Heat Straightening Program

Description

The *Michigan Department of Transportation's (MDOT) Heat Straightening Program* is managed by the Operations Field Services Division, Structural Fabrication Unit and was developed for approved heat straightening contractors and new contractors that are interested in becoming approved by MDOT to heat straighten damaged structural steel. Contractors must be approved by MDOT prior to the Project Letting to be qualified to bid on MDOT projects that have heat straightening work. This document is broken down into the following sections:

1. Heat Straightening
2. MDOT Specifications
3. Contractor Responsibilities
4. Contractor Evaluation Process

Heat Straightening

In general, heat straightening is a process where steel is restrained from moving, heated in a specific pattern, and cooled. If the process is correctly performed, the steel will thermally "upset" and move in the desired direction while not adversely affecting the microstructure and mechanical properties of the steel. The heat straightening process is repeated until the member is in the desired geometry. It is very important that the heating temperature, heating patterns, restraining force, cooling methods, and number of damage-heating cycles adhere to the specifications recommended by the research performed by the below agencies to prevent adverse changes to the mechanical properties of the steel. MDOT's specifications have been developed through research funded by the Federal Highway Administration (FHWA) and National Cooperative Highway Research Program (NCHRP). Listed below are the references used by MDOT for developing project specifications for heat straightening work:

1. *Heat Straightening Repairs of Damaged Steel Bridges, A Technical Guide and Manual of Practice*, FHWA-IF-99-004, October 1998.
2. National Cooperative Highway Program (NCHRP) Report 604, *Heat-Straightening Repair of Damaged Steel Bridge Girders: Fatigue and Fracture Performance*, Report 604, 2008.

MDOT Specifications

Project specifications for heat straightening can be found in the following documents:

1. Subsection 713.03.G of the MDOT's 2012 Standard Specifications for Construction (as modified by 12SS-001A-XX, *Errata to the 2012 Standard Specifications*).
2. 12SP-713A-XX, *Special Provision for Heat Straightening Damaged Structural Steel*

Contractor Responsibilities

Approved heat straightening contractors must adhere to the following responsibilities or risk loss of approval:

1. All relevant contract documents including, but not limited to the MDOT Standard Specifications for Construction, special provisions, and contract plans must be strictly followed;
2. Attend and participate in pre-heat straightening meeting prior to starting heat straightening activities on MDOT projects;
3. All key staff members must have a copy of the project specific approved MDOT Form 0388 (*Heat Straightening Plan*) available at all times while performing heat straightening activities on MDOT projects. Failure to produce the approved plan will result in heat straightening privileges removed from the project until the plan is provided;
4. Key staff member stated in project specific approved *Heat Straightening Plan* is the only individual permitted to apply restraining forces and heating patterns to the damaged structural steel, except as stated in responsibility #5 below.
5. Non-key staff members stated in the *Heat Straightening Plan* are permitted to apply restraining forces and heating patterns under the following conditions:
    - Each non-key staff member must have a dedicated key staff member directly supervise their work at all times. For example, if there are two non-key staff members stated in the *Heat Straightening Plan* then there must be two key staff members included in the plan and to directly supervise the non-key staff members.
    - Key staff member must be arm's length away from non-key staff member at all times during jacking and heating operations.
6. Keep contact and key staff information up to date. Contractors must use MDOT Form 0386 (*MDOT Heat Straightening General Information*) for updating information and email the form to MDOT's Structural Fabrication Unit using the email resource provided at the bottom of this section;
7. Maintain tools and equipment in a satisfactory condition and have all equipment that is used to apply force to the steel equipped with a gauge and calibrated annually or sooner if there is reason to believe the forces being applied are not accurate; and
8. Provide accurate temperature sensing equipment used for monitoring the temperature of the steel to ensure it is not overheated. Calibrate temperature sensing equipment at least annually and verify prior to each use with another calibrated device.

Please direct any questions you have to MDOT's Structural Fabrication Unit using the following email resource: MDOT-StructuralFabrication@michigan.gov

Contractor Evaluation Process

MDOT's contractor evaluation process is the same for both new and currently approved contractors, except the on-site review for a currently approved contractor may be waived by MDOT based on the volume and type of MDOT work that the approved contractor has been involved with over the previous approval period. The evaluation process begins with the contractor submitting documentation for MDOT to review and if everything is in order an on-site review is scheduled. On-site review of the contractor and their key staff members can take place at either a MDOT project site (only for currently approved contractor), the contractor's yard, or one of MDOT's facilities. The location will be decided by MDOT, but preference will be given to meeting at a MDOT project site and MDOT facility. Currently approved contractors are required to be re-evaluated every three years. It is suggested that the approved contractor start the evaluation process by submitting the documentation package at least two months prior to their approval expiration date to prevent lapse in approval and the associated inability to bid on MDOT projects. The following two sections discuss what is required for the documentation and on-site reviews.

Documentation Review

A documentation package must be provided to MDOT that shows the contractor has been engaged in heat straightening damaged structural steel on a continuous basis over the past three years. Below is a list of items required to be included in the package prior to MDOT scheduling an on-site review:

- Completely filled out MDOT Form 0386 (*MDOT Heat Straightening General Information*);
- Brief description stating an understanding of *MDOT's Heat Straightening Program*;
- Brief description stating an understanding of MDOT project specifications;
- Contractor project experience including the following:
    - Project name, location, year worked on, and brief description of the repair performed;
    - Name and contact information for owner of the structure repaired;
    - Name of key staff members on the project; and
    - Photos (before and after) of the repaired area.
- All tools and equipment used to perform and monitor the heat straightening operation; and
- Other.

On-Site Review

An on-site review of the contractor and their key staff members is scheduled once the documentation package is found to be acceptable by MDOT. The contractor is responsible for providing all of the necessary equipment, tools, and materials to demonstrate their ability to heat straighten damaged structural steel a specified amount using all of the basic heating patterns and different restraining force arrangements while meeting MDOT's heat straightening specifications. All individuals proposed by the contractor to be key staff members must be present and perform heat straightening during the on-site review.

MDOT's representative will use MDOT Form 0387 (*Heat Straightening Program Audit Checklist*) to evaluate the contractor and their key staff members and will take photographs of the operations, tools, and equipment for audit records. Please notify the MDOT representative if specific items cannot be photographed. It is important to note that MDOT's representative is responsible for observing and reporting, whereas MDOT's Structural Fabrication Unit will make the overall determination whether the contractor is approved. A letter will be sent by MDOT to the contractor via email and U.S. mail stating the results of the evaluation for their records.