

PART 1 - GENERAL

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| <u>1.1 RELATED REQUIREMENTS</u> | .1 | Section 01 11 00 - General Instructions. |
| | .2 | Section 09 91 13 - Exterior Painting. |
| <u>1.2 PRICE AND PAYMENT PROCEDURES</u> | .1 | Include materials and work required under this section in lump sum price tender bid for structural steel for bridges includes:
.1 Ensure lump sum price includes radiographic examination of optional shop splices and additional field splices. |
| | .2 | Measure structural steel for bridges in tonnes of steel incorporated into Work, computed on basis of CISC Code of Standard Practice including nuts, bolts and washers.
.1 Ensure lump sum price includes radiographic examination of optional shop splices and additional field splices. |
| <u>1.3 REFERENCES</u> | .1 | American Association for State Highway and Transportation Officials (AASHTO)
.1 AASHTO Standard Specifications for Highway Bridges-17th Edition 2002. |
| | .2 | ASTM International
.1 ASTM A 325M-10, Standard Specification for Structural Bolts, Steel, Heat Treated 830 MPa Minimum Tensile Strength Metric.
.2 ASTM A 490M-09, Standard Specification for High-Strength Steel Bolts, Classes 10.9 and 10.9.3, for Structural Steel Joints. |
| | .3 | 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 CAN/CSA S6-06, Canadian Highway Bridge Design Code.
.4 CSA S16-09, Design of Steel Structures.
.5 CSA S269.1-1975(R2003), Falsework for Construction Purposes.
.6 CAN/CSA S826 Series-01, Ferry Boarding Facilities - Design. |
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| 1.3 REFERENCES
(Cont'd) | .3 | (Cont'd) |
| | .7 | CSA W48-06, Filler Metals and Allied Materials for Metal Arc Welding. |
| | .8 | CSA W59-03(R2008), Welded Steel Construction, (Metal Arc Welding). |
| 1.4 ADMINISTRATIVE REQUIREMENTS | .1 | Pre-Installation Meetings: |
| | .1 | Convene pre-installation meeting one week prior to beginning work of this Section and on-site installation, with Departmental Representative to: |
| | .1 | Verify project requirements. |
| | .2 | Review installation and substrate conditions. |
| | .3 | Co-ordination with other building subtrades. |
| | .4 | Review manufacturer's written installation instructions and warranty requirements. |
| | .2 | Prior to start of Work arrange for site visit with Departmental Representative to examine existing site conditions adjacent to demolition work. |
| | .3 | Hold project meetings every week. |
| | .4 | Ensure key personnel site supervisor, project manager and subcontractor representatives attend. |
| | .5 | Departmental Representative will provide written verbal notification of change to meeting schedule established upon contract award 24 hours prior to scheduled meeting. |
| | .6 | Site Meetings: as part of Manufacturer's Services described in PART 3 - FIELD QUALITY CONTROL, schedule site visits, to review Work. |
| 1.5 ACTION AND INFORMATIONAL SUBMITTALS | .1 | Submit in accordance with Section 01 33 00 - Submittal Procedures. |
| | .2 | Product Data: |
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1.5 ACTION AND
INFORMATIONAL
SUBMITTALS
(Cont'd)

- .2 (Cont'd)
 - .1 Submit manufacturer's installation instructions, printed product literature and data sheets for structural steel and include product characteristics, performance criteria, for structural steel and connection items and include product characteristics, performance criteria, recommended design values, physical size, and limitations.
 - .2 Submit two copies of WHMIS MSDS in accordance with Section 01 35 29.06 - Health and Safety Requirements 01 35 43 - Environmental Procedures.
- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Nova Scotia and Prince Edward Island, Canada.
 - .2 Indicate shop and erection details including shop splices, cuts, copes, connections, holes, bearing plates, threaded fasteners, epoxy anchoring system, rivets and welds. Provide design loads for stamped and signed shop drawings by CSA W59, welding symbols.
 - .3 Proposed welding procedures to be stamped and approved by Canadian Welding Bureau.
 - .4 Submit description of methods, temporary bracing and strengthening, sequence of erection and type of equipment proposed for use in erecting structural steel.
- .4 Sustainable Design Submittals: 1
Construction Waste Management:
 - .1 Submit project Waste Management Plan Waste Reduction Workplan highlighting recycling and salvage requirements.
- .5 Quality Assurance Sumittal:
 - .1 Test reports: Provide certified test reports showing compliance with specified performance characteristics and physical properties of post-installed concrete anchoring system.

1.5 ACTION AND
INFORMATIONAL
SUBMITTALS
(Cont'd)

- .6 Installer Qualifications & Procedures for Post-Installed Concrete Anchoring System and Exterior Paint Application: Submit installer qualifications and a letter of procedure stating method of installation/ application, the product purpose for use, the complete installation/ application procedure, and manufacturer training date approval.

1.6 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.
- .1 Ensure Departmental Representative has delivery schedules 7 days minimum prior to shipping.
- .3 Storage and Handling Requirements:
- .1 Provide protective blocking for lifting, transportation and storing.
- .1 Exercise care during fabrication, transportation and erection of girders and beams.
- .2 Do not notch edges of members.
- .3 Do not cause excessive stresses.
- .2 Mark mass on members weighing more than 3 tonnes.
- .3 Protect unpainted weathering steel, before erection, with waterproof covering.
- .4 Ensure that no portion of steel comes into contact with ground.
- .1 Replace defective or damaged materials with new.
- .4 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, and packaging materials as specified in Construction Waste Management Plan Waste Reduction Workplan in accordance with Section 01 74 21 - Construction/Demolition Waste Management.

1.7 QUALITY
ASSURANCE

- .1 Preconstruction Testing:
 - .1 Provide suitable facilities and cooperate with inspection organization and Departmental Representative in carrying out inspection and tests required.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Structural steel: to CSA G40.20/G40.21.
 - .1 W Sections: Grade 350W.
 - .2 Hollow structural sections: Grade 350W Class "C".
 - .3 Rolled channels and angles: Grade 300W.
 - .4 Plates: Grade 300W.
 - .5 Threaded rods: specially threaded for Galvanizing. Grade 300W.
 - .6 Threaded Rod Anchors: AISI Type 316 SS not cut from bulk threaded rod.
 - .7 Bar/Pin: Grade 300W.
 - .8 Leave atmospheric corrosive resistant steel and connections material unpainted, include bolts, nuts, washers and weld deposits of compatible weathering characteristics.
- .2 High strength bolts, nuts and washers: to ASTM A 325M unless noted otherwise.
- .3 Anchor bolts, washers and nuts: to CSA G40.20/G40.21, grade 300W galvanized.
- .4 Welding electrodes: to CSA W48 series.
- .5 Hot dip galvanizing and spun: to CAN/CSA G164, minimum zinc coating of 600 g/m².
- .6 Shrinkage compensating grout: premixed compound consisting of metallic non-metallic aggregate, Portland cement, water reducing and plasticizing agents.

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| <u>2.1 MATERIALS</u>
(Cont'd) | .7 | Cartridge Injection Adhesive Anchors:
Threaded stainless steel rod anchors complete with nuts and washers of matching alloy group and minimum proof stress of equal to or greater than the specified minimum full-size tensile strength of the externally threaded fastener. Polymer or hybrid adhesive injectable mortar system to withstand submerged, water-filled, or wet base material condition. |
| <u>2.2 SOURCE QUALITY CONTROL</u> | .1 | Steel producer qualifications: certified in accordance with CSA G40.20/G40.21. |
| | .2 | Submit Departmental Representative 2 copies of certified test reports for Charpy V-notch test. |
| | .3 | Provide suitable facilities and co-operate with inspection organization and Departmental Representative in carrying out inspection and tests required. |

PART 3 - EXECUTION

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| <u>3.1 EXAMINATION</u> | .1 | Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for structural steel installation in accordance with manufacturer's written instructions.
.1 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
.2 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative. |
| <u>3.2 PREPARATION</u> | .1 | Clean steel surfaces as directed by Departmental Representative when staining or defacing occurs. |
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3.2 PREPARATION
(Cont'd)

- .2 Clean holes with a non oil compressor per manufacturer instructions to remove loose material and drilling dust prior to installation of post-installed adhesive anchoring system.
- .3 Verify location of substructure units, elevations of bearing seats and baseplates, and location of anchor bolts before erection of structural steel; report discrepancies to Departmental Representative.
- .4 Work near river banks or embankments in accordance with written instructions from Departmental Representative.
- .5 Restrict drifting during assembly to minimum required to bring parts into position without enlarging or distorting holes, and without distorting, kinking or sharply bending metal of any unit.
 - .1 Enlarge holes if necessary by reaming only after receipt of written approval from Departmental Representative.
 - .2 Ensure reamed holes are 2 mm maximum larger than bolt size used.
- .6 Place anchor bolts at elevations and locations indicated.
 - .1 Protect holes against entry of water and foreign material.
 - .2 Provide heating and protection as directed by Departmental Representative and completely fill space around anchor bolts with grout.

3.3 INSTALLATION

- .1 Do falsework in accordance to CSA S269.1.
- .2 Do fabrication and erection of structural steel in accordance with CAN/CSA S6, Design of Highway Bridges AASHTO Standard Specifications for Highway Bridges Ontario Highway Bridge Design Code.
- .3 Do welding in accordance with CSA W59, except where specified otherwise.
 - .1 Do welding in shop unless otherwise permitted by Departmental Representative.
 - .2 Weld only at locations indicated.

3.3 INSTALLATION (Cont'd)

- .4 High strength bolting: in accordance with CAN/CSA S6 CSA S16. Use 'turn-of-nut' tightening method.
- .5 Finish: members true to line, free from twists, bends, open joints, sharp corners and sharp edges.
- .6 Allowable tolerance for bolt or rivet holes:
 - .1 Matching holes for rivets and bolts to line up so that dowel 2 mm less in diameter than hole passes freely through assembled members at right angles to such members.
 - .2 Finish holes not more than 2 mm in diameter larger than diameter of rivet or bolt unless otherwise specified by Departmental Representative.
 - .3 Centre-to-centre distance between any two holes of group to vary by not more than 1 mm from dimensioned distance between such holes.
 - .4 Centre-to-centre distance between any two groups of holes to vary not more than maximum of the following:

Centre-to-Centre distance in metres	Tolerance in plus or minus mm
less than 10	1
10 to 20	2
20 to 30	3

- .5 Correct mispunched or misdrilled members only as directed by Departmental Representative.
- .7 Span length tolerances:
 - .1 Girders and beams: plus or minus 6 mm
 - .2 Centre-to-centre of bearing stiffeners and bearing plates: plus or minus 3 mm.
- .8 Girder support requirements:
 - .1 Support top and bottom flanges of ends of girders and intermediate bearing locations of continuous girders parallel to each other at 90 degrees to girder web.
 - .2 Install flat and smooth except as otherwise indicated.
 - .3 Install bearing stiffeners after girder support requirements have been met.
 - .4 Correct irregularities of flanges of girders as permitted by Departmental Representative.

3.3 INSTALLATION
(Cont'd)

- .9 Shop splices:
 - .1 Use complete joint penetration groove welds finished flush.
 - .2 Details of butt joints to CSA W59.
 - .3 Use only as approved by Departmental Representative.
 - .10 Camber:
 - .1 Camber tolerances for plate girders to be to CSA W59.
 - .2 Record measurements of camber of each girder, at points indicated.
 - .3 Fabricate field splices to conform to required camber.
 - .4 Submit diagram to Departmental Representative showing camber for each girder fabricated.
 - .5 Advise Departmental Representative immediately when camber of fabricated girder is greater than specified tolerances.
 - .6 Submit proposal for corrective measures.
 - .7 Undertake remedial measures as approved by Departmental Representative.
 - .11 Shop erection:
 - .1 Support each girder on its bearing points and measure and record deflection at same points indicated for measurement of camber.
 - .2 Measure deflections in plane of girder web.
 - .3 Submit diagram to Departmental Representative showing deflection measurements for each girder before delivery.
 - .4 Shop erection is not required for single span girders with no field splices.
 - .12 Field splices: to approval of Departmental Representative.
 - .13 Mark members in accordance with CSA G40.20/G40.21.
 - .1 Do not use die stamping.
 - .2 Place marking at locations hidden when viewed from exterior after erection when steel is to be left in unpainted condition.
 - .14 Match marking: shop mark bearing assemblies and splices.
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3.3 INSTALLATION
(Cont'd)

- .15 Do injection of adhesive anchoring system in accordance with manufacturer instructions. Do not disturb or load anchors before manufacturer specified cure time has elapsed.
- .16 Submit details of installation and methods of support to Departmental Representative for review prior to commencing protection work.
- .17 Maintain protection of concrete for days after completion of steel erection.
 - .1 Remove waterproof covers and drains and holding structures when steel erection complete.

3.4 FIELD QUALITY
CONTROL

- .1 Manufacturer's Field Services:
 - .1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, protecting and cleaning of steel.
 - .2 Submit manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
 - .3 Ensure manufacturer's representative is present before installation, during critical periods of installation and during construction of field joints testing.
 - .4 Schedule site visits:
 - .1 Upon completion of the Work, after cleaning is carried out.

3.5 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.
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3.5 CLEANING
(Cont'd)

- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal 01 35 21 - LEED Requirements.
- .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

PART 1 - GENERAL

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| <u>1.1 RELATED SECTIONS</u> | .1 | Section 01 33 00 - Submittal Procedures. |
| | .2 | Section 01 74 21 - Construction/Demolition Waste Management And Disposal. |
| | .3 | Section 09 91 13 - Exterior Painting. |
| <u>1.2 REFERENCES</u> | .1 | American Society for Testing and Materials International, (ASTM)
.1 ASTM A 53/A53M-07, Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Steamless.
.2 ASTM A 307-07b, Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength. |
| | .2 | Canadian General Standards Board (CGSB)
.1 CAN/CGSB-1.40-97, Anti-corrosive Structural Steel Alkyd Primer.
.2 CAN/CGSB-1.181-99, Ready-Mixed, Organic Zinc-Rich Coating. |
| | .3 | Canadian Standards Association (CSA International)
.1 CSA-G40.20-04/G40.21-04, General Requirements for Rolled or Welded Structural Quality Steel.
.2 CAN/CSA-G164-M92(R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.
.3 CAN/CSA-S16-01 (R2007)), Limit States Design of Steel Structures.
.4 CSA W48-06, Filler Metals and Allied Materials for Metal Arc Welding (Developed in co-operation with the Canadian Welding Bureau).
.5 CSA W59-03, Welded Steel Construction (Metal Arc Welding) (Imperial Version). |
| | .4 | The Environmental Choice Program
.1 CCD-047a-98, Paints, Surface Coatings.
.2 CCD-048-98, Surface Coatings - Recycled Water-borne. |
| <u>1.3 SUBMITTALS</u> | .1 | Product Data: |
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1.3 SUBMITTALS
(Cont'd)

- .1 (Cont'd)
 - .1 Submit two copies of WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 33 00 - Submittal Procedures. Indicate VOC's:
 - .1 For finishes, coatings, primers and paints.
- .2 Shop Drawings
 - .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
 - .2 Indicate materials, core thicknesses, finishes, connections, joints, method of anchorage, number of anchors, supports, reinforcement, details, and accessories.

1.4 QUALITY
ASSURANCE

- .1 Test Reports: Certified test reports showing compliance with specified performance characteristics and physical properties.
- .2 Certificates: Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

1.5 DELIVERY,
STORAGE AND
HANDLING

- .1 Packing, Shipping, Handling and Unloading:
 - .1 Deliver, store, handle and protect materials in accordance with Section 01 61 00 - Common Product Requirements.

1.6 WASTE
MANAGEMENT AND
DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 - Waste Management And Disposal.
 - .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
 - .3 Collect and separate for disposal paper, plastic, polystyrene and corrugated cardboard packaging material for recycling in accordance with Waste Management Plan.
 - .4 Divert unused metal materials from landfill to metal recycling facility approved by Departmental Representative.
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PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Steel sections and plates: to CAN/CSA-G40.20-04/G40.21-04, Grade 300W.
- .2 Steel pipe: to ASTM A 53/A53M-06a extra strong, black finish.
- .3 Welding materials: to CSA W59-03.
- .4 Welding electrodes: to CSA W48-06 Series.
- .5 Bolts and anchor bolts: to ASTM A 307-04e1.
- .6 Grout: non-shrink, non-metallic, flowable, 50 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 flat 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-M92(R2003).
- .2 Shop coat primer: to CAN/CGSB-1.40.
- .3 Zinc primer: zinc rich, zinc rich epoxy, to CAN/CGSB-1.181-99.

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.

2.4 ISOLATION .1 (Cont'd)
COATING .2 Concrete, mortar and masonry.
(Cont'd)

2.5 SHOP PAINTING .1 Apply exterior paint systems to new or modified metal items in accordance with Section 09 91 13 Exterior Painting, with exception of galvanized or concrete encased items.
.2 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.
.3 Clean and prepare surface to be field welded to SSPC SP-6.

2.6 SCHEDULE OF ITEMS .1 Miscellaneous metal fabrication items include, but are not limited to, the following:
.1 New or existing lateral bracing of structural steel frame; shop painted in accordance with Section 09 91 13.
.2 Add framing for counterweight guides and guide supports; shop painted in accordance with Section 09 91 13.
.3 Exterior railings, guards, and non-structural protective frames; shop painted in accordance with Section 09 91 13.

PART 3 - EXECUTION

3.1 ERECTION .1 Do welding work in accordance with CSA W59-03 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 DCC Representative such as dowels, anchor clips, bar anchors, expansion bolts and shields, and toggles.

3.1 ERECTION
(Cont'd)

- .4 Exposed fastening devices to match finish and be compatible with material through which they pass.
- .5 Provide components for building by other sections in accordance with shop drawings and schedule.
- .6 Make field connections with bolts to CAN/CSA-S16.1-94(R2000), or weld.
- .7 Hand items over for casting into concrete or building into masonry to appropriate trades together with setting templates.
- .8 Touch-up rivets, field welds, bolts and burnt or scratched surfaces after completion of erection with primer.
- .9 Touch-up galvanized surfaces with zinc rich primer where burned by field welding or damaged during erection.

3.2 CLEANING

- .1 Perform cleaning after installation to remove construction and accumulated environmental dirt.
- .2 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.