ITEM 784
REPAIRING STEEL BRIDGE MEMBERS

784.1. **Description.** Repair steel bridge members such as beams, girders, diaphragms, trusses, and piling.

784.2. **Materials.** Furnish materials conforming to the following:
- Epoxy in accordance with DMS-6100, “Epoxies and Adhesives,”
- Grout in accordance with Item 421, “Hydraulic Cement Concrete,”
- Replacement steel in accordance with Item 442, “Metal for Structures,” and
- Paint in accordance with Item 446, “Cleaning and Painting Steel.”

784.3. **Equipment.** Provide equipment, including restraining equipment when required, capable of indicating the amount of force applied.

784.4. **Work Requirements.** Repair or replace steel bridge members in accordance with the plans. Submit a plan that includes the repair method, application of heat and restraint, material, temporary bracing or shoring, and equipment. Obtain approval of the plan before beginning work. Field-weld in accordance with Item 448, “Structural Field Welding.” Perform heat straightening using welding personnel certified for unlimited thickness and all positions in accordance with Item 448. Perform shop fabrication in accordance with Item 441, “Steel Structures.”

A. **Heat Straightening.** Return all distorted members to their original section, tilt, and straightness by heat straightening. Use approved mechanical devices to restrain the member while applying heat to straighten the distorted metal. Do not use mechanical forces to straighten or bend the metal. Do not apply impact loads such as hammer blows. Repair minor dents, nicks, and gouges by grinding the defect to an acceptable contour and appearance with all corners rounded to a 1/16-in. radius. Grind so that the finished grinding marks run in the direction of the applied stresses. Straighten steel members to the tolerances of Table 1.

<table>
<thead>
<tr>
<th>Greatest Cross-Section Dimension</th>
<th>Maximum Cross-Section Displacement</th>
<th>Maximum Departure from Straightness (per foot of length)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Over 36&quot;</td>
<td>0.5&quot;</td>
<td>0.05&quot;</td>
</tr>
<tr>
<td>12&quot; – 36&quot;</td>
<td>0.375&quot;</td>
<td>0.0375&quot;</td>
</tr>
<tr>
<td>Under 12&quot;</td>
<td>0.25&quot;</td>
<td>0.025&quot;</td>
</tr>
</tbody>
</table>

1. **Restraining Force.** When jacks are used, apply and lock off load before applying heat. Limit restraining forces, applied before heating, to the values shown on the plans or as approved. Do not load the member in a manner that causes material to yield without the application of heat.

2. **Heating process.** Do not exceed the maximum allowable temperatures shown in Table 2 when applying heat to steel.

<table>
<thead>
<tr>
<th>Grade</th>
<th>Maximum Temperature (°F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>36</td>
<td>1,200</td>
</tr>
<tr>
<td>50, 50S, 50W, HPS 50W</td>
<td>1,200</td>
</tr>
<tr>
<td>HPS 70W, Q&amp;T and TMCP</td>
<td>1,100</td>
</tr>
<tr>
<td>100/100W and HPS 100/100W</td>
<td>1,100</td>
</tr>
</tbody>
</table>

Use only orifice tips, and proportion tip size to the thickness of the material. Manipulate heating torches to guard against overheating. When vee or rectangular heat patterns are used, mark the
patterns on the steel prior to heating. Bring steel within the planned temperature as rapidly as possible without overheating. Guard against buckling when heating relatively thin, wide plates. Closely monitor temperatures with temperature-sensitive crayons, pyrometers, or infrared non-contact thermometers. Measure the temperature 5–10 seconds after the heating flame leaves the area to be tested.

3. **Cooling.** Cooling with dry compressed air after the steel has cooled to below 600°F is permitted. Do not cool the steel with water or mist. Allow the steel to cool to below 250°F before applying another set of heating patterns.

B. **Section Replacement.** Replace sections of steel members as shown on the plans or as approved.

C. **Bearing Establishment.** Repair areas of incomplete bearing between the slab and the beam by epoxy injection in accordance with Item 780, “Epoxy Injection,” or placement of a grout mixture in accordance with Item 421, “Hydraulic Cement Concrete,” as directed.

D. **Painting.** Complete repairs before painting. Paint repaired area only, unless otherwise shown on plans, in accordance with Item 446, “Cleaning and Painting Steel.” Use System II unless otherwise shown on the plans. Match the color of the existing appearance coating.

784.5. **Measurement.** This Item will be measured by each repaired member or by lump sum for the entire bridge. A member is defined as one of the following individual components:
- steel beam or girder over the length of 1 span, unless otherwise shown on the plans;
- diaphragm and its connecting hardware between adjacent steel beams;
- truss vertical;
- truss diagonal;
- truss sway brace;
- piling; or
- other elements shown on the plans.

784.6. **Payment.** The work performed and materials furnished in accordance with this Item and measured as provided under “Measurement” will be paid for at the unit price bid for “Repairing Steel Bridge Members” of the component specified when measured by each member, or for “Repairing Steel Bridge Members” when measured by lump sum. This price is full compensation for repairing steel bridge members and for steel, grout, epoxy, materials, equipment, labor, tools, and incidentals.

No additional payment will be made if the Contractor elects to replace a member indicated to be repaired.