



BUILDINGS BULLETIN 2010-005
OTCR

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Purpose: This document establishes alternative acceptance criteria for undercut and expansion (displacement-controlled, torque-controlled) anchor systems as prescribed in the 2008 NYC Construction Codes.

Related Code Section(s): BC 1913 MC 1210.3
BC 1704.13

Subject(s): Concrete, anchors, expansion anchors; Concrete, anchors, undercut anchors; Concrete, post-installed anchors

Background: Section BC 1913 requires design of expansion anchors to comply with ACI 318, Appendix D, which subsequently requires qualification of undercut and expansion (displacement-controlled and torque-controlled) anchors to be in accordance with ACI 355.2. This bulletin recognizes ICC-ES AC 193 as an amendment to ACI 355.2 for the qualification of undercut and expansion anchors in concrete.

Description: A post-installed anchor, inserted into hardened concrete, transfers loads to or from the concrete by direct bearing or friction or both. This bulletin establishes alternative acceptance criteria for two types of concrete anchoring systems: Expansion anchor systems and undercut anchor systems.

An undercut anchor is a post-installed anchor that develops its tensile strength from the mechanical interlock provided by undercutting of the concrete at the embedded end of the anchor. The undercutting is achieved with a special drill before installing the anchor or alternatively by the anchor itself during its installation.

Expansion anchors may be torque-controlled, where the expansion is achieved by a torque acting on the screw or bolt; or displacement-controlled, where the expansion is achieved by impact forces acting on a sleeve or plug and the expansion is controlled by the length of travel of the sleeve or plug.

Evaluation Scope: 2008 NYC Construction Codes

Evaluation Criteria: Pursuant to AC 28-113, the Office of Technical Certification and Research recognizes undercut and expansion anchor systems tested and evaluated in accordance with ICC-ES AC193 "*Acceptance Criteria for Mechanical Anchors in Concrete Elements*"¹. Acceptable expansion anchoring systems

shall have an ICC-ES Evaluation Service Report (ESR) issued in accordance with Annex 1 of AC193 and shall comply with the conditions of this bulletin.

Uses: Undercut and expansion anchor systems are used to transmit structural loads from one connected element to the other. The ICC-ES ESR issued for the product provides qualification criteria for the expansion anchor for each loading condition.

Conditions of Acceptance: Undercut and expansion anchor systems 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. Undercut and expansion anchor systems shall be designed in accordance with ACI 318 Appendix D² as per section BC 1913.

B. Installation Requirements

1. Installation requirements shall be in accordance with the manufacturer's instructions, the applicable ICC-ES ESR, and the conditions of this bulletin.
2. Pursuant to section BC 1704.13 item 3, the installation of undercut and expansion anchor systems shall be subject to special inspection requirements of Chapter 17 of the Building Code and 1 RCNY section 101-06. Special Inspectors of undercut and expansion anchor systems shall:
 - a. Maintain the same qualification requirements for the "Concrete – Cast-in-place and Precast" category as defined in 1 RCNY section 101-06, Appendix A;
 - b. Have duties and responsibilities in accordance with, but not limited to, the ICC-ES ESR issued for the installed product; and
 - c. Complete the statement of special inspection by referencing this bulletin under the Special Inspection Item for "Alternative Materials" in section 3.0 of the TR1 form.
3. Undercut and expansion anchor systems shall be labeled as per ICC ES AC193 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. Maintenance

1. Maintenance of undercut and expansion anchor systems used in high pressure steam piping systems shall comply with the following:
 - a. New and existing anchorage shall be subject to annual inspection per section MC 1210.3.1.
 - b. Repair, replacement and relocation of anchorage shall not be permitted without Department's approval as per section MC 1210.3.2.

Reference Standards:

1. ICC-ES AC193 "Acceptance Criteria for Mechanical Anchors in Concrete Elements" (<http://www.icc-es.org/>) effective March 1, 2009
2. ACI 318–02 Appendix D "Anchoring to Concrete" (<http://www.concrete.org/general/home.asp>)