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DESIGN DIRECTIVE

To: Distribution

From: Erik Stoothoff, P.E. *EJS*
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RE: Restraining Rail Fasteners

This design directive is intended to consolidate, reiterate, supplement, and clarify the MBTA's restraining rail fastener design and installation approach, preferences, and requirements.

OBJECTIVE

When fastening restraining rail to running rail on new or existing MBTA transit track (light rail and heavy rail), pretensioned locking bolts shall be included as part of the design, and subsequently procured and installed in conformance with this Directive.

REGULATORY CONTEXT

Design and installation of restraining rail fastening systems shall conform to the standards of MBTA, FTA, and OSHA.

The designer shall review the local requirements and review with MBTA where appropriate. Projects shall be designed in a way to satisfy the regulatory context of the proposed work, while focusing on the Design Principles and Criteria noted herein.

CODES, STANDARDS, REFERENCES, AND GUIDELINES

The direction provided herein shall be used in coordination with all other documented MBTA Standards and Guidelines as well as all applicable policies and procedures. In the event conflicting guidance is provided, the more stringent direction shall be followed, and be documented by the design professional as such.

The latest edition, including revisions, amendments and supplements, of the following publications shall be referenced:

- AREMA Manual for Railway Engineering
- MBTA Maintenance of Way Division, Book of Standard Trackwork Plans
- MBTA Procedure QAP-009, Measuring & Test Equipment Calibration Program

DESIGN PRINCIPLES

The restraining rail assembly consists of running rail, restraining rail, adjustable spacer blocks, and fasteners that join the assembly together. To minimize fatigue and maximize the resiliency of the restraining rail assembly, restraining rail fasteners shall feature a locking mechanism and be properly pretensioned.

FASTENER CRITERIA

1. Minimum bolt requirements:
 - a. Bolt length shall be 9 inches.
 - b. Bolt diameter shall be 1-3/8 inches.
 - c. Bolts shall meet requirements of any of the following:
 - i. ASTM F3125 A490.
 - ii. SAE J429 Grade 8.
 - d. Threads shall be rolled, rather than cut.
 - e. Finish shall provide resistance to corrosion without compromising requirements stated here-in.
2. Minimum nut requirements:
 - a. Nuts shall be compatible with selected bolt.
 - b. Finish shall provide resistance to corrosion without compromising requirements stated here-in.
3. Minimum washer requirements:
 - a. Plate washers shall be per Book of Standard Trackwork Plans drawing 370.
4. Fastener system shall be capable of applying and maintaining a minimum preload of 70% of the minimum ultimate tensile strength.
5. Once affixed with proper torque, fasteners shall not loosen due to vibrations or spike loads generated by railroad traffic.
6. Installation and maintenance of fastening system shall be capable using conventional tools and equipment.
7. Fastening system shall use a locking mechanism such as Huck 360, or approved equal.
8. Nuts and bolts shall not be reused without prior approval from the Authority.

INSTALLATION CRITERIA AND CONSIDERATIONS

PROCEDURE FOR PRETENSIONING FASTENERS

1. Only use continuous rotation torque wrenches that have been calibrated in conformance with the criteria below.
2. Use all required personal protective equipment (PPE).
3. Clean all surfaces, fasteners, and tools prior to installation.
4. Do NOT lubricate surfaces or fasteners.
5. Using a calibrated torque wrench, apply a torque of 2,275 ft-lbs.
Note: This torque is suitable for 1-3/8 inch diameter fasteners only.

6. Do not exceed rated torque for equipment or fasteners.
7. Do not use a torque wrench to break fasteners loose.
8. Do not use broken, heavily worn, or damaged tools.
9. Fasteners used in new construction shall be re-torqued to 2,275 ft-lbs after 1 to 2 weeks of in-service use.
10. Upon installation completion (after re-torquing for new construction), apply matchmarks to clean surface at nut and bolt interface with enamel paint pen. Paint shall be of a color contrasting to the installed fasteners.
11. Keep equipment clean. Ratchet mechanism may slip or break if dirty, which can cause injury or damage.
12. Do not replace worn parts individually.

REQUIREMENTS FOR CALIBRATING TORQUE WRENCHES

1. Calibration of torque wrenches shall be done by MBTA approved calibration laboratory in conformance with ISO 6789:2017.
2. Responsibilities of restraining rail installer (herein referred to as Contractor):
 - a. Maintain a calibration log to ensure torque wrenches are properly calibrated.
 - b. Maintain a regular calibration schedule not to exceed one year or 5000 uses per unit to ensure that all torque wrenches are calibrated to within $\pm 0.25\%$ accuracy.
 - c. Ensure that all torque wrenches used for installing restraining rail fasteners are calibrated and logged.
 - d. Torque wrenches that are found to be out of calibration shall be taken out of service until they have been recalibrated as noted above.
 - e. Any work that was completed using a torque wrench found to be out of calibration shall be checked and corrected as needed using a properly calibrated torque wrench.
 - f. Field calibration will not be allowed.
3. Procedures
 - a. The Calibration Log is used to maintain an accurate record for all calibrated torque wrenches used on MBTA contracts. The Contractor will maintain and utilize the calibration log when sending out a torque wrench for calibration and returning it to service. This allows the Contractor to maintain accountability on all calibrated torque wrenches. The Calibration Log shall, at a minimum, record the following for each torque wrench:
 - i. The current date, location of stored torque wrenches, page number, and torque wrench serial number.
 - ii. The calibrating company's name.
 - iii. The name of the person who sent the torque wrench to be calibrated (print full name).
 - iv. The Model Type and Model Number as well as the serial number.
 - v. The date the torque wrench was sent.
 - vi. The drive size of the torque wrench.

- vii. The date the calibrated torque wrench was returned.
 - viii. The name of the person who received the calibrated torque wrench (print full name).
- b. Calibration log shall be made available to MBTA personnel upon request.
- c. Contractor shall submit means of field verifying accuracy of torque wrenches for approval. Torque wrenches shall be checked using approved method daily prior to use.
- d. Torque wrenches that have not been calibrated using the above procedure shall not be used for installing restraining rails and fasteners.