

Part 1 – General

1.1 RELATED WORK

.1	General requirements:	Division 1
.2	Cast-in-place concrete:	Section 03 30 00
.3	Steel joist framing:	Section 05 21 00
.4	Steel deck:	Section 05 31 00
.5	Metal fabrications:	Section 05 50 00
.6	Painting:	Section 09 91 00

1.2 REFERENCE STANDARDS

- .1 American Society for Training and Materials (ASTM International)
 - .1 ASTM A36/A36M - 08 Standard Specification for Carbon Structural Steel
 - .2 ASTM A53/A53M - 12 Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
 - .3 ASTM A307-10 Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength
 - .4 ASTM A325-10, Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi minimum Tensile Strength
 - .5 ASTM A500/A500M-10a, Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
 - .6 ASTM-A563-07a, Standard Specification for Carbon and Alloy Steel Nuts
 - .7 ASTM D2369-10e1 Standard Test Method for Volatile Content of Coatings
 - .8 ASTM F436-11, Standard Specification for Hardened Steel Washers
- .2 Canadian Institute of Steel Construction (CISC)/Canadian Paint Manufacturers Association (CPMA).
 - .1 CISC/CPMA-2-75-1975, Quick-Drying, Primer for Use on Structural Steel
 - .2 CISC Handbook of Steel Construction, Tenth Edition, 2010
 - .3 CISC Design and Construction of Composite Floor Systems, Chien and Ritchie, 1984
- .3 Canadian Standards Association (CSA International)
 - .1 CSA G40.20-04/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 CSA S16-09, Design of Steel Structures
 - .4 CAN/CSA-S136-07, North American Specifications for the Design of Cold Formed Steel Structural Members
 - .5 CSA W47.1-09, Certification of Companies for Fusion Welding of Steel

- .6 CSA W48-06 (R2011), Filler Metals and Allied Materials for Metal Arc Welding
- .7 CSA W59-13, Welded Steel Construction (Metal Arc Welding)
- .8 CSA W178.2-08, Certification of Welding Inspectors

- .4 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

- .5 Do structural steel work to CSA S16 and CAN/CSA-S136 except where specified otherwise.

- .6 Do welding to CSA W59 except where specified otherwise.

1.3 AS-BUILT DRAWINGS

- .1 Maintain "As-Built" conditions on record drawings in accordance with Division 1.

1.4 SUBMITTALS

- .1 Submit three (3) certified copies of mill test reports covering chemical and physical properties of steel used in this work. Such mill test reports shall be certified by qualified metallurgists confirming that tests conform to requirements of CSA G40.20 and CSA G40.21.

1.5 SHOP DRAWINGS

- .1 Submit shop drawings in accordance with Division 1.
- .2 Each drawing submitted shall bear the signature and stamp of qualified professional Engineer registered in New Brunswick.
- .3 Clearly indicate shop and erection details including cuts, copes, connections, holes, threaded fasteners, and welds. Indicate welds by AWS welding symbols as defined in CSA W59.
- .4 Anchor rod plan and erection drawings shall be originals prepared by fabricator. Reproduction of contract drawings not permitted.
- .5 All shop drawings and material lists are to contain a blank area measuring 70 mm high by 100 mm long located near the bottom right hand corner of the drawing or page. This area is to be reserved for the Departmental Representative's review stamp.

1.6 CONNECTION DESIGN

- .1 The Fabricator shall be responsible for the design, proportioning and detailing of the steel connections. This shall include the design, proportioning and detailing of reinforcement to the members being connected for adequate resistance and transfer of the applied forces and moments, as applicable.
- .2 Submit all typical and special connection design details and calculations in advance of preparing any shop drawings.
- .3 The Departmental Representative reserves the right to review the detailed drawings of the connections to ensure general compliance with the forces shown on the tender documents.

- .4 This review does not relieve in any way the responsibility of the Fabricator for the connections. However, if the Departmental Representative discovers deficiencies in the connections requiring extensive design checks and/or modifications to the detailed shop drawings submitted by the Fabricator, costs incurred by the Departmental Representative above the normal review process will be backcharged against the Contractor.

1.7 COMPANY CERTIFICATION

- .1 To meet the requirements of the National Building Code of Canada, all welding on this project is to be done only by companies certified to Division 1 or 2 of CSA W47.1, Certification of Companies for Fusion Welding of Steel Structures.
- .2 Under CSA W47.1, the Fabricator is required to employ a registered Professional Engineer with an audited background in welding design procedure and practice, as well as welding supervisors and welders, all of whom have had their qualifications audited.
- .3 Only companies certified to CSA W47.1 (Division 1 or 2) at the time of bidding this job will be considered as eligible to bid.
- .4 The Fabricator shall have a certified CISC, ISO9001, Z299 or AISC quality system for fabrication of structural steel in place at time of bid.

Part 2 – Products

2.1 MATERIALS

- .1 Channels, plates, angles and rods: to CSA G40.21, 300W.
- .2 Rolled W sections: to CSA G40.21, 350W.
- .3 Hollow structural sections: to CSA G40.21, 350W, Class C or ASTM A500 Grade C.
- .4 Bolts, nuts and washers: to ASTM A325. Provide galvanized bolts, nuts and washers for unheated steel with special paint.
- .5 Welding materials: to CSA W59.
- .6 Shop paint primer for interior (heated) structural steel not exposed to view: none
- .7 Shop paint primer for steel that will receive intumescent paint and steel that will be sprayed with fire-proofing material: none.
- .8 Shop paint primer for steel exposed to view and other locations noted on drawings: to CISC/CPMA 2-75 that is VOC compliant.
- .9 Steel Primer for exterior (unheated) steel: shall be three component zinc rich epoxy primer 70% solids by weight with zinc portions at least 80% by weight of dried coating. Standard of quality: Ameron Amercoat 68HS or

equivalent. Steel primer shall be supplied by the same manufacturer as the topcoat specified below.

- .10 Steel Topcoat for exterior (unheated) steel: to be high-build epoxy coating having not less than 63% solids by weight. Standard of quality: Ameron Amerlock 370 or equivalent. Epoxy topcoat shall be recommended by paint manufacturer for exterior applications. Colour selection by Consultant.
- .11 Shop galvanizing: hot dip galvanizing with a minimum coating of 0.6 kg per square metre to CAN/CSA-G164. Touch up must be VOC compliant if used interior.
- .12 Anchor rods: CSA G40.21, 300W. Supply anchor rods to size shown on drawings complete with ASTM A563 nuts and ASTM F844 circular washers or plate washers as noted on drawings. Provide galvanized anchor rods at locations indicated on drawings.
- .13 Rods: to CSA G40.21, 300W.
- .14 Welding electrodes: E49XX.
- .15 Anchor rods and embedded steel: structural steel contractor to supply and ship to site all anchor rods and embedded steel to be placed in concrete by concrete contractor or in masonry by masonry contractor.
- .16 Threaded rods for embedment into concrete with epoxy adhesive: CSA G40.21-04, 300W, sized as shown on drawings complete with ASTM-A563 nuts and ASTM F436 circular washers.
- .17 Chemical adhesive anchor system. Hilti HIT HY200, Epcon Acrylic 7 or approved equal.

2.2 FABRICATION

- .1 Do structural steel work to CSA S16 and CAN/CSA-S136 except where specified otherwise.
- .2 Do welding to CSA W59 except where specified otherwise.
- .3 Fabricate structural steel as indicated to CSA S16 and in accordance with reviewed shop drawings.
- .4 Provide punched holes from 11 mm to 27 mm in diameter for attachment of other work. Refer to drawings for details and locations.
- .5 Reinforce openings to maintain required design strength.

- .6 Beam to beam and beam to column connections shall be simple connections proportioned for a minimum of 50% of the total uniformly distributed load for laterally supported beams of the given span as per CISC 350W Handbook of Steel Construction, Tenth Edition, unless noted otherwise on the drawings. Single angle beam connections will not be permitted for main structural beams and girders.
- .7 In addition to the shear as specified in Item 2.2.4, the beam connections shall be designed for the moments and axial forces indicated on the drawings. These forces shall be considered to act simultaneously.
- .8 Unless noted otherwise, loads shown on the drawings are specified loads and moments, shears and axial forces are factored.
- .9 Steel beams, columns, channels, purlins, grating and girts shall be cut from full length stock or ordered cut to length. All substitutions shall be subject to the approval of the Departmental Representative.
- .10 No holes shall be punched or cut in beams, columns or beam to column connections with the exception of those indicated on the drawings. Where such holes are indicated the member shall be reinforced to resist the maximum allowable section moment and shear.
- .11 All bolted connections are to be detailed as bearing type unless otherwise noted on the drawings. All field connections for exterior (unheated) shall be bolted if possible.
- .12 Supply embedded plates, angles and anchor rods for installation by the Concrete Contractor.
- .13 Provide site survey of anchor rod locations. If base plate repairs are required to suit anchor rod locations, submit proposed repair procedures to Departmental Representative for approval.

2.3 SHOP PRIMING STANDARD STRUCTURAL STEEL

- .1 Except as noted below, all interior steel not exposed to view shall be cleaned of loose rust, loose mill scale, oil, dirt, grease and other foreign matter by wire brushing in accordance with CSA S16 and shall not be primed.
- .2 All structural steel that will receive intumescent paint or will be sprayed with fire-proofing material shall be blast cleaned to conform to "The Steel Structures Painting Council" specification SSPC-SP6-07. This steel shall not be primed. Refer to Architectural drawings and specification.
- .3 Structural steel exposed to view: clean, prepare surfaces and shop prime structural steel to CSA S16-09 in preparation for CISC/CPMA Standard 2-75 primer.
- .4 Visual inspection of shop welding shall be carried out prior to shop painting.
- .5 Use primer unadulterated, as prepared by manufacturer. Do not paint when temperature is lower than 7°C.

- .6 Clean surfaces to be field welded; do not paint.

**2.4 SHOP PRIMING EXTERIOR
(UNHEATED) STRUCTURAL STEEL**

- .1 All exterior steel (i.e. unheated) shall be blast cleaned to conform to "The Steel Structures Paintings Council" specification SSPC-SP6-07.
- .2 The zinc epoxy primer shall be mixed, applied to the metal surface immediately after cleaning and cured at the proper temperature in accordance with the manufacturer's recommendations.
- .3 All surfaces shall be completely free of dust and dirt prior to the application of the zinc epoxy.
- .4 The zinc epoxy primer shall be applied to the metal surface with airless spray equipment as recommended by the zinc epoxy manufacturer. All leading edges to be hand stripped prior to spray application.
- .5 The zinc epoxy shall be applied in the shop to obtain a dry film thickness of 3.0 mils (one coat) with a tolerance of -0.25 to +0.5 mils to all surfaces.

**2.5 TOP COAT FOR EXTERIOR
(UNHEATED) STRUCTURAL STEEL**

- .1 Touch-up of damaged areas of the zinc epoxy primer coating shall be carried out in accordance with the above requirements except that brush application may be used in lieu of airless spray equipment.
- .2 Touch-up shall be done with a primer that is recommended by the paint manufacturer and approved by the paint manufacturer for compatibility with the zinc epoxy shop primer.
- .3 The epoxy top coating shall be mixed, applied to the zinc rich primed surfaces and cured at the proper temperature in accordance with the manufacturer's recommendations.
- .4 All surfaces shall be free of dust, dirt, moisture, oil or grease prior to the application of the epoxy coating. Oil and grease shall be removed with a thinner as recommended by the manufacturer of the paint system.
- .5 The zinc epoxy primer is to be applied in the shop and a time period may elapse before applying the final coat of epoxy. Clean all surfaces that are to be top-coated insuring that they are free of all contaminants. The cleaning method must be approved by the coating manufacturer.
- .6 Zinc epoxy primer is to be applied in the shop and a time period may elapse before applying the final coat of epoxy. Clean all surfaces that are to be top-coated insuring that they are free of all contaminants. The cleaning method must be approved by the coating manufacturer.
- .7 The epoxy coating is to be applied in the shop after steel fabrication and priming.

- .8 The epoxy coating shall be applied to the steel surface with airless spray equipment as recommended by the manufacturer of the paint. All leading edges to be hand stripped prior to spray application.
- .9 All surfaces shall receive one top coat (5-7 mils dry film thickness) of High Build Epoxy at the fabrication shop. Touch-up of damaged areas in the field shall be carried out in accordance with the above requirements except that brush application may be used in lieu of airless spray equipment.

2.6 HOT DIP GALVANIZED STRUCTURAL STEEL

- .1 Refer to the construction drawings, prepared as part of this project, for members that shall be hot dip galvanized.

2.7 SUBSTITUTIONS

- .1 Estimate the work on the basis of the member sizes shown on the drawings. Substitution of larger sizes shall not be considered as an extra to the contract. Substitutions to be approved by the Departmental Representative.

Part 3 – Execution

3.1 ERECTION

- .1 Erect structural steel as indicated to CSA S16-09 and in accordance with shop drawings to minimum tolerances. Erect temporary bracing to ensure plumbness and stability. Bracing to remain in place until the decking and permanent bracing are in place and securely connected and the concrete floor slabs have been placed.
- .2 Where indicated, continuously seal members by continuous welds and grind smooth.
- .3 Obtain written permission of Departmental Representative prior to field cutting or altering of structural members.
- .4 Touch up shop primer to bolts, welds and burned or scratched surfaces at completion of erection.

3.2 TOUCH-UP PAINTING

- .1 Field touch up shop primer and shop top coats to bolts, welds and burned or scratched surfaces at completion of erection.
- .2 Field touch-up hot dip galvanized surfaces with premixed zinc rich cold galvanizing compound.
- .3 Touch up coatings must be VOC compliant if used interior application.

**3.3 INSTALLATION OF REINFORCING
STEEL/ANCHOR RODS USING
ADHESIVE ANCHOR SYSTEM**

- .1 Install adhesive anchors in concrete at locations shown on plans and/or as required to complete the works. Installation to be in strict accordance with the manufacturer's written instructions.
- .2 Holes shall be drilled with a quality carbide tipped bit using a rotary impact hammer. Bolts to be torqued to manufacturer's recommended torque.

3.4 INSPECTION AND TESTING

- .1 Inspection and testing of materials and workmanship will be carried out by a testing laboratory approved by the Departmental Representative.
- .2 Departmental Representatives will pay costs of inspection and testing as specified in Division 1.
- .3 Visual welding inspection will be carried out on all welding as outlined in CSA W59 by an inspector certified to CSA W178.2.
- .4 Inspection of connections will be carried out during steel erection. Cooperate with and assist the Testing Company by providing access to all parts of the work as required.
- .5 Inspection of connections will be carried out in accordance with CSA S16.
- .6 Radiographic testing shall be done in the fabrication shop or field in accordance with CSA W59. Extent of radiographic testing:
 - .1 Beam section splices: 100% of cranked beam splices uniformly distributed throughout the beam depth.
- .7 If this testing results in an unacceptable standard, the structural steel contractor will be responsible for reinforcing or repairing all connections and providing a complete radiographic test of the member with the results being made available to the Departmental Representative. Proposed repair methods to be made available to the Departmental Representative for review prior to starting repairs.
- .8 A qualified protective coating inspection firm will verify preparations of structural steel surfaces prior to application of shop primers, review equipment being employed and shall measure dry film thickness of primers and dry film thickness of top coat. Copies of reports shall be submitted to the Departmental Representative.
- .9 If this testing results in an unacceptable standard, the Contractor shall be responsible for the re-cleaning, re-priming of the surfaces until standards are met.

- .10 A technical representative of the primer manufacturer will also review methods of work to ensure manufacturer's recommendations are being strictly adhered to and shall submit a report to the Departmental Representative.
- .11 Additional inspections and testing by the Departmental Representative does not relieve the Contractor of any responsibility.

END OF SECTION

Part 1 – General

1.1 RELATED WORK

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| .1 | General requirements: | Division 1 |
| .2 | Structural Steel for Buildings: | Section 05 12 23 |
| .3 | Steel Deck: | Section 05 31 00 |

1.2 REFERENCE STANDARDS

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| .1 | Canadian Institute of Steel Construction (CISC)/Canadian Paint Manufacturer's Association (CPMA) |
| .1 | CISC/CPMA 2-75 (1975), Quick-Drying, Primer for Use on Structural Steel |
| .2 | CSA International |
| .2 | CSA G40.20-04/G40.21-04, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel |
| .3 | CSA S16-09, Design of Steel Structures |
| .4 | CAN/CSA-S136-07, North American Specification for the Design of Cold Formed Steel Structural Members |
| .5 | CSA W47.1-09, Certification of Companies for Fusion Welding of Steel |
| .6 | CSA W178.2-08, Certification of Welding Inspectors |
| .7 | CSA W59-13, Welded Steel Construction (Metal Arc Welding) |

1.3 SUBMITTALS

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| .1 | Submit standard quality procedures utilized for the manufacturer of the works. |
| .2 | Submit three certified copies of mill test reports covering chemical and physical properties of steel used in this work. Such mill test reports shall be certified by qualified metallurgists confirming that test conform to requirements of CSA G40.20 and CSA G40.21. |

1.4 DESIGN OF STEEL JOISTS

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| .1 | Design steel joists to carry loads indicated on drawings in accordance with CSA S16. |
| .2 | Roof joists to be designed for a maximum live load deflection of $1/360^{\text{th}}$ of the span unless noted otherwise on the drawings. |
| .3 | Unless noted otherwise, loads shown on the drawings are specified loads. |

1.5 SHOP DRAWINGS

- .1 Submit shop drawings in accordance with Division 1.
- .2 Each drawing submitted shall bear the signature and stamp of a qualified professional Engineer registered in New Brunswick.
- .3 Clearly indicate joist spacing, bearing and anchorage details, framing openings, accessories, schedule of materials, depth, camber, splicing details, deflection and loading.
- .4 Erection drawings shall be originals prepared by fabricator. Reproduction of contract drawings is not permitted.
- .5 All shop drawings and materials lists are to contain a blank area measuring 70 mm high by 100 mm long located near the bottom right hand corner of the drawing or page. This area is to be reserved for the Engineer's review stamp.

Part 2 – Products

2.1 MATERIALS

- .1 Structural steel: to CSA G40.21
- .2 Welding materials: to CSA W59
- .3 Shop paint primer for interior steel: to CISC/CPMA 2-75
- .4 Steel Primer for exterior (unheated) steel in overhangs: shall be three component zinc rich epoxy primer 70% solids by weight with zinc portions at least 80% by weight of dried coating. Standard of quality: Ameron Amercoat 68HS or equivalent. Steel primer shall be supplied by the same manufacturer as the topcoat specified below.
- .5 Steel Topcoat for exterior (unheated) steel: to be high-build epoxy coating having not less than 63% solids by weight. Standard of quality: Ameron Amerlock 370 or equivalent. Epoxy topcoat shall be recommended by paint manufacturer for exterior applications. Colour selection by Engineer-Architect.

2.2 FABRICATION

- .1 Fabricate steel joists and accessories to CSA S16 and CAN/CSA-S136.
- .2 Use qualified fabricators in accordance with CSA W47.1.
- .3 Weld to CSA W59.
- .4 Bridging shall be supplied in accordance with the requirements of CSA S16. Use diagonal bridging for all joists 600 mm and deeper. Bridging shall be terminated on either side of the opening and placed to the sides of the openings. Coordinate lines of bridging with the Departmental Representative.
- .5 The open web steel joists are required to furnish lateral support to the top flanges of all supporting steel beams and walls.

- .6 Connections to the supporting steel shall be capable of withstanding a horizontal force of not less than ten percent of the end reactions of the joists but in no case shall be less than 2-20 mm bolts or less than a pair of 5 mm welds 40 mm long.
- .7 Steel joists to be designed for point loads at all bracing locations used to support bottom flanges of supporting beam. The axial load in the bracing angles is to be not less than ten percent of the joist reaction.
- .8 Extended joist ends shall be supplied to a length and position as indicated on the drawings and shall be designed to support the loads indicated, with a maximum live load deflection of $1/360^{\text{th}}$ of the extension.
- .9 Construct shoes of open web steel joists to provide full and level bearing of the shoe.
- .10 Center joist shoes on centerline of supporting steel beams and walls unless noted otherwise.
- .11 Camber joists as per CSA S16 unless shown otherwise on the drawings.
- .12 Fabricate joists as required to allow for runs of mechanical ductwork within the depth of the joists. Confirm size and location of ductwork with the mechanical and architectural drawings.

2.3 SHOP PRIMING INTERIOR STEEL

- .1 Clean, prepare surface and shop prime interior steel to CSA S16 in preparation for CISC/CPMA Standard 2-75 primer.

2.4 SHOP PRIMING UNHEATED STRUCTURAL STEEL

- .1 All unheated steel shall be blast cleaned to conform to "The Steel Structures Paintings Council" specification SSPC-SP6.
- .2 The zinc epoxy primer shall be mixed, applied to the metal surface immediately after cleaning and cured at the proper temperature in accordance with the manufacturer's recommendations.
- .3 All surfaces shall be completely free of dust and dirt prior to the application of the zinc epoxy.
- .4 The zinc epoxy primer shall be applied to the metal surface with airless spray equipment as recommended by the zinc epoxy manufacturer. All leading edges to be hand stripped prior to spray application.
- .5 The zinc epoxy shall be applied in the shop to obtain a dry film thickness of 3.0 mils (one coat) with a tolerance of -0.25 to $+0.5$ mils to all surfaces.

2.5 TOP COAT FOR EXTERIOR (UNHEATED) STRUCTURAL STEEL

- .1 Touch-up of damaged areas of the zinc epoxy primer coating shall be carried out in accordance with the above requirements except that brush application may be used in lieu of airless spray equipment.
- .2 Touch-up shall be done with a primer that is recommended by the paint manufacturer and approved by the paint manufacturer for compatibility with the zinc epoxy shop primer.
- .3 The epoxy top coating shall be mixed, applied to the zinc rich primed surfaces and cured at the proper temperature in accordance with the manufacturer's recommendations.
- .4 All surfaces shall be free of dust, dirt, moisture, oil or grease prior to the application of the epoxy coating. Oil and grease shall be removed with a thinner as recommended by the manufacturer of the paint system.
- .5 Clean all surfaces that are to be top-coated insuring that they are free of all contaminants. The cleaning method must be approved by the coating manufacturer.
- .6 The epoxy coating is to be applied in the shop after steel fabrication and priming.
- .7 The epoxy coating shall be applied to the steel surface with airless spray equipment as recommended by the manufacturer of the paint. All leading edges, corners and welds to be hand striped prior to spray application.
- .8 All surfaces shall receive one top coat (4-6 mils dry film thickness) of fast drying epoxy at the fabrication shop. Touch-up of damaged areas in the field shall be carried out in accordance with the above requirements except that brush application may be used in lieu of airless spray equipment.
- .9 Inspection of shop welding shall be carried out prior to shop painting.

Part 3 – Execution

3.1 ERECTION

- .1 Erect steel joists and bridging as indicated in accordance with shop drawings and specified reference standard CSA S16 to minimum tolerances.
- .2 Obtain written permission from Departmental Representative prior to field cutting or altering joists or bridging.
- .3 No holes shall be burned, punched or drilled into the joists. Use only approved clamping devices for connecting to the joists.

3.2 TOUCH-UP PAINTING

- .1 Field touch up shop primer and shop top coats to bolts, welds and burned or scratched surfaces at completion of erection.
- .2 Primer and top coat shall be VOC compliant.

3.3 INSPECTION AND TESTING

- .1 Inspection and testing of materials and workmanship will be will be carried out by a testing laboratory approved by the Departmental Representative.
- .2 Joist Manufacturer shall pay costs of inspection and testing.
- .3 Visual welding inspection shall be carried out on all welding as outlined in Clauses 7 and 11 of CSA W59 by an inspector certified to CSA Standard W178.2.
- .4 Random spot radiographic weld testing shall be carried out on 10% of the joists randomly selected from each type designed. The weld tests shall be performed on bottom tension chord splices.
- .5 Should inspection and testing reveal work not conforming to these specifications, the defective work shall be repaired or replaced and re-inspected or tested to the satisfaction of the Departmental Representative.
- .6 A copy of the report prepared by the inspector carrying out the welding inspection and testing shall be sent to the Departmental Representative.
- .7 A technical representative of the primer and top coat manufacturer will also review methods of work to ensure manufacturer's recommendations are being strictly adhered to and shall submit a report to the Departmental Representative.

END OF SECTION

Part 1 – General

1.1 RELATED WORK

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| .1 | General Requirements: | Division 1 |
| .2 | Cast-in-Place Concrete: | Section 03 30 00 |
| .3 | Structural Steel for Buildings: | Section 05 12 23 |
| .4 | Steel Joist Framing: | Section 05 21 00 |

1.2 REFERENCE STANDARDS

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| .1 | American Society for Training and Materials (ASTM International) |
| .1 | ASTM A653/A653M-11, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot Dip Process. |
| .2 | ASTM A924/A924M-10a, Standard Specification for General Requirements for Steel Sheet, Metallic Coated by the Hot-Dip Process. |
| .3 | ASTM B633-11 Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel |
| .2 | Canadian General Standards Board (CGSB) |
| .1 | CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Primer |
| .3 | Canadian Standards Association (CSA International) |
| .1 | CSA S16-09, Design of Steel Structures |
| .2 | CAN/CSA-S136-07, North American Specification for the Design of Cold Formed Steel Structural Members |
| .3 | CSA W47.1-09, Certification of Companies for Fusion Welding of Steel |
| .4 | CSA W59-13, 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 |
| .5 | Steel decking work to Canadian Sheet Steel Building Institute Standards for Steel Roof Deck and Steel Floor Deck except where specified otherwise. |
| .6 | Design, fabrication and erection to CSA S16 and CAN/CSA-S136. |
| .7 | Welding to CSA W59 except where specified otherwise. |

1.3 DESIGN CRITERIA

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| .1 | Structural design of steel decking shall be in accordance with the requirements of Canadian Sheet Steel Building Institute Standards for Floor and Roof Decking. Loads shown on the drawings are specified loads. |
| .2 | Steel decking shall safely carry indicated dead and live loads without exceeding maximum working stress of 144 MPa. |

- .3 Deflection under live load only shall not exceed 1/360th of span.
- .4 Floor deck to be concrete composite with a total slab thickness of 165 mm
- .5 Refer to the drawings for depths and minimum gauges.

1.4 SHOP DRAWINGS

- .1 Submit shop drawings in accordance with Division 1.
- .2 Clearly indicate decking plan, profile, dimensions, core thickness, anchorage, spans, supports, projections, openings, and reinforcement details and accessories.
- .3 Shop drawings shall clearly indicate the roof slopes, high points and low points and the deck shall be properly detailed, designed and fabricated to consider roof slopes.
- .4 Every drawing submitted shall bear the signature and stamp of a qualified professional Engineer registered or licensed to practice in the Province of New Brunswick.
- .5 Indicate details of temporary shoring of steel deck such as location, time and duration of placement and removal of shoring.
- .6 All shop drawings and material lists are to contain a blank area measuring 70 mm high by 100 mm long located near the bottom right hand corner of the drawing or page. This area is to be reserved for the Engineer's review stamp.

Part 2 – Products

2.1 MATERIALS

- .1 Metal: to ASTM A653 galvanized steel sheet to ASTM A924, Grade A structural quality. Maximum working stress 144 MPa. Zinc thickness to Z275
- .2 Pre-moulded closures: closed cell foam rubber, profiled to deck corrugations, 25 mm thick.
- .3 Use of scrap metal, end and side pieces, etc., is not permitted.
- .4 Cover plates, cell closures and flashing: galvanized steel sheet with minimum steel core thickness of 1.22 mm.
- .5 Closures to external walls: pre-moulded type.
- .6 Primer: zinc rich, ready mix primer to CGSB-1.181, VOC compliant.
- .7 Stiffened sheet metal angle floor pour stops to be designed by manufacturer to suit overhang.
- .8 Screws to connect roof deck units together at overlapping sidelaps to be No. 12 Hilti S-SLC 02M HWH or approved equal.

2.2 TYPES OF DECKING

- .1 Roof deck: 0.91 mm minimum core thickness, 38 mm deep profile, non-cellular, overlapping side laps with flutes on 152 mm centers, maximum distance between upper flanges to be 67 mm.
- .2 Floor deck: 0.91 mm minimum core thickness, 76 mm deep profile, non-cellular, ribbed faces for concrete bond, upright flute profile, interlocking side laps. Flutes to be on 305 mm or 406 mm centers. Average rib width distance to be not less than twice the deck height.
- .3 All deck units shall have overlapping sidelaps for the proper lateral distribution of vertical loads and in order that all units may be tied together as a diaphragm to resist and transfer lateral forces acting on the building.

Part 3 – Execution

3.1 ERECTION

- .1 Erection of the steel deck shall be performed by the erection forces of the manufacturer or his approved agents and to his instructions.
- .2 Steel deck shall be placed on the supporting steel framework and adjusted to final position before being permanently fastened. Each unit shall be brought to proper bearing.
- .3 All deck shall be fastened to the supporting steel framework with 20 mm diameter fusion welds except that powder actuated fasteners shall be used in areas where deck is being connected to steel with special paint or steel that has been hot dipped galvanized.
- .4 All welding shall be done by competent, experienced welding mechanics. All welds shall be given a protective coat of approved paint primer, promptly upon completion.
- .5 All powder actuated fasteners shall be installed by a trained operator as per the manufacturer's instructions using the appropriate tools. Fasteners shall be driven into the base material so that the two metal washers are tight together, pressing the deck sheet firmly against the base material, but not cutting into the deck material.
- .6 All steel deck shall be connected as follows, except where noted otherwise.
- .7 Roof deck units shall be connected to supporting members at 150 mm centers in each direction. Roof deck shall also be connected at each intermediate deck support (IDS) with 2 welds/fasteners and at other locations shown on the drawings and noted in the specifications.

- .8 Floor deck shall be connected to supporting members at 300 mm centers in each direction. Floor units shall also be connected with 2 welds/fasteners per flute at ends of deck along the building perimeter and along interior openings. At braced frames, floor deck shall be connected at 150 mm centers or with 2 welds/fasteners per flute. Provide additional welds/fasteners as shown on the drawings and noted in the specifications.
- .9 Roof and floor deck units shall be lapped at ends not less than 100 mm.
- .10 All sidelaps of roof deck shall be connected at 300 mm centers with #12 screws.
- .11 All sidelaps of floor deck shall be connected at 600 mm centers with #12 screws.
- .12 Supply and install sheet steel cover plates to cover gaps where units abut or change direction and at high and low roof points. Fasten to each side at 150 mm centers (minimum) using #12 stainless steel screws.
- .13 Supply, install and weld in position sheet metal flashing to close between floor unit and columns.
- .14 Supply and install stiffened galvanized sheet metal angles (min. 12 Ga.), floor thickness x 200 mm minimum at the perimeter of all floor decking and at deck openings as forming for the concrete floors unless noted otherwise.
- .15 Deck shall be fabricated and installed so that it fits the roof slopes indicated on the drawings.
- .16 All deck to span 3 spans minimum unless detailed otherwise.
- .17 Contractor is responsible for additional temporary/permanent support of metal decking, metal edge forms, etc. as required to keep material in proper position during construction.

3.2 CLOSURES

- .1 Provide sheet metal closures as required to contain concrete.
- .2 Where metal decking rests on exterior walls, fill web spaces with neoprene closures.
- .3 Attach metal cell closures and metal flashing at locations required to contain poured concrete.
- .4 Where decking is parallel to steel beams and is terminated at the edges of the beam top flange, install channel or Z closure strips between the beam flange and any top flute which is cut.

3.3 OPENINGS

- .1 Install 64x64x6.4 mm steel angles, perpendicular to flutes, welded to 3 flutes each side of opening for deck openings from 150 mm to 300 mm size. No reinforcement required for openings cut in deck which are smaller than 150 mm square.

- .2 For deck openings over 300 mm, reinforce in accordance with structural steel framing details.

3.4 SUPPORT AT COLUMNS

- .1 Install 76x76x6.4 mm steel angles on face of steel columns where required to support deck.

3.5 COORDINATION

- .1 Coordinate the extent of metal deck with the architectural drawings and verify requirements of other trades for dimensioning and detailing of roof and floor openings.

END OF SECTION

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

- .1 Comply with requirements of Division 1.

1.2 RELATED SECTIONS

- .1 Section 06 10 00: Rough Carpentry.
- .2 Section 07 27 26: Fluid Applied Membrane Air Barrier.
- .3 Section 07 42 43: Composite Metal Wall Panels
- .4 Section 07 46 19: Preformed Metal Wall Cladding.
- .5 Section 07 46 23: Wood Siding.
- .6 Section 09 21 16: Gypsum Board Assemblies.

1.3 REFERENCES

- .1 ASTM A653/A653M-15, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- .2 ASTM A792M-10, Standard Specification for Sheet Steel, 55% Aluminum-Zinc Alloy Coated by the Hot-Dip Process.
- .3 CSA W47.1-09 (2014), Certification of Companies for Fusion Welding of Steel Structures.
- .4 CSA-W59-13, Welded Steel Construction (Metal Arc Welding).
- .5 CAN/CSA-S136-12, North American Specification for the Design of Cold Formed Steel Structural Members.
- .6 CAN/CGSB 7.1-98, Cold Formed Steel Framing Components.
- .7 CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Coating.
- .8 Canadian Sheet Steel Building Institute CSSB I50M, Lightweight Steel Framing Manual.

1.4 SUBMITTALS

- .1 Make submittals in accordance with Section 01 30 00 – Submittal Procedures.
- .2 Shop Drawings:
 - .1 Indicate design loads, member sizes, materials, design thickness exclusive of coatings, coating specifications, connection and bracing details, bridging details, types, sizes, and spacing of fasteners or welds, tolerances, and anchors.
 - .2 Indicated locations, dimensions, openings, tolerances and requirements of related and adjacent Work.
 - .3 Indicate welds by welding symbols as defined in CSA W59. Show nominal weld leg sizes for materials less than 3 mm thick. For such welds the throats shall not be less than the thickness of the thinnest connected part.

.2 (continued)

- .4 Show coordination with exterior cladding, and other attachments including windows, door frames, louvres, and electrical fixtures and panels.
- .5 Shop drawings for metal stud framing shall bear stamp and signature of a professional engineer registered or licensed to practice in the province of Nova Scotia.
- .3 Prior to commencing Work, submit two (2) certified copies of mill reports covering material properties.
- .4 Submit product data for mechanical fasteners, indicating sizes, load capacities, and type of corrosion protection.
- .5 Submit samples of all framing components and fasteners if requested by Departmental Representative.
- .6 Do not construct Work until review of submittals is completed.
- .7 Submit to Departmental Representative manufacturer's written report, within 3 days of review, verifying compliance of Work, as described in PART 3 – FIELD QUALITY CONTROL. Submit two (2) copies of field review reports.

1.5 QUALITY ASSURANCE

- .1 Employ a Professional Engineer registered or licensed to practice in the province of Nova Scotia to design metal stud systems for exterior wall assemblies; to prepare, seal, and sign all submitted shop drawings; and to perform field reviews.
- .2 Do welding in accordance with CSA S136 and CSA W59.
- .3 Companies engaged in welding: certified by the Canadian Welding Bureau to CSA W47.1, with welding procedures approved and welders qualified for the base material types and thicknesses that are to be welded.

1.6 DESIGN CRITERIA

- .1 Calculate structural properties in accordance with CAN/CSA-S136, limit states design principles using factored loads and resistances.
- .2 Calculate loads and load factors in accordance with the National Building Code current edition.
- .3 Determine resistances and resistance factors in accordance with the National Building Code current edition and CSA-S136.
- .4 Conform to the requirements of fire rated assemblies indicated.

- .5 Select studs which will deflect under specified lateral loads not more than $L/240$. Limit free play and movement in connections perpendicular to the plane of the framing to 1 mm relative to the building structure.
- .6 Space wall studs at 400 mm maximum intervals unless otherwise indicated on drawings. Provide additional studs at sides of openings.
- .7 Stud depth is shown on the drawings. Adjust stud material thickness, stud spacing, or both as required by design criteria. Use greater or lesser stud depths only if reviewed and accepted by Departmental Representative.
- .8 Design metal stud systems and attachments to accommodate the full range of tolerances permitted in adjoining materials.
- .9 Design stud end connections to accommodate structural deflections, frame shortening, and vertical tolerances permitted in structure such that studs are not loaded axially. Provide deflection space of 25 mm for differential in floor to head height for all effects combined.
- .10 Take into account local loadings due to anchorage of cladding and interior wall mounted fixtures where shown.
- .11 Design bridging to prevent member rotation and member translation perpendicular to the minor axis for lateral load bearing studs. Provide for secondary stress effects due to torsion between lines of bridging. Do not rely on cladding, sheathing, or insulation for lateral bracing. Provide metal bridging at 1220 mm o.c. maximum. Use closer spacing if required by structural design.

1.7 DELIVERY, STORAGE AND HANDLING

- .1 Protect steel studs during transportation, site storage and installation in accordance with CSSBI Sheet Steel Facts #3.
- .2 Handle and protect galvanized materials from damage to zinc coating.

1.8 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 19 – Construction Waste Management and Disposal.
- .2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard and packaging material in appropriate on site bins for recycling in accordance with Waste Management Plan.
- .4 Divert unused metal materials from landfill to metal recycling facility as approved by Departmental Representative.

PART 2 – PRODUCTS

2.1 MATERIALS

- .1 Steel: to CAN/CSA-S136, fabricated from ASTM A653/A653M, Grade 340 steel.
- .2 Zinc coated steel sheet: commercial quality to ASTM A653/A653M, with Z275 designation coating.
- .3 Welding materials: to CSA W59 and certified by Canadian Welding Bureau.
- .4 Screws: pan head, self-drilling, self-tapping sheet metal screws, corrosion protected to minimum zinc coating thickness of 0.008 mm, length 16 mm minimum or as indicated.
- .5 Anchors: concrete expansion anchors or other suitable drilled type fasteners.
- .6 Bolts, nuts, washers: hot dipped galvanized to CAN/CSA-G164, 600 g/m² zinc coating.
- .7 Touch up primer: zinc rich, to CGSB 1-GP-181M.

2.2 FRAMING

- .1 Member configurations and cutouts: to CAN/CGSB-7.1.
- .2 Steel studs: to CAN/CSA S-136, roll-formed of zinc-coated sheet steel of thickness, material and profile dictated by design and as indicated on drawings. Minimum steel stud thickness 1.22 mm (18 Ga.) - Note: thicker gauge of material may be required for strength and deflection limitation. Acceptable materials: Wind Bearing Studs by Bailey Metal Products Limited, or approved equal. Studs to be identified as to thickness by indelible markings or colour coded by thickness as follows:

<u>Colour Code</u>	<u>Nominal Base Metal thickness (mm)</u>
White	0.91
Yellow	1.22
Green	1.52
Orange	1.91

- .3 Stud tracks: fabricated from same material and finish as steel studs, width to suit stud depth, single piece, minimum steel thickness of 1.92 mm (14 Ga.) unless indicated otherwise on drawings (Note: thicker material may be required for strength). Bottom track: single piece; top track: two piece telescoping.
- .4 Bridging: channels fabricated from same material and finish as studs, 38 x 19.0 x 1.52 mm minimum thickness.

- .5 Bridging angle clips: fabricated from same material and finish as studs, 38 x 38 mm x depth of steel stud, 1.52 mm minimum thickness.
- .6 Tension straps and accessories: as recommended by manufacturer.
- .7 Fasteners, anchors, screws: as recommended by manufacturer.

PART 3 - EXECUTION

3.1 GENERAL

- .1 Do welding in accordance with CSA W59.
- .2 Certification of companies: CSA W47.1 for fusion welding and CSA W55.3 for resistance welding.
- .3 Do work to CSSBI S5.

3.2 ERECTION OF STEEL STUD FRAMING

- .1 Install steel framing in accord with applicable requirements of CAN/CSA-S16.1 and CAN3-S136 and meet applicable requirements of "Lightweight Steel Framing Manual" by CSSBI 50M.
- .2 Erect components to requirements of reviewed shop drawings.
- .3 Anchor tracks to structure at 800 mm o.c. maximum, unless lesser spacing prescribed on shop drawings.
- .4 Install 65 mm minimum nesting track at top of walls where indicated to accommodate vertical deflection. Nest top track into deflection channel a minimum of 25 mm and a maximum of 38 mm. Do not fasten tracks together. Stagger joints and install neoprene separator.
- .5 Seat studs into bottom tracks and two piece telescoping top track.
- .6 Erect steel studs plumb and true within specified tolerances, aligned and securely attached in accordance with manufacturer's recommendations. Do not splice studs.
- .7 Install studs vertically, spaced at 400 mm o.c. and screw fasten to tracks with screws, one at each flange, top nesting track and bottom track. Position stud screw fasteners at nesting track to allow up to 25 mm movement. Do not fasten studs to top track.
- .8 Install studs at not more than 50 mm from abutting walls, openings, and each side of corners and terminations with dissimilar materials.
- .9 Provide temporary bracing, if required for framing to sustain loads applied during erection and subsequent construction.

- .10 Brace steel studs with horizontal internal bridging at 1220 mm maximum vertical centers. Fasten bridging to steel clips fastened to steel studs with screws.
- .11 Reinforce cut-outs which occur within 300 mm of the end of a stud. Align stud cut-outs horizontally. Do not allow additional cut-outs to be made in the field, except as approved by the Engineer responsible for preparation of shop drawings.
- .12 Frame all openings in stud walls, except openings less than 100 mm in any dimension, to adequately carry loads by use of additional framing members and bracing as indicated on drawings. Provide additional framing members at points of attachment of wall mounted fixtures to adequately carry loads by using additional framing members and bracing as required structurally.
- .13 Coordinate installation of studs with installation of service lines.
- .14 Use fasteners with drilling and holding capacities recommended by the manufacturer. Select different fasteners if initial selection fails to drill effectively, or tends to strip out.
- .15 Repair damaged zinc-coating and all welds using zinc-rich primer in accordance with ASTM A780.

3.3 ERECTION TOLERANCES

- .1 Plumb: not to exceed 1/500th of member length.
- .2 Camber: not to exceed 1/1000th of member length. Replace members with local buckling or bends.
- .3 Spacing: not more than +/- 3 mm from design spacing, non-cumulative.
- .4 Location: within 10 mm of the indicated alignment and within 5 mm where alignment of structure permits.
- .5 Gap between end of stud and track web: not more than 2 mm.
- .6 Alignment of adjoining or abutting members in the same plane, where supporting continuous cladding or sheathing: 1 mm. maximum.

3.4 CUT-OUTS

- .1 Maximum size of cutouts to be as follows:

Member Depth	Across Member Depth	Along Member Length	Centre to Centre Spacing (mm)
102	40 max.	102 max.	600 min.
152	40 max.	115 max.	600 min.
203	40 max	115 max	600 min

- .2 Limit distance from centerline of last unreinforced cutout to end of member to less than 300 mm.

3.5 FIELD QUALITY CONTROL

- .1 The Professional Engineer responsible for the design of the exterior wall steel stud system and preparation of the shop drawings shall review the work in progress at the site regularly during construction and submit field reports to the Departmental Representative for each visit.
- .2 The field reviews shall include review of mill test reports, welded connections, member sizes and material thickness, coating thickness, screwed connections, erections tolerances, and all field cutting, including cutting and patching for other trades.

END OF SECTION

PART 1 - GENERAL

1.1.. GENERAL REQUIREMENTS

- .1 Comply with requirements of Division 1.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- .1 Section 03 10 00: Concrete Forming and Accessories.
- .2 Section 04 05 19: Masonry Reinforcement and Connectors.
- .3 Section 05 12 23: Structural Steel for Buildings.
- .4 Section 09 21 16: Gypsum Board Assemblies.
- .5 Section 09 91 00: Painting.

1.3 REFERENCES

- .1 ANSI/NAAMM – American National Standards Institute / Association of American Metal Manufacturers.
- .2 ASTM A53/A53M-07, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
- .3 ASTM A269-13, Specification for Seamless and Welded Austenitic Stainless Steel Tubing.
- .4 ASTM A307-07b, Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.
- .5 ASTM A325M-13, Standard Specification for Structural Bolts, Steel, Heat Treated 830 MPa Minimum Tensile Strength (Metric)
- .6 ASTM A500/A500M-13, Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
- .7 ASTM A480/ A480M - 13b, Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip.
- .8 CAN/CGSB-1.40, Anti-Corrosive Structural Steel, Alkyd Primer.
- .9 CAN/CGSB-1.108, Bituminous Solvent Type Paint.
- .10 CAN/CGSB-1.181, Ready-Mixed, Organic Zinc-Rich Coating.
- .11 CAN/CSA-G40.20/G40.21, General Requirements for Rolled or Welded Structural Quality Steel.
- .12 CAN/CSA-G164, Hot Dip Galvanizing of Irregularly Shaped Articles.
- .13 CAN/CSA-S16, Design of Steel Structures.
- .14 CSA W48, Filler Metals and Allied Materials for Metal Arc Welding.
- .15 CSA W47.1, Certification for Companies for Fusion Welding of Steel.
- .16 CSA W59, Welded Steel Construction (Metal Arc Welding).
- .17 CCD – 0472, Paints, Surface Coatings. The Environmental Choice Program.

1.4 QUALITY ASSURANCE

- .1 Qualifications of Welders: Welding of any stair, ladder, railing component and other steel assemblies shall be performed by fabricator certified under CSA W47.1.

1.5 ACTION AND INFORMATION SUBMITTALS

- .1 Submit shop drawings of all metal fabrications required in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Indicate construction details, sizes of steel sections, thickness of materials, finishes, connections, joints, method of anchorage, number of anchors, supports, reinforcement, details and accessories.
- .3 Shop drawings for structural assemblies, stairs, handrails, guardrails and railings, ladders and other items listed in this Section shall bear stamp and signature of a professional engineer registered or licensed to practice in the province of Nova Scotia.

1.6 WORK SUPPLIED BUT NOT INSTALLED

- .1 Supply following items for installation under other Sections of work: Anchor bolts, bearing plates, sleeves and other inserts to be built into concrete and masonry elements and required for anchorage and support of metal fabrications.
- .2 Supply other Sections with instructions, and if required, templates, necessary for accurate setting of insets and components.

1.7 DELIVERY STORAGE AND HANDLING

- .1 Deliver, store, handle and protect materials in accordance with Section 01 61 00 – Common Product Requirements.
- .2 Deliver, store, handle and protect components to prevent damage, warping, corrosion, permanent distortion of members or chipping and scraping of the paint coat.
- .3 Storage and Protection:
 - .1 Store materials off ground, indoors in dry location and in clean, well-ventilated area.
 - .2 Store and protect stairs and ladders from nicks, scratches and blemishes.
 - .3 Cover exposed stainless steel surfaces with pressure sensitive heavy protection paper or apply strippable plastic coating, before shipping to job site.
 - .4 Leave protective covering in place until final cleaning of building. Provide instructions for removal of protective covering.

1.8 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 – Construction Waste Management and Disposal.
- .2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard and packaging material in appropriate on site bins for recycling in accordance with Waste Management Plan.

- .4 Divert unused metal materials from landfill to metal recycling facility as approved by Departmental Representative.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Comply with CAN/CSA-S16. Provide new materials free from defects impairing strength or durability.
- .2 Steel shapes, plates and angles shall conform to CSA-G40.21 - 300W unless otherwise directed. HSS Sections shall be CSA-G40.21 - 350W, Class C or ASTM A500 Grade C.
- .3 Sheet steel: hot dip galvanized, cold rolled, with stretcher level degree of flatness to ASTM A526, zinc coating designation Z275.
- .4 Steel pipe: to ASTM A53/A53M ($F_y = 241$ MPa), standard weight, prime painted finish.
- .5 Steel tubing: to CAN/CSA-G40.21 or ASTM A500 shapes, sizes and dimensions, as indicated.
- .6 Floor plate: CSA G40.20/G40.21, Grade 300W, pattern: checkered, to sizes as indicated.
- .7 Steel pipe: to ASTM A53/A53M, standard weight, schedule 40 seamless black.
- .8 Architectural welded wire mesh: 50mm x 50mm x 3.18mm, plain steel welded wire mesh, 1220mm x 2440mm flat sheet.
- .9 Bolts and anchor bolts: to ASTM A307.
- .10 Structural bolts: High strength to ASTM A325M. Bolts shall be identifiable by their head markings. Provide galvanized bolts, nuts and washers for steel in unheated locations.
- .11 Welding Materials: to CSA-W59.
- .12 Grout: non-shrink, non-metallic, flowable, 15 MPa, pull-out strength 7.9 MPa at 24 hours.

2.2 FABRICATION

- .1 Steel Stair requirements:
 - .1 Design metal stair, stair railing, landing construction and all connections to NBCC 2010 vertical and horizontal live load requirements.
 - .2 Detail and fabricate stairs to NAAMM Metal Stair Manual, current edition.
 - .3 Weld connections. Make exposed connections of same material, colour and finish as base material on which they occur.

- .1 (continued)
 - .4 Accurately form connections with exposed faces flush:
 - .1 Make mitres and joints tight.
 - .2 Make risers of equal height.
 - .3 Grind exposed welds and steel sections smooth.
 - .4 Shop fabricate stairs in sections as large and complete as practicable.
- .2 Fabricate components in the shop in largest size practicable to minimize field jointing.
- .3 Fabricate work square, true, straight and accurate to required size, with joints closely fitted and properly secured. Accurately cut, machine file and fit joints, corners, copes and mitres.
- .4 Where possible, fit and shop assemble work, ready for erection.
- .5 Reinforce fabricated components to safely withstand expected loads.
- .6 Make joints in built-up sections with hairline joints in least conspicuous locations and manner.
- .7 Make allowance for thermal expansion and contraction when fabricating exterior work.
- .8 Joints shall be welded unless otherwise indicated and unless details of construction do not permit welding. Exposed welds shall be continuous and shall be ground smooth.
- .9 Close exposed open ends of tubular members with welded on steel plugs.
- .10 Where work of other Sections is to be attached to work of this Section, prepare work by drilling and tapping holes, as required to facilitate installation of such other work.
- .11 Work of this Section, supplied for installation under other Sections, shall be prepared as required ready for installation by: drilling, countersinking and tapping holes, forming shapes and cutting to required sizes.
- .12 Grind off mill stampings and fill recessed markings on steel components left exposed to view.
- .13 Use self-tapping shake-proof flat headed screws on items requiring assembly by screws or as indicated.
- .14 Ensure exposed welds are continuous for length of each joint. File or grind exposed welds smooth and flush. Seal exterior steel fabrications to provide corrosion protection to CAN/CSA-S16.1.

2.3 CONNECTIONS

- .1 Design connections to conform to CAN/CSA-S16.
- .2 In general, make shop and field connections with high tensile structural bolts (A325) or by welding.

2.4 FINISHES

- .1 Galvanizing: hot dipped galvanizing with zinc coating 600 g/m² to CAN/CSA-G164.
- .2 Shop coat primer: to CAN/CGSB-1.40 in accordance with chemical component limits and requirements and VOC limits of GS-11.
- .3 Zinc primer: zinc rich, ready mix to CAN/CGSB-1.181, in accordance with chemical component limits and requirements and VOC limits of GS-11.
- .4 Bituminous paint: to CAN/CGSB-1.108, in accordance with chemical component limits and requirements and VOC limits of GS-11.

2.5 SHOP PAINTING

- .1 Primer: VOC limit g/L maximum to GS-11.
- .2 Thoroughly clean steel of loose scale, rust, oil, dirt and other foreign matter. Suitably prepare steel surfaces by power tool cleaning to receive specified finishes. Grind smooth sharp projections.
- .3 Remove oil and grease by solvent cleaning.
- .4 Clean surfaces to be field welded; do not paint.
- .5 Shop apply one coat of primer to components after fabrication except where galvanized, encased in concrete or zinc rich paint finish is required.
- .6 Use primer unadulterated, as prepared by manufacturer. Paint on dry, clean surfaces. Do not paint when temperature is lower than 7°C.
- .7 Apply coat of bituminous enamel to contact surfaces of metal components in contact with cementitious materials and dissimilar metals.
- .8 Apply coatings in the shop and before assembly. Where size permits, galvanize components after assembly.

2.6 MISCELLANEOUS METALS

- .1 Provide items as listed under "Miscellaneous Metals" on the structural drawings.
- .2 Fabricate to requirements specified under this Section except as indicated otherwise.
- .3 Turn over masonry connectors and bar anchors to Section 04 05 00 on site.

2.7 STEEL LINTELS

- .1 Steel angles and hollow structural sections: prime painted, sizes indicated for openings. Provide 200 mm minimum bearing at ends.
- .2 Weld or bolt back-to-back angles to profiles as indicated.
- .3 Finish: shop painted. Galvanize finish for exterior lintels.

2.8 STEEL PAN STAIRS

- .1 Fabricate steel stair with closed riser steel pan construction.
- .2 Form treads and risers from 3 mm thick steel plate. Secure treads and risers to steel angle 35 mm x 35 mm x 5 mm horizontal and vertical and welded to stringers.
- .3 Form wall and outer stringers from steel C310 x 31, with 74 mm flange width.
- .4 Form landings from 38 mm corrugated metal deck reinforced by steel angles 55 mm x 55 mm x 6 mm spaced at 400 mm o.c.
- .5 Provide clip angles for fastening furring channels where applied finish is indicated for underside of stair and landings.
- .6 Extend stringers around mid-landings to form steel base.
- .7 Close ends of stringers where exposed.
- .8 Accurately form connections with exposed faces flush; mitres and joints tight.
- .9 Grind or file exposed welds and steel sections smooth.
- .10 Cope and crank stringers as necessary to line with floor steel members at framed openings for stairs. Apply continuous welds to cranked stringer joints.
- .11 Where gypsum board soffits are indicated below steel stairs and landings, provide clip angles for fastening of metal furring channels. Coordinate with Section 09 21 16 – Gypsum Board Assemblies.
- .12 Form stair pipe railings and handrail from steel pipe and round steel tubing sections, dimensions as shown on drawings and details.
- .13 Continuous weld and grind smooth all connections at pipe railing members and at railing connection to steel stringer.
- .14 Cap and weld exposed ends of handrails and balusters.
- .15 Finish: shop primed. Touch up primer after welding.

2.9 STEEL RAILINGS

- .1 Definition: the term "railing" shall be taken to mean handrails, guardrails, balustrades, guards, rails and railings of all types.
- .2 Fabricate railings to conform to applicable National Building Code of Canada (NBCC 2010) requirements.
- .3 Construct balusters and handrails from round steel pipe with architectural welded wire mesh framed infill panels as shown on drawings.

- .4 Construction: unless otherwise indicated:
 - .1 Cap and weld open ends of tubular members of balusters and handrails with welded steel plugs.
 - .2 Turn exposed ends of wall rails into wall.
 - .3 Support verticals to be at maximum 1000 mm o.c. between.
 - .4 Pipe wall thickness: minimum 2.5 mm.
 - .5 Architectural welded wire mesh infill panels:
 - .1 Secure welded wire mesh neatly into perimeter angle framing so as to produce even and symmetric appearance within angle frame.
 - .2 Weld framed wire mesh infill panel to steel vertical support members and grind smooth all welds.
 - .5 At corners, angles and intersections cope or mitre and weld and grind smooth.
 - .6 Weld balustrades to stingers.
- .5 Pipe railings: unless otherwise indicated:
 - .1 40 mm outside diameter Schedule 40 tubing.
 - .2 Bends: smooth and continuous, without crimping or deflection in the pipe diameter.
 - .3 Welds: even, continuous and ground smooth prior to finishing.
 - .4 Cap and weld exposed ends of balusters and handrails.
- .6 Finish:
 - .1 Interior stairs and railings: Shop primer to CAN/CGSB-1.40.
 - .2 Architectural welded wire mesh: prime and paint on site.

2.10 ELEVATOR PIT ACCESS LADDER

- .1 Stringers: 75 x 10 mm thick, steel plate extending from finished ground floor to 50 mm above top rung.
- .2 Steel Rungs: 25 mm diameter, 700 mm minimum between stringers, welded to stringers at 300 mm o.c. vertically.
- .3 Brackets: 75 x 10 mm plate steel support brackets welded to stringers, each side at 1400 mm maximum o.c., complete with 12 mm diameter steel fixing anchors and slotted connection at steel beam.
- .4 Painted finish.

2.11 PIT COVERS AND FRAMES

- .1 Pit covers (non-vehicle traffic rated): Fabricate from 6mm thick, raised pattern, removable, checkered steel plate with continuous 50 mm wide x 6 mm thick steel edge trim, set in 100mm x 100mm x 6mm thick galvanized steel angle frame with air and water tight gasket. Include anchors at 600 mm o.c. for embedding in concrete.
- .2 Finish: prime painted. Finish coating on site.

2.12 CHANNEL FRAMES

- .1 Fabricate frames from steel, sizes of channel and opening as indicated.
- .2 Weld channels together to form continuous frame for jambs and head of openings, sizes as indicated.
- .3 Weld 50 x 100 x 3 mm thick steel strap anchors to channel jamb frame at 600 mm on centre.
- .4 Finish: galvanized steel.

2.13 ANGLE BRACKETS

- .1 Steel tubing and angle framing and legs for benches and millwork as detailed.
- .2 Continuous welds ground smooth, primed.
- .3 Drill and countersink as required.

2.14 BOLLARDS

- .1 Fabricate concrete filled steel bollards from steel pipe, pipe sizes as indicated on drawings.
- .2 Finish: galvanized steel.

PART 3 - EXECUTION

3.1 EXAMINATION

- .1 Before commencing work, make a thorough examination of other work upon which the miscellaneous metal work is dependent.
- .2 Field verify and coordinate all dimensions and elevations in the field at time of construction. Contractor to verify all dimensions and report any discrepancies to the Departmental Representative before proceeding with the work.

3.2 ERECTION

- .1 Do welding work in accordance with CSA W59 unless specified otherwise.
- .2 Companies to be certified to Division 1 or 2 of CSA W47.1 for fusion welding, CSA W55.3 for resistance welding for structural assemblies. Provide certification that all welded joints are certified by Canadian Welding Bureau.
- .3 Erect and install components square, plumb, straight, and true, accurately fitted, with tight joints and intersections. Drill, cut and fit as necessary to attach this work to adjoining work.

- .4 Provide temporary supports and bracing required to position components until they are permanently anchored in place.
- .5 Provide suitable means of anchorage acceptable to Departmental Representative such as dowels, anchor clips, bar anchors, expansion bolts and shields, and toggles. Securely anchor components in place; unless otherwise indicated, anchor components as follows:
 - .1 To concrete and solid masonry with expansion type anchor bolts.
 - .2 To hollow construction with toggle bolts.
 - .3 To thin metal with screws or bolts.
 - .4 To thick metal with bolts or by welding.
 - .5 To wood with bolts or lag screws.
 - .6 Fill space between railing members and sleeves with non-shrink grout.
- .6 Provide all components required for anchoring. Make anchoring in concealed manner wherever possible. Make exposed fastenings, where approved by Departmental Representative, neatly and of same material, colour, texture and finish as base metal on which they occur. Keep exposed fastenings evenly spaced. Exposed fastening devices to match finish and be compatible with material through which they pass.
- .7 Make field connections with bolts to CAN/CSA-S16, or weld.
- .8 Provide components for building-in by other sections in accordance with shop drawings and schedule.
- .9 Hand items over for casting into concrete or building into masonry to appropriate trades together with setting templates.
- .10 Dissimilar metals and metals in contact with cementitious elements shall have contact surfaces coated with bituminous paint or be isolated by other means as approved by Departmental Representative.
- .11 After installation, clean and refinish damaged finishes, welds, bolt heads and nuts. Touch-up field welds, bolts and burnt or scratched surfaces after completion of erection with primer.
- .12 Touch-up galvanized surfaces with zinc rich primer where burned by field welding.

3.3 STEEL STAIRS

- .1 Install in accordance with NAAMM, Metal Stair Manual.
- .2 Install plumb and true in exact locations, used welded connected wherever possible to provide rigid structure. Provide anchor bolts, bolts and plates for connecting stairs to structure.
- .3 Hand over items for casting into concrete or building into masonry to appropriate trades together with setting templates.
- .4 Do welding work in accordance CSA W59 unless specified otherwise.

- .5 Touch up shop primer to bolts, welds and burned or scratches surfaces at completion of installation.

3.4 STEEL RAILINGS

- .1 Install steel railings at stairs and other locations where indicated on drawings.
- .2 Set railing standards in concrete. Grout to fill hole. Trowel surface smooth and flush with adjacent surfaces.

3.5 PIT COVERS AND FRAMES

- .1 Install covers and frames in locations as indicated.

3.6 ELEVATOR PIT LADDER

- .1 Install access ladder in location where indicated.

3.7 STEEL CHANNEL FRAMES

- .1 Install steel channel frames in locations as indicated.

3.8 STEEL BOLLARDS

- .1 Install steel bollards in locations as indicated.

3.9 SCHEDULE OF COMPONENTS

- .1 The work described in this Section consists of the supply and installation for miscellaneous metal fabrication, assembling, erection, prime painting and touch-up painting of the following items:
 - .1 Provide components made of steel unless otherwise indicated.
 - .2 Provide continuous galvanized steel angles at window sills and jambs where shown on drawings and details.
 - .3 Provide continuous galvanized steel lintels at door and window heads and where shown on drawings and details.
 - .4 Provide steel handrails and guardrails where shown on drawings.
 - .5 Provide steel pan stairs and railings where shown on drawings.
 - .6 Provide pit covers where shown on drawings.
 - .7 Provide pit access ladder where indicated on drawings.
 - .8 Provide bollards where shown on drawings.
 - .9 Masonry strap anchors to columns (see Structural).
 - .10 Steel angles indicated on masonry lintel chart (see Structural).
 - .11 Typical masonry wall connections (to stabilize the tops of interior and exterior block walls - see details and structural drawings.
 - .12 Miscellaneous steel angles, channels, plates, lintels indicated on drawings. But not included on structural drawings or not specifically covered in other sections.
 - .13 All other metal fabrications shown on drawings and not specifically covered in other Sections.

3.9 PAINTING

- .1 Prepare surfaces and finish paint after installation of miscellaneous steel items in accordance with Section 09 91 00 - Painting.

3.10 CLEANING

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

3.11 PROTECTION

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by installation of stairs and other metal fabrications.

END OF SECTION