ITEM 02564.3121XX M - IN PLACE REPAIR OF STEEL STRINGERS

Description

The work shall consist of repairing steel stringers by means of heating and welding.

The work shall be done "in place" at the locations indicated by the Contract Documents in accordance with the stated Repair Procedure.

Materials

Materials for this work shall conform to the following:

1. STEEL: This shall meet the requirements of ASTM A36. Certified copies of the mill test reports shall be given to the Engineer prior to the beginning of work.

2. PAINT AND PAINTING PROCEDURES: The painting of the repaired sections shall be paid for under specific items. Locations for Paint and Removal of Paint will be shown in the Contract Documents.

3. HEATING TORCHES: These shall be approximately 25mm diameter, multi-orifice, (rosebud) type. They shall operate on approximately 170 KPa propane - 850 KPa oxygen. Torches and tips proposed for use are subject to the approval of the D.C.E.S.

4. WELDING ELECTRODES: Welding electrodes shall be 4mm diameter; AWS classification E7018. They shall be furnished in hermetically sealed containers. Immediately upon container opening the electrodes shall be placed into an electrode drying oven. They shall be dried for at least two hours, but no longer than four hours at a temperature held between 230°C and 260°C. After drying, the oven temperature shall be lowered to 120°C. The electrodes shall be kept at 120°C continuously until they are used in the work. Electrodes removed from the oven shall be subject to the following time restrictions based upon relative humidity conditions.

Relative Humidity	Time to Use
Up to 70%	4 hours
70% and above	2 hours

Electrodes not used within the times allowed shall be discarded. Re-drying of electrodes will not be permitted.

5. EQUIPMENT MAINTENANCE: All equipment shall be maintained in good working condition for the duration of this work. Malfunctioning equipment shall be repaired, or replaced, without

Construction Details

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A. HEAT-STRAIGHTENING

Compressive stresses will be permitted up to a maximum of 138MPa. This stress limit will apply to all steel covered by this specification. Jacks or "come-alongs" may be used to produce these stresses prior to and during heating. Any method of handling, supporting or loading that causes the member to distort permanently (yield without the application of heat) will result in rejection of the member.

Members rejected due to permanent distortion will be repaired by methods approved by the D.C.E.S. The Contractor shall submit a proposed repair procedure to the D.C.E.S. for approval. The D.C.E.S. will approve, or modify the submitted procedure, or he will substitute a repair procedure for the Contractor to follow. No work of any nature shall be done to a rejected member until the D.C.E.S.'s approval, or substitute repair procedure has been received by the Contractor. All work performed for reasons of permanent distortion, including nondestructive tests performed by the D.C.E.S. to evaluate the limit and extent of damage, will be done at the expense of the contractor. Delays to the Contractor's operations resulting from permanent distortion damage will be at his expense. No request for extensions of time will be considered.

Heating shall be confined to the patterns described herein and shall be conducted so as to bring the steel within the planned pattern to a temperature between 560°C and 650°C as rapidly as possible without overheating the steel.

Prior to the beginning of heating operations, the Contractor shall provide the Engineer with temperature - indicating crayons manufactured 315°C, 620°C and 675°C.

All existing paint shall be removed to a distance described in the Repair Procedure General Notes. No paint shall be subjected to temperatures in excess of 535°C. All workers shall be equipped with protective clothing and properly fitting respirators utilizing a separate, fully independent air supply as required by OSHA. No worker, not equipped as required by the foregoing, will be permitted at the work locations.

Only truncated triangular heating patterns shall be used. The base of the triangle shall be the flange edge that is convex before heating. The apex of the heating triangle shall be truncated to a 25mm width. The truncated end of the heating triangle shall be located at the junction of the web and flange.

The heating patterns shall be marked on the flange surfaces prior to heating.

The base of the heating triangle shall not exceed 250mm regardless of flange width or thickness.

Sufficient heating patterns shall be used to eliminate unsightly chording effects.

Heating shall begin at the truncated end of the heating pattern. Heating shall progress slowly toward the base of the pattern spreading with an included angle of 15 to 30 degrees.

If flange thickness exceed 32mm or if cover plates are attached to flanges of any thickness, two torches shall be used and heat shall be applied simultaneously to both the top and bottom surfaces of the flange at each heat pattern.

The heating torches shall not begin to progress toward the base of the heating pattern until the truncated end of the pattern is brought up to the specified temperature. Once heating begins to progress toward the base of the pattern, the heating torches shall not be returned to the apex of the heating triangle.

The heating torches shall be manipulated to guard against general and surface overheating. When heating thick plates, it may be necessary to occasionally interrupt heating for periods of less than one minute to allow the heat to soak into the flange and avoid surface overheating.

Quenching with water or water and air will not be permitted. Cooling with dry compressed air will be permitted after the steel has cooled to 315°C.

Any heating procedure which causes a portion of the steel to be heated to a temperature greater than 650°C shall be considered destructive heating. Destructive heating shall automatically cause the rejection of the steel.

Steel rejected due to destructive heating shall be subject to the same restrictions and procedures as previously noted for permanent distortion of steel members by the Contractor. All repair, test, and delay costs shall be borne by the Contractor.

B. OXYGEN CUTTING: Oxygen cutting shall be done in accordance with the requirements of the SCM, Section 6.

C. WELDING: Welding shall be done in accordance with the requirements of the SCM, Section 7.

D. NON-DESTRUCTIVE TESTING: (N.D.T.) This shall be done as required by the Repair Procedure.

E. INSPECTION: In addition to the N.D.T., visual inspections shall be done to all of the repaired stringer. Should the welds not meet the acceptance criteria of the SCM or if cracks are found in the Base Metal, the D.C.E.S. shall be immediately notified of the particulars.

The Contractor shall submit a proposed repair procedure based upon the inspection findings. The proposal shall be subject to the approval, modification and substitution requisites given previously for the repair of permanently distorted members. No work of any nature shall be done to, or in the near vicinity of, the unacceptable welds or cracked Base Metal prior to the repair being completed.

F. TOLERANCES: After heat-straightening, welding and welding operations are completed, the stringer shall be measured for sweep tolerances. Sweep tolerances shall be 6mm per 3.00m, except that at point of impact, a localized distortion of 20mm in 1.50m is acceptable.

Dents at points of impact shall be repaired by welding and grinding.

G. RECONNECTION: All steel to be reconnected shall be reconnected after repair work has been completed.

H. PAINTING: Painting work shall be done only after all the work has been completed and to be paid for under appropriate paint pay items in the Contract.

I. SUPPORTING POSTS: Support posts shall be erected where called for in the Contract Documents. The Contractor shall assume full responsibility for the adequacy of all temporary supports.

Method of Measurement

Payment will be made by lump sum. No field measurements will be taken.

Basis of Payment

The Lump Sum Price Bid for this item shall include the cost of furnishing all labor, materials, and equipment necessary to complete all the work, including ultrasonic testing, magnetic particle inspection, and engineering certification.

Payment for the repair of preexisting flaws revealed by visual or magnetic particle inspection procedure will be paid for by agreed prices.

No payment will be made for the repair of defects made or improperly corrected by the Contractor.