

# ANSI/ASSP Z117.1-2016

## Safety Requirements for Entering Confined Spaces

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**ANSI®**  
**ANSI/ASSE Z117.1 – 2016**

**American National Standard**

**Safety Requirements for  
Entering Confined Spaces**

Secretariat

**American Society of Safety Engineers**  
520 N. Northwest Highway  
Park Ridge, IL 60068

**Approved August 4, 2016**

**Effective January 1, 2017**

**American National Standards Institute, Inc.**

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Published October 2016 by:

**American Society of Safety Engineers**  
**520 N. Northwest Highway**  
**Park Ridge, IL 60068**  
**(847) 699-2929 • [www.asse.org](http://www.asse.org)**

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Printed in the United States of America

## Foreword (This Foreword is not a part of American National Standard Z117.1 – 2016.)

This standard was developed by an American National Standards Committee, national in scope, functioning under the procedures of the American National Standards Institute with the American Society of Safety Engineers (ASSE) as Secretariat. This standard provides minimum requirements to be followed while entering, working in and exiting confined spaces at ambient atmospheric pressure.

It is intended that the procedures and performance requirements detailed herein will be adopted by every employer whose operations fall within the scope and purpose of the standard.

Neither the standards committee, nor the secretariat, feel that this standard is perfect or in its ultimate form. It is recognized that new developments are to be expected, and that revisions of the standard will be necessary as the art progresses and further experience is gained. It is felt, however, that uniform requirements are very much needed and that the standard in its present form provides for the minimum performance requirements necessary in developing and implementing a comprehensive confined space program for the protection of personnel.

In 1993, OSHA estimated that 238,000 establishments had permit required confined spaces. These establishments employed approximately 1.6 million workers, including contractors, who entered 4.8 million permit-required confined spaces annually. OSHA further estimated that 63 fatalities and 13,000 lost workdays and non-lost workday cases involving confined spaces entry occurred annually.

OSHA and NIOSH data during the period 1980-1993 indicated atmospheric conditions were the leading cause of death associated with confined space entry. The data indicated that oxygen deficiency, hydrogen sulfide, methane, and inert gases ranked as the leading specific atmospheric hazardous conditions. Engulfment was found to be second in terms of occurrence. Mechanical asphyxiation from loose materials such as grain, agricultural products, sand, cement and gravel was dominant. Evidence suggested that the cause of death associated with confined space entry has not changed appreciably during recent years.

In the revision of the 2009 version of Z117.1, the ASC reviewed recent data and information addressing confined space incidents. Federal OSHA fatality and catastrophe statistics were collected from their database using confined space as the search words between years 2002 and 2012. A total of 222 cases were reviewed and it was determined that over 80% of fatalities were still caused by atmospheric hazards, and oxygen deficiency was the leading atmospheric hazard.

It should be understood that the fatality cases in this sampling do not represent all U.S. confined space incidents resulting in fatalities. The mining, agriculture and maritime sectors as well as various states with their own primary jurisdiction for safety and health enforcement are likely to be the source of many more cases not discussed within the Foreword of the Z117.1 standard. Upon review of this data, much remains to be done, particularly in regards to verification of atmospheres for entrants prior to and during confined space activity.

The Z117 Committee acknowledges the critical role of design in influencing the safe entry and work in confined spaces. ANSI has an existing standard ANSI/ASSE Z590.3, *Prevention through Design*, this standard should be consulted when considering design modifications. The failure to incorporate safety during the design process and overlooked design deficiencies can often increase the risk for entrants: examples are (1) means of entry (portals, hatchways, etc.) which are too small, improperly located or that complicate/inhibit escape; (2) spaces which are convoluted, unnecessarily obstructed or hazardously configured; (3) internal clearances which are too tight for safe passage; (4) space penetration distances which are excessive without alternative means of access or escape; (5) absence of appropriate devices to isolate all energy sources from the space; (6) no provision for vessel mechanisms/devices to prevent loose materials from bridging, compacting, etc. (7) lack of features that would enhance space ventilation

effectiveness; (8) structural weaknesses in walls, floors, ceilings, fixed apertures such as ladders, walkways or pipes containing gases, liquids, or steam, or which increase hazard risk to entrants while working or coming in contact with stated structures in confined spaces; (9) absence of anchor points for retrieval devices and (10) locating gauges, floats and shut off valves outside the confined space will design out the need to possibly enter in the first place.

The standard does not attempt to address these issues. It is believed they are best dealt with by the purchaser, employer or owner during a project's design, acquisition or construction. However, it is recommended that designers, manufacturers and users make confined space design issues a priority when new or modified machinery, equipment, processes or facilities are contemplated.

For existing confined spaces which have recognized design deficiencies, it should be the responsibility of those authorizing entry to either:

- modify or correct the deficiencies when possible; or
- employ alternate means to accomplish the work without exposing personnel; or
- develop and implement specific safe entry procedures for each confined space; or
- dismantle, open, remove, etc. the equipment/process rather than enter if the risk is deemed unacceptable.

The Z117 Committee solicits public input that may suggest revisions to the standard. Such input should be sent to the Secretariat, American Society of Safety Engineers, 520 N. Northwest Highway, Park Ridge, IL 60068.

This standard was processed and approved for submittal to ANSI by American National Standards Committee on Confined Spaces Z117. Committee approval of the standard does not necessarily imply that all committee members voted for its approval. At the time of approval, the Z117 Committee had the following members:

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