



## Iowa Department of Transportation

### SPECIAL PROVISIONS FOR A1010 STRUCTURAL STEEL

Woodbury County  
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Effective Date  
August 18, 2015

THE STANDARD SPECIFICATIONS, SERIES 2012, ARE AMENDED BY THE FOLLOWING MODIFICATIONS AND ADDITIONS. THESE ARE DEVELOPMENTAL SPECIFICATIONS AND THEY SHALL PREVAIL OVER THOSE PUBLISHED IN THE STANDARD SPECIFICATIONS.

#### 120354a.01 DESCRIPTION.

- A. Apply Section 2408 of the Standard Specifications with the following modifications.
- B. This special provision addresses materials, handling requirements, and fabrication requirements specific to A1010 structural steel.

#### 120354a.02 MATERIALS REQUIREMENTS, IDENTIFICATION, AND FABRICATION.

##### A. Base Materials.

1. The Fabricator shall certify that all material, including welding consumables, are of domestic origin in accordance with the Standard Specifications.
2. Steel plates utilized to fabricate members shall meet requirements of ASTM A1010, Grade 50, and shall have a minimum chromium content of 12%. The steel shall have a Young's modulus of 29,000 ksi and a minimum average Charpy V-notch fracture toughness of 30 foot-pounds at 10°F.
3. **Galvanized High Strength Bolts, Nuts, and Washers.**  
Apply [Article 4153.06 of the Standard Specifications](#).

##### B. Identification of Steel during Fabrication.

The Contractor shall provide check samples from material furnished for fabrication for testing purposes.

1. The plates, shapes or bars from which check samples are required will be designated by the Engineer, and shall be ordered from the mill with the extra size required for samples. The Engineer may take additional samples from drop-offs or scrap material as deemed necessary. No more than two samples will be required from any one plate, shape, or

bar. Remove material for check samples in the presence of the Engineer. The Engineer will select the locations where samples are to be taken according to 11.3 - location of ASTM A6. To verify the accuracy of test reports for ASTM A1010 check samples of both ends of one plate of each thickness from the same heat and treatment batch are required.

2. ~~Check samples in plates shall be rectangular, not less than 24 inches long in the required normal direction of rolling with width of 6 inches. Check samples in bars or shapes shall be the full section and at least 24 inches long. Check samples from plates shall be rectangular, with a width of 6 inches and not less than 24 inches long such that the 24 inch length is transverse to the final direction of rolling of the plate as in ASTM A6, 11.2. In removing the sample, take care not to damage it by overheating. The Contractor shall contract with a third party certified lab to perform machining and testing of specimens. The machining and testing of specimens shall be performed in the presence of the Engineer.~~
3. The normal basis of acceptance of material will be the mill report and check sample test report, and fabrication need not be held up pending results of check tests. If the check tests indicate material with properties failing to meet the minimum requirements of the material specification, the material may be rejected and the Contractor required to order new material at no expense to the Contracting Authority.
4. For purposes of determining compliance with these Specifications, if the results of ~~an original~~ a check tensile specimen are ~~within 2000 psi of the required tensile strength, within 1000 psi of the required yield point, or within 2% of the required elongation~~ less than 70,000 psi tensile strength, less than 50,000 psi yield strength, or less than 18% elongation, a retest will be permitted on two more specimens from the same ~~test sample~~ plate. The retest tensile specimens must be oriented with the longitudinal axis of the specimens transverse to the final direction of rolling of the plate as in ASTM A6, 11.2. If the results from both of these retest specimens meet Specifications, the plates of the thickness represented by the sample will be accepted. ~~The specimens must be oriented with the final direction of rolling in the same manner as the original specimen.~~ The extra material from the plates, ~~shapes or bars that is~~ not used for check testing shall become the property of the Contractor.

**C. Bent Plates.**

If a radius shorter than parameters listed in Table 2408.02-2 is essential, the following shall apply. Hot bend plates at a temperature no greater than 1200°F. If the edges are sheared, the minimum bend radius for bends perpendicular to the major rolling direction shall be equal to 1/2 of the material thickness; the minimum bend radius for bends parallel to the major rolling direction shall be equal to twice the material thickness.

**D. Thermal Cutting.**

Plates shall be cut by plasma cutting, powder cutting, or laser cutting, and operations shall follow the guidelines of the equipment supplier with particular care not to use excessive cutting speeds. Oxygen cutting is not permitted. Alternate methods of cutting may be submitted to the Engineer for review and approval.

**E. Stress Relief Heat Treatment.**

Do not anneal or normalize members made of ASTM A 709 Grade 100/100W steel. A1010 material shall be stress relieved at temperatures of 1300°F or less. Stress relieve only with the Engineer's approval.

**F. Bolt Holes.**

Holes shall not be punched to full size. Instead, subpunch and ream, subdrill and ream, or drill full size holes in main stress carrying members. Drill full size holes for members (other than main

stress carrying members) made of material no thicker than 3/4 inch for carbon steel and 5/8 inch for alloy steel.

**G. Grinding, Sanding, Weld Cleaning.**

Perform fabrication of ASTM A1010 steel using new tools. Do not use tools previously used on carbon steel unless approved by the Engineer.

**120354a.03 CONSTRUCTION.**

**A. Welding.**

**SECTION 1. General Provisions**

**1.3 Welding Processes**

**ADD** the following Paragraphs after the existing 1.3.1:

**1.3.1.1** All welding procedures shall be qualified in accordance with AWS D1.5. Welding of main members and welding of attachments thereto shall be performed using only shielded metal arc (SMAW), flux cored arc (FCAW), or submerged arc (SAW), in addition to stud welding processes. Unless otherwise approved by the Engineer, all welding of butt splices and flange to web welds and stiffeners to web welds shall be done using the submerged arc (SAW) process. Shielded metal arc (SMAW) welding may be used for repairs to butt splices and flange to web welds. When using the submerged metal arc (SAW) process, prior to fabrication the Contractor shall provide evidence that the necessary weld properties including strength, ductility, and toughness can be achieved, and that distortion can be controlled.

**1.3.1.3** Unless otherwise permitted by the Engineer, in order to avoid diminished heat-affected zone toughness, the maximum heat input is 25 kJ/in for material thickness less than 1/2 inch, and no greater than 70 kJ/in for thicker material. Voltage and current should be set at the low to middle portion of the electrode manufacturer’s range. Weld beads should be of the stringer type and of a size sufficient for the application without overwelding. For heat input values outside this range, qualification of the welding procedures shall be done per AWS D1.5 with the approval of the Engineer.

**1.3.1.4** Preheat material sufficiently to eliminate surface moisture. The maximum interpass temperature shall be 400°F unless otherwise approved by the Engineer.

**1.3.1.5** The recommended consumables for welding by welding process are as follows, except as noted in 1.3.1.6 below:

<b>WELDING PROCESS</b>	<b>FILLER WIRE</b>		<b>FLUX OR SHIELDING GAS</b> (See Note 1)
	<u>DESIGNATION</u>	<u>SPECIFICATION</u>	
SMAW	E309L-xx E308L-xx E316L-xx	ANSI/AWS A5.4	NOT USED
FCAW	E309LTx-x E308LTx-x E316LTx-x	ANSI/AWS A5.22	CO <sub>2</sub> , Ar-O <sub>2</sub> (1 – 5%), Ar-CO <sub>2</sub> (5 – 25%)
SAW	E309L E308L E316L	ANSI/AWS A5.9	NEUTRAL FLUX

Note 1: Match to electrode per manufacturer's recommendation.

1.3.1.6 Welding of A1010 steel to carbon steel shall be done employing 309L.

### **SECTION 3. Workmanship**

#### **3.2 Preparation of Base Metal**

**ADD** the following paragraph before the existing first Paragraph 3.2.2:

For all members, thermal cutting shall be in accordance with Section 2408.02, H.

### **SECTION 5. Qualifications**

#### **Part B. Welder, Welding Operator, and Tack Welder Qualification**

##### **5.21 General Requirements**

**ADD** Perform welder qualification test per AWS 01.5 Part B on ASTM A1010 steel plate in the presence of the Engineer. Welders must be qualified for groove welds per Section 5.23.1.2 and fillet welds per Section 5.23.1.4 of AWS D1.5. Separate qualification tests for groove and fillet welds are required. Give notice of two weeks to the Engineer prior to test performance. Welders, welding operators, and tack welders who have not passed the qualification test with ASTM A1010 steel base and filler are not allowed to perform work on ASTM A1010 steel materials.

##### **5.23 Qualification Tests Required**

**ADD**

1. ~~Perform Procedure Qualification Testing using 1/2 inch and 1 3/4 inch plate in accordance with Figure 5.1 of AWS 01.5 using a B-U4a-G joint detail with a 3/8 inch root gap as modified in Attachment 1.~~ Welding processes shall be as per AWS welding code.
2. Ultrasonic inspection of ASTM A1010 full penetration weld is qualified by mock-up testing developed by the Fabricator and approved by the Engineer.

### **SECTION 6. Inspection**

#### **Part A. General Requirements**

##### **6.7 Nondestructive Testing**

**ADD**

1. Perform inspection identified in AWS 01.5 Section 6.7.7 by ASTM E165 Standard Test Method for Liquid Penetrate Examination.
2. Perform fillet weld soundness test per Section 5.10.2.2 of AWS D1.5.

#### **B. Shop Assembly.**

No base metal repairs may be made without prior approval of the Engineer. Submit detailed documentation of discontinuity and extent of repair to the Engineer.

#### **120354a.04 METHOD OF MEASUREMENT.**

The Method of Measurement for Structural Steel (A1010) and incidental metal parts involved in fabrication and construction shall be in accordance with Section 2408.04, C and D.

**120354a.05 BASIS OF PAYMENT.**

Payment for Structural Steel (A1010) and incidental metal parts shall be in accordance with Section 2408.05, C and D.