
**SAMPLING AND TESTING OF HIGH-STRENGTH STRUCTURAL BOLTS,
NUTS AND WASHERS: 2019 CBC**

Disciplines: Structural**History:** Revised 09/24/19 under 2019 CBC
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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) clarifies material identification, sampling and testing of high-strength structural bolts, nuts and washers used on construction projects under DSA's 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) F3125/F3125M¹.
- Carbon and Alloy Steel Nuts manufactured under ASTM A563.
- Hardened Steel Washers manufactured under ASTM F436.

At the design professional's discretion, as noted on the DSA-approved construction documents, the requirements of this IR shall apply to other high-strength fastener assemblies recognized by American Institute of Steel Construction (AISC) 360 Section J3.1 or fasteners having a specified minimum of at least $F_y = 58$ ksi or $F_t = 90$ ksi. 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.

BACKGROUND: The California Building Code (CBC) requires sampling and testing of high-strength structural bolts (HSB) and either periodic or continuous special inspection of high-strength structural bolting operations. Refer to *IR 17-9: High-Strength Structural Bolting Inspection* for inspection requirements of high-strength structural bolts, nuts and washers. Sampling and testing of all HSBs shall be conducted in accordance with CBC, applicable reference standards (e.g., Specification for Structural Joints Using High-Strength Bolts by the Research Council on Structural Connections, AISC 360, AISC 341, etc.) and the requirements of this IR. In accordance with *IR A-8: Project Inspector and Assistant Inspector Duties and Performance*, the project inspector shall coordinate scheduling with the bolting special inspector

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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or Laboratory of Record (LOR), as applicable, to ensure material verification, sampling, testing, and required reports of fastener components occurs.

1. MATERIAL IDENTIFICATION: The project inspector shall monitor the bolting special inspector’s identification of high-strength fastener components or assemblies delivered to the jobsite. 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 below.



- 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.
- 1.4 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 LOR.

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 be sampled at a rate of three complete fastener assemblies for every 100 or fraction thereof for each type of bolt to be installed in the project.

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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, Section 4-335(d) and (e). A sample test report form *DSA 208: High Strength Bolt Test Report* is available on DSA's website. For reporting of special inspection duties associated with material identification and inspections noted in this IR, refer to IRs 17-9 and 17-12: *Special Inspection Reporting Requirements*.

6. FAILURE TO PERFORM: Failure to inspect the work in a professional and competent manner, report defective work, file all required reports in a truthful and timely manner, or fulfill any other duties defined by the code may result in withdrawal of the HSB special inspector's DSA acceptance and/or withdrawal of the LOR's DSA acceptance (reference CAC 4-335.1[c]). This includes but is not limited to withdrawal of acceptance or approval to work on any current or future projects under DSA jurisdiction.

REFERENCES:

2019 California Code of Regulations (CCR) Title 24

Part 2: California Building Code (CBC), Sections 1705A.2.1, 1705A.2.6, Table 1705A.2.1 and 2213A.1

This IR is intended for use by the 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.

This IR is subject to revision at any time. Please check DSA's website for currently effective IRs. Only IRs listed on the webpage at <https://www.dgs.ca.gov/dsa/publications> at the time of project application submittal to DSA are considered applicable.