STANDARD

ANSI/ASHRAE Standard 171-2017
(Supersedes ANSI/ASHRAE Standard 171-2008)

Method of Testing for Rating Seismic and Wind Restraints

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SPECIAL NOTE

This American National Standard (ANS) is a national voluntary consensus Standard developed under the auspices of ASHRAE. *Consensus* is defined by the American National Standards Institute (ANSI), of which ASHRAE is a member and which has approved this Standard as an ANS, as "substantial agreement reached by directly and materially affected interest categories. This signifies the concurrence of more than a simple majority, but not necessarily unanimity. Consensus requires that all views and objections be considered, and that an effort be made toward their resolution." Compliance with this Standard is voluntary until and unless a legal jurisdiction makes compliance mandatory through legislation.

ASHRAE obtains consensus through participation of its national and international members, associated societies, and public review.

ASHRAE Standards are prepared by a Project Committee appointed specifically for the purpose of writing the Standard. The Project Committee Chair and Vice-Chair must be members of ASHRAE; while other committee members may or may not be ASHRAE members, all must be technically qualified in the subject area of the Standard. Every effort is made to balance the concerned interests on all Project Committees.

The Senior Manager of Standards of ASHRAE should be contacted for

a. interpretation of the contents of this Standard,
b. participation in the next review of the Standard,
c. offering constructive criticism for improving the Standard, or
d. permission to reprint portions of the Standard.

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NOTE

Approved addenda, errata, or interpretations for this standard can be downloaded free of charge from the ASHRAE website at www.ashrae.org/technology.

(This foreword is not part of this standard. It is merely informative and does not contain requirements necessary for conformance to the standard. It has not been processed according to the ANSI requirements for a standard and may contain material that has not been subject to public review or a consensus process. Unresolved objectors on informative material are not offered the right to appeal at ASHRAE or ANSI.)

FOREWORD

Seismic and wind restraints are motion-limiting devices used to secure nonstructural components by minimizing the differential movement between a component and the supporting building structure during an earthquake or a high-wind event. In many cases, the restraints are vital to ensuring the continued operation of a facility after an extreme event; they help ensure building systems do not flex excessively, break, or fall on building occupants. Because restraints can play such an important life-safety role, it is necessary to ensure they are capable of withstanding the anticipated design loads.

This testing for rating standard helps restraint manufacturers to determine that capability and is based on modern engineering practices, research, testing, and similar standards of other organizations. The advice of manufacturers, users, trade associations, and local authorities has also been considered.

There are many types of restraints—e.g., restraints with integral vibration isolation, sway-bracing restraints for suspended components, snubbers and rigid restraints for floor mounted components—and this standard attempts to address the most common types in a manner that corresponds with design methodologies defined in modern building codes.

This revision is a complete overhaul of the original standard, published in 2008, replacing a static push/pull test method with a cyclical, low-frequency test method and establishing a rating methodology for use with building codes. Restraint capacities determined using the previous version are no longer considered valid.

1. PURPOSE

This standard provides a test procedure for rating the capacity of seismic and wind *restraints* for nonstructural components and systems by determining the maximum loads a *restraint* can withstand without breakage or excessive deformation.

2. SCOPE

This standard is limited in its application and is appropriate only for certain types of *restraints* made with certain materials, as defined below.

2.1 Types of Restraints

a. *Single-directional*, single-axis, multiangle (e.g., *cable restraints* that provide tension-only restraint and can be installed at various angles).

b. *Bidirectional*, single-axis, multiangle (e.g., rigid braces/ *restraints*).

c. *Single-directional*, single-axis, single-angle (e.g., *bumpers* that limit the motion of nonstructural components in one direction).

d. Multidirectional, multiaxis, with no operating clearance (e.g., brackets and other rigid *restraints* that connect nonstructural components directly to structure).

e. Multidirectional, multiaxis, with operating clearance (e.g., *snubbers* that limit the motion of nonstructural components in multiple directions).

f. Multidirectional, multiaxis, with integral isolation (e.g., combination isolator/*restraints* that provide vibration isolation for nonstructural components and include a means of multiaxial restraint).

2.2 Restraint Materials

a. Ferrous metals, including those used in ductile castings, structural stainless steel, and structural carbon steel.
b. Nonferrous materials such as aluminum, copper, and brass.
c. Nonmetallic materials such as fiberglass, elastomer, natural rubber, and composites.

2.3 Not Included in Scope

a. This standard does not address the durability of any supported equipment, or other nonstructural components, and their ability to remain functional during and at the conclusion of a seismic event.
b. This standard does not apply to *restraints* using nonductile materials.
c. Unless otherwise defined, individual parts used in a complete restraint system assembly are not meant to be tested and rated using this standard.
d. Any attachment *fasteners* and any members in the load path on the structural side of the building-attached components are outside the scope of this standard.
e. Any intermediate component support frames or bases between the restraint and the nonstructural component being restrained are outside the scope of this test standard and, for the purposes of this method, are considered part of the component.
f. This standard is not appropriate for determining the capacity of devices that are used in extreme shock (e.g., blast) or long-term dynamic loading applications.

3. TERMS, DEFINITIONS, AND UNITS

3.1 Terms and Definitions

anticipated maximum capacity load,* lbs (kN)*: the manufacturer-supplied value representing the greatest unfactored load on a particular axis that the restraint being tested is expected to withstand. This value is given to the test lab before the start of testing and is used for setting test load values and for limiting the final *rated capacity*. This value may need to be adjusted by the manufacturer if, through no fault of the test setup, a sample fails during the initial loading sequence (see Section 7.4).

axis, X; Y; Z: this standard refers to the horizontal orthogonal axes (relative to the floor plane) as “X” and “Y” and the verti-