CONSTRUCTION SPECIFICATION FOR STRUCTURAL STEEL FOR BRIDGES

TABLE OF CONTENTS

906.01 SCOPE

This specification covers the construction requirements for the fabrication, delivery, and erection of structural steel for highway bridges.

906.02 REFERENCES

This specification refers to the following standards, specifications, or publications:

Ontario Provincial Standard Specifications, Construction

OPSS 911 Coating Structural Steel Systems
OPSS 919 Formwork and Falsework
OPSS 922 Installation of Bearings

Ontario Provincial Standard Specifications, Materials

OPSS 1202 Bearings-Elastomeric Plain and Steel Laminated
OPSS 1203 Bearings-Rotational and Sliding Surface

Ontario Ministry of Transportation Publications

Structural Manual

CSA Standards

B95-1962 (R2002)	Surface Texture (Roughness, Waviness and Lay)
G40.20/40.21-13 (R2018)	General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel
S6-19	Canadian Highway Bridge Design Code
W47.1-09 (R2014)	Certification of Companies for Fusion Welding of Steel
W48-18	Filler Metals and Allied Materials for Metal Arc Welding
W59-18	Welded Steel Construction (Metal Arc Welding)
W178.1-18	Certification of Welding Inspection Organizations
W178.2-18	Certification of Welding Inspectors

ASTM International

A108 - 18	Steel Bar, Carbon and Alloy, Cold-Finished
A563M - 07(2013)	Carbon and Alloy Steel Nuts (Metric)
A588 / A588M - 19	High-Strength Low-Alloy Structural Steel, up to 50 ksi [345 MPa] Minimum Yield Point, With Atmospheric Corrosion Resistance
A709 / A709M - 18	Structural Steel for Bridges
F436 / F436M - 18	Hardened Steel Washers Inch and Metric Dimensions
F3125 / F3125M - 19	High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength

International Organization for Standardization/International Electrotechnical Commission (ISO/IEC)

17025:2017 General Requirements for the Competence of the Testing and Calibration Laboratories

Joint Publications of the Society for Protective Coatings (SSPC) and National Association of Corrosion Engineers (NACE)

SSPC-SP6/NACE No. 3-2007 Commercial Blast Cleaning

906.03 DEFINITIONS

For the purpose of this specification, the following definitions apply:

Bearing Contact Area means two planes that are in contact or have a separation between them not exceeding 0.12 mm.

Erection Diagrams means drawings showing the dimensioned layout of the steel structure, from which shop details are made, and that correlate the fabricator's piece markings with the location in the structure.

Faying Surface means the mating surface of a member that is in contact with another member to which it is to be joined.

Flush means a profile of weld reinforcement in which there is a smooth gradual transition between the base and weld metal involving grinding where necessary. Weld reinforcement not exceeding 1 mm in height may remain on each surface, unless the weld is part of a faying surface when all reinforcement is removed.

Fracture Critical Member means a member, including attachments, in a single load path structure that is subject to tensile stress and whose failure could lead to collapse of the structure.

Inspector means an individual who is a Canadian Welding Bureau (CWB) certified Level 2 or Level 3 inspector according to the requirements of CSA W178.2 and has documented evidence of professional knowledge, skill, and experience in the inspection of fabrication and erection of steel bridges.

New Steel means structural steel that has not previously been used.

Non-Destructive Testing Technician means an individual who has documented evidence of training, professional knowledge, skill, and experience in non-destructive testing of structural steel welds and material, and has a valid certificate showing qualification to a Level 2 or 3 according to CGSB 48.9712 for the non-destructive testing specified.

Primary Tension Member means a member including attachments that are subject to tension stress.

Smooth means a profile of weld reinforcement, in which the surface finish or weld reinforcement has sufficiently smooth gradual transition, involving grinding where necessary. Weld reinforcement not exceeding the following limits, may remain on each surface:

2 mm for plate thickness ≤ 50 mm
3 mm for plate thickness > 50 mm

Snug Tight means the tightness attained by a few impacts of an impact wrench or the full effort of a person using a spud wrench.

906.04 DESIGN AND SUBMISSION REQUIREMENTS

906.04.01 Design Requirements

906.04.01.01 General

Design shall be according to CSA-S6 and the Structural Manual.

906.04.01.02 Welding

Welding design shall be according to CSA W59.

Welding procedures shall be according to CSA W47.1 and CSA W59, except where modified by CSA-S6, Clause A10.1.5.

Symbols for welding and non-destructive testing shall be according to CSA W59.

906.04.02 Submissions

906.04.02.01 General

When other authorities are involved in the approval of the design or construction of a highway structure, submissions shall be made at least 35 Days prior to commencement of work and one additional copy of the submission shall be provided for each authority.

The requirements of each authority shall be satisfied prior to commencement of fabrication.

906.04.02.02 Shop Drawings and Welding Procedures

Three sets of the shop drawings and welding procedures shall be submitted to the Contract Administrator at least seven Days prior to commencement of fabrication, for information purposes only. Prior to making a submission, an Engineer's seal and signature shall be affixed on the shop drawings and welding procedures verifying that the details and procedures are in conformance with the Contract Documents.

The shop drawings shall include at least the following:

a) Full detail dimensions and sizes of all component parts of the structure. These dimensions shall make allowance for changes in shape due to weld shrinkage, camber, and any other effects that cause finished dimensions to differ from initial dimensions.

b) Identification marking of each member for erection.

c) All necessary specifications and standards for the materials to be used.

d) Identification of areas requiring special surface treatment.

e) Identification of fracture-critical and primary tension members and component parts. Attachments having a length of more than 100 mm in the direction of tension and welded to the tension zone of a fracture-critical or primary tension member shall be treated as part of that member.

f) Bolt installation requirements, including number of fitting up bolts required at each connection and oversize and slotted holes.

g) Details of all welds, including the identification of any welds which require a surface finish of smooth or flush.

h) Identification of material and welds requiring non-destructive testing, including the limits of the weld undergoing testing and the frequency and type of testing.

i) Temporary welds.

j) Location of shop and field splices.

Fabrication shall not commence until the fabricator has received one set of shop drawings and welding procedures sealed and signed by an Engineer.

A copy of the shop drawings and welding procedures shall be at the fabrication facility during fabrication.

906.04.02.03 Erection Diagrams and Erection Procedure Drawings and Calculations

Three sets of the erection diagrams and erection procedure drawings and calculations shall be submitted to the Contract Administrator at least seven Days prior to commencement of erection, for information purposes only. Prior to making a submission, an Engineer's seal and signature shall be affixed on the erection diagrams and erection procedure drawings and calculations verifying that the erection diagrams and erection procedure drawings and calculations are consistent with the Contract Documents.

Erection diagrams and erection procedure drawings shall include at least the following:

a) Principal dimensions of the bridge.

b) Identification marking of each member for erection.

c) Sizes of all members.

d) Field welding requirements, including identification of welds requiring non-destructive testing.

e) Size and type of bolts.

f) Bolt installation requirements, including the number of fitting up bolts required at each connection and identification of oversize and slotted holes.

g) Bracing during erection of structural steel.

h) Treatment at faying surfaces for joints designed as slip critical.

Erection shall not commence until one set of erection diagrams and erection procedure drawings and calculations sealed and signed by an Engineer have been received.

A copy of the erection diagrams and the erection procedure drawings and calculations shall be at the site during erection.

906.04.02.04 Mill Test Certificates

Prior to the use of any material in fabrication, two copies of the mill test certificates for that material shall be submitted to the Contract Administrator, confirming that the material is according to the Contract Documents.

Copies of the mill test certificates for all material to be used in the fabrication shall be available for review at the fabricating plant during fabrication. The certificates shall show that the material is according to the Contract Documents.

Material used in fabrication shall be directly traceable to the mill test certificate. When material is divided, identification marking shall be transferred to all pieces.

When mill test certificates originate from a mill outside of Canada or the United States of America, the information on the mill test certificate shall be verified by testing at a Canadian laboratory. This laboratory shall be certified by an organization accredited by the Standards Council of Canada to comply with the requirements of ISO/IEC 17025 for the specific tests or type of tests required by the material standard specified on the mill test certificate. The Canadian laboratory's test certificate shall be identified with the name of the laboratory and appropriate wording stating that the material is according to the specified Contract requirements. The certificate shall include the appropriate material specification number, testing date (i.e., yyyy-mm-dd), signature of an authorized officer of the Canadian laboratory, and be traceable to the original mill test certificate. Material coupons to be tested in the Canadian Laboratory for the purpose of verifying mill test certificates originating from a mill outside of Canada or the Unites States of America shall be taken from the material sample once the material has arrived in Canada.

906.04.02.05 Test Reports for Fasteners

Proof that the bolts, nuts, and washers meet the chemical composition, mechanical properties, dimensions, workmanship, and head burst as required by ASTM F3125, ASTM A563, or ASTM F436 shall be submitted to the Contract Administrator. Verification of the acceptability of assemblage of zinc-coated bolts, nuts, and washers delivered to the job site shall also be submitted to the Contract Administrator.

For bolts, nuts, and washers supplied from a manufacturer outside Canada or the United States of America, the above information shall be verified by testing at a Canadian laboratory as outlined in the Mill Test Certificates clause.

906.04.02.06 Independent Testing Organization and Technician Information

The name of the independent testing organization and the non-destructive testing technicians, together with proof of certification, shall be submitted to the Contract Administrator a minimum of seven Days prior to the commencement of fabrication, for information purposes only.

906.04.03 Inspection after Fabrication of the Structural Steel

A Manufacturer's Certificate of Conformance and a Request to Proceed shall be submitted to the Contract Administrator upon completion of the fabrication of the structural steel and prior to shipping from the plant.

The structural steel shall not be delivered from the plant until the Contract Administrator has received the Manufacturer's Certificate of Conformance, Request to Proceed, and issued a Notice to Proceed.

906.05 MATERIALS

906.05.01 Steel

Structural steel shall be new steel and of the grade and category specified in the Contract Documents and shall be according to CSA G40.20/G40.21.

ASTM A588 may be substituted when either of the following steel grades have been specified:

a) CSA G40.20/G40.21, Grade 350A.

b) CSA G40.20/G40.21, Grade 350AT, when the Charpy impact energy requirements are verified by the submission of test documentation.

ASTM A709, Grade 345 or Grade 345S may be substituted when either of the following steel grades have been specified:

a) CSA G40.20/G40.21, Grade 350W.

b) CSA G40.20/G40.21, Grade 350WT, when the Charpy impact energy requirements are verified by the submission of test documentation.

Substitution of other material for size and grade is not permitted unless approval is received from the Contract Administrator.

Material testing shall confirm that all structural steel to be used in welded fabrication contains less than 0.0008% boron. Boron content shall be reported on the mill test certificate. When verification by testing at a Canadian laboratory is required as outlined in the Mill Test Certificate clause, the boron content shall also be verified and reported.

The steel shall be identified as specified in the Control of Material clause.

906.05.02 High Strength Bolts, Nuts, and Washers

High strength bolts shall be according to ASTM F3125, Grade A325M or Grade A490M.

High strength nuts, and hardened washers shall be suitable for use with the types of bolts being specified and shall be according to ASTM A563 and ASTM F436.

The nuts, bolts, and washers shall be supplied and shipped together as an assembly from the same manufacturer.

High strength bolts, nuts, and washers for use with unpainted corrosion-resistant steel shall be Type 3. Bolts, nuts, and washers used with steel specified in the Contract Documents to receive a paint coating or galvanizing shall be Type 1 and shall be galvanized. High strength Grade A490M bolts shall not be galvanized or plated.

906.05.03 Electrodes

Welding electrodes, electrode and flux or electrode and gas combinations shall be low hydrogen (level H16 or less) and shall be according to CSA W47.1, CSA W48, and Section 12 of CSA W59.

The weld metal shall meet the Charpy V notch impact energy requirements of CSA-S6, Table 10.15 for fracture-critical members and Table 10.14 for primary tension members.

Weld metal used with corrosion resistant steels shall have similar corrosion resistance and colour to the base metal and shall be according to CSA W59.

906.05.04 Stud Shear Connectors

Stud shear connectors shall meet the requirements of ASTM A108 Grades G10100 to G10200. All stud shear connectors shall meet the requirements of CSA W59, Annex H. Only studs of Type B as defined by CSA W59, Annex H, shall be used.

906.05.05 Pins and Rollers

Pins and rollers more than 175 mm in diameter shall be forged and annealed or forged and normalized. Pins and rollers 175 mm or less in diameter shall be forged and annealed, forged and normalized, or cold-finished carbon-steel shafting.

906.05.06 Bearings

Bearings shall be according to OPSS 1202 or OPSS 1203 or both.

906.07 CONSTRUCTION

906.07.01 Fabrication

906.07.01.01 General

The fabrication shall be according to CSA-S6, Clause A10.1.4.

All Atmospheric Corrosion Resistant (ACR) steel components shall be abrasive blast-cleaned according to SSPC-SP6/NACE No. 3 to completely remove mill scale, rust, coating, oxides, corrosion products, oil, grease, dust, dirt, and other foreign matter.

906.07.01.02 Plate Edges

Plasma arc cutting of plates up to and including 25 mm in thickness is permitted. Plasma arc cutting of plates thicker than 25 mm shall not be permitted unless approval is received in writing from the Contract Administrator. Plasma arc cutting of plates shall use oxygen as the cutting gas and all edges shall be square and free of dross.

The quality of cut edges and the inspection and repair of planar discontinuities shall be according to CSA W59.

Corners of oxygen cut girder flanges shall be chamfered 1.5 to 2.0 mm by grinding.

906.07.01.03 Straightening Material

Material with sharp kinks shall be rejected. Straightening of bends shall only be done using mechanical means or by the application of controlled heating according to CSA W59. Details of the straightening procedure including testing requirements, sealed and signed by an Engineer shall be submitted to the Contract Administrator prior to the straightening, for information purposes only.

Straightening shall only be carried out in the presence of the Owner's inspector. The Contract Administrator shall be given seven Days prior notice to arrange for the inspection.

If necessary, the Contract Administrator shall specify additional testing to be performed by the Contractor. If evidence of damage is discovered, the material shall be rejected, and the cost of testing shall be at the expense of the Contractor.

906.07.01.04 Cambering

When rolled sections are heat cambered, the details of the heat cambering procedure, sealed and signed by an Engineer, shall be submitted to the Contract Administrator seven Days prior to cambering, for information purposes only.

Plate girders shall have the required camber cut into the web with suitable allowance for camber loss due to cutting and welding.

Steel box girders fabricated with webs in an upright position shall have the fabricated camber verified by subtracting ordinates for deflections for girder segments from the relaxed camber diagram ordinates.

The use of heat to alter the camber of fracture critical or primary tension members shall be subject to approval by the Contract Administrator prior to the application of heat.

The ends of cambered girders shall be vertical under full dead load.

906.07.01.05 Horizontally Curved Girders

906.07.01.05.01 Heat Curving of Rolled Beams and Welded Girders

Girders shall be cambered before heat curving.

A detailed procedure for the heat curving operation, sealed and signed by an Engineer, shall be submitted to the Contract Administrator 14 Days prior to heat curving, for information purposes only.

906.07.01.06 Identification Marking for Erection

Each member shall carry an erection mark for identification.

Permanent marking shall be affixed in an area not exposed to view in the finished structure.

906.07.01.07 Welded Construction

906.07.01.07.01 General

All welded construction shall be according to CSA W59 and Clause A10.1.5 of CSA-S6.

All welding shall be carried out by welders having a CSA W47.1 identification card valid for the type of welding to be done and for the duration of the welding work.

The fabrication weld metal requirements, base metal repairs, and repairs of weld in fracture critical and primary tension members shall be according to CSA-S6, Clause 10.23.6.

Any company responsible for welding structures fabricated or erected according to CSA-S6 shall be certified according to CSA W47.1, Division 1 or 2.

906.07.01.07.02 Altering the Sweep of Fracture-Critical and Primary Tension Members

The use of heat to alter the sweep of fracture critical or primary tension members shall be subject to approval by the Contract Administrator, prior to the application of heat.

906.07.01.07.03 Submissions of Repair Procedures

Canadian Welding Bureau (CWB) approved welding procedure specifications, data-sheets, and repair procedures for prequalification sealed and signed by an Engineer, shall be submitted for approval to the Contract Administrator 14 Days prior to commencement of work.

906.07.01.07.04 Assembly for Welding

Assembly for welding shall be according to CSA W59 and the following:

a) Bearing stiffeners shall be vertical under full dead load.

b) Intermediate stiffeners shall be either true vertical or perpendicular to the horizontal work lines used to layout the girder.

c) Bearing stiffeners fitted to bear shall have a minimum bearing contact area of 75% and a maximum separation of 1 mm over the remaining area.

d) Fitted intermediate stiffeners shall have a minimum bearing contact area of 25% and a maximum separation of 2 mm.

906.07.01.07.05 Temporary Welds

Temporary welds shall not be used on fracture-critical and primary tension members.

Temporary welds shall not be used on flange material in compression, unless approved by the Contract Administrator.

906.07.01.07.06 Preheat, Interpass Temperature, and Heat Input Control

When making welding repairs to fracture-critical and primary tension members, the preheat requirements shall be according to CSA-S6, Table 10.16.

906.07.01.07.07 Profile of Welds

Profile of welds shall be according to CSA W59 and the Structural Manual.

906.07.01.07.08 Corrections

Welding corrections and repairs to fracture-critical and primary tension members shall be according to CSA-S6, Clause 10.23.6.

Any steel members subjected to shape corrections or straightening shall be allowed to cool in still air.

906.07.01.07.09 Peening

Peening, when required, shall be subject to approval by the Contract Administrator.

906.07.01.07.10 Stress Relief-Heat Treatment

Stress relief-heat treatment temperatures shall be recorded using thermo-couples or other methods acceptable to the Contract Administrator. A record showing temperature and time data of the heat-treating operation shall be maintained and be made available to the Contract Administrator upon request.

906.07.01.07.11 Welding Inspection

906.07.01.07.11.01 General

All welding inspection shall be according to CSA W59.

906.07.01.07.11.02 Identification Cards - Canadian Welding Bureau

Prior to commencement of welding, the Canadian Welding Bureau's transferable or non-transferable identification cards for each tacker, welder, or welding operator to be employed on the work shall be made available to the Contract Administrator. Such identification cards shall be currently valid and shall indicate the welding processes and the welding positions at which the personnel are qualified to weld.

906.07.01.07.11.03 Certification of the Independent Testing Organization

The independent organization undertaking welding testing under the Quality Control subsection shall be certified for testing bridges according to CSA W178.1. The certification shall encompass at least the following methods: radiographic, ultrasonic, and magnetic particle.

906.07.01.07.11.04 Certification of the Non-Destructive Testing Technician

The independent organization’s non-destructive testing technician undertaking non-destructive testing of welds under the Quality Control subsection shall be certified according to CGSB 48.9712 Level 2 or Level 3 for the methods used.

906.07.01.07.12 Welding Corrections and Repairs for Fracture-Critical and Primary Tension Members

906.07.01.07.12.01 General

All repair procedures requiring approval shall be submitted to the Contract Administrator at least 14 Days prior to commencement of the work.

Repair procedures shall be according to CSA-S6, Clause 10.23.6.

906.07.01.07.12.02 Approval for Non-Critical Repairs

Non-critical repairs are those listed in CSA-S6, Clause 10.23.6.

Repair procedures shall be prepared and submitted to the Contract Administrator. Work on the repair shall not commence until the Contract Administrator has given written approval to proceed.

906.07.01.07.12.03 Approval for Critical Repairs

Repair procedures that are beyond those described in CSA-S6, Subclause 10.23.6.4 are considered critical and shall be individually approved by the Contract Administrator before repair welding proceeds.

Critical repairs include those listed in CSA-S6, Clause 10.23.6.

906.07.01.07.13 Non-Destructive Testing of Fracture Critical Members

The fabricator shall maintain documentation of all visual and non-destructive testing for review and verification by the Contract Administrator. Documentation shall be submitted to the Contract Administrator upon completion of the project.

906.07.01.07.14 Repair of Welds

Any section of weld that does not meet the acceptance standards shall be removed, re-welded, and re-examined.

906.07.01.07.15 Bolted Construction

906.07.01.07.15.01 General

Bolted construction shall be according to CSA-S6, Clause A10.1.6.

Once all bolts in a joint are brought to a snug tight condition and all plies in the connection are in firm contact, the nuts and the protruding bolt ends shall be match marked using an indelible paint marker before final tightening to enable the amount of relative rotation to be determined. Match marking does not relieve the bolting inspector's responsibility to ensure the inspection requirements of CSA-S6 are satisfied.

Bolts shall be sufficiently long to exclude threads from the shear plane.

906.07.01.07.15.02 Plasma Arc Cutting of Holes

Plasma arc cutting of holes shall only be permitted in plates up to and including 20 mm in thickness. Plasma arc cut holes shall be produced by mechanically guided means and the diameter of the holes shall be greater than or equal to the thickness of the plate. When plasma arc cutting of holes is permitted, the cutting gas as well as the shielding gas shall be oxygen and the surface roughness shall not exceed 25 microns (1000 micro-inches) as defined in CSA B95 Occasional gouges not more than 1.5 mm in depth are permitted. Thermally cut holes shall be 2 mm larger than the nominal diameter of the bolt and the taper shall not exceed 0.5 degrees.

906.07.01.07.15.03 Holes Drilled Using Numerically Controlled Machines

As an alternative to the shop trial assembly requirements of CSA-S6 when numerically controlled machines have prepared the boltholes, a check assembly consisting of the first components of each type of bolthole pattern to be made shall be undertaken to adequately demonstrate the accuracy of the drilling. If the check assembly is satisfactory, further assemblies of like components are not required. If the check assembly is unsatisfactory, the work shall be redone or repaired in a manner acceptable to the Contract Administrator.

906.07.01.07.15.04 Inspection

Inspection shall be according to CSA-S6 as required.

906.07.01.07.16 Tolerances

906.07.01.07.16.01 Dimensional and Workmanship Tolerances

Dimensional and workmanship tolerances shall be according to CSA W59 and Clause A10.1.7 of CSA-S6.

906.07.02 Delivery

A delivery schedule shall be provided to the Contract Administrator not less than five Days prior to shipping.

Delivery shall include loading of the members, transportation, unloading, storage at the storage site and temporary works for access.

Structural steel shall be loaded for shipping in such a manner that it can be transported and unloaded at its destination without being excessively stressed, deformed, or otherwise damaged.

Plate girders shall be transported with their webs in a vertical plane. When girders cannot be shipped with their webs in the vertical plane, static and dynamic forces during handling, transportation, and storage shall be determined using a dynamic load allowance of 100%. Computed stresses shall be according to CSA-S6, Clause 10.10 and the maximum cyclic stress range shall not exceed the constant amplitude fatigue threshold for the appropriate fatigue categories specified in CSA-S6, Table 10.4. All the calculations and associated sketches, including reasons why the girders cannot be shipped with the webs in the vertical plane, shall be submitted by the Contractor to the Contract Administrator for approval seven Days prior to shipping. The calculations and sketches shall be sealed and signed by an Engineer.

Structural steel, when stored, shall be stored in a manner to avoid excessive stress deformation or other damage.

Advertising by means of removable signing is permitted on elements only while in transit to the specified site. Any permanent markings on a surface that would be visible after installation shall not be permitted.

906.07.03 Erection

906.07.03.01 General

The Contract Administrator shall be notified in writing of the starting erection date at least 14 Days prior to the commencement of field operations.

Erection shall be according to CSA-S6, Clause A10.1.10. Additional permanent material may be provided to ensure that the member capacities are not exceeded during erection, if approved by the Contract Administrator. The additional material shall be shown in the erection diagram.

Repairs to erected material shall only be permitted after the Contract Administrator has approved the repair procedure.

Welding shall not be used to fill misplaced holes.

Hammering that can damage or distort the members is not permitted.

906.07.03.02 Falsework

Falsework shall be according to OPSS 919.

906.07.03.03 Connections

Holes made in the field shall be drilled or sub-drilled and reamed.

Any error that prevents the proper assembly and fitting of parts shall be reported and the proposed method of correction shall be submitted to the Contract Administrator. Corrective measures shall not commence until the submitted proposal is accepted.

Bolt heads shall be located on the outside faces of the exterior girders.

Bolt heads in field splices for box girders shall be located on the exterior surfaces.

906.07.03.04 Maintaining Alignment and Camber

The bridge shall be erected to the alignment and elevations specified in the Contract Documents.

906.07.03.05 Bearings

The installation of bearings shall be according to OPSS 922.

906.07.03.06 Coatings

Coating of new structural steel shall be according to OPSS 911.

906.07.04 Quality Control

906.07.04.01 General

Quality control shall be according to CSA-S6, Clause A10.1.8. The acceptance standards of CSA W59 for dynamically loaded structures shall also apply.

In addition to quality control measures instituted by the Contractor, the Contractor shall be responsible for the quality control procedures specified herein.

906.07.04.02 Control of Material

A record for each component shall be kept identifying the material as to heat number, corresponding mill test certificate, and colour coding or other identification markings.

906.07.04.03 Visual Inspection

The Contractor’s inspector shall carry out full visual inspection.

906.07.04.04 Non-Destructive Testing

906.07.04.04.01 General

An independent testing organization shall carry out all non-destructive testing of the welds for bridge structures by using radiographic, ultrasonic, magnetic particle, and liquid penetrant test methods as applicable.

A non-destructive testing technician shall do the testing.

Neither the technician nor the independent testing organization shall be changed without the approval of the Contract Administrator.

906.07.04.04.02 Notification of Testing

The independent testing organization shall be given at least five Days notice of when the work is ready for testing. Such notice shall include the type and quantity of work to be tested.

906.07.04.04.03 Testing of Welds

Radiographic, ultrasonic, or magnetic particle testing shall be carried out using procedures according to CSA W59.

The amount and location of welding to be tested shall not be less than:

a) Visual inspection of all welds.

b) Radiographic or ultrasonic inspection of groove welds in flanges and webs of built-up girders:

   i. Flange splices in tension or stress reversal zones: 100% of all welds.
   ii. Flange splices in compression zones: 100% of the weld of 1 in 4 splices.
   iii. Web splices for 1/2 the depth from the tension flange: 100% of the weld length for each weld.
   iv. Web splices for 1/2 the depth from the compression flange: 100% of the weld length of 1 in 4 splices.

   If defects are found during testing of compression zones, two additional zones shall be tested for each zone exhibiting defects.

c) Magnetic particle inspection of web-to-flange fillet welds:

   i. Submerged-arc welds - 25% of length of each weld.
   ii. Semi-automatic welds - 50% of length of each weld.
   iii. Manual welds - 100% of length of each weld.

d) Magnetic particle inspection of fillet welds in connection plates and stiffeners to which diaphragms or cross bracing are attached:

   i. For 1/2 the depth from the tension flange: 100% of weld length of each weld.
   ii. Transverse welds on tension flanges: 100% of weld length of each weld.

e) Arc strikes shall be lightly ground and checked for cracks by magnetic particle inspection.

Radiographic and ultrasonic testing shall be performed prior to the assembly of the flanges to the webs.

906.07.05 Repair of Welds

Any section of weld that does not meet the acceptance standards shall be removed, re-welded, and re-examined.

906.07.06 Inspection Reports

Inspection reports shall be sealed and signed by an Engineer.

Inspection reports shall be made available to the Owner’s inspector upon request. Copies of all inspection reports shall be submitted to the Contract Administrator within seven Days of inspection.

906.07.07 Erected Girder Elevations

The top of flange elevations and top of splice plate elevations specified in the Contract Documents shall be checked and recorded and shall be submitted to the Contract Administrator within seven Days.

906.07.08 Inspection after Installation of the Structural Steel

A Request to Proceed shall be submitted to the Contract Administrator after the installation of the structural steel.

The next operation shall not proceed until a Notice to Proceed has been received from the Contract Administrator.

906.07.09 Management of Excess Material

Management of excess material shall be according to the Contract Documents.

906.08 QUALITY ASSURANCE

906.08.01 General

Visual inspection, non-destructive testing, and sampling shall be done in the fabrication shop and in the field by an Owner's inspector to confirm the material supplied, fabrication, and erection has been done as specified in the Contract Documents.

Electric power, scaffolding, protection from the weather, and free access for inspection and testing of material, to all aspects of the fabrication, delivery, and erection of the structural steel shall be supplied.

906.10 BASIS OF PAYMENT

906.10.01 Fabrication of Structural Steel - Item

Payment at the Contract price for the above tender item shall be full compensation for all labour, Equipment, and Material to do the work.

Structural steel that is stored at the fabricator's premises or some other location away from the Working Area shall be paid for when the Contractor obtains a lease from the property owner that names the Owner as the tenant. The Owner shall provide the form of lease for this purpose that specifies payment of $10.00 for the term of the lease. The Contractor shall retain full responsibility for the members.

906.10.02 Delivery of Structural Steel - Item
Erection of Structural Steel - Item

Payment at the Contract price for the above tender items shall be full compensation for all labour, Equipment, and Material to do the work.

906.10.03 Shop and Field Inspection and Testing

The supply of electric power, scaffolding, protection from the weather, and access for material testing and inspection shall be the Contractor’s responsibility at no extra cost to the Owner.

906.10.04 Bearings

Payment for the supply and installation of bearings shall be according to OPSS 922.

When the Contract does not contain a separate item for bearings and bearings are not paid as part of any concrete tender item according to OPSS 904, the Contract price for the erection of structural steel shall include full compensation for all labour, Equipment, and Material to supply and install the bearings.