



Standard Test Methods for Strength of Anchors in Concrete and Masonry Elements¹

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This standard has been approved for use by agencies of the Department of Defense.

1. Scope

1.1 These test methods cover procedures for determining the static, seismic, fatigue and shock, tensile and shear strengths of post-installed and cast-in-place anchorage systems in structural members made of concrete or structural members made of masonry. Only those tests required by the specifying authority need to be performed.

1.2 These test methods are intended for use with such anchorage devices designed to be installed perpendicular to a plane surface of the structural member.

1.3 Whereas combined tension and shear as well as torsion tests are performed under special conditions, such tests are not covered in the methods described herein.

1.4 While individual procedures are given for static, seismic, fatigue and shock testing, nothing herein shall preclude the use of combined testing conditions which incorporate two or more of these types of tests, (such as seismic, fatigue and shock tests in series), since the same equipment is used for each of these tests.

1.5 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 ASTM Standards:

- E 4 Practices for Force Verification of Testing Machines²
- E 171 Specification for Standard Atmospheres for Conditioning and Testing Flexible Barrier Materials³
- E 468 Practice for Presentation of Constant Amplitude Fatigue Test Results for Metallic Materials²
- E 575 Practice for Reporting Data from Structural Tests of Building Constructions, Elements, Connections, and Assemblies⁴

¹ These test methods are under the jurisdiction of ASTM Committee E-6 on Performance of Buildings and are the direct responsibility of Subcommittee E06.13 on Structural Performance of Connections in Building Constructions.

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² *Annual Book of ASTM Standards*, Vol 03.01.

³ *Annual Book of ASTM Standards*, Vol 15.09.

⁴ *Annual Book of ASTM Standards*, Vol 04.11.

3. Terminology

3.1 Definitions of Terms Specific to This Standard:

3.1.1 *adhesive anchor*—a post-installed anchor that derives its holding strength from the chemical compound between the wall of the hole and the anchor rods. The materials used include epoxy, cementitious material, polyester resin, and other similar types.

3.1.2 *anchor spacing*—the distance between anchors measured centerline to centerline, in mm (in.); also, the minimum distance between reaction points of the test frame.

3.1.3 *cast-in-place anchor*—an anchor that is installed prior to the placement of concrete and derives its holding strength from plates, lugs, or other protrusions that are cast into the concrete.

3.1.4 *displacement*—movement of an anchor relative to the structural member. For tension tests, displacement is measured along the axis of the anchor, and for shear tests, displacement is measured perpendicular to the axis of the anchor, in mm (in.).

3.1.5 *edge distance*—side cover distance or the distance from the centerline of an anchor to the nearest edge of a structural member, in mm (in.); also, minimum distance from the centerline to the test frame.

3.1.6 *embedment depth*—distance from the test member surface to the installed end of the anchor, in mm (in.), prior to the setting of the anchor.

3.1.7 *expansion anchor*—a post-installed anchor that derives its holding strength through a mechanically expanded system which exerts forces against the sides of the drilled hole.

3.1.8 *fatigue test*—a laboratory test that applies repeated load cycles to an anchorage system for the purpose of determining the fatigue life or fatigue strength of that system.

3.1.9 *LVDT*—a linear variable differential transformer used for measuring the displacement or movement of an anchor or anchor system.

3.1.10 *post-installed anchor*—an anchor that is installed after the placement and hardening of concrete.

3.1.11 *run-out*—a condition where failure did not occur at a specified number of load cycles in a fatigue test.

3.1.12 *safe working loads*—the allowable or design load obtained by applying factors of safety to the ultimate load of the anchorage device, kN (lbf).

3.1.13 *seismic test*—a laboratory test that applies load