ASHRAE STANDARD

Method of Testing Seismic Restraint Devices for HVAC&R Equipment

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NOTE

When addenda, interpretations, or errata to this standard have been approved, they can be downloaded free of charge from the ASHRAE Web site at www.ashrae.org.

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FOREWORD

This standard was created to provide an accepted method for verifying the seismic capabilities of seismic restraints. The need for such a method was recognized in ASHRAE's A Practical Guide to Seismic Restraint*, and ASHRAE Technical Committee 2.7, Seismic and Wind Restraint Design, proposed that this standard be developed. Currently the manufacturers of seismic restraints test their products in different ways. The aim of this standard is to give architects, engineers, and manufacturers a common method of determining the capabilities of seismic restraints.*

1. PURPOSE

The purpose of this standard is to provide static-test procedures for determining the capacity of seismic restraints for HVAC&R equipment. These test procedures determine the maximum force a restraint can withstand without breakage or permanent deformation.

2. SCOPE

This standard applies to the following types of seismic restraints that are manufactured from the following types of materials.

2.1 Types of Seismic Restraints

a. Cable restraints used for HVAC&R equipment that is mounted on the floor or suspended from the building structure and for associated pipe, ductwork, electrical raceways, and other devices suspended from the building structure.
b. Combination isolator/restraints that are directly mounted to equipment or to structural frames attached to equipment, including isolated curbs.
c. Seismic snubbers that are directly mounted to equipment or mounted to structural frames attached to equipment.
d. Structural shapes (i.e., rigid bracing) used for HVAC&R equipment that is mounted on the floor or suspended from the building structure and for associated pipe, ductwork, electrical raceways, and other devices suspended from the building structure.

2.2 Types of Materials

a. Ferrous metals, including those used in ductile castings, structural stainless steel, and structural carbon steel.
b. Non-ferrous materials, including aluminum, copper, and brass.
c. Non-metallic materials such as fiberglass, elastomers, natural rubber, and composites.
d. This standard does not apply to non-ductile materials.

3. DEFINITIONS

The following key terms used in the standard are defined in this section.

anchor: a device for connecting equipment and attachments to the building structure.

attachments: support systems used to connect equipment, pipe, conduit, or ductwork to the building.

bumper: an angle or other steel shape that is rigidly mounted to the building structure in a pattern around the equipment base to limit horizontal movement.

cable brace: a steel cable designed for use as a seismic sway brace for suspended equipment, piping, or ductwork. Also see *pre-stretched cable***.**

calibration: the process of checking (and adjusting as needed) the accuracy of a measuring instrument by comparison with a national standard.

cantilevered: used to describe a support member connected at one end and unsupported at the other end.

combination isolator/restraint: a seismic restraint device that acts as both a vibration isolator and a seismic restraint (snubber).

differential movement: the relative movement between two objects or surfaces.

deformation: a change in test-specimen dimensions as a result of an applied force.

ductile: having the capability for plastic deformation in tension and shear.

ductility: the ability of an element in a tensile test to be elongated at least 14% and reduced in area by at least 30%.

elastomeric: having flexibility in all directions such that the material will return to its original shape if removed from its environment.

failure: the point at which the test specimen can no longer accept load or is not capable of continuing to serve as seismic restraint.

grommet: a rubber or elastomeric bushing-shaped ring that may be used in restrained springs and snubbers or with bolts to provide a cushioned or flexible connection.

load path: the path that a load travels when there is seismic support of equipment and internal components. It can be traced though connections and support steel to the building structure.

mode of failure: an indication of how a component failed (including the component and type of failure).

non-ductile: not having the capability for plastic deformation in tension or shear.

pre-stretched cable: cable that is stretched after it is manufactured.

restrained spring: a vibration isolator containing a spring enclosed in a welded or bolted steel housing that limits the movement of the spring equipment attachment.