SECTION 05 12 00

STRUCTURAL STEEL
08/18

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

AISC 303	(2016) Code of Standard Practice for Steel Buildings and Bridges
AISC 325	(2017) Steel Construction Manual
AISC 341	(2016) Seismic Provisions for Structural Steel Buildings
AISC 360	(2016) Specification for Structural Steel Buildings
AISC 420	(2010) Certification Standard for Shop Application of Complex Protective Coating Systems

AMERICAN WELDING SOCIETY (AWS)

AWS A2.4	(2012) Standard Symbols for Welding, Brazing and Nondestructive Examination
AWS D1.1/D1.1M	(2020; Errata 1 2021) Structural Welding Code - Steel
AWS D1.8/D1.8M	(2016) Structural Welding Code—Seismic Supplement

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME B46.1	(2009) Surface Texture, Surface Roughness, Waviness and Lay

ASTM INTERNATIONAL (ASTM)

ASTM A143/A143M	(2007; R 2014) Standard Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement
ASTM B695	(2021) Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel

ASTM F3125/F3125M	(2015a) Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 830 MPa and 1040 MPa Minimum Tensile Strength, Metric Dimensions
ASTM F959/F959M	(2017a) Standard Specification for Compressible-Washer-Type Direct Tension Indicators for Use with Structural Fasteners, Metric Series

CRANE MANUFACTURERS ASSOCIATION OF AMERICA (CMAA)

CMAA 70	(2015) Specification for Top Running Bridge and Gantry Type Multiple Girder Electric Overhead Traveling Cranes

ARCHITECTURAL INSTITUTE OF JAPAN (AIJ)

JASS 6	(2015) Structural Steelwork Specification for Building Construction

JAPANESE STANDARDS ASSOCIATION (JSA)

JIS B 1048	(2007) Fasteners - Hot Dip Galvanized Coatings
JIS B 1180	(2014) Hexagon Head Bolts and Hexagon Screws
JIS B 1181	(2014) Hexagon Nuts and Hexagon Thin Nuts
JIS B 1186	(2013) Sets of High Strength Hexagon Bolt, Hexagon Nut and Plain Washers for Friction Grip Joints
JIS B 1198	(2011) Headed Studs
JIS B 1220	(2015) Set of Anchor Bolt for Structures
JIS G 3106	(2020) Rolled Steels for Welded Structure
JIS B 1256	(2008) Plain Washers
JIS G 3136	(2022) Rolled Steels for Building Structure
JIS G 3192	(2014) Dimensions, Mass and Permissible Variations of Hot Rolled Steel Sections
JIS G 3193	(2008) Dimensions, Mass and Permissible Variations of Hot Rolled Steel Plates, Sheets, and Strips
JIS G 3444	(2021) Carbon Steel Tubes for General Structure
JIS G 3466	(2021) Carbon Steel Square and Rectangular Tubes for General Structure
JIS G 4321	(2000) Stainless Steel for Building

	Structure
JIS Z 2305	(2013) Non-destructive Testing - Qualification and Certification of Personnel
JIS H 8641	(2021) Hot Dip Galvanized Coatings
JIS K 5674	(2019) Lead-Free, Chromium-Free Anticorrosive Paints
JIS Z 3021	(2016) Welding and Allied Processes - Symbolic Representation
JIS Z 3060	(2015) Method of Ultrasonic Testing for Welds of Ferritic Steel

JAPANESE SOCIETY OF STEEL CONSTRUCTION (JSS)

JSS II 09	(2015) Sets of Torshear Type High Strength Bolt, Hexagonal Nut and Plain Washer for Structural Joints

MINISTRY OF LAND, INFRASTRUCTURE, TRANSPORT AND TOURISM (MLIT)

MLIT-SS Chapter 7	(2019) Public Building Construction Standard Specifications - Ch.7 Steel Frame Work

ASSOCIATION FOR MATERIALS PROTECTION AND PERFORMANCE (AMPP)

SSPC PA 1	(2016) Shop, Field, and Maintenance Coating of Metals
SSPC SP 3	(1982; E 2004) Power Tool Cleaning
SSPC SP 6/NACE No.3	(2007) Commercial Blast Cleaning

U.S. DEPARTMENT OF DEFENSE (DOD)

UFC 3-301-01	(2023; with Change 1, 2023) Structural Engineering

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR Part 1926, Subpart R	Steel Erection

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are [for Contractor Quality Control approval.][for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government.] Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Erection and Erection Bracing Drawings; G[, [_____]]

SD-02 Shop Drawings

Fabrication Drawings Including Details of Connections; G[, [_____]]

SD-03 Product Data

Shop Primer

Welding Electrodes and Rods

Direct Tension Indicator Washers

Non-Shrink Grout

Tension Control Bolts

SD-05 Design Data

[Shoring and Temporary Bracing; G[, [_____]]

] SD-06 Test Reports

Class B Coating

Weld Inspection Reports

Direct Tension Indicator Washer Inspection Reports

Bolt Testing Reports

[Embrittlement Test Reports

] SD-07 Certificates

][MLIT Structural Steel Fabricator Quality Certification

][MLIT Structural Steel Erector Quality Certification

] Welding Procedure Specifications (WPS)

[Overhead, Top Running Crane Rail Beam

][1.3 MLIT QUALITY CERTIFICATION

Work must be fabricated by MLIT Structural Steel Fabricator, Category M [R] [H]. Submit MLIT Structural Steel Fabricator quality certification.

Work must be erected by MLIT Structural Steel Certified Erector. Submit MLIT Structural Steel erector quality certification.

][1.4 SEISMIC PROVISIONS

Provide the structural steel system in accordance with AISC 341, Chapter J as amended by UFC 3-301-01.

]1.5 QUALITY ASSURANCE

1.5.1 Preconstruction Submittals

1.5.1.1 Erection and Erection Bracing Drawings

Submit for record purposes. Indicate the sequence of erection, temporary shoring and bracing. The erection drawings must conform to JASS 6 and MLIT-SS Chapter 7.[Erection drawings must be reviewed, stamped and sealed by a registered professional engineer.]

1.5.2 Fabrication Drawing Requirements

Submit fabrication drawings for approval prior to fabrication. Prepare in accordance with JASS 6 and MLIT-SS Chapter 7. Fabrication drawings must not be reproductions of contract drawings.[Sign and seal fabrication drawings by a registered professional engineer.] Include complete information for the fabrication and erection of the structure's components, including the location, type, and size of bolts, welds, member sizes and lengths, connection details, blocks, copes, and cuts. Use AWS A2.4 or JIS Z 3021 standard welding symbols.[Shoring and temporary bracing must be designed and sealed by a registered professional engineer and submitted for record purposes[, with calculations,] as part of the drawings.] Clearly highlight any deviations from the details shown on the contract drawings highlighted on the fabrication drawings. Explain the reasons for any deviations from the contract drawings.

1.5.3 Certifications

1.5.3.1 Welding Procedures and Qualifications

Prior to welding, submit certification for each welder stating the type of welding and positions qualified for, the code and procedure qualified under, date qualified, and the firm and individual certifying the qualification tests.[If the qualification date of the welder or welding operator is more than 6 months old, the welding operator's qualification certificate must be accompanied by a current certificate by the welder attesting to the fact that he has been engaged in welding since the date of certification, with no break in welding service greater than 6 months.]

Conform to all requirements specified in JASS 6 [and AWS D1.8/D1.8M].

[1.5.3.2 Overhead, Top Running Crane Rail Beam

Submit written field survey results for overhead, top running crane rail beam verifying tolerance requirements per CMAA 70.

]PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

[Conform the design of structural steel system to AISC 360, AISC 303, AISC 341, and UFC 3-301-01.]

Provide the structural steel system, including [shop primer] [galvanizing], complete and ready for use. Provide structural steel systems including materials, installation, workmanship, fabrication, assembly, erection, inspection, quality control, and testing in accordance with JASS 6 and MLIT-SS Chapter 7, except as modified in this contract.

2.2 STEEL

2.2.1 Structural Steel

Wide flange and WT shapes, JIS G 3136, SN490B, 325 MPa. Angles and Channels JIS G 3106, SM400, 235 MPa. Plates, JIS G 3136, SN400B, 235 MPa [SN490B, 325 MPa], unless otherwise indicated on contract drawings.[Provide structural steel containing a minimum of [80][_____] percent recycled content.]

2.2.2 Structural Steel Tubing

JIS G 3466, STKR400, 245MPa.[Provide structural steel tubing containing a minimum of [25][90][_____] percent recycled content.]

2.2.3 Steel Pipe

JIS G 3444, STK 400 and 235 MPa.[Provide steel pipe containing a minimum of [50][_____] percent recycled content.]

2.3 BOLTS, NUTS, AND WASHERS

Submit the certified manufacturer's mill reports which clearly show the applicable JIS mechanical and chemical requirements together with the actual test results for the supplied fasteners.

2.3.1 Common Grade Bolts

2.3.1.1 Bolts

JIS B 1180 with 420 MPa minimum tensile strength, plain finish [hot dipped zinc coating in accordance with JIS B 1048]. The bolt heads and the nuts of the supplied fasteners must be marked with the manufacturer's identification mark, the strength grade and type specified by JIS or JASS 6 specifications.

2.3.1.2 Nuts

Heavy hex style JIS B 1181, plain finish [hot dipped zinc coating in accordance with JIS B 1048].

[2.3.1.3 Self-Locking Nuts

Provide nuts with a locking pin set in the nut. The locking pin must slide along the bolt threads, and by reversing the direction of the locking pin, the nut can be removed without damaging the nut or bolt. Provide stainless steel locking pins.

]2.3.1.4 Washers

JIS B 1256, plain finish [hot dipped zinc coating in accordance with JIS B 1048].

2.3.2 High-Strength Bolts

High strength bolts and nuts must be shipped together in the same shipping container. Fasteners indicated to be galvanized shall be tested by the supplier to show that the galvanized nut with the supplied lubricant

provided may be rotated from the snug tight condition well in excess of the rotation required for pretentioned installation without stripping. The supplier shall supply nuts that have been lubricated and tested with the supplied bolts.

2.3.2.1 Bolts

JIS B 1186, Type F10T.

[JIS B 1186, Type F8T hot dipped zinc coating] [MLIT certified 12G SHTB hot dipped zinc coating].

2.3.2.2 Nuts

JIS B 1186, F10 [hot dipped zinc coating].

2.3.2.3 Direct Tension Indicator Washers

ASTM F959/F959M.[Provide ASTM B695, Class 55, Type 1 galvanizing.] Submit product data for direct tension indicator washers.

2.3.2.4 Washers

JIS B 1186, F35, plain carbon steel [hot dipped zinc coating].

2.3.3 Tension Control Bolts

MLIT approved JSS II 09, JIS B 1186 S10T twistoff style assemblies consisting of steel structural bolts with splined ends, heavy-hex carbon steel nuts, and hardened carbon steel washers. Assembly finish must be [plain]. Submit product data for tension control bolts.

2.3.4 Foundation Anchorage

2.3.4.1 Anchor Rods

JIS B 1220 ABR 400 [ABR490] [hot dipped galvanized]. [Stainless steel JIS B 1220, ABR520SUS.] [Stainless steel JIS B 1220, ABR520SUS conforming to JIS G 4321, Type SUS316A.]

2.3.4.2 Anchor Nuts

Hexagon nuts JIS B 1220 ABR 400 [ABR490] [hot dipped galvanized]. [Stainless steel JIS B 1220, ABR520SUS.] [Stainless steel JIS B 1220, ABR520SUS conforming to JIS G 4321, Type SUS316A.]

2.3.4.3 Anchor Washers

JIS B 1220 ABR 400 [ABR490] [hot dipped galvanized]. [Stainless steel JIS B 1220, ABR520SUS.] [Stainless steel G 4321 Type SUS316A conforming to JIS B 1220].

2.3.4.4 Anchor Plate Washers

JIS B 1220 ABR 400 [ABR490] [hot dipped galvanized]. [Stainless steel JIS G 4321 Type SUS304A [Type SUS316A] conforming to JIS B 1220].

2.4 STRUCTURAL STEEL ACCESSORIES

2.4.1 Welding Electrodes and Rods

AWS D1.1/D1.1M or JASS 6[and AWS D1.8/D1.8M]. Submit product data for welding electrodes and rods.

2.4.2 Non-Shrink Grout

Packaged dry, hydraulic cement non-shrink grout, that is non-metallic, non-corrosive, non-bleed, with the following performance requirements when prepared using the highest water-to-solids ratio, maximum flow, or most fluid consistency at 23.0 plus/minus 2.0 degrees C:

a. Minimum compressive strengths: 7.0 MPa at 1 day; 17.0 MPa at 3 day; 24.0 MPa at 7 day; and 34.0 MPa at 28 day.

b. Early height change (maximum percent at time of final setting): + 4.0 percent.

c. Height change of moist cured hardened grout: 0.0 to + 0.3 percent at 1-day, 3-day, 14-day and 28-day.

2.4.3 Welded Shear Stud Connectors

JIS B 1198 [,450MPa minimum ultimate tensile strength] [and 350MPa minimum yield strength].

[2.5 GALVANIZING

JIS B 1048 for threaded parts or JIS H 8641 for structural steel members, as applicable, unless specified otherwise galvanize after fabrication where practicable.

]2.6 FABRICATION

Fabrication must be in accordance with the applicable provisions of AISC 325and JASS 6. Fabrication and assembly must be done in the shop to the greatest extent possible. Punch, subpunch and ream, or drill bolt [and pin] holes perpendicular to the surface of the member.

Compression joints depending on contact bearing must have a surface roughness not in excess of 13 micrometer as determined by ASME B46.1, and ends must be square within the tolerances for milled ends specified in JIS G 3192, JIS G 3193, and JASS 6.

Shop splices of members between field splices will be permitted only where indicated on the Contract Drawings. Splices not indicated require the approval of the Contracting Officer.

[Do not splice truss top and bottom chords except as approved by the Contracting Officer. Provide chord splices at panel joints at approximately the third point of the span. The center of gravity lines of truss members must intersect at panel points unless otherwise approved by the Contracting Officer. When the center of gravity lines do not intersect at a panel point, make provisions for the stresses due to eccentricity. Camber of trusses must be 3 mm in 3.0 meters unless otherwise indicated.

]2.6.1 Markings

Prior to erection, identify members by a painted erection mark. Connecting parts assembled in the shop for reaming holes in field connections must be match marked with scratch and notch marks. Do not locate erection markings on areas to be welded. Do not locate match markings in areas that will decrease member strength or cause stress concentrations.[Affix embossed tags to hot-dipped galvanized members.]

2.6.2 Shop Primer

Shop prime structural steel, JIS K 5674 lead Free, chromium Free, anticorrosive paint, except as modified herein, in accordance with SSPC PA 1. Do not prime steel surfaces embedded in concrete, galvanized surfaces,[surfaces to receive sprayed-on fireproofing,] [surfaces to receive epoxy coatings,] [surfaces designed as part of a composite steel concrete section,] [slip critical surfaces of high strength bolted connections,] or surfaces within 13 mm of the toe of the welds prior to welding (except surfaces on which metal decking and shear studs are to be welded). If flash rusting occurs, re-clean the surface prior to application of primer. Apply primer [in accordance with endorsement "SPE-P1" ["SPE-P2"] ["SPE-P3"] of AISC 420 or approved equal NACE or SSPC certification] [_____]to a minimum dry film thickness of 0.05 mm. Submit shop primer product data. See Section 09 90 00 PAINTS AND COATINGS and Section 09 97 13.27 HIGH PERFORMANCE COATING FOR STEEL STRUCTURES for finish coating requirements, where applicable.

Prime slip critical surfaces with a Class B coating in accordance with AISC 325. Submit test report for Class B coating.

Prior to assembly, prime surfaces which will be concealed or inaccessible after assembly. Do not apply primer in foggy or rainy weather; when the ambient temperature is below 7 degrees C or over 35 degrees C; or when the primer may be exposed to temperatures below 4 degrees C within 48 hours after application, unless approved otherwise by the Contracting Officer. Repair damaged primed surfaces with an additional coat of primer.

2.6.2.1 Cleaning

SSPC SP 6/NACE No.3, except steel exposed in spaces above ceilings, attic spaces, furred spaces, and chases that will be hidden to view in finished construction may be cleaned to SSPC SP 3 when recommended by the shop primer manufacturer. Maintain steel surfaces free from rust, dirt, oil, grease, and other contaminants through final assembly.

[2.6.3 [Fireproofing] [and] [Epoxy] Coated Surfaces

Clean and prepare surfaces to receive [sprayed-on fireproofing] [epoxy] coatings in accordance with the manufacturer's recommendations, and as specified in Section 07 81 00 SPRAY-APPLIED FIREPROOFING.

][2.6.4 Surface Finishes

ASME B46.1 maximum surface roughness of 125 for pin, pinholes, and sliding bearings, unless indicated otherwise.

]2.7 DRAINAGE HOLES

Drill adequate drainage holes to eliminate water traps. Hole diameter

must be 13 mm and location indicated on the detail drawings. Hole size and locations must not affect the structural integrity.

PART 3 EXECUTION

3.1 ERECTION

a. Erection of structural steel must be in accordance with the applicable provisions of AISC 325, AISC 303 and 29 CFR Part 1926, Subpart R or MLIT-SS Chapter 7 and JASS 6.

After final positioning of steel members, provide full bearing under base plates and bearing plates using nonshrink grout. Place nonshrink grout in accordance with the manufacturer's instructions or MLIT-SS Chapter 7 and JASS 6.

3.1.1 STORAGE

Store the material out of contact with the ground in such manner and location as to minimize deterioration.

3.2 CONNECTIONS

Except as modified in this section, design connections indicated in accordance with AISC 360. Build connections into existing work. Do not tighten anchor bolts set in concrete with impact torque wrenches. Holes must not be cut or enlarged by burning. Bolts, nuts, and washers must be clean of dirt and rust, and lubricated immediately prior to installation.

3.2.1 Common Grade Bolts

Tighten JIS B 1180 bolts to a "snug tight" fit. "Snug tight" is the tightness that exists when plies in a joint are in firm contact. If firm contact of joint plies cannot be obtained with a few impacts of an impact wrench, or the full effort of a man using a spud wrench, contact the Contracting Officer for further instructions.

3.2.2 High-Strength Bolts

Provide direct tension indicator washers in all JIS B 1186 bolted connections. Bolts must be installed in connection holes and initially brought to a snug tight fit. After the initial tightening procedure, fully tension bolts, progressing from the most rigid part of a connection to the free edges.

Fastener components shall be protected from dirt and moisture in closed containers at the site of the installation. Fastener components that are not incorporated into the work shall be returned to protected storage at the end of the work shift.

3.2.2.1 Installation of Direct Tension Indicator Washers (DTIW)

Where possible, install the DTIW under the bolt head and tighten the nut. If the DTIW is installed adjacent to the turned element, provide a flat washer between the DTIW and nut when the nut is turned for tightening, and between the DTIW and bolt head when the bolt head is turned for tightening. In addition to the DTIW, provide flat washers under both the bolt head and nut when JIS Bolts equivalent to ASTM F3125/F3125M, Grade A490M bolts are used.

3.2.3 Tension Control Bolts

Bolts must be installed in connection holes and initially brought to a snug tight fit. After the initial tightening procedure, fully tension bolts, progressing from the most rigid part of a connection to the free edges.

3.3 GAS CUTTING

Use of gas-cutting torch in the field for correcting fabrication errors is not permitted on any major member in the structural framing. Use of a gas cutting torch will be permitted on minor members not under stress only after approval has been obtained from the Contracting Officer.

3.4 WELDING

Welding must be in accordance with JASS 6[and AWS D1.8/D1.8M].[Grind exposed welds smooth as indicated.] Provide JASS 6 qualified welders, welding operators, and tackers.

Develop and submit the Welding Procedure Specifications (WPS) for all welding, including welding done using prequalified procedures. Submit for approval all WPS, whether prequalified or qualified by testing.

3.4.1 Removal of Temporary Welds, Run-Off Plates, and Backing Strips

[Removal is not required][Remove only from finished areas].[Remove backing strips from bottom flange of moment connections, backgouge the root pass to sound weld metal and reinforce with a 8 mm fillet weld minimum.]

3.5 SHOP PRIMER REPAIR

Repair shop primer in accordance with the paint manufacturer's recommendation for surfaces damaged by handling, transporting, cutting, welding, or bolting.

3.5.1 Field Priming

Field prime steel exposed to the weather, or located in building areas without HVAC for control of relative humidity. After erection, the field bolt heads and nuts, field welds, and any abrasions in the shop coat must be cleaned and primed with paint of the same quality as that used for the shop coat.

[3.6 GALVANIZING REPAIR

Repair damage to galvanized coatings using JASS 6 zinc rich paint for galvanizing damaged by handling, transporting, cutting, welding, or bolting. Do not heat surfaces to which repair paint has been applied.

]3.7 FIELD QUALITY CONTROL

Perform field tests, and provide labor, equipment, and incidentals required for testing[, except that electric power for field tests will be furnished as set forth in Division 1]. Notify the Contracting Officer in writing of defective welds, bolts, nuts, and washers within 7 working days of the date of the inspection.

3.7.1 Welds

3.7.1.1 Visual Inspection

Perform in accordance with JASS 6. Furnish the services of certified welding inspectors for fabrication and erection inspection and testing and verification inspections. A Certified Welding Inspector must perform visual inspection on 100 percent of all welds. Document this inspection in the Visual Weld Inspection Log. Submit certificates indicating that certified welding inspectors meet the requirements of Japanese Welding Engineering Society (JWES) and JASS 6.

[Inspect proper preparation, size, gaging location, and acceptability of all welds; identification marking; operation and current characteristics of welding sets in use.

]3.7.1.2 Nondestructive Testing

Nondestructive testing must be in accordance with JASS 6 and JIS Z 3060[and AWS D1.8/D1.8M]. Ultrasonic testing must be performed in accordance with Table [6.2] [or 6.3] of AWS D1.1/D1.1M. Test locations must be [as indicated][selected by the Contracting Officer]. All personnel performing NDT must be certified in accordance with JIS Z 2305 in the method of testing being performed. Submit certificates showing compliance with JIS Z 2305 for all NDT technicians. If more than [20] [_____] percent of welds made by a welder contain defects identified by testing, then all groove welds made by that welder must be tested by ultrasonic testing, and all fillet welds made by that welder must be inspected by magnetic particle testing (MT) or dye penetrant testing (PT) as approved by the Contracting Officer. When groove welds made by an individual welder are required to be tested, magnetic particle or dye penetrant testing may be used only in areas inaccessible to ultrasonic testing. Retest all repaired areas. Submit weld inspection reports.

Testing frequency: Provide the following types and number of tests:

Test Type	Number of Tests
Ultrasonic	[_____]50 percent of CJP Welds
Magnetic Particle	[_____]50 percent of PJP and Fillet Welds
Dye Penetrant	[_____]50 percent of PJP and Fillet Welds
[_____]	[_____]

3.7.2 Direct Tension Indicator Washers

3.7.2.1 Direct Tension Indicator Washer Compression

Test direct tension indicator washers in place to verify that they have been compressed sufficiently to provide the 0.38 mm gap, as required by ASTM F959/F959M. Submit direct tension indicator washer inspection reports.

[3.7.2.2 Direct Tension Indicator Gaps

In addition to the above testing, an independent testing agency as

approved by the Contracting Officer, must test in place the direct tension indicator gaps on 20 percent of the installed direct tension indicator washers to verify that the ASTM F959/F959M direct tension indicator gaps have been achieved. If more than 10 percent of the direct tension indicators tested have not been compressed sufficiently to provide the average gaps required by ASTM F959/F959M, test all in place direct tension indicator washers to verify that the ASTM F959/F959M direct tension indicator gaps have been achieved. Test locations must be selected by the Contracting Officer.

]3.7.3 High-Strength Bolts

3.7.3.1 Testing Bolt, Nut, and Washer Assemblies

Test a minimum of [3] [_____] bolt, nut, and washer assemblies from each mill certificate batch in a tension measuring device at the job site prior to the beginning of bolting start-up. Demonstrate that the bolts and nuts, when used together, can develop tension not less than the provisions specified in AISC 360, depending on bolt size and grade. The bolt tension must be developed by tightening the nut. A representative of the manufacturer or supplier must be present to ensure that the fasteners are properly used, and to demonstrate that the fastener assemblies supplied satisfy the specified requirements. Submit bolt testing reports.

3.7.3.2 Inspection

Inspection procedures must be in accordance with JASS 6 and MLIT-SS Chapter 7. As a minimum, high-strength bolting inspection tasks shall be in accordance with Section 01 45 35 SPECIAL INSPECTION. Confirm and report to the Contracting Officer that the materials meet the project specification and that they are properly stored. Confirm that the faying surfaces have been properly prepared before the connections are assembled. Observe the specified job site testing and calibration, and confirm that the procedure to be used provides the required tension. Monitor the work to ensure the testing procedures are routinely followed on joints that are specified to be fully tensioned.

[Inspect calibration of torque wrenches for high-strength bolts.

]3.7.3.3 Testing

The Government has the option to perform nondestructive tests on [5] [_____] percent of the installed bolts to verify compliance with pre-load bolt tension requirements. Provide the required access for the Government to perform the tests. The nondestructive testing will be done in-place using an ultrasonic measuring device or any other device capable of determining in-place pre-load bolt tension. The test locations must be selected by the Contracting Officer. If more than [10] [_____] percent of the bolts tested contain defects identified by testing, then all bolts used from the batch from which the tested bolts were taken, must be tested at the Contractor's expense. Retest new bolts after installation at the Contractor's expense.

[3.7.4 Testing for Embrittlement

ASTM A143/A143M for steel products hot-dip galvanized after fabrication. Submit embrittlement test reports.

]3.7.5 Inspection and Testing of Steel Stud Welding

Perform verification inspection and testing of steel stud welding conforming to the requirements of JASS 6, Stud Welding Clause. The Contracting Officer will serve as the verification inspector. Bend test studs that do not show a full 360 degree weld flash or have been repaired by welding as required by JASS 6, Stud Welding Clause. Studs that crack under testing in the weld, base metal or shank will be rejected and replaced by the Contractor at no additional cost.

-- End of Section --