ANSI/ASSP Z117.1-2022

Safety Requirements for Entering Confined Spaces

AMERICAN SOCIETY OF
SAFETY PROFESSIONALS

Approved American National Standard
ANSI

ANSI/ASSP Z117.1 – 2022

American National Standard

Safety Requirements for Entering Confined Spaces

Secretariat

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

Approved January 28, 2022

American National Standards Institute

American National Standard

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Published February 2022 by:

American Society of Safety Professionals
520 N. Northwest Highway
Park Ridge, IL 60068
(847) 699-2929 • www.assp.org

Printed in the United States of America

Foreword (This Foreword is not a part of American National Standard Z117.1 – 2022.)

This standard was developed by a standards committee, national in scope, functioning under the procedures of the American National Standards Institute with the American Society of Safety Professionals (ASSP) 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 committee 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.

In this current version of Z117.1, the committee reviewed recent data from OSHA’s fatality database for 2019 to include federal and state cases concerning only workers that have died on the job. Then that list, which involved hundreds of cases, was separated into cases that could involve confined spaces. The cases that were counted were cases involving asphyxiations and poisons such as possible atmospheric hazards such as oxygen deficiency, carbon monoxide and hydrogen sulfide, engulfments such as grain and water, and falls and mechanical hazards. The data revealed 34 cases of possible confined space fatalities which 18 involved asphyxiants and toxic exposures, 12 involved engulfment by grain or water, 3 involved falls and 1 involved a mechanical auger. We still see that asphyxiants and toxic atmospheres are the leading cause of death in confined spaces, however engulfment in grain silos and storage bins is a very close second. We must continue to ventilate, test and prevent employees from entering silos and grain bins without adequate retrieval and fall protection equipment worn by entrants.

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 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 regard to verification of atmospheres for entrants prior to and during confined space activity. All data needs to be thoroughly reviewed to determine cause of death and if any action could have been done to prevent the unfortunate loss of life.

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/ASSP 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.

Normative Requirements: This standard uses the single column format common to many international standards. The normative requirements appear aligned to the left margin. To meet the requirements of this standard, machinery, equipment and process suppliers and users must conform to these normative requirements. These requirements typically use the verb “shall.”

> *Note: The informative or explanatory notes in this standard appear indented, in italics, in a reduced font size, which is an effort to provide a visual signal to the reader that this is an informative note, not normative text, and is not to be considered part of the requirements of this standard; this text is advisory in nature only. The suppliers and users are not required to conform to the informative note. The informative note is presented in this manner in an attempt to enhance readability and to provide explanation or guidance to the sections they follow.*

Revisions: The Z117 Committee welcomes proposals for revisions to this standard. Revisions are made to the standard periodically (usually five years from the date of the standard) to incorporate changes that appear necessary or desirable, as demonstrated by experience gained from the application of the standard. Proposals should be as specific as possible, citing the relevant section number(s), the proposed wording and the reason for the proposal. Pertinent documentation would enable the Z117 Committee to process the changes in a more-timely manner.

Interpretations: Upon a request in writing to the Secretariat, the Z117 Committee will render an interpretation of any requirement of the standard. The request for interpretation should be clear, citing the relevant section number(s) and phrased as a request for a clarification of a specific requirement. Oral interpretations are not provided.

No one but the Z117 Committee (through the Z117 Secretariat) is authorized to provide any interpretation of this standard.

Approval: Neither the Z117 Committee nor American National Standards Institute (ANSI) approves, certifies, rates or endorses any item, construction, proprietary device or activity.

Appendices: Appendices are included in most standards to provide the user with additional information related to the subject of the standard. Appendices are not part of the approved standard.

Checklists: Checklists included in Z117 standards may be copied and used in non-commercial settings only.

Committee Meetings: The Z117 Committee normally meets twice per year, however committee officers can alter this at any time due to situational conditions. Persons wishing to attend a meeting should contact the Secretariat for information.

Standard Approval: This standard was processed and approved for submittal to ANSI by the Standards Committee on Confined Spaces, Z117. Approval of the standard does not necessarily imply (nor is it required) that all Committee members voted for its approval. At the time ANSI approved this standard, the Z117 Committee had the following members:

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Terry L. Ketchum, Vice-Chair
Rick Blanchette, Secretary
Jennie Dalesandro, Administrative Technical Support

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Contents

AMERICAN NATIONAL STANDARD Z117.1
SAFETY REQUIREMENTS FOR
ENTERING CONFINED SPACES

1. General

1.1 Scope

This standard provides minimum safety requirements to be followed while entering, exiting and working in confined spaces at ambient atmospheric pressure.

> *Note: The scope of this standard does not address confined space design issues. Please see the Foreword of this standard for additional general information addressing confined space design.*

1.2 Exceptions

This standard does not apply to industries that have their own specific national consensus standards (i.e., maritime, agriculture, construction, etc.). Also excluded are the following activities: underground mining, tunneling, caisson work, excavations, and intentionally inert confined spaces or other similar tasks.

1.3 Purpose

The purpose of this standard is to establish minimum requirements and procedures for the safety and health of employees who work in, and in connection with, confined spaces.

1.4 Performance Standard

This standard is a performance standard if followed, results in observable outcomes achieving improvements and, as such, is not intended to replace existing specific standards and procedures, but rather to support those that meet the performance objectives defined in this standard. See Appendix B for a listing of other established national consensus standards pertaining to confined space.

1.5 Application

This standard is designed for voluntary application immediately upon approval as an American National Standard.

2. Definitions

Atmospheric Tester. A qualified person selected by the employer who tests or monitors a permit space as necessary to determine if acceptable limits are maintained and is able to interpret results.

Attendant. Person assigned to monitor a confined space process or operation and provide support or react as required for the safety of the entrants.

Biological Hazards. Microbial agents presenting a risk or potential risk to the well-being of humans through inhalation, ingestion, skin absorption or injection.

> *Note: Microorganisms may cause a toxic release or an oxygen deficient atmosphere. Biological hazards may include but are not limited to infectious or parasitic agents; microorganisms such as bacteria, some fungi, mold, yeasts and algae; plants and plant products, and animals and animal products, which may under the right conditions cause occupational disease.*

Blinding/Blanking. Inserting a solid barrier able to withstand maximum pressure across the open end of a pipe, line or duct or in between two flanges, leading into or out of the confined