

Part 1      General

1.1      REFERENCES

- .1 American Society for Testing and Materials International, (ASTM)
  - .1 ASTM A36/A36M-12, Standard Specification for Carbon Structural Steel
  - .2 ASTM A123/A123M-12, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
  - .3 ASTM A193/A193M-12b, Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature or High Pressure Service and Other Special Purpose Applications
  - .4 ASTM A307-12, Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength
  - .5 ASTM A325-10e1, Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
  - .6 ASTM A325M-13, Standard Specification for Structural Bolts, Steel, Heat Treated 830 MPa Minimum Tensile Strength (Metric)
  - .7 ASTM A490-12, Standard Specification for Structural Bolts, Alloy Steel, Heat Treated, 150 ksi Minimum Tensile Strength
  - .8 ASTM A490M-12, Standard Specification for High-Strength Steel Bolts, Classes 10.9 and 10.9.3, for Structural Steel Joints (Metric)
  - .9 ASTM A500/A500M-10a, Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
  - .10 ASTM A780/A780M-09, Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
- .2 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB 85.10-99, Protective Coatings for Metals
  - .2 CAN/CGSB 1.40-97, Anticorrosive Structural Steel Alkyd Primer
- .3 Canadian Institute of Steel Construction (CISC)
  - .1 Handbook of Steel Construction - Tenth Edition, 2011
- .4 Canadian Institute of Steel Construction (CISC)/Canadian Paint Manufacturer's Association (CPMA)
  - .1 CISC/CPMA 1-73a, Quick-Drying One-Coat Paint for use on Structural Steel
  - .2 CISC/CPMA 2-75, Quick-Drying Primer for use on Structural Steel
- .5 Canadian Standards Association (CSA International)
  - .1 CSA G40.20-13/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/ Structural Quality Steel
  - .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 W47.1-09, Certification of Companies for Fusion Welding of Steel Structures

- .5 CSA W48-06(R2011), Filler Metals and Allied Materials for Metal Arc Welding
- .6 CSA W55.3-08, Resistance Welding Qualification Code for Fabricators of Structural members Used in Buildings
- .7 CSA W59-03(R2008), Welded Steel Construction (Metal Arc Welding).
- .6 Canadian Institute of Steel Construction (CISC)/Canadian Paint Manufacturer's Association (CPMA)
  - .1 CISC/CPMA 1-73a, A Quick-drying One-coat Paint for Use on Structural Steel.
- .7 The Society for Protective Coatings (SSPC)
  - .1 SSPC Painting Manual, Volume 2, 2008 Edition, SSPC SP-2 Hand Tool Cleaning Surface Preparation Standard

1.2 DESIGN REQUIREMENTS

- .1 Design details and connections in accordance with requirements of CAN/CSA-S16 and CAN/CSA-S136 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 Submit sketches and design calculations stamped and signed by qualified professional engineer licensed in Province of Manitoba, Canada for non-standard connections, such as moment connections.

1.3 SHOP DRAWINGS

- .1 Submit shop drawings including fabrication and erection documents and materials list in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Erection drawings: indicate details and information necessary for assembly and erection purposes including:
  - .1 Description of methods
  - .2 Member size, steel layout, field dimensions, cuts, copings, holes, bolt and weld locations, connections, baseplate elevations, and anchor bolt size and locations.
  - .3 Sequence of erection
  - .4 Type of equipment used in erection
  - .5 Temporary bracing
  - .6 Indicate shop and field bolts and welds separately
  - .7 Welds by welding symbols as defined in CSA W59

- .3 Indicate drilling and cutting requirements for installation of other Sections work.
- .4 Ensure Fabricator drawings showing designed assemblies, components and connections are stamped and signed by qualified professional engineer licensed in the province of Manitoba, Canada.
- .5 Reproduction of contract drawings for use as erection drawings is not permitted without written approval from Departmental Representative.
- .6 Temporary Bracing
  - .1 Submit temporary bracing plan to Departmental Representative for review prior to erection. Plan to show sequence and layout of temporary bracing measures and temporary spacers to ensure consistent expansion joint widths.

1.4 QUALITY ASSURANCE

- .1 If requested, submit 2 copies of mill test reports prior to fabrication of structural steel.
  - .1 Mill test reports to show chemical and physical properties and other details of steel to be incorporated in project.
  - .2 If requested, provide mill test reports certified by metallurgists qualified to practice in province of Manitoba, Canada.
- .2 If requested, provide certification stating that materials and products used in fabrication conform to applicable material and products standards called for by design drawings and specifications.
- .3 Companies must be certified under Division 1 or 2.1 of CSA W47.1 for fusion welding and/or CSA W55.3 for resistance welding.
- .4 If requested, provide certification that all welded joints are qualified by Canadian Welding Bureau.
- .5 If requested, provide Departmental Representative access to plant for examination of steel work undergoing fabrication.
- .6 If requested, provide any materials required for sampling and/or testing.

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Divert unused metal materials from landfill to metal recycling facility.
- .4 Divert unused paint material from landfill to official hazardous material collections site.

- .5 Do not dispose of unused paint materials into sewer systems, into lakes, streams, onto ground or in other location where it will pose health or environmental hazard.

1.6 DELIVERY, STORAGE, AND HANDLING

- .1 Verify available storage space on site.
- .2 Handle and store steel joists on site to cause no damage to new structure and other materials.
- .3 Store structural steel, under cover, on blocks or skids and clear of the ground and standing water.
- .4 Cleaning and Waste Management in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

1.7 SITE CONDITIONS

- .1 Prior to field erection, examine work of other trades on which work of this Section affects and report errors or omissions that may affect this work. Commencement of work indicates acceptance of site conditions.

Part 2 Products

2.1 MATERIALS

- .1 Structural Steel: to CSA G40.20/G40.21 Grade 350W, and CSA S136.
- .2 Plates, Angles, Channels: to CSA G40.20/G40.21, Grade 300 W.
- .3 Structural Steel Hollow Sections: to CSA G40.20/G40.21, Grade 350, Class C. Large diameter HSS to ASTM A500 Grade C.
- .4 Anchor Bolts: to CSA G40.20/G40.21, Grade 300W and ASTM A36/A36M.
- .5 High Strength Anchor Bolts: to A193/A193M and ASTM A325M.
- .6 Bolts, Nuts and Washers: to ASTM A307, ASTM A325M, and ASTM A490/A490M.
- .7 Welding Materials: to CSA W48 and CSA W59, and certified by Canadian Welding Bureau.
- .8 Shop Paint Primer: fast dry alkyd metal shop coat primer (grey) to CISC/CPMA Standard 1-73a.
- .9 Hot Dip Galvanizing: to ASTM A123/A123M.

2.2 FABRICATION

- .1 Fabricate structural steel in accordance with CAN/CSA-S16, CAN/CSA-S136, and in accordance with reviewed shop drawings.
- .2 Install shear studs in accordance with CSA W59.

- .3 Continuously seal members by continuous welds where indicated.
- .4 Provide wall anchors, base plates and weld plates for wall bearing beams.
- .5 Design connections to adequately transfer all shears, bending moments from all live, dead building loads indicated. Weld plates in concrete assume maximum of 75 mm eccentricity to face of plate.
- .6 Make connections not to conflict with architectural clearances.
- .7 Fabricate beams, columns in one piece, full length. Do not fabricate from welded together partial lengths unless approved in writing by Departmental Representative.
- .8 Steel Fabricator to design and supply angles as indicated for support and suspension of mechanical equipment.
- .9 Reinforcing for all openings in steel deck greater than 400mm x 400mm is to be designed, supplied and installed by the structural steel supplier unless noted otherwise. Refer to architectural, structural, mechanical, and electrical drawings for required openings.
- .10 Provide openings for pipes, ducts, etc., reinforce as indicated.
- .11 Provide holes in top and bottom flanges as required for attachment of other work.
- .12 Make all provisions for thermal expansion, contraction.
- .13 Use clean, straight material. Replace material with kinks, bends not indicated.

2.3 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 other foreign matter. Prepare surface according to SSPC-SP-3.
- .3 Apply one coat of grey primer in shop to all steel surfaces to achieve minimum dry film thickness of not less than 1 mil, except:
  - .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 Galvanized steel
- .4 Apply primer under cover on dry surfaces when surface and air temperatures are above 5 degrees C.
- .5 Maintain dry condition and 5 degrees C minimum temperature until primer is thoroughly dry.

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

Part 3 Execution

3.1 GENERAL

- .1 Structural steel work: in accordance with CAN/CSA-S16 and CAN/CSA-S136.
- .2 Welding: in accordance with CSA W59
- .3 All welders and welding procedures to be certified by Canadian Welding Bureau
- .4 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 of steel
- .5

3.2 CONNECTION TO EXISTING WORK

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

3.3 MARKING

- .1 Mark materials in accordance with CAN/CSA G40.20-13/G40.21-13. Do not use die stamping. If steel is to be left in unpainted condition, place marking at locations not visible from exterior after erection.
- .2 Match marking: shop mark bearing assemblies and splices for fit and match.

3.4 ERECTION

- .1 Erect structural steel, as indicated and in accordance with CAN/CSA-S16 and CAN/CSA-S136 and in accordance with reviewed erection drawings.
- .2 Erect finished members true to line free from twists, bends, and open joints. Level and plumb to a tolerance of 1 to 500. Tolerances for member length, straightness, and plumbness to meet CSA G40.20-13/G40.21-13 and CSA S16.
- .3 Cut existing steel components only where shown. Grind smooth all cut surfaces.
- .4 Obtain written permission of Departmental Representative prior to field cutting, field cut holes or altering of structural members that is not shown on shop drawings.
- .5 Clean with mechanical brush and touch up shop primer to bolts, rivets, welds and burned or scratched surfaces at completion of erection.

- .6 Continuously seal members by continuous welds where indicated. Grind smooth.
- .7 Report all failures of material not coming together properly to Departmental Representative before corrective measures taken. Obtain Departmental Representative approval for corrective methods.
- .8 Use wooden mallets to drive, hammer steel members into position. Do not use iron sledges.
- .9 Provide for and assume sole risk and responsibility for dead loads, wind loads, material, erection equipment, other loads, erection stresses, etc. by bolting, guying, or welding work during progress.
- .10 Use sufficient, temporary bracing to maintain structural steel frame plumb, in true alignment until erection complete. Provide spacers between adjacent steel beams at expansion joints.
- .11 Remove on completion temporary bracing, ties used to carry all lateral loads the structure will be subjected to during erection.
- .12 Execute field assembly and welding as called for and required.
- .13 Torque tighten high tensile steel bolt field connections for friction type connection.
- .14 Cut, reinforce all required holes, slots not indicated through structural members necessary for passage of mechanical ductwork, piping, electrical conduits, etc. on site.
- .15 Set column base plates and beam bearing plates level and to proper elevation on leveling nuts or steel shims, ready for grouting.
- .16 Connect upstanding legs of miscellaneous steel lintels 762 mm o/c max. by bolting or welding. Provide minimum 200 mm long bearing each side for full lintel width.
- .17 Erect all columns with vertical misalignment not exceeding 13 mm per 30 m height.
- .18 Ensure members with both ends milled have maximum variation 0.79 mm in overall length.
- .19 Ensure members without milled ends framed into steel structure have variation of detail length maximum 3 mm for members 3 m or less length, maximum 3 mm for members over 3 m.

### 3.5 FIELD PAINTING

- .1 Paint in accordance with Section 09 91 23 - Interior Painting.
  - .1 Touch up all damaged surfaces and surfaces without shop coat with primer to CAN/CGSB-1.40. Apply in accordance with CAN/CGSB 85.10.
  - .2 Touch up galvanized surfaces with zinc rich primer where burned by field welding

3.6 CLEANING

- .1 Clean up rubbish and debris promptly as work proceeds and at conclusion of work. Remove from site.

END OF SECTION



PART 1 - GENERAL

1.1 REFERENCES

- .1 ASTM International
  - .1 ASTM A 53/A 53M-12, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
  - .2 ASTM A 269-13, Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
  - .3 ASTM A 307-12, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
- .2 CSA International
  - .1 CSA G40.20/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
  - .2 CAN/CSA G164-M92(R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.
  - .3 CSA S16-09, Design of Steel Structures.
  - .4 CSA W48-06(R2011), Filler Metals and Allied Materials for Metal Arc Welding (Developed in co-operation with the Canadian Welding Bureau).
  - .5 CSA W59-03(R2008), Welded Steel Construction (Metal Arc Welding) Metric.
- .3 Environmental Choice Program
  - .1 CCD-047-98(R2005), Architectural Surface Coatings.
  - .2 CCD-048-98(R2006), Surface Coatings - Recycled Water-borne.
- .4 Green Seal Environmental Standards (GS)
  - .1 GS-11-2008, 2nd Edition, Paints and Coatings.
- .5 Health Canada / Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (MSDS).
- .6 The Master Painters Institute (MPI)
  - .1 Architectural Painting Specification Manual - current edition.

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 sections, plates, pipe, tubing and bolts and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Submit two copies of WHMIS MSDS in accordance with Health Canada / Workplace Hazardous Materials Information System.

.1 For finishes, coatings, primers, and paints applied on site: indicate VOC concentration in g/L in accordance with Section 01 47 15 - Sustainable Requirements: Construction.

.3 Shop Drawings:

.1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Manitoba, Canada.

.2 Indicate materials, core thicknesses, finishes, connections, joints, method of anchorage, number of anchors, supports, reinforcement, details, and accessories.

### 1.3 QUALITY ASSURANCE

.1 Test Reports: submit certified test reports showing compliance with specified performance characteristics and physical properties.

.2 Certifications: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

### 1.4 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 in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Replace defective or damaged materials with new.

.4 Develop Waste Reduction Workplan related to Work of this Section and in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

.5 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, and packaging materials as specified in Waste Reduction Workplan in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- .1 Steel sections and plates: to CSA G40.20/G40.21, Grade 350W.
- .2 Steel pipe: to ASTM A53/A53M standard weight extra strong double extra strong, black galvanized finish.
- .3 Welding materials: to CSA W59.
- .4 Welding electrodes: to CSA W48 Series.
- .5 Bolts and anchor bolts: to ASTM A307.
- .6 Grout: non-shrink, non-metallic, flowable, 15 MPa at 24 hours.

### 2.2 FABRICATION

- .1 Fabricate work square, true, straight and accurate to required size, with joints closely fitted and properly secured.
- .2 Use self-tapping shake-proof round headed screws on items requiring assembly by screws or as indicated.
- .3 Where possible, fit and shop assemble work, ready for erection.
- .4 Ensure exposed welds are continuous for length of each joint. File or grind exposed welds smooth and flush.

### 2.3 FINISHES

- .1 Galvanizing: hot dipped galvanizing with zinc coating 600 g/m2 to CAN/CSA-G164.
- .2 Chromium plating: chrome on steel with plating sequence of 0.009 mm thickness of copper 0.010 mm thickness of nickel and 0.0025 mm thickness of chromium.
- .3 Shop coat primer: MPI- INT 5.1A MPI- INT 5.1B and in accordance with chemical component limits and restrictions requirements and VOC limits in accordance with Section 01 47 15 - Sustainable Requirements: Construction.
- .4 Zinc primer: zinc rich, ready mix to MPI-INT EXT 5.2C in accordance with chemical component limits and restrictions requirements and VOC limits of in accordance with Section 01 47 15 - Sustainable Requirements: Construction.

2.4 ISOLATION  
COATING

- .1 Isolate aluminum from following components, by means of bituminous paint:
  - .1 Dissimilar metals except stainless steel, zinc, or white bronze of small area.
  - .2 Concrete, mortar and masonry.
  - .3 Wood.

2.5 SHOP PAINTING

- .1 Primer: VOC limit in accordance with Section 01 47 15 - Sustainable Requirements: Construction.
- .2 Apply one shop coat of primer to metal items, with exception of galvanized or concrete encased items.
- .3 Use primer unadulterated, as prepared by manufacturer. Paint on dry surfaces, free from rust, scale, grease. Do not paint when temperature is lower than 7 degrees C.
- .4 Clean surfaces to be field welded; do not paint.

PART 3 - EXECUTION

3.1 EXAMINATION

- .1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for metal fabrications installation in accordance with manufacturer's written instructions.
  - .1 Visually inspect substrate in presence of Departmental Representative.
  - .2 Inform Departmental Representative 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 Departmental Representative.

3.2 ERECTION

- .1 Do welding work in accordance with CSA W59 unless specified otherwise.
- .2 Erect metalwork square, plumb, straight, and true, accurately fitted, with tight joints and intersections.
- .3 Provide suitable means of anchorage acceptable to Departmental Representative such as dowels, anchor clips, bar anchors, expansion bolts and shields, and toggles.
- .4 Exposed fastening devices to match finish and be compatible with material through which they pass.

- .5 Supply components for work by other trades in accordance with shop drawings and schedule.
- .6 Make field connections with bolts to CSA S16 or Weld field connection.
- .7 Deliver items over for casting into concrete and building into masonry together with setting templates to appropriate location and construction personnel.
- .8 Touch-up rivets, field welds, bolts and burnt or scratched surfaces with primer after completion of:
  - .1 Primer: VOC limit in accordance with Section 01 47 15 - Sustainable Requirements: Construction.
- .9 Touch-up galvanized surfaces with zinc rich primer where burned by field welding.
  - .1 Primer: VOC limit in accordance with Section 01 47 15 - Sustainable Requirements: Construction.

### 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.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
  - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

### 3.4 PROTECTION

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

END OF SECTION