



**SPECIAL PROVISIONS
FOR
HEAT STRAIGHTENING OF BRIDGE BEAMS**

**Polk County
IMN-235-2(653)0--0E-77**

**Effective Date
April 17, 2018**

THE STANDARD SPECIFICATIONS, SERIES 2015, ARE AMENDED BY THE FOLLOWING MODIFICATIONS AND ADDITIONS. THESE ARE SPECIAL PROVISIONS AND THEY SHALL PREVAIL OVER THOSE PUBLISHED IN THE STANDARD SPECIFICATIONS.

150381.01 DESCRIPTION.

This work is to permanently repair a damaged welded plate girder on the 218 foot by 39 foot continuous welded plate girder bridge carrying East o North I-80 ramp over I-235, 0.2 miles East of West junction I-80. This bridge was struck by an over height load on westbound I-235. The damaged beam shall be repaired by heat straightening to restore it to its original shape and alignment.

150381.02 EXPERIENCE REQUIREMENTS.

Prior to beginning work, submit to the Engineer documentation of 10 or more years of experience in the field of heat straightening major structural elements on highway or railroad bridges and a documented list of at least three bridge structures that have been successfully heat straightened.

150381.03 NOTIFICATION AND PRELIMINARY WORK.

- A.** Notify the Engineer 2 weeks prior to the starting date of heat straightening operations.
- B.** Prior to blast cleaning of structural steel, the Contractor and the Engineer shall inspect the damaged section for gouges, sharp dents, cracks or other impact caused defects and document any damage observed. If additional cracks are found other than those noted in the plans, the Iowa DOT's Office of Bridges and Structures will be informed by the Engineer prior to the Contractor proceeding with the repair.
- C.** In accordance with the plans, blast clean the portions of the beam, that have been damaged and require heat straightening.

150381.04 REPAIR BEAM, HEAT STRAIGHTENING.

- A.** Jacks or "Come-Alongs" may be used to mechanically augment the heat straightening process. Jacking forces shall be limited to 4 tons. Loading shall be judiciously applied to the beam during the straightening process. The jacking force shall not be adjusted during heating or before the

temperature in the beam has cooled to 600°F or less. Adequately brace the adjacent beams at the jacking locations in order to prevent overloading due to applied lateral loads.

- B. Heating shall be done using No. 8 or smaller torch tips on an oxygen-acetylene gas mixture. Vee line or spot heating patterns shall be conducted to bring the steel within the planned pattern to a temperature between 600°F and 1200°F to produce deformations of the steel member conforming to the tolerances outlined on the plans and these special provisions. After the beam has been heat straightened, the heating pattern used shall be furnished to the Engineer for informational purposes. In no case shall the temperature exceed 1200°F (a dull red) as determined with use of temperature indicating crayons, liquids or a bimetal thermometer.
- C. Provide the Engineer with temperature indicating crayons manufactured for 600°F, 1000°F, and 1350°F.
- D. The temperature of the heated metal may be determined by the color of the steel adjacent to the tip of the torch by using temperature crayons to correlate the temperature of the heated metal to the color of the steel. In normal daylight conditions, 1200°F will be indicated by a satiny, silver color near the torch tip. After cooling, the area should be gray in color.
- E. Only quenching with clean dry air will be permitted. Cooling with compressed air may be done only after the steel has cooled naturally to at least 600°F. Cooling shall be uniform throughout the heated area.
- F. After the heat straightening has been completed, the Engineer will visually inspect the repaired beam. At the Engineer's discretion, nondestructive testing of the structural steel and weld may be performed if cracks are suspected. The Contracting Authority will do all testing.

150381.05 TOLERANCES.

The alignment of the repaired beam shall be within the following tolerances:

- Tolerances for sweep shall be 1/4 inch per 20 feet of length.
- Vertical deflections or waves in the flange shall not be more than 1/4 inch.
- The web shall be straightened to within 1/4 inch of plumb.
- Camber shall be within 1/4 inch of comparable readings of an undamaged adjacent interior beam. Camber readings shall be taken at 2 foot intervals within the span and submitted to the Engineer. In the event that the camber is not within tolerances, adjust camber using the heating process.

150381.06 PERFORMANCE.

If the alignment of the beam is not straightened to within the tolerances specified or if the beam is cracked as a result of the heat straightening process, replace or repair the portions of the beam as determined by the Office of Bridges and Structures of the Iowa Department of Transportation. The cost of repair or replacement with a new section of beam, associated materials, and labor shall be borne by the Contractor at no cost to the Contracting Authority.

150381.07 METHOD OF MEASUREMENT.

The Contractor will be paid the lump sum contract price bid for Repair Beam, Heat Straightening, As Per Plan.

150381.08 BASIS OF PAYMENT.

This lump sum shall include furnishing all labor, materials and equipment required to heat straighten all damaged portions of the beam to its original alignment as noted herein. This includes furnishing all jacks and temporary bracing needed in the heat straightening process.