
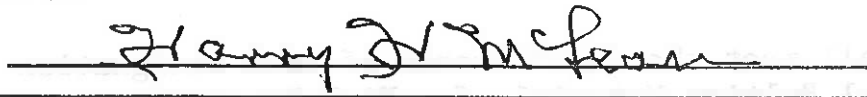


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TO:  Director, Preliminary Plan Review Bureau MALCOLM D. GRAHAM	PREL.	FINAL	 <b>ENGINEERING INSTRUCTION</b> NEW YORK STATE DEPARTMENT OF TRANSPORTATION
	PHOTOGRAM. LANDSCAPE		
	RECEIVED FACILITIES DESIGN SUBDIVISION MAY 22 1973		
	CIRC.	FILE	
Distribution: <input checked="" type="checkbox"/> Main Office <input type="checkbox"/> Regions <input type="checkbox"/> Special			Code: EI 73-30 Date: 4-30-73 Supersedes:
APPROVED: 			

Recently, the quality assurance standards for stainless steel connecting hardware as specified for traffic sign installations have come under close scrutiny in the main office. (These include the present NYSDOT Special Specification for span and cantilever sign supports ITEMS 474, 475, 476, 476A and 476B and are covered by the new AASHO format specifications in Section 644-SIGN STRUCTURES.) As a result of a pilot sampling and testing program initiated in cooperation with Region 10, a highly variable product quality was indicated. A discussion with design personnel indicated a need for a Statewide sampling of this hardware, replacing the present system of accepting these materials exclusively by Manufacturer's Certification.

In order to insure the suitability of stainless steel connecting hardware in Department traffic sign installations, the following guidelines are set forth establishing a sampling policy applicable to all projects in which these items exist:

**A. Current Department Design Practice and Related ASTM Specifications**

1. Grade B-6 stainless steel bolts shall be used in the flange connections of aluminum sign truss spans (present ITEMS 476, 476A and 476B: AASHO format pay item numbers 644.03, 644.04 and 644.05 respectively) and sign support to post connection of aluminum cantilever structures (present ITEMS 474 and 475: AASHO format pay item numbers 644.01 and 644.02 respectively).

The B-6 bolts shall meet the requirements of ASTM Designation A-193, Alloy Steel Bolting Materials for High-Temperature Service, Grade B-6 (AISI Type 410) with a minimum yield strength of 85,000 psi. Bolts having a yield strength in excess of 130,000 psi will be rejected.

Subject: STAINLESS STEEL CONNECTING HARDWARE FOR TRAFFIC SIGN INSTALLATIONS

Nuts for the B-6 bolts shall meet the requirements of ASTM Designation A-194, Carbon and Alloy Steel Nuts for High-Pressure and High-Temperature Service, Grade 6 (AISI Type 416).

2. All other stainless steel bolting hardware for sign structures shall be Grade B-8.

The B-8 bolts shall meet the requirements of ASTM Designation A-193, Alloy Steel Bolting Materials for High-Temperature Service, Class 1, Grade B-8 (AISI Type 304) with a minimum yield strength of 30,000 psi.

Nuts for the B-8 bolts shall meet the requirements of ASTM Designation A-194, Carbon and Alloy Steel Nuts for High-Pressure and High-Temperature Service, Grade 8 (AISI Type 304).

3. Flat washers for all stainless steel bolting hardware, Grade B-6 and Grade B-8, shall meet the requirements of ASTM Designation A-167, Corrosion-Resisting Chromium-Nickel Steel Plate, Sheet and Strip, AISI Type 302 or 304.
4. Lock washers for all stainless steel bolting hardware, Grade B-6 and Grade B-8, shall meet the requirements of ASTM Designation A-313, Chromium-Nickel Stainless and Heat Resisting Steel Spring Wire, AISI Types 302 and 305. They shall be fabricated and cold worked to a hardness of Rockwell C35-43, or equivalent.
5. Set screws shall be stainless steel meeting the requirements of ASTM Designation A-320, Alloy Steel Bolting Materials for Low-Temperature Service, AISI Type 303. Set screws not threaded through both layers of metal shall have cup points.

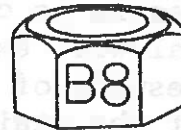
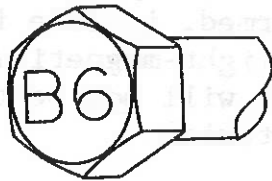
#### B. Project Sampling Procedure for the Engineer-In-Charge

1. Categorizes all stainless steel bolting hardware into unique groups. The parameters which determine uniqueness are listed below. Variation in any of these factors would make a product unique.

Subject: STAINLESS STEEL CONNECTING HARDWARE FOR TRAFFIC SIGN INSTALLATIONS

- a) ASTM grade of stainless and/or AISI Type
  - b) Length (Bolts)
  - c) Diameter
  - d) Radius (U-Bolts)
2. Checks for the appropriate stamped marking on nuts, bolts and studs, indicating the grade of stainless. This shall be stamped on the top of the head of bolts, on the side of the nuts and on one end of studs and stud bolts. If the stainless steel bolts, studs, u-bolts and/or nuts are not identified in this manner, the product(s) not marked shall be considered unacceptable.

e.g.,



3. Selects three (3) sets from each unique group of stainless steel bolts, u-bolts, and set screws. (For the purposes of this Instruction a "set" shall constitute a bolt, u-bolt, or set screw and the appropriate number of accompanying flatwashers, lockwashers, and nuts.) Where applicable, the components of a set should be fastened together for sample transmittal. (e.g., a 3/4" diameter flatwasher and lockwasher should be placed on a 3/4" diameter bolt and secured with the appropriate 3/4" nut.)
4. OPTIONAL - Tests for the magnetism of each unique stainless steel connecting product sampled. This test will be for informational purposes only to determine whether the bolts, nuts, flatwashers, lockwashers and set screws sampled are strongly magnetic (Grade B-6) or non-magnetic (Grade B-8). A magnet(s) to make this test will be provided to each Engineer-In-Charge through the Regional Materials Engineer.

NOTES: This test is particularly critical for those products identified as Grade B-6, the only material acceptable for flange connections and post to arm connections.

Subject: STAINLESS STEEL CONNECTING HARDWARE FOR TRAFFIC SIGN INSTALLATIONS

Past experience has indicated that in some lots of stainless steel which are marked as either entirely Grade B-6 or Grade B-8, a mixture of these grades may actually be present. This relatively quick screening procedure would help identify those lots where this problem exists.

Where practical, after the sampled quantity has been tested for magnetism, the remainder or at least a portion of the stainless steel connecting products in the sampled lot should undergo this test to insure homogeneity.

Because Grade B-8 stainless steel may develop magnetic properties as it is cold deformed, in some instances this material will exhibit "slight-magnetism". Therefore, the results of this test will not be cause for rejection of the stainless material.

5. Determines the location on the sign structure where the stainless steel product(s) will be used. (e.g., Post to arm connection - single arm cantilever structure; clamp bolt for post to arm connector.)
6. Prepares a separate FORM BR-240 for each unique sample (3 sets) of stainless steel hardware being transmitted to the Materials Bureau for testing. It is important to completely describe the stainless steel connecting products by use of the BR-240. The completed BR-240 should specifically include the following information:
  - a) In box No. 1. Material - the grade, diameter, length and radius (u-bolt) of the stainless steel bolt in the sample being transmitted. (e.g., Stainless, B-6, 5/8"  $\emptyset$ , 5" L.)
  - b) In box No. 6. Quantity In Lot - an estimate, if not known exactly, of the total number of this type of unique stainless steel hardware which the sample represents.

Subject: STAINLESS STEEL CONNECTING HARDWARE FOR TRAFFIC SIGN INSTALLATIONS

- c) In box No. 14. Sampled By - the name of the sampler and the Region where the sample has been taken.
- d) In box No. 16. Additional Information - a description of the location where the product(s) will be used on the structure, and the results of the magnetic test, if performed, for each piece of stainless hardware included in the sample.

NOTE: It is imperative that the location of use be correctly identified since the Materials Bureau will test all products for Grade B-8 stainless except post to arm connecting hardware and flange connecting hardware. This is consistent with the Department's current design practice, as previously mentioned. The only exception to this rule may occur in older, on-going contracts where items such as u-bolts might have been specified as Grade B-6. Grade B-8 stainless is now desired and will be accepted as a replacement, but if a Grade B-6 stainless is supplied it will be tested and accepted based on its B-6 properties. When this situation arises, it should be clearly noted on the accompanying BR-240.

7. Forwards the unique sample, accompanying completed FORM BR-240, and a copy of the Manufacturer's Certification(s) for the chemical analysis and physical tests covering these products to the Materials Bureau.

It is recommended that all stainless steel connecting hardware be job sampled at least three (3) weeks prior to the erection of the sign structure to allow ample time for testing and reply.

Subject: STAINLESS STEEL CONNECTING HARDWARE FOR TRAFFIC SIGN INSTALLATIONS

Obviously, this procedure will impose a need for close cooperation with the sign erector and contractor in obtaining the hardware and certifications at an early date. However, considering the recent problems encountered with this material, it is hoped that these controls will benefit all parties concerned.

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