

ITEM 564.41 nnnn16 - HIGH PERFORMANCE STEEL, HPS GRADE 485W

DESCRIPTION:

Under this work, the Contractor shall furnish and erect structural steel in accordance with this specification and the contract documents.

All provisions of Subsection 564 of the Standard Specifications and the New York State Steel Construction Manual shall apply, except as modified on the plans or in this specification.

MATERIALS:

All High Performance Steel furnished under this item shall meet the requirements of the latest edition of ASTM A709M Grade HPS485W material and the supplementary requirement S83 Zone 3 for Non-Fracture Critical material or S84 Zone 3 for Fracture Critical Material. The requirements of A709 Section 5 *Heat Treatment* is hereby modified to permit the use of non-heat treated material (TMCP).

The Contractor is advised that quenched and tempered HPS 485W steel plates may be limited to a 15.24 meter maximum delivery length from the mill.

All non-HPS elements shall meet the requirements of ASTM A709M Grade 345W material and Section 564 of the Standard Specifications.

CONSTRUCTION DETAILS:

All structural steel work, including but not limited to shop drawings, fabrication, inspection and transportation shall be done in accordance with the provisions of the NYS Steel Construction Manual, as modified by the Contract documents.

Fabricators shall be certified in accordance with the AISC Quality Certification Program in the "Major Steel Bridges (Cbr)" category with the "Fracture Critical Members (F)" endorsement or an approved equal prior to the start of fabrication.

Welding:

Welding shall be in accordance with the ANSI/AASHTO/AWS D1.5-2002 *Bridge Welding Code* including the AASHTO *Guide Specifications for Highway Bridge Fabrication with HPS 70W Steel* published in September of 2000, modified as follows:

Welding procedure specifications shall be submitted to the Metals Engineering Unit for determination of welding procedure qualification (WPQR) tests to be performed.

WPQR tests must be witnessed by a representative of the Department and be performed within three years of the start of fabrication. Results of the welding procedure qualification tests and final welding procedure specifications shall be submitted to the Metals Engineering Unit for review and approval. Qualification tests shall measure tensile strength, yield strength, ductility and toughness of the course grained area of the Heat Affected Zone (HAZ). The notch in the specimens shall be carefully located in the course grained area of the HAZ as determined by macroetching the specimens prior to machining and testing. The toughness requirement (Table 4.1, Zone I & II) for the HAZ shall be the same as the weld metal.

Welders and welding operators shall be qualified in accordance with AWS D1.5 Section 5, Part B using radiographic examination only. Qualification testing shall be performed within three years of the start of fabrication.

Filler metal shall meet the requirements of AWS D1.5, Table 4.1 *Matching Filler Metal Requirements* for Welding Procedure Specifications (WPS) qualified in accordance with Article 5.12 as follows:

Filler metals used for complete penetration groove welds connecting HPS485 material shall conform to AWS D1.5, Table 4.1 for Grade 485W material.

Filler metals used for complete penetration groove welds connecting HPS485 material to Grade 345W material shall conform to AWS D1.5, Table 4.1 using either Grade 345W or 485W material

Filler metals used to attach stiffeners and connection plates to HPS485 webs and flanges shall conform to AWS D1.5, Table 4.1 using either Grade 345W or 485W material.

Filler metals for fillet welds connecting HPS webs to HPS flanges shall conform to AWS D1.5, Table 4.1 for 485W material unless undermatching filler metals are allowed in the contract plans. If undermatching is allowed, filler metals shall meet the requirements for 345W material.

Only Submerged Arc Welding (SAW) and Shielded Metal Arc Welding (SMAW) are permitted when welding HPS485 material. Consumable handling requirements shall be in accordance with AWS D1.5 Articles 12.6.5 and 12.6.6 except that all consumables shall meet the hydrogen control level of either H4 or H8. The electrode and flux combinations shall conform to the following:

(A) Submerged Arc Welding process:

Electrode: LA-85 by the Lincoln Electric Company

Flux: MIL 800-HPNi by the Lincoln Electric Company

(B) Shielded Metal Arc Welding process:

Matching: E9018MR*
Undermatching: E8018MR*

Note: MR designation required for all SMAW electrodes.

Preheat and interpass temperatures shall meet the requirements of Table 3 in the *AASHTO Guide Specifications for Highway Bridge Fabrication with HPS 70W Steel (September 2000)*, with the higher temperatures required when using H8 consumables.

The fillet welds shall be magnetic particle (MP) tested in accordance with Section 6.7.2 of AWS D1.5. MP tests shall be done as described in Section 18 of the NYS Steel Construction Manual using the yoke technique, modified to test in the AC output mode only.

100% of all complete penetration groove welds in tension and stress reversal areas of the plate girders shall be evaluated by and conform to both radiographic and ultrasonic tests as described in Sections 16 and 17 of the NYS Steel Construction Manual. Testing must be completed before repairs are made to the weld.

Complete penetration groove welds in compression shall be evaluated in accordance with AWS D1.5 Article 6.7.1.2.

Restrictions

Application of heat for any reason must be done by procedures approved by the Deputy Chief Engineer Structures. In addition, heating is limited to 590°C maximum for quench and tempered materials and 480°C maximum for TMCP material unless otherwise approved by the DCES.

METHOD OF MEASUREMENT

Measurement will be made per kilogram for HPS steel used in hybrid designs and by lump sum for entire girders consisting of HPS.

BASIS OF PAYMENT

The provisions of Subsection 564-5 shall apply.