

SAMPLING AND TESTING OF HIGH-STRENGTH STRUCTURAL BOLTS, NUTS AND WASHERS: 2016 and 2013 CBC

Disciplines: Structural

History:

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Division of the State Architect (DSA) documents referenced within this publication are available on the [DSA Forms](#) or [DSA Publications](#) webpages.

PURPOSE: This interpretation of Regulations (IR) provides clarification of specific code requirements relating to material identification, sampling, and testing of high-strength structural bolts, nuts, and washers used on projects under DSA jurisdiction.

SCOPE: This IR is applicable to high-strength bolts, nuts, and washers that are used in steel frame bolted joints and are manufactured under the following standards:

- Bolts manufactured under American Society for Testing and Materials (ASTM) designation F3125/F3125M – 15a¹.
- Carbon and Alloy Steel Nuts manufactured under ASTM designation A563.
- Hardened Steel Washers manufactured under ASTM designation F436.

Identification, sampling, and testing requirements for threaded steel anchor bolts and anchor rods are outside the scope of this IR. See *IR 17-11: Identification, Sampling and Testing of Threaded Steel Anchor Bolts and Anchor Rods* for additional information. DSA requirements for the following items are addressed herein.

- Material identification and required identification documentation
- Fastener sampling
- Frequency of sampling
- Fastener testing
- Reporting

1. MATERIAL IDENTIFICATION: The process of identifying high-strength fastener components or assemblies delivered to the jobsite shall be initiated by the project inspector and completed by bolting special inspector. Fastener components found to have met all of the following criteria shall be considered identifiable and shall be sampled and tested per Sections 2, 3 and 3.1.

- 1.1** All fastener components delivered to the project site or steel fabrication shop shall be in containers sealed by the manufacturer.
- 1.2** All fastener containers shall be readily identifiable and traceable to the bolt manufacturer's Material Test Report (MTR) provided with the shipment.
- 1.3** All fastener containers shall be clearly marked by the manufacturer and include the following information: ASTM designation, grade, type and style, size, name of manufacturer, number of pieces, and lot number.

¹ ASTM F3125/F3125M consolidates and replaces ASTM A325, ASTM A325M, ASTM A490, ASTM A490M, ASTM F1852, and ASTM F2280. Under ASTM F3125/F3125M, A325, A325M, A490, A490M, F1852, and F2280 are now designated as Grades.

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1.4 The MTR shall clearly state that the material conforms to the appropriate ASTM designation as required by the DSA approved construction documents.

2. **FASTENER SAMPLING:** All high-strength bolts, nuts and washers sampled for testing shall be selected by a designated representative of the laboratory of record.

All bolt components or fastener assemblies sampled for testing shall be visually inspected for proper markings, condition, and possible defects (e.g., quench cracks, forge cracks, head burst, etc.) per ASTM requirements.

3. **FREQUENCY OF SAMPLING:** Fastener assemblies shall be sampled at a minimum per frequencies listed below based on whether they are identifiable or not, unless approved otherwise in writing by the responsible DSA field engineer. For the purposes of this IR, type of bolt in this section is defined by: bolt manufacturer, ASTM grade, diameter (without respect to length), and coating.

3.1 **Identifiable components:** Fastener assemblies with components found to be identifiable in accordance with Section 1 above shall be sampled as follows:

3.1.1 Projects requiring the installation of less than 1,600 fastener assemblies of a type of bolt: sample one complete fastener assembly for every 400 or fraction thereof for each type of bolt to be installed in the project, but not less than three complete fastener assemblies for each type of bolt to be installed in the project.

3.1.2 Projects requiring the installation of 1,600 or more fastener assemblies of a type of bolt: sample identifiable fastener assemblies at a rate of one per 1,200 (or fraction thereof) but not less than three complete fastener assemblies for each type of bolt to be installed in the project.

3.2 **Unidentifiable components:** Fastener assemblies with components found to be unidentifiable in accordance with Section 1 above shall sample three complete fastener assemblies for every 100 or fraction thereof for each type of bolt to be installed in the project.

4. **FASTENER TESTING:** All testing of high-strength bolts, nuts, and washers shall be conducted by a laboratory evaluated and approved specifically for that purpose by DSA. Testing shall be conducted in accordance with ASTM F606 as follows.

- Bolts (ASTM F3125): Proof load, wedge tension, and hardness
- Nuts (ASTM A563): Proof load and hardness
- Washers (ASTM F436): Hardness only

5. **REPORTING:** Test reports shall be provided and distributed in accordance with the California Administrative Code requirements. A sample test report form *DSA 208: High Strength Bolt Test Result* is available on the DSA website.

REFERENCES:

California Code of Regulations (CCR) Title 24

Part 2, 2016 California Building Code (CBC), Sections 2213A.1, 2212.6.1*

2013 CBC, Sections 2213A.1, 2212.6.1*

This IR is intended for use by DSA staff and by design professionals to promote statewide consistency for review and approval of plans and specifications as well as construction oversight of projects within the jurisdiction of DSA, which includes State of California public schools (K-12), community colleges and state-owned or state-leased essential services buildings. This IR indicates an acceptable method for achieving compliance with applicable codes and regulations, although other methods proposed by design professionals may be considered by DSA.

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