

COLORADO DEPARTMENT OF TRANSPORTATION STAFF BRIDGE FABRICATION INSPECTION MANUAL	Effective: March 18, 2019 Supersedes: January 28, 2015
Fabrication Inspection of Structural Steel Items for CDOT Road and Bridge	

## 1.0 SCOPE

1.1 This plan provides a procedural guide for fabrication quality assurance inspection of structural steel items, for CDOT road and bridge projects. The purpose of this guide is to establish consistent and uniform inspection and testing procedures, in order to ensure that fabricated structural steel items and fabrication processes meet the quality requirements of the contract.

1.2 Fabricated structural steel items shall include 509 Structural Steel, 512 Bearing Devices, 518 Expansion Devices, 613 lighting, and 614 Sign Structures. When specific contract requirements differ from the standard specifications and details for the above items, they shall be addressed by Project Special Provisions.

1.3 Quality assurance (QA), as defined in 509.14 (a) and AWS D1.5, 6.1.1.2 and 6.1.2.2, is the prerogative of the Engineer. The QA Inspector is the duly designated person who acts for and on behalf of the Engineer on all matters within the scope of the contract documents and the limit of authority delegated by the Engineer. QA inspection and testing shall be performed to the extent necessary to verify that an acceptable product is being furnished as specified in the contract documents.

1.4 This plan outlines inspection details, frequencies, personnel qualifications, documentation, communication, and responsibilities.

## 2.0 REFERENCE

2.1 Referenced specification documents are the latest edition as revised or updated by approved supplements or interim editions published prior to the bid advertisement.

2.2 The specification and plan precedence, in accordance with 105.04 and 509.02, is:

- Project Special Provisions
- Standard Special Provisions Plans
- Supplemental Specifications
- Standard Specifications
- AASHTO/AWS D1.5
- AWS D1.1

2.3 CDOT Quality Assurance Procedures:

- QAP 5900 Structural Steel Quality Assurance Program - Bridges
- QAP 5910 Visual Test Procedure of Bridge Weldments
- QAP 5915 Visual Test Procedure of Base Metal Discontinuities
- QAP 5916 Visual Inspection of Joint Fit-Up
- QAP 5920 Visual Inspection of Bolted Joints

COLORADO DEPARTMENT OF TRANSPORTATION STAFF BRIDGE FABRICATION INSPECTION MANUAL	Effective: March 18, 2019 Supersedes: January 28, 2015
Fabrication Inspection of Structural Steel Items for CDOT Road and Bridge	

- QAP 5924 Rotational Capacity Test of Bolt Fastener Assemblies with Lengths Shorter than 2 ¼ Inch
- QAP 5925 Rotational Capacity Test of Bolt Fastener Assemblies with Lengths 2 ¼ Inches and Longer
- QAP 5926 Installation/Verification Test of Bolt Assemblies
- QAP 5930 Magnetic Particle Inspection Procedure; Continuous Yolk, Dry, Visible Particles
- QAP 5940 Qualification of Liquid Penetrant Inspection Procedures and Material Sensitivity Tests
- QAP 5942 Procedure for Fabrication of Liquid Penetrant Control Specimen
- QAP 5945 Liquid Penetrant Inspection Procedure
- QAP 5950 Procedure for Determining the Characteristics of an Ultrasonic Search Unit
- QAP 5951 Ultrasonic Inspection Procedure for Butt Welds Using Structural Carbon Steel or High-Strength Low Alloy Structural Steel for Welding
- QAP 5952 Ultrasonic Inspection Procedure for Testing Welds Which Incorporate Permanent Back-Up Bars
- QAP 5953 Ultrasonic Inspection Procedure for Complete Joint Penetration (CJP) Welds
- QAP 5957 Ultrasonic Inspection Procedure for Bridge Pins
- QAP 5960 Superficial Hardness Testing of Metallic Materials Using a Portable Hardness Testing Device

2.4 Fabricator Documents:

- AISC Certification
- CDOT Approved Quality Control Plan
- CDOT Approved Written Practice (ASNT SNT-TC-1A)
- Inspector and Nondestructive Testing Personnel Qualification Records
- Welding Procedure Specifications
- Welding Procedure Qualification Records
- Welder Qualification Records

**3.0 QA PERSONNEL QUALIFICATIONS**

3.1 The QA Inspector shall meet the requirements as specified in AWS D1.5, 6.1.3.1.

3.2 Personnel performing ultrasonic testing shall have a minimum certification of NDT Level II, in conformance with the American Society for Nondestructive Testing's (ASNT) Recommended Practice No. SNT-TC-1A. Individuals may also be certified by the ASNT, as ASNT NDT Level II, or through the ASNT Central Certification Program (ACCP), in which case they shall be referred to as an ACCP Level II.

Personnel performing magnetic particle testing shall have a minimum certification of either an NDT Level II, an ASNT Level II, an ACCP Level II, or an equivalent satisfactory to the Engineer.

COLORADO DEPARTMENT OF TRANSPORTATION STAFF BRIDGE FABRICATION INSPECTION MANUAL	Effective: March 18, 2019 Supersedes: January 28, 2015
Fabrication Inspection of Structural Steel Items for CDOT Road and Bridge	

**4.0 QA RESPONSIBILITIES AND COMMUNICATION**

4.1 The Fabrication Inspection Program is an extension of the inspection process in the field. The program allows project staff to concentrate on their areas of expertise on the project site, while providing qualified staff to inspect fabricated components at the manufacturer's facility. Final product acceptance is the prerogative of the Engineer. Quality Assurance Inspectors determine the acceptability of the product in accordance with contract specifications and make recommendation, to the Project Engineer, whether or not the product conforms to the requirements of the contract.

4.2 The center point of communication for the quality assurance inspection process is the Project Engineer. The QA Inspector reports to the Project Engineer on all matters of quality assurance. The Project Engineer then notifies the Designer of Record, the Contractor, the Quality Assurance Manager, and the Quality Control Manager, when it is deemed necessary.

4.3 The CDOT Project and Resident Engineers are responsible for writing Contract Modification Orders, handling schedule changes and delays, and handling Contractor claims. All fabrication issues that affect field construction administration are reported to these positions.

4.4 The Designer of Record is the person responsible for clarification and resolution of design issues. The Project Engineer is the primary liaison between the QA Inspector and the Designer of Record.

**5.0 PLAN, SHOP DRAWING, SPECIFICATION, AND RECORD REVIEW**

5.1 Plan and code issues that affect welding, fabrication, base metal, consumable requirements, stress category identification, and nondestructive evaluation and acceptance criteria should be resolved by the Quality Assurance Inspector and the Quality Assurance Manager.

5.2 Issues affecting the design of the fabricated item shall be communicated to the Designer of Record and the Project Engineer for resolution.

5.3 Issues impacting the cost of the work or the project schedule shall be communicated in writing to the Project and Resident Engineers, for prompt resolution.

5.4 In cases where the shop drawings deviate from the plans or specifications, the QA Inspector shall inform the Quality Assurance Manager and the Project Engineer. When these issues involve the design of the fabricated item, the Project Engineer shall contact the Designer of Record.

5.5 Weldment details that cannot be practically performed or promote defect inclusion shall be noted and communicated to the Project Engineer and the Designer for resolution. These details shall also be documented in the Quality Control Manager's Permanent Project Record.

5.6 Welding Procedure Specifications (WPS), Welding Procedure Qualification Records (PQR), and Welder Qualification Records (WQR) shall be reviewed along with shop drawings, prior to the prefabrication meeting and/or fabrication of the product. Welding Procedure Specifications shall be supported by Welder and Procedure Qualification Tests and documented. All variables shall be

Fabrication Inspection of Structural Steel Items for CDOT Road and Bridge

verified to conform within the qualified range from the PQR. Essential variables, as defined by AWS D1.5, Bridge Welding Code, shall be listed in the WPS. All essential and non-essential variables shall be listed by the Fabricator in the WPS. Any changes in essential variables shall require a new WPS and possibly requalification.

5.7 PQR welding and test procedures shall be witnessed by a CDOT inspector. In cases where a CDOT inspector cannot be available, a CDOT approved inspector may be utilized instead. A CDOT representative or CDOT approved representative shall provide a required witness signature on all PQR test reports.

5.8 Prior to the prefabrication meeting, the Fabricator shall submit for review by the QAM, their AISC Certification, Quality Control Program (including the Written Practice), Nondestructive Testing and Inspection Certifications, and Organizational Chart.

#### **6.0 PREFABRICATION MEETING**

6.1 A prefabrication meeting shall be scheduled for: new fabricators, complex projects requiring clarification, or fabrication details warranting special consideration. The QA Inspector(s) assigned to the project as well as the QA Manager will attend the prefabrication meeting. All correspondence shall be kept for the permanent project file.

6.2 Before the prefabrication meeting, inspect the Fabricator's facility and all phases of the fabrication process, including material handling processes. Verify general weld quality acceptance and note any defective weld processes or fabrication techniques. Review shop crane capacities, methods of clamping, and chaining material. Ensure that methods of moving, loading, and transporting members prevent overstressing and distortion.

6.3 All deficiencies or concerns discovered during pre-inspection shall be addressed with the Fabricator at the prefabrication meeting. All Fabricator questions or concerns regarding specification requirements or fabrication details will be addressed during the prefabrication meeting, or as soon as resolution can be determined. Issues affecting design changes shall be noted and communicated to the Designer of Record for resolution. Resolution from the Designer of Record shall be in writing.

#### **7.0 MATERIALS AUDIT**

7.1 Inspect and record heat numbers for main members and all major items. Verify that heat numbers on main members have appropriate certified mill test reports with statements of domesticity. When material cannot be confidently identified, chemical and physical tests, including CVN shall be performed prior to incorporation into the bridge. Testing shall be paid for by the Fabricator and the testing agency shall be acceptable to the Engineer. Sampling shall comply with AASHTO M 160 requirements. Verify that the steel grades specified on the plans have been used and are in the proper locations, especially for hybrid girders. Verify heat numbers on all material incorporated into the structure. QC shall retain heat number traceability on any material previously cut, stored, and later incorporated into the structure. Acceptability of QC methods of material traceability and storage

COLORADO DEPARTMENT OF TRANSPORTATION STAFF BRIDGE FABRICATION INSPECTION MANUAL	Effective: March 18 2019 Supersedes: January 28, 2015
Fabrication Inspection of Structural Steel Items for CDOT Road and Bridge	

shall be determined prior to the start of fabrication. Rolling direction shall be indicated on the shop drawings for all main members.

Material designation, grade, type, chemical, and physical properties shall meet the requirements of the contract specifications.

Verification shall be performed at the following frequency:

- 100% Fracture Critical Members and consumables
- 100% Shop installed Rotational Capacity Fastener Lots
- 100% Field installed Rotational Capacity Fastener Lots
- 100% Hybrid main member web and flanges
- 30% Redundant main members and consumables, unless main members are hybrid
- 5% Secondary members
- 25% Paint

The QAM will review Certified Mill Test Reports (CMTR) at this same frequency.

7.2 Deviations or deficiencies discovered during review shall be documented for the project permanent record. Issues affecting the design shall be communicated to the Designer of Record, for resolution.

7.3 Review CMTR's for consumables. Determine consumable specification compliance relevant to code specifications, WPS/PQR, and AWS class designation. These tests are only valid if less than one year old. Verify compliance of additional lot tests required for Fracture Critical Members with the specification requirements.

7.4 Verify that low hydrogen consumable handling and storage practices comply with the specification requirements at least two times during the course of fabrication.

7.5 Plate Material Inspection - Inspect cut plate surfaces for the presence of miscuts, delaminations, and gouges, using QAP 5915. When defects are discovered, the Fabricator shall report to the QA Inspector the extent of all repair areas in accordance with CDOT 509.17 (d). The repairs shall be made in accordance with AWS D1.5, 3.2.3 and CDOT 509.20 (g), and documented in accordance with AWS D1.5, 6.5.8. Inspect plate repairs to ensure compliance with preapproved repair procedures. Inspect the first possible repair, when it occurs. If the repair is to be welded, verify joint preparation, minimum preheat, welding parameters, and nondestructive testing.

7.6 Review QC hardness test results for thermal cut edges (TCE) of base metal on tension main members, per CDOT 509.18 (f). Perform QA hardness testing in accordance with QAP 5960 as necessary to assure compliance. This verification shall be done at least once for every main member heat number.

## 8.0 WELDING

8.1 Welding Equipment - Welding equipment calibration records shall be reviewed at the start of fabrication and at suitable intervals throughout the project, with a minimum of two reviews during fabrication. Verify that QC calibrates voltage and amperage with external tongs every 10 working days and has recorded the results. Welding equipment inspection shall include gas flow

COLORADO DEPARTMENT OF TRANSPORTATION STAFF BRIDGE FABRICATION INSPECTION MANUAL	Effective: March 18, 2019 Supersedes: January 28, 2015
Fabrication Inspection of Structural Steel Items for CDOT Road and Bridge	

meters, work and ground leads and their connections to the welding unit, and electrical meters. Witness QC equipment tests or perform QA verification equipment tests at the start of fabrication, when noticeable weld quality changes occur, and at least twice during fabrication on each project.

8.2 Base Metal Inspection - Plate edges, weld joint fit-up and base metal surfaces shall be inspected in accordance with QAP 5915 and QAP 5916. When the inspector is in the shop, perform this base metal inspection daily during the first week of fabrication. Subsequently, inspect each joint type and flange heat at least once per week.

8.3 Verify in process welding compliance to the WPS limitation of variables at the start of fabrication and periodically throughout fabrication.

8.4 Welder Qualifications - Review the welders, welding operators, and tack welders qualification records (WQR). Qualification is required for each specific individual, process, position, type of weldment, base metal, and filler metal. Verify that welders, welding operators, and tack welders perform operations within the parameters of their respective qualifications. The duration of the WQR is three years, unless QC has maintained acceptable performance continuity records, in accordance with AWS D1.5, 5.21.4, in which case the period of effectiveness is indefinite. Evidence of recurring unacceptable weld quality shall require removal of the welder from production until additional training is received and requalification tests are performed. All finished welds shall be identified by the welders mark listed on the WQR. The mark shall not be placed closer than one inch from the weld heat affected zone. Welder identification marks shall be made with "low stress" die stamps. The Fabricator's WQR's shall be kept current and submitted to the Quality Assurance Inspector as updated.

8.5 Joint Fit-up Verification - Joint design and fit-up tolerance are indicated in the approved welding specification. Verify that joint design and fit-up tolerances conform to AWS D1.5.

Visually inspect joint fit-up using QAP 5916. Joint parameters to be inspected include bevel angle, joint root face and opening, surface preparation, alignment and placement of backing strips and run-off tabs. Check spacing and angles for accuracy on set up jigs. Ensure the absence of laminations and occlusions on joint surfaces. Verify base metal and weld joint surface preparations. Check arc stability and verify that grounding is secure. Inspect initial and intermediate weld pass width, depth, and contour. Note any undercut, overlap, or crater cracks.

8.6 Inspect the finished weld surface and document any visible defects. These inspections shall be performed randomly, but at least twice for each typical joint and at least once every two visits to the fabrication facility.

COLORADO DEPARTMENT OF TRANSPORTATION STAFF BRIDGE FABRICATION INSPECTION MANUAL	Effective: March 18, 2019 Supersedes: January 28, 2015
Fabrication Inspection of Structural Steel Items for CDOT Road and Bridge	

**9.0 IN-PROCESS VISUAL WELD INSPECTION**

9.1 In process welding, including tacks and production welds, shall be inspected by the Fabricator's QC Personnel, per Clause 6 of AWS D1.5. The QC CWI is responsible for signature approval of all completed weldments. This includes 100% final weld visual inspection. QA shall inspect tack and final welds, daily and throughout fabrication, in accordance with QAP 5910, as well as ensuring that QC is providing continuous welding inspection.

QA inspection may be performed prior to or after acceptance of the work by QC. Fracture critical members, main member welds, and fatigue sensitive details shall be given priority.

9.2 In process QC/QA inspection includes: base and filler metals, base metal preparation, storage and handling of consumables, ambient weather conditions in the immediate vicinity of welding, wind velocity affecting gas shielding, joint fit-up and configuration, minimum gap in stiffener to flange locations, minimum preheats of base metals, interpass and post heat requirements, mitigation of arc strikes, proper lead connections and the absence of arcing and copper inclusions, proper weld start and termination techniques, absence of cracking, acceptable weld porosity, undercut, overlap, underrun, concavity, convexity, and absence of craters and associated cracking. QA shall perform in-process visual weld inspection daily.

9.3 Final Weld Inspection - QA shall perform 100% final visual inspection on all welds. This inspection shall ensure the absence of: Cracks, unincorporated tack welds, unacceptable weld profiles, arc strikes, and unapproved weld repairs.

**10.0 NONDESTRUCTIVE TESTING**

10.1 Competent surface and subsurface nondestructive evaluation is critical to ensure structural soundness of weldments. Verify that the QC NDT is in conformance with specification procedures, the Fabricator's Written Practice, and the applicable CDOT Quality Assurance Procedures. All QC procedures must be reviewed and accepted by the QA Manager prior to QC performing the evaluations.

10.2 Regardless of the NDT method used, trends indicating process defects shall be brought to the attention of the QA Manager.

10.3 Visual Inspection - Visual inspection shall be performed in accordance with QAP 5910. Visual inspection shall be performed and acceptance determined prior to performing any other nondestructive evaluation method.

10.4 The listed CDOT QAP's define applicability of the respective test methods. However, QA may select condition specific NDT methods to ensure soundness. Defect indications shall be brought to the attention of the Quality Assurance Manager. NDT methods will be selected based on the suspected defect, weld process, base and filler metals, and cost/benefit considerations.

Fabrication Inspection of Structural Steel Items for CDOT Road and Bridge

10.5 Complimentary NDT methods may be necessary to determine structural soundness of specific weldments. Evaluations not performed in accordance with the applicable QAP are invalid.

10.6 Repairs - Repair welds shall be a QA inspection priority. Repairs, especially short welded repairs are inherently more likely to exhibit fracture.

Fracture Critical - Repairs in designated Fracture Critical Members (FCM) and tension zones in redundant members are prioritized for careful scrutiny during inspection.

All Repairs - The Fabricator shall submit repair procedures to QA for review and written acceptance. Repairs affecting any change to plan details shall require preapproval from the Designer of Record. QA shall audit identified repairs to verify that weld repairs were performed to preapproved procedures and QC inspected and tested. Record the location and type of defect for selected repairs. Verify that approved preheat and WPS's were used to make the repair. Repaired areas are tested using the same methods and acceptance criteria as required for the original stress category of the member or connection. Repairs that induce more than two heat cycles in a specific location are prohibited. All QC records for a given member shall be reviewed prior to acceptance of that member.

Gouges - Gouges in flame cut plate edges, especially on flanges, which are less than ¼ inch deep need not be repaired by welding. These discontinuities shall be faired to the base metal edge with a slope not exceeding one in ten. Occasional notches or gouges greater than ¼ inch deep shall be repaired by welding and tested with the Magnetic Particle Method, ASTM E 709. Verify that QC has performed and documented these tests. Verify that QC hardness tests were performed.

10.7 Magnetic Particle Inspection - Magnetic particle testing shall be performed in accordance with ASTM E709 and QAP 5930, using alternating current. This procedure shall be used to evaluate, and as necessary to verify suspected fracture. Magnetic particle testing shall be used to evaluate stop-start and fillet weld termini on main members in tension. Magnetic particle testing shall also be used to evaluate all repair locations.

The test locations shall be:

Starts and Stops in Main Member Submerged Arc Welds (SAW) - In most cases, these weld termini will occur on a run off tab or be trimmed from the main member. However, when they are incorporated on the member, particular attention shall be given to evaluate the weld root for centerline, crater, transverse, and heat affected zone fracture.

Starts and Stops in Main Member Flux Core Arc Welds (FCAW) - Incorporated weld termini shall be evaluated with particular attention to lack of fusion in the area of the weld toe. This may be aggravated by the use of exclusive carbon dioxide shielding gas, inadequate preheat, and/or failure to remove mill scale or oxides from the base metal.



COLORADO DEPARTMENT OF TRANSPORTATION STAFF BRIDGE FABRICATION INSPECTION MANUAL	Effective: March 18, 2019 Supersedes: January 28, 2015
Fabrication Inspection of Structural Steel Items for CDOT Road and Bridge	

Welds Utilizing Back-Up Bars on Butt Splices - AWS D1.5 prohibits the permanent use of back-up bars on welds transverse to the direction of stress. This includes butt splices, due to the high incidence of fractures associated with this weldment. In the case of unavoidable welds made using back-up bars in tension or stress reversal locations, including edges of tension flanges, the back-up bars shall be removed and the weld tested using the magnetic particle and ultrasonic testing.

The listed Magnetic Particle Method test locations may be checked by QA at least once in every five girders. In the event that fracture is discovered, all similar welds shall be evaluated and the QA Manager notified. QA shall review QC test results on each inspection trip and record the outcome of their review.

10.8 Ultrasonic Evaluation - Properly performed, ultrasonic evaluation is an effective nondestructive subsurface evaluation method. Competent ultrasonic evaluation is essential to ensure structural absence of subsurface fracture.

Table 509-1 in the CDOT Standard Specification specifies the quality control test frequencies for ultrasonic testing. QC NDT test results are indicated by marking the weldment as well as a written report. Review QC NDT reports once per week.

When attachments are fillet welded to main stress carrying members which (1) subject the parent metal to higher possibility of lamellar tearing, such as cruciform bearing stiffeners welded to webs or diaphragms, and (2) are not attached normal to the web or diaphragm, requiring a significant increase in the amount of filler metal and heat input required on the obtuse side of the joint, or (3) fillet welds in excess of 3/4 inch; the NDT operator shall determine soundness of the parent metal by ultrasonic straight beam (longitudinal wave) method (QAP 5951). This shall be performed on each main member heat, after the weldment is complete, to ensure the absence of delamination.

**11.0 SHOP ASSEMBLY (BLOCKING) AND GEOMETRY VERIFICATION**

11.1 Shop assembly of main members shall be done according to 509.21. At this time, connections shall be pinned for drilling per 509.19 (l) and match marked per 509.21 (h). Verify related geometries and dimensions (length, camber, field splice joint gaps, angular relation to chord lines, offsets, stiffener locations, hole locations, etc.).

**12.0 HOLES**

12.1 Holes for bolted connections shall be produced in accordance with CDOT Standard Specification 509.19 (k). Thermal cut holes are prohibited, unless they are subsequently reamed or drilled. Full size die punched holes on main members and splice plates are also prohibited due to resultant suppressed CVN values in the cold worked metal adjacent to the periphery of the hole. All burrs must be removed.

COLORADO DEPARTMENT OF TRANSPORTATION STAFF BRIDGE FABRICATION INSPECTION MANUAL	Effective: March 18, 2019 Supersedes: January 28, 2015
Fabrication Inspection of Structural Steel Items for CDOT Road and Bridge	

**13.0 WELDED STUD SHEAR CONNECTORS**

13.1 Stud welding shall be done in accordance with CDOT 509.20 (h) and AWS D1.5, Clause 7, except that the angle of bend shall be 45 degrees. Verify that QC performs the minimum bend test frequency. When the base metal is less than 0 degrees F, verify that proper preheat is used. All ceramic ferrules shall be removed. Verify that the resultant bend does not reduce concrete cover to less than the minimum required, and/or interfere with deck forms and reinforcing steel. QA shall sound three studs on each member during fabrication or final inspection. Suspected deficient studs shall be bend tested. Any failure shall require three additional bend tests. Any additional failures shall require impacting all studs to assess fusion. Results shall be recorded.

**14.0 INSPECTION AND TESTING OF FASTENERS**

14.1 Inspect fastener containers for manufacturer's identification, assembly fastener contents, component set lot numbers, and rotational capacity test lot numbers. All data on the containers must be legible and permanently marked. Bolts, nuts, and washers should be assembled in sets as a RC lot and tested at the manufacturer/supplier facility. Check for container damage and/or possible contamination. Black bolts must have adequate lubrication (indicated by touch). Galvanized fasteners shall have lubricated nuts, as indicated by visible dye. All fasteners shall be stored in their original containers and properly sealed for protection and prevention of contamination and corrosion.

14.2 Verify that manufacturer's test reports represent the supplied fasteners identified on the containers. Review the manufacturer's test reports for each component and assembly. Review test result specification compliance (chemistry, proof load, wedge tests, HRC values, and zinc coating thickness). The test data shall indicate the original heat number of the steel and be traceable to the original CMTR. All lot numbers shall be listed. All set lots shall have rotational capacity tests by the manufacturer or supplier (this is the rotational capacity test of the married components) as required by the contract specifications.

Note: Galvanized fasteners must be tested after zinc coating is applied.

14.3 On-site field or shop rotational capacity tests are also required. These tests are performed immediately prior to the time of installation. The QA Inspector shall perform the rotational capacity tests in accordance with QAP 5924 and QAP 5925. Two sets per RC lot shall be tested by the QA Inspector.

14.4 Installation/Verification Tests - Prior to installation, the Fabricator shall perform installation verification tests. These tests shall be performed in accordance with QAP 5926, and shall be witnessed by the QA Inspector.

COLORADO DEPARTMENT OF TRANSPORTATION STAFF BRIDGE FABRICATION INSPECTION MANUAL	Effective: March 18, 2019 Supersedes: January 28, 2015
Fabrication Inspection of Structural Steel Items for CDOT Road and Bridge	

**15.0 PAINT**

15.1 Preparation of surfaces to be painted, shall comply with Section 509.24 of the CDOT Standard Specifications. Welds shall be cleaned in accordance with AWS D1.5, Clause 3.

15.2 Paint to be applied shall conform to Section 708 of the CDOT Standard Specification and/or the project special provision.

15.3 The application of paint shall conform to Sections 509.24 and 509.29 of the CDOT Standard Specifications, as amended by any Project Special Provisions.

**16.0 ZINC COATING**

16.1 Galvanized structural steel, including fasteners shall conform to the requirements of 509.23 of the CDOT Standard Specifications. Repairs shall conform to 509.23 and 509.27 (h). Black steel must be cleaned prior to galvanizing to achieve acceptable results. Randomly inspect materials prior to shipment or at the galvanizing facility. Verify QC has performed coating thickness tests and the results meet specifications.

**17.0 DOCUMENTATION**

17.1 QC shall forward all inspection and test reports to the QA Inspector prior to shipment of the member(s). Reports for each member shall be reviewed prior to acceptance. When the QA Inspector is present at the Fabricator's facility and members are completed and fully documented, then the Bridge member QA acceptance shall be indicated by the CDOT stamp placed on the near side web. If the QA Inspector is not available at the time of completion, as is often the case with out of state fabricators, the Project Engineer shall be notified by QA of the status of the member(s). In the case of any member noted for repair, where the repair was not confirmed as acceptable prior to shipment, an inspection shall be performed at the project site.

17.2 Report distribution shall be as follows:

Form #193, notes on plans, Certified Mill Test Reports, nondestructive test results, material guarantees, QC reports, daily diaries, girder inspection reports, fabrication progress reports, and dimensional verification reports shall be forwarded to the Project Engineer at the completion of the project. In the case of noncompliance issues during fabrication, these documents will be forwarded at that time, for use in resolution. Copies of these documents shall also be kept in the QA Project File.

General correspondence, approvals, directives, change orders, and revisions shall be communicated and forwarded to the Project Engineer, when they are received by the QA Inspector. They shall also be added to the QA Project File.

COLORADO DEPARTMENT OF TRANSPORTATION STAFF BRIDGE FABRICATION INSPECTION MANUAL	Effective: March 18, 2019 Supersedes: January 28, 2015
Fabrication Inspection of Structural Steel Items for CDOT Road and Bridge	

Documentation by the Quality Assurance Inspector should provide comprehensive information for future reference. The QA Project File shall be archived for permanent record.

17.3 Appendix A provides an inspection checklist for the QA Inspector.

17.4 Appendix B outlines a schedule for Quality Assurance Inspection.

17.5 Appendix C provides a list of CDOT forms for use in documenting inspection activities.

The form #193 is an official CDOT document and shall be used by all QA Inspectors for the acceptance of pay items. Forms QAP 5900 (a) through QAP 5900 (I) are provided for convenience and may be replaced with Consultant and/or Fabricator forms.