

GUIDELINES for the PROCUREMENT of SPECIALTY INSPECTION SERVICES for STRUCTURAL STEEL FABRICATION, ERECTION, and COATING

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DRAFT

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1. BACKGROUND

This document is a guide for project managers to prepare Construction Administration consultant assignments that include requirements for specialized inspection of:

- fabrication and erection of steel and aluminum sign support structures,
- fabrication and erection of structural steel,
- coating of structural steel.

As the type, complexity, magnitude, and limitations of a project will govern the scope of the work, it is the responsibility of the project manager to ensure that the inspection assignment for a particular project is tailored to meet the specific project requirements. This document is intended to be complimentary to the Construction Administrative Inspection Specification (CAIS). Where any inconsistency may exist between this document and the CAIS, the CAIS takes precedence.

Specialty inspectors may be hired as sub-consultants to CA firms.

As applicable, parts of this document may be copied into the terms-of-reference for Contract Administration consultant assignments. Refer to Appendix A for a sample Terms of Reference.

2. FABRICATION AND ERECTION OF STRUCTURAL STEEL AND ALUMINUM STRUCTURES

2.1 INTRODUCTION

As performance and durability of steel and aluminum structures depends largely on three processes; fabrication, coating application and erection, the Ministry requires independent inspection of these processes for quality assurance.

Typically, the Ministry's Contract Administrators hire specialized companies to do visual inspection. Since there is a reluctance to provide full-time inspection services for products that have been certified by engineers, only representative samples of the materials and components are required to be visually inspected. With this greatly reduced level of visual inspection, the inspector cannot be expected to witness the Contractor's non-destructive testing of the welding. Because of this, some non-destructive testing is now required for Quality Assurance purposes. For coating of structural steel, the frequency of Quality Assurance inspection remains full time throughout the coating operation.

Fabricators of several products, such as Monotube steel sign support structures, are pre-approved and listed in the Ministry's Designated Sources for Materials (DSM). Quality Assurance for such products is arranged on a random basis, by the DSM custodial office, so an independent inspection on each contract is not required.

The terms of reference must be carefully reviewed for adequacy and applicability for particular contracts.

2.2 QUALIFICATIONS

2.2.1 INSPECTION FIRMS

The company undertaking inspection of fabrication and erection of structural steel shall:

- Be Canadian Welding Bureau (CWB) certified in accordance with CSA W178.1, Certification of Welding Inspection Organizations for Bridges and Industrial Structures. Certification shall include visual inspection as well as any non-destructive testing methods required to fulfill the scope of the contract. Non-destructive testing methods may include ultrasonic, radiographic, magnetic particle and liquid penetrant inspection.
- When hired to undertake condition surveys, provide an inspector experienced in conducting steel condition surveys who shall work under the direct supervision of a professional engineer familiar with the type of work being done.
- Demonstrate successful experience, achieved within the preceding five years, on assignments of similar size and scope. Work experience shall include similar inspection activities to those required in the current project.
- Be capable of deploying qualified and experienced inspectors.
- Be independent firms, not owned by, in whole or in part, or affiliated with, the Contactor, sub-contractor, or supplier of construction materials for Ministry construction projects.

2.2.2 INSPECTION PERSONNEL

All phases of inspection and testing shall be undertaken by certified personnel, employed by a CWB certified company. Inspection personnel shall be as follows:

2.2.2.1 Visual Inspector:

The Visual Inspector shall be certified by CWB for inspection of welds in accordance with CSA W178.2, Certification of Welding Inspectors. Certification shall be to either CWB level 2 or CWB level 3.

2.2.2.2 Non-Destructive Testing Personnel:

Technicians undertaking testing of structural steel and welds shall be certified under CAN/CGSB48.9712, Non-destructive Testing – Qualification and Certification of NDT Personnel, to either CGSB level 2 or CGSB level 3 for the method used.

2.3 DOCUMENTS

The Ministry or its agent shall provide the following documents to the inspection firm:

Document	<i>Documents provided after procurement of inspection services</i>	<i>Denotes documents that should be validated (sealed and signed) as per the requirements of the Contract Documents</i>
Contract Drawings	-	-
Erection Procedures	Yes	Yes
Welding Procedures	Yes	Yes
Mill Test Certificates	Yes	-
Erection Drawings	Yes	Yes

2.4 STANDARDS AND SPECIFICATIONS

The inspection firm is required to ensure compliance with the following standards and specifications, as applicable:

Specification	Title
OPSS 906	Construction Specification for Structural Steel for Bridges
OPSS 915	Construction Specification for Sign Support Structures
OPSS 922	Construction Specification for Installation of Bearings
OPSS 1203	Material Specification for Bearings - Rotational and Sliding Surface
CSA G40.20/G40.21	General Requirements for Rolled or Welded Structural Quality Steel/ Structural Quality Steel
CSA W47.1	Certification of Companies for Fusion Welding of Steel
CSA W47.2	Certification of Companies for Fusion Welding of Aluminum
CSA W59	Welded Steel Construction (Metal Arc Welding)
CSA W59.2	Welded Aluminum Construction

The edition (date) of each specification and standard special provision should be as specified in the Contract Documents. This is not necessarily the most recent edition of a specification that has been published by OPSS or that is being used by MTO. Applicable standard specifications may be found in the 109-series, 112-series, or 900-series. Non-standard specifications may also apply in a specific contract.

2.5 TERMS OF REFERENCE

The structural steel inspection tasks include but are not limited to the following:

2.5.1 FABRICATION INSPECTION

- 2.5.1.1 Confirm fabricator(s) certification(s) and personnel qualifications.
- 2.5.1.2 Identification of structural steel and welding material (e.g. correlation of heat numbers to mill test certificates) and verification that materials used conform to the contract requirements.
- 2.5.1.3 Inspection of in-process fabrication and verification of conformance with approved procedures.
- 2.5.1.4 Verification of dimensions (layout, fit-up, camber etc.).
- 2.5.1.5 Verification that coating of girders is in accordance with Section 3 of these guidelines.
- 2.5.1.6 Visual inspection of welds.
- 2.5.1.7 Visual inspection of repairs to fracture critical and primary tension members, including a review of Contractor's test results for these repairs.
- 2.5.1.8 Review of Contractor's Quality Control reports and non-destructive test results.
- 2.5.1.9 Identify and notify Contract Administrator of any quality concerns, deviations, or non-conforming work.
- 2.5.1.10 Review of fabrication related requests for clarification from the Contractor, as required by the Contract Administrator, and provide comments and interpretation of relevant Contract Documents.
- 2.5.1.11 Non-destructive testing of welds.
- 2.5.1.12 Submission of interim reports covering all inspection tasks performed and a final inspection report. Final report shall detail the components inspected, the results of the shop inspections, any design and construction issues encountered along with their solutions, and any outstanding items.
- 2.5.1.13 Verification of weld consumables (e.g. specification, grade, size, storage, etc.).
- 2.5.1.14 Confirmation that welding complies with approved welding procedures.

2.5.2 ERECTION INSPECTION

- 2.5.2.1 Confirmation of erector(s) certification(s) and personnel qualifications.
- 2.5.2.2 Inspection of concrete surface at bearing locations.
- 2.5.2.3 Inspection of layout of bearing points and anchor pins.
- 2.5.2.4 Inspection of bridge bearings for damage, location, orientation, etc.
- 2.5.2.5 Check and ensure that erection of the components is in compliance with approved Erection Diagrams and Erection Procedures.
- 2.5.2.6 Witnessing of the erection of main components.
- 2.5.2.7 Inspection of fit-up, alignment and plumbness of structural components.
- 2.5.2.8 Verification of grade, type, size, and location of high strength bolts.

- 2.5.2.9** Confirmation of installation of high-strength bolts by the turn-of-nut method.
- 2.5.2.10** Confirmation of compliance of welding operations with approved welding procedure.
- 2.5.2.11** Visual inspection of field welds.
- 2.5.2.12** Inspection of surface preparation and touch-up painting in accordance with Section 3 of these guidelines.
- 2.5.2.13** Recording, maintaining and submission of a daily diary recording all relevant field activities including weather and temperature.
- 2.5.2.14** Submission of interim reports for all inspection tasks performed and a final inspection report. The final report shall detail the components inspected, the results of the shop inspections, any design and construction issues encountered along with their solutions, and any outstanding items.

2.5.3 SCOPE OF INSPECTION

The frequency of inspection shall be adequate to fulfil the inspection requirements of this clause.

Shop inspections shall be scheduled such that inspection encompasses various stages of fabrication. Typically, this will include a minimum of one shop visit at the start of fabrication, one intermediate shop visit during which a number of components will be at various stages of completion, and one shop visit near the end of fabrication when most components are complete or nearing completion.

For structural steel girder fabrication projects, a minimum of 40 hours should be included for structural steel inspection.

Similarly, field inspections shall be scheduled to capture various stages of erection. This includes a minimum of one site visit within the first 25% of progress, one site visit after 50% progress, and one site visit after 75% of progress.

For projects requiring additional inspection beyond the minimum outlined above, overall tonnage may be used to provide an estimated number of inspection hours based on the following table:

Girder Type	Hours Per Tonne
Plate	1/4
Box	1/3

For example, on a 480 tonne plate girder project, the number of inspection hours would be the equivalent of fifteen 8-hour visits. In the case of a box girder, the same sized project would be equivalent to twenty 8-hour visits.

Inspection requirements for rehabilitation projects must be determined on a case-by-case basis. Inspection hours typically cannot be estimated by tonnage as the work involved can vary significantly

between projects and can be highly influenced by the project schedule, access to work location, site conditions, etc. As a result, the ratio of hours to tonne tends to be much higher for rehabilitation inspection than for shop fabrication and erection inspections.

When inspection is specified to be carried out on a random basis, the structural components to be inspected shall be selected by the Contract Administrator. The results of this inspection shall be indicative of the acceptability of all components fabricated.

For complex structures, such as skewed, curved, arch, truss bridges, any steel with complex geometries, or atypical steel repairs, it is recommended that a pre-fabrication meeting is held prior to construction to review specifications, deliverables and inspection/quality assurance details of the structural steel components that will be fabricated, erected, or repaired. When such a meeting is held, at the request of the Contract Administrator, representative(s) from the inspection firm shall attend.

2.5.3.1 Fabrication Inspection

Bridge Structures:

- Identification of the material of 100% of the components inspected.
- Visual inspection of in-process fabrication of 25% of girders. Inspection shall be such that each girder line in each bridge structure included in the contract is represented.
- Non-destructive testing of 25% of girders in each bridge structure included in the contract as follows:
 - All groove welds in the tension flange by ultrasonic testing (UT) for their full length;
 - 1 in 4 groove welds in compression flanges by UT;
 - 100% UT of all groove welds in web for 1/2 the depth from the tension flange and 25% for the remainder of the web;
 - 100% magnetic particle inspection of full length of web to flange fillet connections for full length of each joint;
- 25% of secondary components (bracing, attachments) of all girders in the contract shall be visually inspected.
- Visual inspection and non-destructive testing of welds should be performed such that each welder / operator is represented.

Sign Support Structures:

- Identification of the material of 100% of the components inspected.
- Visual inspection of 100% of the in-process fabrication of 25% of all sign support structures in a contract. This inspection shall encompass at least one sign support structure.
- Non-destructive testing of the welds of one of the sign support structures in a contract as follows:
 - For shop-fabricated legs (columns), UT of longitudinal groove welds for two metres from the

leg/base plate connection along the lower leg portion of the tri-chord static sign support structure.

- For shop-fabricated legs (columns), UT of full length of longitudinal groove weld of the legs of the cantilever static sign support structures
- UT of full penetration groove welds at the chord 'crank' locations of the aluminum end components of the changeable message sign support structures (The 'crank' location is the joint in the end component where the horizontal chords meet the sloping chords.)

2.5.3.2 Erection Inspection

- Inspection of the erection of 25% of girders. Inspection shall be such that each girder line in each bridge structure included in the contract is represented.
- Check that beams have not been damaged and are set to the specified alignment and seated properly with either permanent or temporary braces as specified.
- Erection inspection shall include inspection of the installation of all bracing components required to maintain stability of the girders and one line of diaphragms attached to the girders being inspected.
- Inspection of the erection of a minimum of one sign support structure per contract.
- Check that the Manufacturer's Certificate of Conformance is supplied and reviewed in accordance with the requirements of the Contract Documents.

2.5.3.3 Structural Steel Coating Inspection

- See Section 3.

2.6 CONTACT

Enquiries and comments about this section should be directed to:

Head, Bridge Design
Ministry of Transportation
Structures Office
Standards and Contracts Branch
2nd Floor, Garden City Tower
301 St Paul Street
St Catharines, ON L2R 7R4
structuresoffice@ontario.ca

3. COATING OF STRUCTURAL STEEL

3.1 INTRODUCTION

The section addresses procurement of inspection services for:

- coating of new structural steel
- coating existing structural steel
- coating new railings
- coating existing railings
- coating warranty evaluation purposes

3.2 QUALIFICATIONS

3.2.1 INSPECTION FIRMS

Firms employed for the inspection of coating of structural steel shall:

- Demonstrate successful experience, achieved within the preceding five years, on assignments of similar magnitude and scope. The work experience shall have included inspection of the coating of bridges.
- Be capable of deploying qualified and experienced inspectors.

3.2.2 INSPECTION PERSONNEL¹

3.2.2.1 Inspection of Coating of New Structural Steel²

Paint Coatings:

The Inspector must be a Certified Basic Coatings Inspector (CIP Level 1), or a graduate of the MTO's Coating Course; and be working under the direct technical supervision of a Senior Certified Coatings Inspector (CIP Level 3); or

The Inspector must be a Certified Coatings Inspector (CIP Level 2).

Specialty Coatings³:

The Inspector must be a Certified Coatings Inspector (CIP Level 2).

3.2.2.2 Inspection of Coating of Existing Structural Steel²

Paint Coatings:

The Inspector must be a Certified Basic Coatings Inspector (CIP Level 1), or a graduate of the MTO's Coating Course; and be working under the direct technical supervision of a Senior Certified Coatings Inspector (CIP Level 3).

Specialty Coatings³:

The Inspector must be a Certified Coatings Inspector (CIP Level 2) and be working under the direct technical supervision of a Senior Certified Coatings Inspector (CIP Level 3).

3.2.2.3 Performance Warranty Evaluation of Structural Steel Coatings⁴:

The Inspector must be a Senior Certified Coatings Inspector (CIP Level 3) with a minimum of five years of coating inspection experience after obtaining Level 3 certification.

Notes:

- ¹ *The qualifications described for coating inspection personnel are the minimum requirements.*
- ² *There are some differences in the qualification requirements for inspection of coating of new structural steel and for inspection of coating of existing structural steel.*
- ³ *Specialty coatings involve processes such as hot dip galvanizing, metallizing and powder coatings.*
- ⁴ *Performance Warranty inspections are carried out in the 22nd or 23rd month of the (24- month) warranty period for coating of existing structural steel and railing system.*

3.3 DOCUMENTS

The Ministry or its agent shall provide the following documents to the inspection firm:

- MTO Contract Drawings
- Contract Documents

3.4 STANDARDS AND SPECIFICATIONS

The inspection firm is required to ensure compliance with the following applicable standard specifications:

Specification*	Title
OPSS 911	Construction Specification for Coating Structural Steel and Railing Systems

* The edition (date) of each specification and applicable special provisions should be as specified in the contract. This is not necessarily the latest edition of the specification that has been published by OPSS or that is being used by MTO. For OPSS 911, applicable standard special provisions to modify OPSS 911 may be found in the 109-series and 911-series of special provisions. Non-standard special specifications may also apply in a specific contract.

3.5 TERMS OF REFERENCE

3.5.1 INSPECTION OF SURFACE PREPARATION AND COATING

The structural steel coating inspection tasks include but are not limited to the following:

- 3.5.1.1** Confirm supplied material is from the approved list that was submitted by the Contractor at the commencement of the contract.
- 3.5.1.2** Verify that material is sampled as required by the Contract Documents.
- 3.5.1.3** Confirm that all requirements of the manufacturers' product data sheets are met.
- 3.5.1.4** Confirm individual coating products used in the coating system come from the same manufacturer and are compatible.
- 3.5.1.5** Check that surface preparation is carried out as specified in the Contract Documents and meets the specified Society for Protective Coatings (SSPC) standard.
- 3.5.1.6** Verify that the maximum time between final surface preparation and prime coat application as specified in the Contract Documents is not exceeded.
- 3.5.1.7** Testing of temperature, humidity, and dew point.
- 3.5.1.8** Check that the coat application is carried out as specified in the Contract Documents.
- 3.5.1.9** Inspect the coating system to identify defects such as blistering, bubbling, mud cracking, dry spray, pinholes, sagging, flaking, peeling, or scaling.
- 3.5.1.10** Check that the Dry Film Thickness (DFT) gauge utilized by the fabricator is calibrated according to SSPC PA-2. Only Type 2 gauges are to be used.
- 3.5.1.11** Measure DFT according to ASTM D7091. Test frequencies to be in accordance with SSPC PA-2 with acceptability as per Coating Thickness Restriction Level 3. Acceptance of multiple coats will be based on the cumulative minimum and maximum requirements after each coat application. Deficiencies to be corrected before acceptance and proceeding with subsequent coat.
- 3.5.1.12** Check that all blast abrasive, dust, and other debris are removed from the steel surface and each coating surface prior to the application of the subsequent coat.
- 3.5.1.13** Submission of a final inspection report upon completion of the structural steel coating operation that details the components inspected, the results of the inspections, any design and construction issues encountered along with their solutions, and any outstanding items.

For additional details of the inspection tasks, refer to the current version of the Construction Administrative Inspection Specification (CAIS) 911 – Coating Structural Steel Systems.

Note: The signature of a Senior Certified Coatings Inspector (CIP Level 3) is required for all inspection assignments except when the coating inspection of new structural steel was performed by a Certified Coatings Inspector (CIP Level 2). In such cases the reports shall bear the signature of the Certified Coatings Inspector (CIP Level 2).

3.5.2 FREQUENCY OF INSPECTION

Full-time throughout for all components being coated.

3.5.3 INSPECTION FOR PERFORMANCE WARRANTY ACCEPTANCE

Inspect the coating system to identify the following defective coating conditions:

- 3.5.3.1** Visible corrosion products, except at locations defined in the Contract Documents as difficult to access, blistering, bubbling, checking, cracking, wrinkling, delaminations, dry spray, pinholes, sagging, flaking, mud cracking, peeling, scaling, or undercutting.
- 3.5.3.2** Coating applied over dirt, debris, blasting debris, corrosion products not removed during surface preparation, or steel projections.
- 3.5.3.3** Incomplete coatings.
- 3.5.3.4** Damage to the coating caused by the Contractor's operations or excessive blast dust on the finish coat.

Inspection procedures shall include:

- 3.5.3.5** Visually examining the structural steel coating on the structure, covered under the scope of this assignment. Checking for any defects with a microscope (30X minimum) and probing with a knife, where appropriate.

In cases where the visual inspection as described in 3.5.3.5 reveal coating deficiencies listed above under 3.5.3.1-3.5.3.4, the following additional inspection procedures described in 3.5.3.6 and 3.5.3.7 shall be undertaken:

3.5.3.6 Total DFT Measurements Using Type 2 Magnetic Gauge:

- Conduct DFT measurements at locations exhibiting coating deficiencies.

3.5.3.7 DFT Measurements Using Tooke Gauge:

- Conduct DFT measurements at locations exhibiting coating deficiencies according to ASTM D4138 "Standard Practice for Measurement of Dry Film Thickness of Protective Coating Systems by Destructive, Cross Sectioning Means", to determine the DFT of

individual layers and also to determine the condition of the substrate.

- Repair the coating system damaged by this destructive test procedure as follows:
 - solvent clean the area according to SSPC-SP1;
 - feather the edges of the scribed surface using fine sandpaper;
 - remove the dust; and
 - apply two (2) coats of a DSM listed Zinc-Rich Touch-up paint per manufacturer's recommendations, according to OPSS 911 and OPSS 1704.

Report and materials to be submitted:

- 3.5.3.8** Taking appropriate paint chip samples in order to help check for the causes of any defects (i.e.: peeling, flaking, delamination). A sample of each of the above noted defects, properly labelled, shall be placed in sample bags and submitted, as part of the report, to the Ministry of Transportation.
- 3.5.3.9** Taking colour photographs of the structure, and any defects in the coating, in sufficient quantities to fully document the extent and nature of the defects. These photographs shall form part of the report.
- 3.5.3.10** Within two (2) weeks of the completion of the inspection, preparing and supplying to the Ministry of Transportation, four (4) hard copies and one electronic copy of a detailed Technical Report on the condition of the coating system and the causes of any observed defects. The report, at a minimum, shall itemize/describe all the defects; establish their location (without demarcating the steel); estimate the total surface area of the defects; and offer an explanation as to the cause of the defects.

Note: Section 3.5.3 should only be included if:

- *More than 200m² of existing structural steel is being coated; and*
- *It is the intent that the service provider for this contract will be responsible for completing the warranty inspection (warranty inspections may be completed under a different inspection assignment as they are completed approximately 2 years after contract completion).*

3.6 CONTACT

Enquiries and comments about this section should be directed to:

Head, Bridge Design
Ministry of Transportation
Structures Office
Standards and Contracts Branch
2nd Floor, Garden City Tower
301 St Paul Street
St Catharines, ON L2R 7R4
structuresoffice@ontario.ca

APPENDIX A

Sample Terms of Reference Structural Steel Specialist Services

1. General

1.1. The Structural Steel Specialist(s) shall provide services to ensure that all structural steel fabrication, erection, and coating is carried out in accordance with Contract Documents. The Specialist shall report to the Contract Administrator and is required to provide inspections, liaison, technical assistance, support, and reporting as required for structural steel fabrication, erection, and coating operations.

1.2. The services include:

[Note to User: Any of these specialty areas may be removed if they are not required]

1.2.1. Structural Steel Inspection Services – Fabrication

1.2.2. Structural Steel Inspection Services - Erection

1.2.3. Structural Steel Inspection Services - Coating

1.3. The Specialist shall develop a Specialty Work Plan summarizing project-specific tasks in the format below:

Operation: Specialty Work Plan		
Major Tasks	Deliverable Record(s)	Staff Name
List major tasks associated with Structural Steel Specialist Services.	List associated Deliverable Record(s) for each task.	Provide name of person responsible for each task and highlight experience for this operation in resume.

2. Services

2.1. Inspections must be carried out in accordance with the requirements of the Contract Documents, Contract Drawings, Standards, and Specifications.

2.2. The Specialist shall liaise with representatives from the CA team, Ministry, Contractor, fabricators, and Sub-Contractors. The Specialist shall attend meetings when requested by the CA and must be available on-call for immediate assistance to the CA.

2.3. The Specialist shall be required to provide expert opinion and recommendations on the Contractor's requests for clarifications, change proposals, and submissions related to structural steel fabrication, erection, and coating operations.

- 2.4. The Specialist shall identify and notify the CA of any QC and QA concerns, deviations, deficient or non-conforming work, or other non-compliance situations. Written recommendations are to be provided.
- 2.5. The Specialist shall work under the direct supervision of a Professional Engineer with demonstrated knowledge of welding fundamentals, welding procedures, and welding related codes and standards.

3. Deliverables and Records

- 3.1. The Specialist shall prepare Interim Reports for each shop or site visit outlining the fabricator's activities, inspection findings, and all instructions given by the Specialist. These shall be provided to the CA and Ministry within 3 business days of completion of the shop visit.
- 3.2. Upon completion of the fabrication or erection process, a Final Report shall be provided to the CA and Ministry. The Final Report shall include all relevant details and photos and shall be submitted within 5 business days of completion of fabrication or erection. The Final Report shall reference the Interim Reports and should summarize the milestones of the Interim Reports, any design or construction problems that arose, and their solutions. Any unresolved issues shall also be included in the Final Report.

The Engineer(s) supervising the services shall affirm that the services have been performed satisfactorily and shall seal the Final Report. Two printed copies and an electronic copy (PDF format) of the Final Report shall be submitted to the CA.

4. Structural Steel Inspection Services - Fabrication

[Note to User: This Section may be removed in its entirety if Structural Steel Inspection Services - Fabrication is not required.]

4.1. Scope of Work

[Note to User: The Project Specific Scope of Work shall be amended to reflect the actual work for the Contract with input from Quality Assurance, Operations, and Structural Section representatives.]

The Structural Steel Specialist scope of work and tasks shall be completed during the shop fabrication of steel components.

The Specialist shall complete a minimum of [#] shop visits to witness the fabrication of the girders. Each visit shall include a minimum of [#] days for [#] hours each day ([#] hours total) of in-shop inspection.

The visits shall be scheduled such that inspection encompasses various stages of fabrication. Typically, this will include a minimum of one shop visit at the start of fabrication, one intermediate visit when multiple components will be at various stages of fabrication, and one visit near the end of fabrication when most components are complete or nearing completion.

- 4.1.1. The inspection of bridge structures shall include:

- Identification of the material of 100% of the components inspected.
- Visual inspection of in-process fabrication of 25% of girders. Inspection shall be such that each girder line in each bridge structure included in the contract is represented.
- Non-destructive testing of 25% of girders in each bridge structure included in the contract as follows:
 - o All groove welds in tension flange by ultrasonic testing (UT);
 - o 1 in 4 groove welds in compression flange by UT;
 - o 100% UT of all groove welds in web for 1/2 the depth from the tension flange and 25% for the remainder of the web;
 - o 100% magnetic particle inspection of full length of web to flange fillet connections for full length of each joint.
- 25% of secondary components (bracing, attachments) of all girders in the contract shall be visually inspected.
- Visual inspection and non-destructive testing of welds should be performed such that each welder / operator is represented.

4.2. Terms of Reference

[Note to User: The Project Specific Terms of Reference shall be amended to reflect the actual work for the Contract with input from Quality Assurance, Operations, and Structural Section representatives.]

The structural steel inspection tasks shall include but are not limited to the following:

- Confirm fabricator(s) certification(s) and personnel qualifications.
- Identification of structural steel and welding material (e.g. correlation of heat numbers to mill test certificates) and verification that materials used conform to the contract requirements.
- Inspection of in-process fabrication and verification of conformance with approved procedures.
- Verification of dimensions (layout, fit-up, camber etc.).
- Verification of coating of girders.
- Visual inspection of welds.
- Visual inspection of repairs to fracture critical and primary tension members, including a review of Contractor's test results for these repairs.
- Review of Contractor's Quality Control reports and non-destructive test results.
- Identify and notify Contract Administrator of any quality concerns, deviations, or non-conforming work.
- Review of fabrication related requests for clarification from the Contractor, as required by the Contract Administrator, and provide comments and interpretation of relevant Contract Documents.

- Non-destructive testing of welds.
- Verification of weld consumables (e.g. specification, grade, size, storage, etc.).
- Confirmation that welding complies with approved welding procedures.

4.3. Qualifications

[Note to User: The Project Specific Qualifications shall be amended to reflect the actual work for the Contract with input from Quality Assurance, Operations, and Structural Section representatives.]

The Structural Steel Specialist shall be employed by a company certified in accordance with CSA W178.1 - Certification of Welding Inspection Organizations for Bridges and Industrial Structures. Certification shall include visual inspection as well as any non-destructive testing methods required to fulfill the scope of the contract. Non-destructive testing methods may include ultrasonic, radiographic, magnetic particle, and liquid penetrant inspection.

The Structural Steel Specialist shall be certified in accordance with CSA W178.2, Certification of Welding Inspectors. Certification shall be to either CWB level 2 or CWB level 3.

When non-destructive testing is required, certification shall be according to CAN/CGSB 48.9712, Non-destructive Testing – Qualification and Certification of NDT Personnel, to either CGSB level 2 or CGSB level 3 for the method used.

5. Structural Steel Inspection Services - Erection

[Note to User: This Section may be removed in its entirety if Structural Steel Inspection Services - Erection is not required.]

5.1. Scope of Work

[Note to User: The Project Specific Scope of Work shall be amended to reflect the actual work for the Contract with input from Quality Assurance, Operations, and Structural Section representatives.]

The Structural Steel Specialist scope of work and tasks shall be completed during the field erection of steel components.

The Specialist shall complete a minimum of [#] site visits to witness the erection of the steel girders and the installation of bracing components. Each visit shall include a minimum of [#] days for [#] hours each day ([#] hours total) of on-site inspection.

5.1.1. The erection inspection of bridge structures shall include:

- Inspection of the erection of 25% of girders. Inspection shall be such that each girder line in each bridge structure included in the contract is represented.
- Check that beams have not been damaged and are set to the specified alignment and seated properly.
- Inspection of all bracing components required to maintain the stability of the girders as well as the diaphragms attached to the girders being inspected.
- Check that the Manufacturer's Certificate of Conformance is supplied and reviewed in

accordance with the requirements of the Contract Documents.

5.2. Terms of Reference

[Note to User: The Project Specific Terms of Reference shall be amended to reflect the actual work for the Contract with input from Quality Assurance, Operations, and Structural Section representatives.]

The structural steel erection inspection tasks shall include but are not limited to the following:

- Confirmation of erector(s), certification(s), and personnel qualifications.
- Inspection of concrete surface at bearing locations.
- Inspection of layout of bearing points and anchor pins.
- Inspection of bridge bearings for damage, location, orientation, etc.
- Check and ensure that erection of the components is in compliance with approved Erection Diagrams and Erection Procedures.
- Witnessing of the erection of main components.
- Inspection of fit-up, alignment and plumbness of structural components.
- Verification of grade, type, size, and location of high strength bolts.
- Confirmation of installation of high-strength bolts by the turn-of-nut method.
- Confirmation of compliance of welding operations with approved welding procedure.
- Visual inspection of field welds.
- Inspection of surface preparation and touch-up painting in accordance with Section II of these guidelines.
- Recording, maintaining and submission of a daily diary recording all relevant field activities including weather and temperature.

5.3. Qualifications

[Note to User: The Project Specific Qualifications shall be amended to reflect the actual work for the Contract with input from Quality Assurance, Operations, and Structural Section representatives.]

The Structural Steel Specialist shall be employed by a company certified in accordance with CSA W178.1 - Certification of Welding Inspection Organizations for Bridges and Industrial Structures. Certification shall include visual inspection as well as any non-destructive testing methods required to fulfill the scope of the contract. Non-destructive testing methods may include ultrasonic, radiographic, magnetic particle, and liquid penetrant inspection.

The Structural Steel Specialist shall be certified in accordance with CSA W178.2, Certification of Welding Inspectors. Certification shall be to either CWB level 2 or CWB level 3.

6. Structural Steel Inspection Services - Coating

[Note to User: This Section may be removed in its entirety if Structural Steel Inspection Services - Coating is not required.]

6.1. Scope of Work

[Note to User: The Project Specific Scope of Work shall be amended to reflect the actual work for the Contract with input from Quality Assurance, Operations, and Structural Section representatives.]

The Structural Steel Coating Specialist scope of work and tasks shall be completed during the shop coating of steel components.

Coating inspection shall be full-time throughout the Contractor's coating operations.

Inspection shall include surface preparation and application of coating.

6.2. Terms of Reference

[Note to User: The Project Specific Terms of Reference shall be amended to reflect the actual work for the Contract with input from Quality Assurance, Operations, and Structural Section representatives.]

The structural steel coating inspection tasks shall include but are not limited to the following:

- Confirm supplied material is from the approved list that was submitted by the Contractor at the commencement of the contract.
- Verify that material is sampled as required by the Contract Documents.
- Verify that all requirements of the manufacturers' product data sheets are met.
- Confirm individual coating products used in the coating system come from the same manufacturer and are compatible.
- Check that surface preparation is carried out as specified in the Contract Documents and meets the specified SSPC standard.
- Verify that the maximum time between final surface preparation and prime coat application as specified in the Contract Documents is not exceeded.
- Testing of temperature, humidity, and dew point.
- Check that the coat application is carried out as specified in the Contract Documents.
- Inspect the coating system to identify defects such as blistering, bubbling, mud cracking, dry spray, pinholes, sagging, flaking, peeling, or scaling.
- Check that the DFT gauge utilized by the fabricator is calibrated according to SSPC PA-2. Only Type 2 gauges are to be used.
- Measure dry film thickness according to ASTM D7091. Test frequencies to be in accordance with SSPC PA-2 with acceptability as per Coating Thickness Restriction Level 3. Acceptance of multiple coats will be based on the cumulative minimum and maximum requirements after each coat application. Deficiencies to be corrected before acceptance and proceeding with subsequent coat.

- Check that all blast abrasive, dust, and other debris are removed from the steel surface and each coating surface prior to the application of the subsequent coat.
- Submission of interim reports for all inspection tasks performed and a final inspection report upon the completion of the structural steel coating operation. The final report shall detail the components inspected, the results of the inspections, any design and construction issues encountered along with their solutions, and any outstanding items.

6.3. Qualifications

[Note to User: The Project Specific Qualifications shall be amended to reflect the actual work for the Contract with input from Quality Assurance, Operations, and Structural Section representatives.]

The Structural Steel Coating Specialist shall be employed by a company that demonstrates successful experience, achieved within the previous five years, on assignments of similar magnitude and scope. The work experience shall have included inspection of the coating of bridges. The company shall be capable of deploying qualified and experienced coating inspectors.

For paint coatings, the Specialist shall be a:

- Certified Basic Coatings Inspector (CIP Level 1), or a graduate of the MTO's Coating Course, and be working under the direct technical supervision of a Senior Certified Coatings Inspector (CIP Level 3); or
- Certified Coatings Inspector (CIP Level 2); or
- Senior Certified Coatings Inspector (CIP Level 3).

For specialty coatings, including processes such as hot dip galvanizing, metallizing, and powder coating, the Specialist shall be a:

- Certified Coatings Inspector (CIP Level 2); or
- Senior Certified Coatings Inspector (CIP Level 3).