corrosive for Metal.
- 1.3 ACTION AND INFORMATIONAL SUBMITTALS
  - .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
  - .2 Product Data:
    - .1 Submit manufacturer's instructions, printed product literature and data sheets for glued-laminated construction and include product characteristics, performance criteria, physical size, finish and limitations.
    - .2 Submit two copies of WHMIS MSDS in accordance with Section 01 35 29.06 - Health and Safety Requirements and 01 35 43 - Environmental Procedures.
  - .3 Shop Drawings:
    - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Manitoba, Canada.
    - .2 Submit erection drawings in accordance with CSA S16 and CSA O86.
    - .3 Shop drawings for members: indicate stress grade, service grade and appearance grades, shop applied finishes, camber, cuts, ledgers, holes and connection details.
  - .4 Certifications: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
    - .1 Submit manufacturer's plant certification to CSA O177, Appendix B at completion of fabrication.
  - .5 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence, cleaning procedures.
  - .6 Manufacturers Reports:
    - .1 Manufacturer's Field Reports: submit manufacturer's written reports within 3 days of review, verifying compliance of Work, as described in Part 3 - FIELD QUALITY CONTROL.
- 1.4 QUALITY ASSURANCE
  - .1 Qualifications:

- .1 Manufacture structural glued-laminated members in plant certified by CSA as meeting requirements of CSA O177, class X.
- .2 Submit certificate in accordance with CSA O177, Appendix B at completion of fabrication.
- .3 Fabricator for welded steel connections to be certified to CSA W47.1.
- .4 Place authorization labels on glued-laminated members indicating manufactured in CSA certified plant.
- .5 Certification of material protective sealer.

#### 1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements:
  - .1 Deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
  - .2 Apply protective sealer to glued-laminated units before shipping unless specified otherwise.
  - .3 Wrap commercial and quality grade members prior to leaving plant with a moisture resistant wrapping.
  - .4 Use padded, non-marring slings for handling glued-laminated members.
  - .5 Protect corners with wood blocking.
  - .6 Make adequate provision for delivery and handling stresses.
- .3 Storage and Handling Requirements:
  - .1 Store materials off ground, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Slit underside of membrane covering during storage at site without defacing member.
  - .3 Store glued-laminated units and protect from weather, block off ground and separate with stripping, so air may circulate around faces of members.
  - .4 Cover glued-laminated units with opaque moisture resistant membrane if stored outside.
  - .5 Store and protect glue-laminated products from nicks, scratches, and blemishes.
  - .6 Replace defective or damaged materials with new.

#### 1.6 MATERIALS

- .1 Laminating stock: SPF, to CAN/CSA-O122.
  - .1 CAN/CSA-Z809 or FSC or SFI certified.
- .2 Adhesive: to CSA O112.10, to grade of service required in accordance with CAN/CSA-O122.

- .3 Factory-applied sealer for glued-laminated members: penetrating type, clear, non-yellowing liquid.
    - .1 Coatings: VOC limit 275 g/L maximum to SCAQMD Rule 1113.
    - .2 Compatible with site-applied coatings.
    - .3 Acceptable product: Sansin KP-12.
  - .4 Fastenings:
    - .1 Split ring connections: hot rolled carbon steel, SAE 1010, in accordance with SAE handbook.
    - .2 Shear plate connections:
      - .1 Pressed steel type: hot rolled carbon steel, SAE 1010, in accordance with SAE handbook.
      - .2 Malleable iron type: to ASTM A47/A47M, grade 350.
    - .3 Lag screws: to ASME B18.2.1
    - .4 Bolts: to ASTM A307.
    - .5 Side plates: to CSA G40.20/G40.21.
    - .6 Drift pins: to ASTM A307.
    - .7 Glued-laminated rivets: CSA G40.20/G40.21, ASTM A36.
    - .8 Nails and spikes: to CSA B111.
    - .9 Truss plates: light gauge galvanized sheet steel to ASTM A653, yield point 255 230 MPa.
  - .5 Shop coat primer for steel connections: to MPI #18.
  - .6 Galvanizing: to ASTM A123/A123M, hot dipped, minimum zinc coating of 610 g/m<sup>2</sup>.
- 1.7 FABRICATION
- .1 Fabricate members to following classifications:
    - .1 Stress grade: to CSA O86 24f-E bending grade.
    - .2 Service grade: interior.
    - .3 Appearance grade: quality.
  - .2 Mark laminated members for identification during erection. Marks not to be visible in final assembly.
  - .3 Design connections to CSA O86, and CSA S16 unless specifically detailed, to resist shears, moments and forces indicated.
    - .1 Fabricate in accordance with CSA S16.
  - .4 Prime connections after fabrication.

Part 2 Execution

2.1 EXAMINATION

- .1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for glue-laminated material installation in accordance with manufacturer's written instructions.
  - .1 Visually inspect substrate.
  - .2 Inform Consultant of unacceptable conditions immediately upon discovery.
  - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Consultant.

2.2 ERECTION

- .1 Protect protective sealer from damage before erection.
  - .1 Touch up damaged areas on site with specified sealer.
- .2 Erect glued-laminated members as indicated and in accordance with reviewed and approved erection drawings.
- .3 Brace and anchor members until permanently secured by structure.
- .4 Make adequate provisions for erection stresses.
- .5 Splice and join only at locations as indicated on reviewed and approved erection drawings.
- .6 Do not field cut or alter members without Consultant's approval. If approved, preservative treat cut ends.

2.3 FIELD QUALITY CONTROL

- .1 Manufacturer's Field Services:
  - .1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, protecting and cleaning of product.
  - .2 Submit manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
  - .3 Ensure manufacturer's representative is present before and during critical periods of installation, construction of field joints and testing.
  - .4 Schedule site visits:
    - .1 After delivery and storage of products, and when preparatory Work, or other Work, on which the Work of this Section depends, is complete but before installation begins.
    - .2 Twice during progress of Work at 25% and 60% complete.
    - .3 Upon completion of the Work, after cleaning is carried out.

2.4 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

2.5 PROTECTION

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by glue laminated construction installation.

END OF SECTION