

# ASCE STANDARD

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American Society of Civil Engineers

## Earthquake-Actuated Automatic Gas Shutoff Devices

This document uses both Système International (SI) units and customary units.

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#### **ABSTRACT**

This Standard, *Earthquake-Actuated Automatic Gas Shutoff Devices* (ASCE 25-97), provides minimum functionality requirements for earthquake-actuated automatic gas shutoff devices and systems meant to include mechanical devices consisting of a sensing means and a means to shut off the flow of gaseous fuels. It basically applies to single-family or multi-family structures of three stories or less. The seismic performance requirements established by this Standard are based upon data from recent earthquakes, primarily in Southern California.

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# STANDARDS

In April 1980, the Board of Direction approved ASCE Rules for Standards Committees to govern the writing and maintenance of standards developed by the Society. All such standards are developed by a consensus standards process managed by the Management Group F (MGF), Codes and Standards. The consensus process includes balloting by the balanced standards committee made up of Society members and nonmembers, balloting by the membership of ASCE as a whole, and balloting by the public. All standards are updated or reaffirmed by the same process at intervals not exceeding 5 years.

The following Standards have been issued.

- ANSI/ASCE 1-82 N-725 Guideline for Design and Analysis of Nuclear Safety Related Earth Structures
- ANSI/ASCE 2-91 Measurement of Oxygen Transfer in Clean Water
- ANSI/ASCE 3-91 Standard for the Structural Design of Composite Slabs and ANSI/ASCE 9-91 Standard Practice for the Construction and Inspection of Composite Slabs
- ANSE 4-86 Seismic Analysis of Safety-Related Nuclear Structures
- Building Code Requirements for Masonry Structures (ACI530-95/ASCE5-95/TMS402-95) and Specifications for Masonry Structures (ACI530.1-95/ASCE6-95/TMS602-95)
- ANSI/ASCE 7-95 Minimum Design Loads for Buildings and Other Structures
- ANSI/ASCE 8-90 Standard Specification for the Design of Cold-Formed Stainless Steel Structural Members
- ANSI/ASCE 9-91 listed with ASCE 3-91
- ANSI/ASCE 10-97 Design of Latticed Steel Transmission Structures
- ANSI/ASCE 11-90 Guideline for Structural Condition Assessment of Existing Buildings
- ANSI/ASCE 12-91 Guideline for the Design of Urban Subsurface Drainage
- ASCE 13-93 Standard Guidelines for Installation of Urban Subsurface Drainage
- ASCE 14-93 Standard Guidelines for Operation and Maintenance of Urban Subsurface Drainage
- ANSI/ASCE 15-93 Standard Practice for Direct Design of Buried Precast Concrete Pipe Using Standard Installations (SIDD)
- ASCE 16-95 Standard for Load and Resistance Factor Design (LRFD) of Engineered Wood Construction
- ASCE 21-96 Automated People Mover Standards—Part I
- ASCE 22-97 Independent Project Peer Review
- ASCE 23-97 Specification for Structural Steel Beams with Web Openings
- ASCE 25-97 Earthquake-Actuated Automatic Gas Shutoff Devices

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# FOREWORD

The material presented in this publication has been prepared in accordance with recognized engineering principles. This Standard and Commentary should not be used without first securing competent advice with respect to their suitability for any given application. The publication of the material contained herein is not intended as a representation or warranty

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# ACKNOWLEDGMENTS

The American Society of Civil Engineers (ASCE) acknowledges the work of the Earthquake-Actuated Automatic Gas Shutoff Devices Standards Committee of the Lifelines Standards Council, Codes and Standards Activities Council. This group comprises individuals from many backgrounds including: manufacturing, gas industry, consulting engineering,

government, insurance industry, education, and private practice. This Standard was prepared through the consensus standards process by balloting in compliance with procedures of ASCE's Codes and Standards Activities Council. Individuals serving on the Standards Committee are:

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# HISTORY OF THE DEVELOPMENT OF THE STANDARD

Initiation of a standard for earthquake-actuated automatic gas shutoff devices began in 1977 with a request from the American National Standards Committee Z21 to the Automatic Gas Valve Working Committee of its Subcommittee on Standards for Gas Appliance Control Devices. In 1978, a working group was appointed to proceed with this task, and a draft standard was prepared.

The draft standard was distributed for review and comment in mid-1979. A revised draft standard was adopted by the Z21 Committee by letter ballot in December, 1979. The first edition of the Standard for Earthquake-Actuated Automatic Gas Shutoff Systems was approved as an American National Standard by the American National Standards Institute on April 16, 1981.

In 1981, the secretariat for this Standard was transferred from the American Gas Association to the American Society of Mechanical Engineers (ASME). The ASME committee responsible for the Standard did not initiate any changes. In 1991, a proposal was approved for the formation of a Pre-standards Committee within the Gas and Liquid Fuel Lifelines Committee of the American Society of Civil Engineers' (ASCE) Technical Council on Lifeline Earthquake Engineering to revise the shutoff valve standard.

A full Standard Committee was formed in late 1992 and met for the first time in early 1993. The Committee was formed of manufacturing, engineering, local and state government, and insurance representatives.

The aggressive data collection effort following the January 17, 1994, Northridge earthquake provided a unique opportunity to assess the risk posed to the public by natural gas-related post-earthquake fires and ground motions for which automatic gas shutoff would be beneficial. The ASCE Standard Committee met in the months following the Northridge earthquake and finalized the scope of research needed to support development of the revised Standard.

Research focused on two key areas. It was decided that dynamic testing of current devices was needed to quantify performance characteristics. The other key area was in-depth examination of Northridge earthquake data on ground motions, structural damage, fire initiation, and actuation of existing earthquake shutoff devices.

A proposal to perform research in these two areas was prepared for ASCE by the Standard Committee, and the project was jointly funded by the Federal Emergency Management Agency (FEMA), natural gas utilities, and shutoff device manufacturers. The research project was initiated in March of 1995 and completed in November of 1995.

Performance characteristics of the devices tested were determined and evaluated for both discrete dynamic loads and complex motions such as simulated earthquakes. The results of the dynamic testing of the devices currently on the market bracketed the ranges that were used in defining the actuation requirements in response to seismic disturbances.

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# Earthquake-Actuated Automatic Gas Shutoff Devices

## 1.0 GENERAL

Except as modified by this Standard, devices qualified to this Standard shall conform to the applicable specifications of ANSI Z21.21.

## 1.1 SCOPE

This Standard provides minimum functionality requirements for earthquake-actuated automatic gas shutoff devices and systems (hereafter referred to as *devices*) meant to include mechanical devices consisting of a sensing means and a means to shut off the flow of gas.

The components or parts of devices not covered by this Standard or the applicable sections of ANSI Z21.21 shall be in accordance with the applicable American National Standards Institute and industry standards.

## 1.2 APPLICABILITY

The typical configuration considered in this Standard is a single-family or multifamily structure of three stories or less. The seismic performance requirements established by this Standard are based upon data from the most recent earthquakes, primarily in southern California. This Standard is applicable only to devices carrying gaseous fuels such as natural gas and propane.

### 1.2.1 Pressure Rating

This Standard applies to devices having maximum operating gas pressure ratings of 0.5 psi (3.4 kPa) up to and including 60 psi (414 kPa).

### 1.2.2 Mounting

This Standard applies to devices that are to be mounted in strict accordance with manufacturer's specifications, and in a manner as to be sensitive to earthquake ground motions and not motions that might result from the dynamic response of structures, equipment, or other appurtenances.

## 1.3 OPERATION

### 1.3.1 Mode of Operation

The device shall be designed to operate automatically. Actuation of gas shutoff may be accomplished

either directly or indirectly by mechanical or other means.

### 1.3.2 Operating Conditions

Devices covered by this Standard shall be capable of operating at ambient temperatures of  $-10^{\circ}$  F to  $150^{\circ}$  F ( $-23^{\circ}$  C to  $66^{\circ}$  C) unless manufacturers specify lower minimum or higher maximum operating temperature ranges.

### 1.3.3 Pressure Specification

All references to psi throughout this Standard are to be considered gage pressures unless otherwise noted.

## 1.4 MARKING

### 1.4.1 Permanent Label

In addition to the requirements of ANSI Z21.21, each device shall have a permanent labeling to identify this Standard, as follows:

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### 1.4.2 Installation Warning

All devices shall have the following warning affixed to the device with a tag and on the device shipping carton:

**WARNING!** This device must be installed by a qualified installer in accordance with the manufacturer's installation instructions; if improperly installed, failure to function as intended or unwarranted interruption of gas service could result.

### 1.4.3 Resetting Warning

All devices shall bear the following warning:  
Following actuation of this device, reset the device and restore service only after a qualified person has verified no gas leak exists.

## 1.5 WARRANTY

Manufacturers shall warrant the performance of devices for a specified time to meet this Standard.