**Revise Section 509 of the Standard Specifications as follows:**

**Revise subsection 509.02, add to paragraph 1, as follows:**

The latest edition of the AASHTO LRFD Bridge Design Specifications, with current interim specifications, will govern the design of steel bridges, unless otherwise noted on the plans. Welding and fabrication of steel structures shall conform to the Bridge Welding Code ANSI/AASHTO/AWS D1.5, as amended by the contract documents. When AWS D1.5 is cited in the Standard Specifications, the reference shall be to the latest edition of the Bridge Welding Code. Current AWS Welder Qualification Test Report (WQTR) based upon the parameter limitations of the Welding Procedure Specification (WPS) for the process shall be submitted to the Engineer for review.



**Revise subsection 509.06, revise paragraph 1, as follows:**

**509.06** **Structural Tubing.** Steel base metal to be used for tubular structures, including bridge rail, shall conform to the plans or AWS D1.1 ~~section~~ ~~5.2.1.~~ The grade and specification to be used shall be specified in the Contract. ~~The AWS D1.1 Sub Clause 9.15.2, 9.15.9, C-9.11 thru 9-C.19 needs to be referenced.~~

**Revise subsection 509.08, revise paragraphs 1, 2, and 3 as follows:**

**509.08 High Strength Bolts.** Unless otherwise shown in the Contract, all bolts for fastening of structural steel shall be high strength bolts. High strength bolts, including suitable nuts and plain hardened washers, shall conform to ~~AASHTO M~~ ~~164~~ ASTM F3125. In general, Type 1 bolts shall be used and bolts for self-weathering steel shall be Type 3, unless otherwise shown in the Contract.

Bolt and nut dimensions shall conform to AISC. ~~section 4~~ Threads for all bolts shall conform to the United Standard Series UNC-ANSI B1.1, Class 2A for external threads and Class 2B for internal threads. ~~The length of the bolts shall be such that the point of the bolt will be flush with or outside of the face of the nut when completely installed.~~ Sufficient thread must be provided to prevent the nut from encountering thread runout.

Washers and beveled washers shall conform to ASTM F436. Washers and beveled washers for AISC American Standard beams and channels or when bearing surfaces have a slope exceeding 1:20 with respect to a plane normal to the bolt axis shall be square or rectangular, shall taper in thickness, and shall conform to the dimensions given in AISC. ~~section 4.~~

**Revise subsection 509.14, revise (a) paragraph 1, (b), and (c) as follows:**

 **Notice of Fabrication.**

1. *Process Control and Quality Assurance.* Process Control (PC) of structural steel fabrication is the responsibility of the Contractor. The PC inspector is the duly designated person who acts for and on ~~in~~ behalf of the fabricator on inspection, testing, and quality matters within the scope of the contract documents. PC inspection and testing shall be performed at least to the extent specified in chapter 6 of AWS D1.5, and additionally as necessary to en~~in~~sure conformance with the requirements of the contract documents.

Quality Assurance (QA) is the prerogative of the Engineer. The QA inspector is the duly designated person who acts for and o~~i~~n behalf of the Engineer on all matters within the scope of the C~~c~~ontract documents as delegated by the Engineer. QA inspection and testing shall be performed to the extent necessary to verify that an acceptable product is being finished in accordance with the provisions of the C~~c~~ontract documents. The QA inspector shall have the authority to verify the qualifications of PC inspectors and nondestructive testing (NDT) personnel to specified levels by written or performance tests or other means as determined necessary.

1. *Start of Shop Work.* Shop work shall not be started until the Contractor notifies the Engineer in writing where the shop orders were placed. The fabricator shall give two weeks’ ~~prior~~ notice prior to beginning of shop work, so that inspection may be provided. The proposed production schedule, including the start of production and shipment dates, shall be submitted to the Engineer.
2. *Notice of Shipment.* The Department's QA inspector shall be notified seven days in advance of shipment of structural steel to the jobsite. Notification shall include all part numbers included in the release. Prior to final QA inspection the contractor shall provide copies of the QC test reports, copies of the MTR’s for the material that is included in the release, and certificates of conformance (COC) with the contract documents.

**Revise subsection 509.15. 509.16, and 509.17 as follows:**

**509.15 Plans and Shop Drawings.** The Contractor shall furnish shop drawings in conformity with subsection 105.02 for all structural steel bid under this section. Shop drawings shall specifically identify each piece, the direction of rolling for plates where specific orientation is required, the location of all welded splices, and the location, the extent, and the criteria of nondestructive testing. Pieces of steel that require Charpy V-Notch tests shall be identified and listed as to the frequency of test used. The detail drawing shall include a “T” designation for weld joints that are considered as tension.

**509.16 Shop Facilities for Fabrication.** Structural steel fabricators for all bridge structures as a minimum ~~other than rolled beams~~ shall be certified under the AISC Quality Certification Program, ~~Major Steel Bridges~~ as a~~n~~ ~~Advanced~~ Certified Bridge Fabricator – Intermediate (IBR) ~~(ABR), and shall have a Fracture Critical~~ ~~Endorsement~~. The fabricator shall have successfully built at least two major ~~trapezoid box~~ steel girder bridges of similar design within the last 5 years. The experience shall be submitted for acceptance to the Engineer prior to the bid process. The fabricator shall be certified to the AISC program for Sophisticated Paint Endorsement (SPE). Portions of work exposed to view shall be neatly finished. Lifting chains shall be provided with adequate softeners to prevent damage to the material while lifting and turning. If hooks are used for lifting, they shall have sufficient width of jaw and throat to prevent overstress and distortion from handling. Spreader beams, or multiple cranes, shall be provided for lifting plates and long members to prevent overstress and distortion. Welds and tack welds shall not be cracked from moving of members. Such occurrence shall require a written distortion control plan and complete inspection until the problem is corrected. The distortion control program and process control reports shall be forwarded to the QA inspector.

All cutting, fitting, welding, and painting shall be done in areas that are kept dry.

 **Inspection.**

1. *Process Control Plan.* ~~The fabricator shall submit a written process control plan to the QA inspector prior to the beginning of fabrication. The process control plan shall outline the process control tasks to be performed by the fabricator to ensure that all work conforms to the Contract. The fabricator's personnel intended to be used for inspection and nondestructive testing shall~~ The contractor shall submit a written “Welding ~~Quality~~ Process Control Plan” (W~~Q~~PCP) to the Engineer prior to the beginning of fabrication. The W~~Q~~PCP shall outline the quality control tasks to be performed by the fabricator to ensure that all work conforms to the Contract. The W~~Q~~PCP shall include the following items at a minimum:

* Name of the welding firm, welding quality control inspection firm, and Non-Destructive Testing (NDT) firm hired by the contractor as applicable. Name and qualifications of the welding Quality Control Manager and Quality Control Inspectors.
* Documentation of all certifications for welders, welding operators and tack welders.
* Name and qualifications of NDT personnel including level of certifications and expiration date.
* Quality Control Procedures:
  + - Methods and frequencies for performing all required visual inspection and NDT.
    - Methods of documentation for identification and tracking of welds including rejected lengths.
    - Procedures for indentifying members distorted by welding and monitoring methods for straightening.
    - Calibration procedures for all NDT equipment.
    - Procedures for performing all NDT required.

The W~~Q~~PCP shall be subject to approval by the Engineer

1. *Frequency.* Inspection of all intervals of fabrication welding, including each shift on a daily basis, shall be performed by an AWS certified welding inspector, or an AWS certified assistant welding inspector under the direct supervision of the certified welding inspector. Direct supervision shall be defined as onsite monitoring of all inspection activities ~~on each shift on a daily basis~~ anytime welding or cutting operations are being performed.
2. *Supervision.* Adequate supervision and process control inspection of all welding shall be provided to ensure satisfactory, consistent, and uniform workmanship. Recurring weld defects shall be considered as evidence that proper control and supervision are not being provided. Welding and associated fabrication operations shall be suspended when, in the opinion of the QA inspector, there is a lack of proper process control. Operations shall not resume until the fabricator has made a significant change in procedure. Proposed changes shall be defined and submitted in writing and approved by the QA inspector prior to resuming fabrication. Changes shall both correct the problem and prevent reoccurrence.
3. *Edge Discontinuities.* All plates and shapes shall be inspected at the edges ~~and~~ ~~ends of plates~~ for the presence of laminar discontinuities and inclusions prior to welding or fitting to other pieces. The extent of all areas to be repaired shall be reported to the QA inspector.
4. *Welding Meters.* Verification of welding meters shall be performed no less than once every ten working days. A calibrated tong ammeter and voltmeter, external to the welding machine, shall be used. Records of these calibrations shall be available for review by the QA inspector.
5. *Reports.* The PC inspector shall submit the following reports to the QA inspector prior to acceptance: all nondestructive test reports, including tests of all repaired areas, the visual test report for all welds, dimensions, camber, and sweep measurements, welder qualification records, welding procedure specifications, procedure qualification records, welding machine settings, material traceability to each main member plate, and paint inspection reports. After each girder has been inspected by process control and has been accepted as conforming to the contract requirements, but prior to painting, the QA inspector shall be notified. The QA inspector shall determine the acceptability of the girder.

All contract deficiencies discovered shall be corrected by the fabricator prior to acceptance. ~~The QA inspector will mark approval of the member with the~~ ~~Department's stamp, when accepted~~. Material subsequently found defective due to damage incurred in shipping and handling may be rejected even if previously accepted.

Materials rejected by the QA inspector will be subject to re-inspection prior to shipment. Re-inspection will normally be made at the next regular inspection; however, if no regular inspection is scheduled, and re-inspection is deemed necessary by the Engineer to assure compliance with the contract documents, the Contractor will be responsible for the transportation and per diem cost for the re-inspection. A deduction shall be made from the bid item cost for the item requiring re-inspection.

~~Materials will not be accepted at the project site if they do not bear the~~ ~~inspector's stamp of acceptance~~. A request for quality assurance inspection shall be given seven calendar days in advance. If it is determined that materials are not acceptance-stamped because they were not offered for shop inspection, or shipped after rejection at the shop, the materials shall be returned to the shop for inspection and correction as necessary. The cost of inspection and corrections made to rejected material at the project site shall be borne by the Contractor.

**Revise subsection 509.18, (b), 1. C. as follows:**

* + 1. *Splices.* Splices of main members, secondary members, or backing, when approved to be left in place, which attach to a main member, shall be ultrasonically tested and accepted prior to attaching to another member. Ultrasonic acceptance-rejection criteria shall be in accordance with ~~either table 6.3 or~~ ~~table~~ ~~6.26.3.2,~~ ~~of~~ AWS D1.5 as determined by the category of stress of the main member to which the secondary member is attached. All flanges which connect at a splice, indicating a change from tension to compression, shall be tested in accordance with the tension criteria ~~of table 6.34~~ of AWS D1.5.

**Revise Table 509-1 as follows:**

## Table 509-1

|  |  |  |  |
| --- | --- | --- | --- |
| **Element** | **Tension-**  **Compression1** | **Weld Orientation2** | **Percent Inspection3** |
| Flange  Flange  Flange  Flange | Tension  Tension  Compression  Compression | Transverse  Longitudinal Transverse  Longitudinal | 100  25  25  10 |
| Web  Web  Web  Web | Tension**4**  Tension**4**  Compression  Compression | Transverse  Longitudinal Transverse  Longitudinal | 100  25  25  10 |
| Pier & End Diaphragms | Tension**4**  Tension**4**  Compression  Compression | Transverse  Longitudinal Transverse  Longitudinal | 100  25  25  10 |
| Notes:   1. Tension areas shall be tested in accordance with the current edition of AWS DI.5. ~~Table 6.3~~ Compression areas shall be tested in accordance with the current edition ~~Table 6.4~~ of AWS D1.5. 2. The orientation is referenced with respect to the longitudinal center line of the girder for flanges and webs. The orientation is referenced parallel to the center line of bearing for end and pier diaphragms. 3. If any rejectable discontinuities are found in any weld tested less than 100%, the remaining length of that weld and all similar welds in that member shall be tested. 4. The tension area of webs and end or pier diaphragms is defined as 1»6the depth of the web from the tension flange. | | | |

**Revise subsection 509.18, (b), 3. as follows:**

1. *Preparation of Test Material and Testing Procedures.* All groove welds shall be ground flush to a maximum surface roughness (ANSI B46.1) of 125 microinches and a medium range waviness such that no gap greater than 0.020 inch is present beneath a 2 inch long straightedge placed anywhere on the test surface. The test surface shall be ground to bright metal and allow intimate coupling with the search unit. Failure to provide this condition shall result in repair or removal and re-welding of the joint, or alternative nondestructive testing methods, as determined by the QA inspector. The testing procedures established in the current edition of AWS D1.5, ~~section 6.19~~ shall be amended as follows:

**Revise subsection 509.18, (b), 3. D. (2) and (5) as follows:**

(2) Face A on both connecting members of flanges at a butt weld must lie in a single plane. Scanning of butt welds in which Face A and Face B individually lie within the same plane shall be performed in Leg I and Leg II from each side of the weld axis ~~(Form VII-9, AWS D1.5)~~. Should neither Face A nor Face B lie in a single plane, the testing procedure shall be as follows: Face A from the thinner material shall be tested both in Leg I and Leg II. The thicker material shall be tested from Leg I from both Face A and Face B. Leg II from Face A shall be evaluated when it originates from the thinner material. Transducers with frequencies greater than 2.25 MHZ may be used to facilitate locating the discontinuities, but evaluation for acceptance shall be made in accordance with ~~chapter 6, part C~~ ~~of~~ AWS D1.5.

(5) Evaluation using reject may be used to evaluate flaws, only if calibration is in accordance with AWS D1.5, ~~6.17.1~~ and the vertical linearity is within plus or minus 1 dB for a 60 dB range. ~~Both AWS D1.5 forms VII-8 and VII-9 shall be recorded and submitted to the QA inspector prior to approval, whether or not reject is used.~~

**Revise subsection 509.18, (d), first paragraph and (e) first paragraph as follows:**

*(d) Magnetic Particle Testing.* Magnetic particle testing shall be performed on areas defined in AWS D1.5 and this subsection. Magnetic particle testing shall be conducted in accordance with ASTM E 709 and AWS D1.5, except as amended herein. Alternating current shall be used. The yoke spacing shall be between 2 and 4 inches. The minimum lifting power shall be 10 pounds. Red dry particles shall be used. The light intensity shall meet ASTM E 709, Section 7.

*(e) Radiographic Testing.* When radiographic testing is specified, it shall be performed in accordance with ~~chapter 6, part B of~~ AWS D1.5, except that *edge blocks shall be used. Radiographs shall be identified as follows:*

**Revise subsection 509.19, (a), 5th paragraph, starting with “The Contractor shall . . .”, as follows:**

~~The Contractor shall furnish,~~ If requested by the Engineer, the Contractor shall furnish an affidavit which certifies that ~~throughout the fabrication~~ the identification of steel has been maintained in accordance with this Specification.

**Revise subsection 509.19, (i), 2. as follows**:

2. *Type of Heating.* Beams and girders may be curved by either continuous or V-type heating as approved by the Engineer. For the continuous method, a strip along the edge of the top and bottom flange shall be heated simultaneously; the strip shall be of sufficient width and temperature to obtain the required curvature. For the V-type heating, the top and bottom flanges shall be heated in truncated triangular wedge-shaped areas having their base along the flange edge and spaced at regular intervals along each flange; the spacing and temperature shall be as required to obtain the required curvature, and heating shall progress along the top and bottom flange at approximately the same rate.

**Revise subsection 509.19, (j) as follows:**

1. *Facing of Bearing Surfaces.* The surface finish of bearing and base plates and other bearing surfaces that are to come in contact with each other or with concrete shall meet the following ANSI B46.1 surface roughness requirements in microinches:

|  |  |
| --- | --- |
| Steel Slabs | ANSI 2000 |
| Heavy plates in contact in shoes to be welded | ANSI 1000 |
| Milled ends of compression members, milled or ground ends of stiffeners and fillers | ANSI 500 |
| Bridge rollers and rockers | ANSI 250 |
| Pins and pin holes | ANSI 125 |

Sliding bearings ANSI 125

**Revise subsection 509.20, (a), first paragraph and (c) as follows:**

 **Welding.**

1. *Process.* Welding of steel structures shall conform to AWS D1.5 as amended herein. All web and flange butt joints and web to flange welds shall be made using the submerged arc welding process (SAW). Alloy "active" fluxes shall not be used in groove welds or fillet welds with more than three passes. Repairs may be made using submerged arc welding or shielded metal arc welding (SMAW). Flux core arc welding (FCAW) will be permitted on secondary to main member attachments when performed in the flat or horizontal positions. Vertical or overhead FCAW welding shall be limited to only that work approved by the ~~QA Inspector~~Engineer of Record and Staff Bridge.

The ratio of the width of the face to the depth of penetration of each Submerged Arc Welding fillet pass shall be a minimum of 1.1:1. This shall be verified by macroetch testing and included in the *Procedure Qualification Record (PQR)*. The test heat input and voltage qualified shall establish the maximum values used in fabrication welding. These values shall be indicated in the Welding Procedure Specification.

The macroetch shall be performed in accordance with Figure 5.8 of AWS D1.5, with the following exception: The T-joint shall contain an acute angle less than or equal to the smallest acute angle to be used in fabrication. The acute angle tested qualifies all angles equal to or greater than this angle. Both sides of the T-joint shall be welded.

1. *Base Metal Preparation.* The preparation of base metal shall be in accordance with AWS D1.5, with the following exception: All mill scale and rust shall be removed from the surfaces of main members on which all welds are made by any process. Surfaces and edges to be welded shall not exceed an ANSI B46.1 roughness value of 500 microinches.
2. *Run On-off Plates.* Run-on and run-off plates shall be used on all butt joints. They shall be of the same base metal as the material being welded. Removal of these plates shall be accomplished by cutting the plates off and grinding to a surface finish in accordance with AWS D1.5.

**Revise subsection 509.21, first paragraph as follows:**

 **Shop Assembly.**

*Field Connections.* Of main members of trusses, arches, continuous beam spans, bents, towers (each face), plate girders, and rigid frames shall be assembled in the shop with milled ends of compression members in full bearing and the subsize holes reamed to the specified size while the connections are assembled. Assembly may be full truss or girder assembly, progressive truss or girder assembly, full chord assembly, progressive chord assembly, or special complete structure assembly at the fabricator's option unless assembly methods are specified on the plans.

**Revise subsection 509.23 and 509.24 (a) as follows:**

 **Galvanizing.** Bolts, washers, and nuts used in the assembly and erection of galvanized railing and posts or where specified, shall be galvanized in accordance with AASHTO M 232 Class C or shall be zinc coated in accordance with AASHTO M 298. Structural steel shall be galvanized in accordance with AASHTO M 111. Uncleaned slag lines, bare spots, blisters, flux spots or inclusions, dross, acid, or black spots that exceed 1 square inch or occur on more than 5 percent of the pieces in the lot shall be cause for rejection of the lot. The materials may be stripped, regalvanized, and again submitted for test and inspection; otherwise the entire lot shall be rejected. Pieces less than 5 percent of the lot may, with the approval of the Engineer, be zinc coated by an approved zinc rod, in accordance with ASTM A 780, if applied to correct areas less than 1 square inch. Materials may only be stripped and regalvanized a single time.

 **Shop Cleaning And Painting of Steel.** Graffiti shall be removed prior to painting, or in the case of ASTM A 709 Grade 50W steel, prior to shipping.

1. *Cleaning of Unpainted ASTM A 709 Grade 50W Steel.* The exterior surfaces of unpainted ASTM A 709 Grade 50W steel shall be cleaned with abrasive blasting to a minimum standard of Sa2 to remove mill scale and foreign material which would prohibit rusting to a uniform color. This cleaning shall occur after fabrication and prior to shipping. The use of paint, wax, crayon or similar materials for making steelwork during fabrication and erection shall not be permitted. Care shall be taken on site with both storage and handling of the girders such that the developing rust is not damaged.

**Revise subsection 509.26, add into the first paragraph and revise (a) and (b) as follows:**

 **Field Welding and Inspection.** Field welding will not be permitted unless shown on the plans or approved by the Engineer, except to attach studs. Prior to the start of any field welding, all required welding documentation including welder qualifications, WPS, PQR, and WQTR shall be submitted to the Engineer for review and approval. All field welding ~~will~~ shall be completed by a ~~qualified~~ welder qualified under ~~the~~ ~~given process and~~ AWS D1.5 welding code requirements. All field welding and inspection including Stay-in-Place metal deck forms shall be performed in accordance with this specification and AWS D1.5. Studs shall be free from rust, rust pits, scale, oil, moisture, paint, and other deleterious matter that would adversely affect the welding operation. Surfaces to which studs are to be welded shall be free of scale, rust, moisture, paint, and other injurious material that would prevent proper welding or produce objectionable fumes. Additional studs shall be tested in accordance with AWS

D1.5 ~~paragraph 7.5.4.1~~ when the base metal temperature is below 32 F at the time of welding. Stud welding shall not be done when the base metal temperature is below 0 F at the time of welding.

1. *Stud welding in the field.* Automatic stud welding guns shall be used to weld studs to girders. The operator shall be qualified per AWS D1.5. ~~Subsection~~ ~~7.7.4~~. The base metal where the stud is to be welded shall be ground to bright metal immediately prior to the weld being made. Manual welding will not be allowed except to make repairs. Stud welding shall be in accordance with subsection 509.20 (h).
2. *Repairing Stud Welds.* Electrodes used to repair stud welds shall be kept in rod ovens in accordance with AWS D1.5. ~~Subsection 12.6.~~ The fillet weld size shall be a minimum of 5/16 inch. The welder shall be prequalified for the welding process used and stud welding.

**Revise subsection 509.27, revise paragraphs 2, 3 and 4 as follows:**

 **Erection of Steel Structures.**

Structural steel members shall be erected to prevent damage to all elements of the structure and in a safe manner. Structural steel members to which the erection specification applies are those members that bear on the substructure of a bridge. The primary members such as beams and girders shall be temporarily anchored and braced as they are erected to preclude detrimental movement in any direction, and to prevent overturning and buckling. Struts, bracing, tie cables, and other devices used for temporary restraint shall be considered falsework and shall be designed to resist all loads imposed during each stage of construction until the deck concrete has attained the Field Compressive Strength shown in Table 601-1.

At least two steel girders shall be erected when girders are initially placed in any span, unless the Engineer provides a written waiver to this requirement. Diaphragms and cross frames between girders shall be connected to the girders and all diaphragm or cross frame connection bolt holes filled with bolts that are at least snug tight during erection~~. The Contractor’s Engineer shall specify bolt torque requirements, if any, prior to releasing girders from the crane.~~ Steel box girders need not be erected in pairs.

At least one week prior to the Pre-Erection Conference, the Contractor shall submit an Erection Plan to the Engineer. The Erection Plan will be reviewed by the Engineer and Staff Bridge concurrently and combined comments will be submitted in writing within one week. These comments shall be addressed in the final plan. The Final Erection Plan shall be signed and sealed by the Contractor’s Engineer and marked “Approved for Construction”. ~~the Contractor shall approve, sign and submit an Erection Plan to the Engineer for record purposes only. The Erection Plan shall be stamped “Approved for Construction” and signed by the Contractor. The Erection Plan will not be approved by the Engineer.~~ If falsework drawings are required, they shall conform to and be submitted in accordance with subsection 601.11.

The ~~company~~ Contractor performing steel girder erection shall be ~~certified to~~ an AISC Advanced Certified Steel Erector ~~(ASCE)~~. The erector shall have successfully completed erection of at least 2 major bridge structures within the last 5 years and have a minimum of 5 years of experience with the erection of bridges. The experience shall be submitted for acceptance to the Engineer prior to the bid process.

**Revise subsection 509.27, fourth paragraph following (8) as follows:**

When a bridge spans traffic of any kind, including those where vehicles, railroad, watercraft or pedestrians have access onto, under~~neath~~ or adjacent to ~~except for~~ ~~to include construction traffic and the Contractor’s employees~~, ~~the~~ Contractor’s Engineer shall inspect and provide written approval ~~of~~ that the erected girders are safe prior to opening the area beneath the girders to traffic. For this specification, traffic is defined as the vehicles, railroad, pedestrians, and watercraft moving along a route. The Contractor shall perform daily inspections of the erected girders and other permanent and temporary bridge elements until the deck concrete has attained the Field Compressive Strength. The Contractor’s Engineer shall provide an inspection form to the Engineer and the Contractor that lists the items the Contractor will document during the daily inspection of the erected girders. The inspection form shall include inspection items specific to each bridge being constructed. The Contractor shall provide the Engineer and the Contractor’s Engineer with written documentation of these inspections within 24 hours of each inspection.

**Revise subsection 509.27 (i) as follows:**

*(j) Handling and Installation.* During erection the parts shall be accurately assembled, as shown on the plans, and match-marks shall be followed. The material shall be so handled that parts will not be bent, broken, or otherwise damaged. Hammering which will damage or distort the members will not be permitted on exterior surfaces. Bearing surfaces and surfaces to be in permanent contact shall be cleaned before the members are assembled.

For fit up of girder field splices and field connections of main stress carrying members, erection pins shall be installed in all corner bolt holes on each side of splice, plus a minimum of ~~25~~ 50 percent of the bolt holes, evenly distributed throughout the splice. ~~shall have a minimum of one half of the holes filled with high strength bolts and cylindrical erection pins, with the~~ The diameter of the erection pins shall be no less than the hole diameter minus 1/64 inch. At least ~~25~~ 50 percent of bolt holes shall be filled with high strength bolts. These bolts shall be fully tightened before external support systems are removed and the connections completed by belting, unless otherwise specified. ~~Erection pins which are no less than~~ ~~1~~~~»~~~~64~~ ~~inch in diameter smaller than the drilled holes shall be used at the extreme corners of the pattern in main member connections.~~ ~~This~~ The requirement for erection pins in the corner bolt holes does not apply to diaphragms and lateral bracing in straight girder spans, provided the member is adequately supported prior to removal of the external support. Members that are assembled prior to being erected shall have all bolts installed and fully tightened. The structure shall not carry traffic or construction loads without approval of the Engineer.

**Revise subsection 509.28, (b), second paragraph; (c) 1. and (d) as follows:**

*(b) Materials.* Washer type direct tension indicators shall conform to ASTM F 959.

Bolts shall be ~~AASHTO M164~~ ASTM F3125 Type 1 for connections which are painted. Bolts for unpainted ASTM A 709 Grade 50W steel shall be AASHTO M 164

Type 3. The maximum tensile strength shall be 150 ksi for bolts 1 inch or less in diameter and 120 ksi for larger bolts.

Nuts shall be AASHTO M 292 grade 2H or AASHTO M291 grade DH for plain or galvanized fasteners, except connections for unpainted ASTM A 709 Grade 50W steel, in which case nuts shall be AASHTO M 291 grade DH3 or C3. For galvanized fasteners, the nuts shall be over-tapped to the minimum amount required for the fastener assembly.

All nuts, bolts, and washers shall have the manufacturer's markings on them.

All galvanized nuts shall be lubricated with a lubricant containing a visible dye so a visual check can be made for the lubricant at the time of field installation. Plain bolts shall be "oily" to the touch when installed. Weathered or rusty items shall be cleaned and relubricated prior to installation.

1. *Test Requirements.* All high strength fasteners, including black bolts and nuts, shall be subjected to a rotational-capacity test in accordance with AASHTO M 164, section 8.5 and shall meet the following requirements:
   1. *Tension Procedure.* Fasteners shall be turned two times the required number of turns (from snug tight conditions) indicated in the AASHTO Standard Specifications for Highway Bridges,Table 10.17B, in a ~~Skidmore-Wilhelm calibrator~~ Calibrated Measuring Device~~, or equivalent~~ ~~tension measuring device~~, without stripping or failure.
2. *Field Connections.* Unless otherwise specified, all field connections shall be made with A325 (Type III) tension control bolts, or standard A325 (Type III) bolts using the “Turn of the Nut” Method in accordance with FHWA Report No. FHWA-SA-91-031 “High Strength Bolts for Bridges”, Appendix A2. ~~high-strength bolts which include direct tension indicators. Direct tension indicators shall be either washer type direct tension indicators or tension control bolts.~~ Washer type indicators shall not be used. ~~with unpainted ASTM A 709 Grade 50W steel.~~

**Revise subsection 509.28, (h), first paragraph; and (h)1. as follows:**

*(h) Inspection.* The Contractor shall provide an acceptable platform from which the Engineer can inspect bolt tension and determine whether the work meets specification requirements. The following inspection and testing procedure shall be used for all high strength bolts used in structural connections unless a more extensive or different inspection is specified.

* 1. *Quality Assurance.* The Engineer will inspect a sufficient number of fasteners to en~~as~~sure compliance with Table 509-3 using a method commensurate with the type of fastener used. All loose fasteners shall be brought into compliance.

**Revise subsection 509.28, Table 509-3 as follows:**

## Table 509-3

|  |  |
| --- | --- |
| **Nominal Bolt Size** | **Required Minimum Bolt Tension (lbs.)** |
| ½ | 13~~2~~,000 |
| 5/8 | 20~~19~~,000 |
| ¾ | 29~~8~~,000 |
| 7/8 | 41~~39~~,000 |
| 1 | 54~~41~~,000 |
| 1 1/8 | 59~~6~~,000 |
| 1 ¼ | 75~~1~~,000 |
| 1 3/8 | 89~~5~~,000 |
| 1 ½ | 108~~3~~,000 |

**Revise subsection 509.29, (a) as follows:**

 **Field Cleaning and Painting of Steel.**

1. *Self-Weathering Steel.* Unpainted ASTM A 709 Grade 50W steel shall be cleaned of foreign material after erection to assure uniform weathering of the steel. It may be necessary to perform a final blast cleaning after deck construction at locations specified by the Engineer.

**Revise subsection 509.30 as follows:**

 **Fracture Control Plan.** The Fracture Control Plan (FCP) applies to all main stress carrying members identified on the plans as fracture critical. Welded butt joints spliced within fracture critical members (FCMs), including weld and fillet weld attachments to FCMs, shall be welded and tested in accordance with this plan. The FCP shall be in accordance with the latest edition of AWS D1.5, ~~Section 12~~. Chemical and mechanical tests, as required by this plan, shall be the responsibility of the fabricator.