SECTION 05 05 23.16

STRUCTURAL WELDING
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 360	(2016) Specification for Structural Steel Buildings

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 D1.3/D1.3M	(2018) Structural Welding Code - Sheet Steel
AWS D1.4/D1.4M	(2011) Structural Welding Code - Reinforcing Steel
AWS D1.8/D1.8M	(2016) Structural Welding Code—Seismic Supplement

ARCHITECTURAL INSTITUTE OF JAPAN (AIJ)

JASS 6	(2015) Structural Steelwork Specification for Building Construction

JAPANESE STANDARDS ASSOCIATION (JSA)

JIS Z 2305	(2013) Non-destructive Testing - Qualification and Certification of Personnel
JIS Z 2320	(2007) Non-destructive Testing - Magnetic Particle Testing
JIS Z 2343	(2001) Non-destructive Testing - Penetrant Testing
JIS Z 3021	(2016) Welding and Allied Processes - Symbolic Representation
JIS Z 3400	(2013) Quality Requirements for Fusion Welding of Metallic Materials

JIS Z 3420	(2003) Specification and Approval of Welding Procedures for Metallic Materials - General Rules
JIS Z 3801	(2018) Standard Qualification Test and Acceptance Requirements for Manual Welding Technique
JIS Z 3841	(2018) Standard Qualification Test and Acceptance Requirements for Semi-Automatic Welding Technique
JIS Z 3881	(2014) Standard Qualification Procedure for Gas Pressure Welding Technique of Steel Bars for Concrete Reinforcement

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

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

THE JAPAN WELDING ENGINEERING SOCIETY (JWES)

WES 9009	(2007) Safety and Health in Welding, Thermal Cutting, and Allied Processes Parts 1 through 6

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.] [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

Welding Quality Assurance Plan; G

SD-03 Product Data

Welding Procedure Qualifications; G

Welder, Welding Operator, and Tacker Qualification

Previous Qualifications

Pre-Qualified Procedures; G

Welding Electrodes and Rods

SD-06 Test Reports

Nondestructive Testing

Weld Inspection Log

SD-07 Certificates

Certified Welding Inspector

Nondestructive Testing Personnel

1.3 QUALITY ASSURANCE

Except for pre-qualified (in accordance with JASS 6 and JIS Z 3420) and previously qualified procedures, each Contractor performing welding must record in detail and qualify the welding procedure specification for any welding procedure followed in the fabrication of weldments. Conform welding procedure qualifications to AWS D1.1/D1.1M[, AWS D1.8/D1.8M] or JASS 6 and JIS Z 3420 and to the specifications in this section. Submit for approval copies of the welding procedure specification and the procedure qualification records for each type of welding being performed. Submission of the welder, welding operator, or tacker qualification test records is also required. Approval of any procedure, however, does not relieve the Contractor of the sole responsibility for producing a finished structure meeting all the specified requirements. Submit this information on the forms in Annex M of AWS D1.1/D1.1M or in accordance with JIS Z 3420. Individually identify and clearly reference on the detail drawings and erection drawings all welding procedure specifications, or suitably key them to the contract drawings. In case of conflict between this specification and AWS D1.1/D1.1M or JASS 6 and JIS Z 3420, this specification governs.

1.3.1 General Requirements

Fabricate work in MLIT Certified Fabrication Plant. Erect work by MLIT Certified Erector.

a. For Structural Projects, provide documentation of the following:

(1) Component Thickness 3 mm and greater: Qualification documents (WPS, PQR, and WPQ) in accordance with JASS 6 and JIS Z 3420 [and AWS D1.8/D1.8M].

(2) Component Thickness Less than 3 mm: Qualification documents (WPS, PQR, and WPQ) in accordance with AWS D1.3/D1.3M or JASS 6 and JIS Z 3420.

(3) Reinforcing Steel: Qualification documents (WPS, PQR, and WPQ) in accordance with AWS D1.4/D1.4M or JASS 6 and JIS Z 3881.

1.3.2 Previous Qualifications

Welding procedures previously qualified by test in accordance with JASS 6, may be accepted for this contract without re-qualification, upon receipt of the test results, if the following conditions are met:

a. Testing was performed by an approved testing laboratory, technical consultant, or the Contractor's approved quality control organization.

b. The qualified welding procedure conforms to the requirements of this specification and is applicable to welding conditions encountered under this contract.

c. The welder, welding operator, and tacker qualification tests conform to the requirements of this specification and are applicable to welding conditions encountered under this contract.

1.3.3 Pre-qualified Procedures

Welding procedures which are considered pre-qualified as specified in JASS 6 will be accepted without further qualification. Submit for approval a listing or an annotated drawing to indicate the joints not pre-qualified. Procedure qualification is mandatory for these joints. [No pre-qualified welding procedures are allowed. Qualify the welding procedures and welders by tests prescribed in the applicable code or specification not withstanding the fact the code or specification may allow pre-qualified procedures.]

1.3.4 Welder, Welding Operator, and Tacker Qualification

Each welder, welding operator, and tacker assigned to work on this contract must be qualified in accordance with the applicable requirements of JASS 6, JIS Z 3801 and JIS Z 3841, [AWS D1.8/D1.8M] and as specified in this section. Welders, welding operators, and tackers who make acceptable procedure qualification test welds will be considered qualified for the welding procedure used within the applicable essential variables for welder qualification.

1.3.4.1 Previous Personnel Qualifications

At the discretion of the Contracting Officer, welders, welding operators, and tackers qualified by test within the previous 6 months may be accepted for this contract without re-qualification if all the following conditions are met:

a. Copies of the welding procedure specifications, the procedure qualification test records, and the welder, welding operator, and tacker qualification test records are submitted and approved in accordance with the specified requirements for detail drawings.

b. Testing was performed by an approved testing laboratory, technical consultant, or the Contractor's approved quality control organization.

c. The welder, welding operator, and tacker qualification tests conform to the requirements of this specification and are applicable to welding conditions encountered under this contract.

1.3.4.2 Certificates

Before assigning any welder, welding operator, or tacker to work under this contract, submit the names and certification that each individual is qualified as specified. State in the certification the type of welding and positions for which the welder, welding operator, or tacker is qualified, the code and procedure under which the individual is qualified, the date qualified, and the name of the firm and person certifying the qualification tests. Keep the certification current, on file, and furnish 3 copies.

1.3.4.3 Renewal of Qualification

Re-qualification of a welder or welding operator is required under any of the following conditions:

a. It has been more than 6 months since the welder or welding operator has used the specific welding process for which he is qualified.

b. There is specific reason to question the welder or welding operator's ability to make welds that meet the requirements of these specifications.

c. The welder or welding operator was qualified by an employer other than those firms performing work under this contract, and a qualification test has not been taken within the past 12 months. Submit as evidence of conformance all records showing periods of employment, name of employer where welder, or welding operator, was last employed, and the process for which qualified.

d. A tacker who passes the qualification test is considered eligible to perform tack welding indefinitely in the positions and with the processes for which he/she is qualified, unless there is some specific reason to question the tacker's ability or there has been a gap greater than 6 months since he/she last used the process. In such a case, the tacker is required to pass the prescribed tack welding test.

1.3.5 Inspector Qualification

Submit certificates indicating that certified welding inspectors meet the requirements of JASS 6. Submit qualifications for nondestructive testing personnel in accordance with the requirements of JIS Z 2305 Levels 1 or 2 in the applicable nondestructive testing method. Level I inspectors must have direct supervision of a Level II inspector.

1.3.6 Symbols and Safety

Use symbols in accordance with AWS A2.4 or JIS Z 3021, unless otherwise indicated. Follow safe welding practices and safety precautions during welding in conformance with WES 9009.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

[Conform the design of welded connections to AISC 360, unless otherwise indicated or specified.]Material with welds will not be accepted unless the welding is specified or indicated on the drawings, in conformance to JASS 6 or MLIT-SS Chapter 7, or otherwise approved. Perform welding as specified in this section, except where additional requirements are shown on the drawings or are specified in other sections. Do not commence welding until welding procedures, inspectors, nondestructive testing personnel, welders, welding operators, and tackers have been qualified and the submittals approved by the Contracting Officer. Perform all testing at or near the work site. Maintain records of the test results obtained in welding procedure, welder, welding operator, and tacker performance qualifications.

2.1.1 Pre-erection Conference

Hold a pre-erection conference prior to the start of the field welding, to bring all affected parties together and to gain a naturally clear understanding of the project and the Welding Procedure Specifications (WPS) (submitted for all welding, including welding done using

pre-qualified procedures). Mandatory attendance is required by all Contractor's welding production and inspection personnel and appropriate Government personnel. Include as items for discussion: responsibilities of various parties; welding procedures and processes to be followed; welding sequence (both within a joint and joint sequence within the building); inspection requirements and procedures, both visual and nondestructive testing; welding schedule; and other items deemed necessary by the attendees.

2.2 WELDING EQUIPMENT AND MATERIALS

Provide all welding equipment, welding electrodes and rods, welding wire, and fluxes capable of producing satisfactory welds when used by a qualified welder or welding operator. [Use [_____] welding electrodes.] [Perform welding using the [_____] process.] Provide welding equipment and materials that comply with the applicable requirements of AWS D1.1/D1.1M or JASS 6[and AWS D1.8/D1.8M]. Submit product data on welding electrodes and rods.

PART 3 EXECUTION

3.1 WELDING OPERATIONS

3.1.1 Requirements

Conform workmanship and techniques for welded construction to the requirements of JASS 6 and JIS Z 3400[, AWS D1.8/D1.8M and AISC 360]. [When JASS 6 and JIS Z 3400, AWS D1.8/D1.8M and AISC 360 specification conflict, the requirements of AISC 360 and AWS D1.8/D1.8M govern.]

3.1.2 Identification

Identify all welds in one of the following ways:

a. Submit written records to indicate the location of welds made by each welder, welding operator, or tacker.

b. Identify all work performed by each welder, welding operator, or tacker with an assigned number, letter, or symbol to identify welds made by that individual. The Contracting Officer may require welders, welding operators, and tackers to apply their symbol next to the weld by means of rubber stamp, felt-tipped marker with waterproof ink, or other methods that do not cause an indentation in the metal. Place the identification mark for seam welds adjacent to the weld at 1 m intervals. Identification with die stamps or electric etchers is not allowed.

3.2 QUALITY CONTROL

Perform testing using an approved inspection or testing laboratory or technical consultant; or if approved, the Contractor's inspection and testing personnel may be used instead of the commercial inspection or testing laboratory or technical consultant. A Certified Welding Inspector must perform visual inspection on 100 percent of all welds. Document this inspection in the Visual Weld Inspection Log. Test [50][_____] percent of CJP welds using ultrasonic testing per Table [6.2] [or 6.3] of AWS D1.1/D1.1M. Randomly test [50][_____] percent of all PJP and fillet welds or as indicated by magnetic particle or dye penetrant testing. Verify the welds conform to paragraph STANDARDS OF ACCEPTANCE. Conform

procedures and techniques for inspection with applicable requirements of JASS 6[, AWS D1.8/D1.8M], JIS Z 2343, and JIS Z 2320. Submit a Welding Quality Assurance Plan and records of tests and inspections.

3.3 STANDARDS OF ACCEPTANCE

Conform dimensional tolerances for welded construction, details of welds, and quality of welds with the applicable requirements of JASS 6[, AWS D1.8/D1.8M] and the contract drawings. Submit all records of nondestructive testing.

3.3.1 Nondestructive Testing

The welding is subject to inspection and tests in the mill, shop, and field. Inspection and tests in the mill or shop do not relieve the Contractor of the responsibility to furnish weldments of satisfactory quality. When materials or workmanship do not conform to the specification requirements, the Government reserves the right to reject material or workmanship or both at any time before final acceptance of the structure containing the weldment. Any indication of a defect is regarded as a defect, unless re-evaluation by nondestructive methods or by surface conditioning shows that no unacceptable defect is present. Submit all records of nondestructive testing in accordance with paragraph STANDARDS OF ACCEPTANCE.

3.3.2 Destructive Tests

Make all repairs when metallographic specimens are removed from any part of a structure. Employ only qualified welders or welding operators, and use the proper joints and welding procedures, including peening or heat treatment if required, to develop the full strength of the members and joints cut and to relieve residual stress.

3.4 GOVERNMENT INSPECTION AND TESTING

In addition to the inspection and tests performed by the Contractor for quality control, the Government will perform inspection and testing for acceptance to the extent determined by the Contracting Officer. The work may be performed by the Government's own forces or under a separate contract for inspection and testing. The Government reserves the right to perform supplemental nondestructive and destructive tests to determine compliance with paragraph STANDARDS OF ACCEPTANCE.

3.5 CORRECTIONS AND REPAIRS

If inspection or testing indicates defects in the weld joints, repair defective welds using a qualified welder or welding operator as applicable. Conduct corrections in accordance with the requirements of AWS D1.1/D1.1M or JASS 6[, AWS D1.8/D1.8M] and the specifications. Repair all defects in accordance with the approved procedures. Repair defects discovered between passes before additional weld material is deposited. Wherever a defect is removed and repair by welding is not required, blend the affected area into the surrounding surface to eliminate sharp notches, crevices, or corners. After a defect is thought to have been removed, and before re-welding, examine the area by suitable methods to ensure that the defect has been eliminated. Repaired welds must meet the inspection requirements for the original welds.

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