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Purpose: This document establishes acceptance criteria for threaded high-strength steel reinforcing bars as alternative materials in the 2008 NYC Construction Codes.

Related Code Section(s): BC 1901.2, BC 1903.5, BC 1902

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 of 97,000 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 with a specified yield strength exceeding 60,000 psi shall be permitted provided the yield strength shall be 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: 2008 NYC Construction Codes

Evaluation Criteria: Pursuant to 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 ICC-ES Evaluation Service Report (ESR) issued in accordance with AC 237 and shall comply with the conditions of this bulletin.

Splices by either mechanical connectors or lap splice shall comply with chapter 12 of ACI 318.

Acceptable mechanical connectors shall have an ICC-ES Evaluation Service Report (ESR) issued in accordance with AC 133 "*Acceptance Criteria for Mechanical Connectors for Steel Bar Reinforcement*" [3] for use with threaded high-strength steel bars.

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 2008 NYC Construction Codes and other applicable provisions including but not limited to the following:

A. Design

1. 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.
2. The yield strength of threaded high-strength steel reinforcing bars measured by the offset method of ASTM A370 "*Standard Test Methods and Definitions for Mechanical Testing of Steel Products*" [4] at 0.2% offset shall not exceed 1.25 times the specified yield strength used for design.
3. Minimum elongation shall be not less than 6% when tested in accordance with ASTM A370 and table 1 of AC 237.
4. For computing shear strength and torsional strength, the yield stress shall not exceed 60,000 psi.
5. 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 ICC-ES ESR 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 only as longitudinal and transverse reinforcement in reinforced concrete subject to the conditions and restrictions of this bulletin, AC 237, and the 2008 New York City Building Code.
2. The high-strength bars shall not be used in beams or slabs.
3. The high-strength bars shall not be used in buildings assigned to Seismic Design Categories C, D, E or F.
4. The high-strength steel bars shall not be welded.
5. The high-strength steel bars shall not be bent, if the nominal bar size exceeds No. 14 diameter.
6. Threaded high-strength steel bars shall only be used with concrete having a specified

compressive strength (f'_c) within the range of 6,000 psi to 12,000 psi.

Referenced Standards:

1. ACI 318-02 *"Building Code Requirements for Structural Concrete"*
2. ICC-ES AC 237 *"Acceptance Criteria for Threaded High-Strength Steel Bars For Concrete Construction"* Effective July 1, 2009 (http://www.icc-es.org/criteria/pdf_files/AC237.pdf)
3. ICC-ES AC133 *"Acceptance Criteria for Mechanical Connector Systems For Reinforcing Bars"* Effective June 1, 2008 (http://www.icc-es.org/criteria/pdf_files/AC133.pdf)
4. ASTM A370-09ae1 *"Standard Test Methods and Definitions for Mechanical Testing of Steel Products"*