



BUILDINGS BULLETIN 2016-001

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Purpose: This document establishes acceptance criteria for threaded high-strength steel reinforcing bars as alternative materials in the NYC Construction Codes.

Related Code Section(s):

BC 1901.2	BC 1903.5
BC 1902	BC 1704.4

Subject(s): Concrete, reinforcement; Concrete, reinforced concrete; Concrete, reinforcing bars; Reinforcement, concrete; Steel, reinforcement, concrete; Steel, high-strength; Steel, high-strength, threaded reinforcing bars

Description: Threaded high-strength steel reinforcing bars shall be defined as steel bars having a minimum yield strength exceeding 80,000 psi and up to 100,000 psi with protrusions in a threaded orientation used as reinforcement in concrete construction. The threaded protrusions permit connections with approved mechanical anchorages and splices.

The New York City Building Code references ACI 318, "*Building Code Requirements for Structural Concrete*"¹ for specific requirements for steel reinforcement. Section 3.5.3.2 of the ACI Code states that steel deformed reinforcing bars shall conform to one of the ASTM specifications listed in Section 3.5.3.1, which includes ASTM A615⁴ for carbon steel and ASTM A706⁵ for low-alloy steel. Section 3.5.3.2 also states that for bars with a specified yield strength of at least 60,000 psi the yield strength shall be taken as the stress corresponding to a strain of 0.35 percent. Additionally, section 9.4 of the ACI Code states that designs shall not be based on a yield strength in excess of 80,000 psi except for prestressing steel.

Since threaded high-strength steel reinforcing bars have a yield strength in excess of 80,000 psi, this bulletin establishes an acceptance criteria for such materials within the limitations stated below.

Evaluation Scope: NYC Construction Codes

Evaluation Criteria: Pursuant to Section AC 28-113, the Office of Technical Certification and Research recognizes threaded high-strength steel bars for concrete reinforcement tested and evaluated in accordance with AC 237,

*“Acceptance Criteria for Threaded High-Strength Steel Bars for Concrete Reinforcement”*². Acceptable threaded high-strength steel bars for concrete reinforcement shall have an evaluation or code compliance report issued in accordance with AC 237 and shall comply with the conditions of this bulletin. The agency providing the evaluation or code compliance report shall be accredited to ISO 17065.

Splices by either mechanical connectors or lap splice shall comply with Chapter 12 of ACI 318. Acceptable mechanical connectors shall have evaluation or code compliance report issued in accordance with AC 133 *“Acceptance Criteria for Mechanical Connectors for Steel Bar Reinforcement”*³ for use with threaded high-strength steel bars. The agency providing the evaluation or code compliance report shall be accredited to ISO 17065.

Uses: Threaded high-strength steel reinforcing bars are steel bars with protrusions in a threaded orientation for use as reinforcement in concrete construction.

Conditions of Acceptance: Threaded high-strength steel reinforcing bars shall be designed and installed in accordance with the NYC Construction Codes and other applicable provisions including but not limited to the following:

A. Design

1. According to Section 3.5.3.2 of ACI 318, the threaded high-strength steel reinforcing bars shall conform to the latest version of one of the ASTM specifications listed in Section 3.5.3.1 of the same code, which includes ASTM A615 for carbon steel and ASTM A706 for low-alloy steel.
2. The specified yield strength of threaded high-strength steel reinforcing bars used for design shall be taken as the stress corresponding to a strain of 0.35 percent or as determined by using the offset method with a 0.2% offset in accordance with Section 3.2.1 of AC 237 provided the threaded high-strength steel reinforcing bar has an evaluation or code compliance report issued in accordance with AC 237. Acceptable threaded high-strength steel reinforcing bars complying with the 0.2% offset method shall have an evaluation or code compliance report issued with evaluation performed in accordance with Annex A of AC 237.
3. Minimum elongation shall be not less than the minimum values shown in table 3 of AC 237.
4. For the purpose of providing lateral support to longitudinal steel reinforcing bars and for providing confinement, the yield strength of high-strength steel bars used for design calculations shall not exceed 100,000 psi for spirals and 80,000 psi for non-spiral reinforcing bars.
5. For the purpose of providing shear and torsional resistance, the yield strength of high-strength steel bars used for design calculations shall not exceed 60,000 psi.
6. Splicing by either mechanical couplers or lap splices shall conform to section 3.5 of AC 237, and chapter 12 of ACI 318. Additionally, mechanical couplers shall comply with AC 133. Mechanical splices shall be staggered such that no more than half of the total reinforcement is spliced within 36 inches.

B. Installation Requirements

1. Installation requirements shall be in accordance with the manufacturer’s instructions, the evaluation or code compliance report issued for the installed product, the installation requirements of ACI 318, and the conditions of this bulletin.
2. Pursuant to section BC 1704.4, the installation of threaded high-strength steel reinforcing bars shall be subject to special inspection requirements of Chapter 17 of the Building Code for concrete construction, 1RCNY section 101-06 and the following:
 - a. Special inspections shall verify that splices made with mechanical connectors are installed in accordance with the manufactures specifications. Special inspections shall verify adequate torque is applied to mechanical connections.
 - b. Installer and special inspector shall be trained by the manufacturer on installation requirements.

3. Threaded high-strength steel reinforcing bars shall be labeled as per AC 237 section 2.1.3. All shipments and deliveries of materials shall be accompanied by a certificate or label certifying that the materials shipped or delivered are equivalent to those tested and approved.

C. Restrictions

1. Threaded high-strength steel bars for concrete reinforcement shall be used as reinforcement in reinforced concrete subject to the conditions and restrictions of this bulletin, AC 237, and the New York City Construction Codes.
2. The high-strength steel reinforcement is limited for use as (a) longitudinal reinforcement for resisting flexure, axial force, and for shrinkage and temperature, in reinforced concrete structures that are not special seismic systems; (b) lateral support of longitudinal bars or for concrete confinement, in reinforced concrete structures that are not special seismic systems; (c) shear reinforcement including shear friction, in reinforced concrete structures that are not special seismic systems; and, (d) torsional reinforcement including longitudinal and transverse reinforcement.
3. The high-strength bars shall not be used in beams or slabs.
4. The high-strength bars shall not be used in buildings assigned to Seismic Design Categories C, D, E or F.
5. The high-strength steel bars shall not be welded.
6. The high-strength steel bars shall not be bent, if the nominal bar size exceeds No. 14 diameter.
7. The specified concrete compressive strength (f'_c) shall range from 6,000 psi to 12,000 psi.
8. This criteria is applicable to reinforcement under provisions of ACI 318 described in Table 2 of AC237, as referenced in Section 1901.2 of IBC.
9. This criteria is limited to uncoated reinforcement installed in normal-weight concrete, with no more than 12 inch of fresh concrete placed below horizontal reinforcement.

Referenced Standards:

1. ACI 318-11 *"Building Code Requirements for Structural Concrete"*
2. ICC-ES AC 237-15 *"Acceptance Criteria for Threaded High-Strength Steel Bars For Concrete Construction"* Approved February 2015 (http://www.icc-es.org/criteria/pdf_files/AC237.pdf)
3. ICC-ES AC133 *"Acceptance Criteria for Mechanical Connector Systems For Reinforcing Bars"* Approved May 2014 (http://www.icc-es.org/criteria/pdf_files/AC133.pdf)
4. ASTM A615-15 "Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement"
5. ASTM A706 -15 "Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement"