



Department of the Air Force
HQ AEDC (AFMC)
Arnold AFB, TN 37389

Safety, Health, and Environmental Standard

Title: CONFINED SPACES
Standard No.: B5
Effective Date: 03/17/2015
Releasability: There are no releasability restrictions on this publication.

The provisions and requirements of this standard are mandatory for use by all personnel engaged in work tasks necessary to fulfill the AEDC mission. Please contact your safety, industrial health and/or environmental representative for clarification or questions regarding this standard.

Approved:

Contractor/ATA Director
Safety, Health, and Environmental

Air Force Functional Chief

SHE Standard B5 Confined Spaces

Record of Review/Revision

(Current revisions are highlighted in yellow and marked with a vertical line in the right margin.)

Date/POC	Description
01/19/15 Bidmead	Removed verbiage implying SSHAs for all spaces must be in Matrix. Changed entry permit review and retention requirements in paragraphs 4.1.5 for compliance with OSHA mandatory requirements.
08/14/13 Tate	Three-year review: Changed SHG to SHE throughout. Deleted reference to GC-215 in Confined Space Entry Permit definition. Clarified LEL in 4.1.1.7.2 Added reference to SHE Standard B1 to note in 4.1.4.4; minor rewording for clarification in section 4.1.5. Incorporated name change to AF Form 592 Hot Work throughout. Clarified role of department having jurisdiction over confined space when readying the space for entry by outside contractor. Added ANSI/ASSE Z117.1 as reference; added note to annex to reference SHE Standard B3. Removed statements in Section 4.1.8 that are redundant with SHE Standard C5 Welding and Cutting (Hot Work). No change to processes.
03/11/13	Added NFAC supplement; no other change.
02/28/11 Tate/Roosa	Two year review; administrative/reformatting updates. Clarified retrieval system use and signage for permit-required confined spaces; updated refresher training to reflect CBT rather than classroom and eliminated references to specific training records maintenance which is already covered by operating contractor and DOD/AF procedure; eliminated obsolete Annex C.
04/30/09 Tate/Roosa 6/30/09 Bragg	Annual review, minor administrative changes from Industrial Hygiene to clarify definitions; no change in process or requirements.
04/22/08 Tate/Roosa	Annual review, no changes required at this time.
04/25/07 Bidmead	Removed Sample GC-77 (formerly Annex A) and Sample PRCS work instruction (formerly Annex B) and resolved resulting consistency issues for terms “procedure” and “work instruction.” Updated affected paragraphs. Changed definition of “Confined Space Entry” for consistency with AFOSH and OSHA standards.
10/24/06 Roosa	Added information to address confined space entry for distinguished visitors.
06/30/06 Roosa	Annual review. Made minor grammatical changes, removed extraneous wording; incorporated new language regarding signage; added note to Annex B; removed requirement for annual refresher training; reformatted Annex B.
06/24/05 Jennings	Annual review; no change required.
02/20/05 Jennings	Revised to allow paper GC-215 forms to be used Updated training requirements Revised Annex A to comply with the eMatrix format Revised Annex B to comply with Operating Contractor Work Instruction Format
05/04/04 Jennings	Review SSHA every 2 years instead of 1, per A4. Inserted Master Work Permit Issuing Official Revised Annex A Revised Annex B
07/11/02 Jennings/Tate	AEDC Safety, Health and Environmental Standard, B5 Confined Spaces revised to meet current OSHA, Air Force and Contractor safety requirements and regulations.



Safety, Health, and Environmental Standard

CONFINED SPACES

1.0 INTRODUCTION/SCOPE/APPLICABILITY

- 1.1 Introduction – This standard establishes general guidelines for the safety of personnel when performing work in confined spaces. It describes the tasks, activities and actions required when employees have duties and responsibilities in confined spaces at AEDC
- 1.2 Scope – This standard shall be considered the AEDC Confined Space Program, incorporating requirements and objectives of OSHA 1910.146 and other nationally recognized national consensus standards. If there are any conflicts between this standard and industry or national codes, standards or regulatory requirements, the Base Operating Contractor shall notify the government.
- 1.3 Applicability – This standard applies to all AEDC confined spaces and outlines evaluation, hazard assessment, and employee training requirements and responsibilities necessary to prevent occupational injuries and illnesses associated with confined space work activities. For outside contractor personnel, training requirements are established and provided by their management.

2.0 BASIC HAZARDS/HUMAN FACTORS

2.1 Basic Hazards

- 2.1.1 Hazards peculiar to confined spaces are described in the definitions below. Asphyxiation is the leading cause of death in confined spaces. The asphyxiations that have occurred in permit spaces have generally resulted from oxygen deficiency or exposure to toxic atmospheres.
- 2.1.2 Failure to deenergize equipment inside a confined space prior to employee entry is a factor in many accidents.
- 2.1.3 The physical nature of many confined spaces compounds the risks of exposure to atmospheric or other serious hazards. The elements of confinement, limited access, and restricted airflow can result in hazardous conditions that would not normally arise in an open workplace.
- 2.1.4 An analysis of data on confined space incidents at AEDC from 1970 to 2006 confirms that of the nine fatalities at AEDC, seven occurred in confined spaces. Causes of death ranged from asphyxiation, fire, and explosion, to crushing.

2.2 Human Factors

Lack of knowledge of the hazards in the confined space is one of the leading factors for people suffering injury in the space. Through the use of hazard analysis for the confined space, implementation of approved confined space entry procedures, training, and recognition of hazards by entrants are the main countermeasures developed by industry and AEDC to prevent injury to personnel.

3.0 DEFINITIONS

Air-Purifying Respirator – A device designed to protect the wearer from inhalation of harmful dusts, mist, fumes, vapors or gases by removing contaminants from the ambient air by way of a filter or chemical absorbent.

Attendant – The individual who is trained in accordance with this standard, and who is stationed and remains outside the confined space through the duration of entry operations as required by the entry procedure or entry permit.

Base Operating Contractor – A long-term contractor directly accountable to the Air Force for the AEDC mission; term used to identify the AEDC Operation, Maintenance, Information Management and Support Contractor.

Blanking or Blinding – The absolute closure of a pipe, line or duct by inserting a solid plate or cap, which completely covers the bore, and is capable of withstanding the maximum upstream pressure.

Confined Space – A space large enough and so configured that an employee can bodily enter and perform assigned work, having limited or restricted means for entry or exit, and not designed for continuous employee occupancy. Examples include tanks, vessels, storage bins, vaults, and pits are spaces that may have limited means of entry.

Confined Space Entry – The act by which a person intentionally passes through an opening into a permit/procedure-required confined space. Entry is made as soon as any part of the entrant’s body breaks the plane of an opening into the space.

Confined Space Entry Permit – Form GC-77 AEDC Operations Confined Space Entry Permit is used when a confined space entry procedure is not available or applicable. The intent of the use of the GC-77 permit is that it only be used when time does not permit preparation of a confined space entry procedure.

Confined Space Entry Procedure – The procedure used for AEDC confined space entry at AEDC; this document may be in the format of a written work instruction. Hazards identified in the hazard analysis shall be considered when developing the Confined Space Entry Procedure.

Confined Space Hazard – Hazards peculiar to confined spaces include confinement, egress restrictions, oxygen deficiency, asphyxiants, explosive and/or flammable atmospheres, hazardous materials, temperature and pressure extremes, etc. Hazards encountered under normal work conditions such as electric shock, moving machinery, pneumatic operations, slips, trips, etc., may also be present.

Control of Hazard – To hold in restraint, check. To enter a confined space the hazards shall be controlled at a minimum (see isolation) to make it safe for entry. Example: A single valve that is shut and locked as protection for an oxygen deficiency gas (i.e., nitrogen). Note that control of hazard and elimination of hazard cannot be used interchangeably for reclassification of a confined space.

Custodian – The person designated on the “Danger Permit – Required Entry” sign. This person is normally the supervisor, manager, or the individual authorizing entry. This individual is responsible for overall knowledge of the confined space, including hazards present, abatement methods, and entry requirements.

Double Block and Bleed – A method used to isolate a confined space from line, duct or pipe by closing two in-line valves in a piping system and opening a valve between them which is vented to a safe location. This method usually qualifies as “elimination of the hazard.”

Elimination of Hazard – To get rid of, or remove such that the hazard no longer exists; removal of the hazard or energy from the confined space. To classify a confined space as non-permit required, atmospheric (to include potential) hazards and serious safety and health hazards must be eliminated. Note that elimination of hazard and control of hazard cannot be used interchangeably for reclassification of a confined space.

Entrant – The individual trained in accordance with the standard who is authorized by the employer to enter a confined space.

Hazard Analysis (HA) – An analytical method used to evaluate systems or processes to identify hazards and recommend steps to eliminate or reduce risks associated with these hazards. Several types of hazard analysis are in common use. The type used depends upon the system or process being evaluated. See Section 4.1.3, and AEDC Safety, Health, and Environmental (SHE) Standard A4 System Safety.

Hazardous Atmosphere – An atmosphere that may expose employees to the risk of death, incapacitation, impairment of ability to self-rescue (escape unaided from a permit-required space), injury, or acute illness from one or more of the following:

- (1) Flammable gas, vapor, or mist in excess of 10% of its lower flammable limit (LFL).
- (2) Airborne combustible dust at a concentration that meets or exceeds its LFL.
- (3) Atmospheric oxygen concentration below 19.5% or above 23.5%.
- (4) Atmospheric concentration of any substance that could result in employee exposure in excess of its dose or Permissible Exposure Limit (PEL).
- (5) Any other atmospheric condition that is immediately dangerous to life or health.

Immediately Dangerous to Life or Health (IDLH) – Any condition which poses an immediate threat of loss of life; may result in irreversible or immediate severe health effects, eye damage, irritation, or other conditions which could impair escape from the permit-required confined space.

Individual Authorizing Entry – Person authorized to allow entry into confined spaces under his control; see custodian.

Isolation – The process by which a permit-required space is removed from service and completely protected against the release of energy and material into the space by such means as: blanking or blinding; misaligning or removing sections of lines, pipes, or ducts; double block and bleed system; lockout or tagout of all sources of energy; or blocking or disconnecting all mechanical linkages. The term isolation includes elimination *and* control methods.

Lower Explosive Limit (LEL) or Lower Flammable Limit – The minimum concentration of a combustible gas or vapor in air (usually expressed in percent by volume) that will ignite if an ignition source is present.

Non-Permit Required Confined Space – A confined space that does not contain or, with respect to atmospheric hazards, have the potential to contain any hazard capable of causing death or serious physical harm.

Outside Contractor/Subcontractor - An organization employed by a contractor or the Air Force to do construction, maintenance, repair or other work at AEDC. There is no employment relationship, control or supervision of the subcontractor's employees by AEDC contractors. Also referred to as the construction contractor.

Oxygen Deficiency – An atmosphere having less than the percentage of oxygen found in normal air. Air contains approximately 21% oxygen at sea level. OSHA considers less than 19.5% oxygen content in air as potentially hazardous to life.

Permissible Exposure Limit (PEL) – OSHA exposure limit time-weighted average concentration for a normal eight-hour workday and a 40-hour work week, to which nearly all workers may be repeatedly exposed, day after day, without adverse effect.

Permit-Required Confined Space (PRCS) – A confined space that has one or more of the following characteristics: contains or has a potential to contain a hazardous atmosphere, contains material that has potential to engulf an entrant, has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor which slopes downward and tapers to a smaller cross-section, or contains any other recognized serious safety or health hazard.

Rescue Response Team – A rescue team consisting of AEDC Fire Department personnel trained to fulfill the requirements of this standard.

Retrieval Line – A line or rope secured to an anchor point or lifting device outside of a confined space and attached to a full-body harness, chest harness, or wristlets worn by personnel entering the confined space.

Retrieval System – The equipment, or method [including a retrieval line, chest or full-body harness, wristlets (if appropriate), and a lifting device or anchor] used for non-entry rescue of persons from permit-required spaces. Required for PRCSs unless the equipment would increase overall risk of entry or would not contribute to rescue of the entrant.

Self-Contained Breathing Apparatus (SCBA) – An atmosphere-supplied respirator in which the wearer carries a personal air supply usually in a compressed gas cylinder worn on his back.

Serious Safety or Health Hazard – OSHA defines as “...substantial probability that death or serious physical harm could result from a condition which exists, or from one or more practices, means, methods, operations, or processes which have been adopted or are in use...”

Supplied-Air Respirator – A respirator that supplies the wearer with clean, breathable air provided by a compressor, air mover or compressed gas cylinders.

Threshold Limit Value (TLV) – The time-weighted average concentration for a normal eight-hour workday and a 40-hour work week, to which nearly all workers may be repeatedly exposed, day after day, without adverse effect.

Upper Explosive Limit (UEL) (or Upper Flammable Limit) – The highest concentration of flammable gas or vapor that will burn in the presence of an ignition source.

4.0 REQUIREMENTS/RESPONSIBILITIES

4.1 Requirements

Each AEDC confined space shall be identified and analyzed to ensure the space is safe for entry.

4.1.1 General Requirements

- 4.1.1.1 Positive blocks shall be provided to prevent flammable, toxic, irritating, or asphyxiating gases or vapors from entering confined workspaces. Positive blocks include depressurization, isolation, or reducing the hazard by double valve protection, blanking off, or disconnecting all supply sources. All unwanted energy transfer sources such as electrical or pneumatic equipment that may cause harm to personnel or damage to equipment shall be de-energized and locked out.
- 4.1.1.2 If a hazardous atmosphere is detected during a confined space entry, all entrants shall evacuate the confined space. The space shall be evaluated to determine how the hazardous atmosphere developed. In addition, measures shall be implemented to protect the entrants from the hazardous atmospheres before a subsequent entry takes place. SHE and AEDC Fire Department personnel shall assist in this evaluation as necessary to ensure a safe atmosphere.
- 4.1.1.3 Confined space hazards can be eliminated or reduced by engineering methods such as redesigning systems, providing ventilating systems, or reconstructing to permit easier and safer entry and egress. Administrative controls such as limiting time spent in the area to prevent overexposures (i.e., work rest cycles), work procedures, training, and warning devices, may be incorporated to reduce exposure. Personal protective equipment shall be used if hazards cannot be completely eliminated.
- 4.1.1.4 If work requires the introduction of hazardous materials, a revised HA and a confined space procedure shall be completed and coordinated between supervision and SHE.
- 4.1.1.5 The point of entry to each identified PRCS shall have a danger sign posted at the point of entry identifying it as a PRCS. The sign should reflect precautions/actions to be taken or the entry procedure to be followed before authorized entry, a point of contact, phone number, and an identification number unique to the confined space. (See Annex A, Confined Space Sign).

EXCEPTION: PRCS signage may not be required at the entrance to a space if the entrance is secured so as to require special tools or equipment (wrenches, cutting torches, etc.) to open the space before an employee can intentionally enter. If locks are used to secure the openings to confined spaces, positive key control shall be strictly enforced and maintained. The Individual Authorizing Entry is responsible for control and access to keys used to secure confined spaces. These exceptions apply only if the supervisor or custodian of the space can meet the requirements of this paragraph and accepts responsibility for ensuring all employees are made aware of and understand the hazards of PRCSs in the organization.
- 4.1.1.6 An attendant trained in rescue methods and procedures appropriate for rescue operations shall be stationed outside the PRCS access opening while such space is occupied. The attendant shall not enter the PRCS for rescue attempt. Attendants shall maintain continuous effective contact with authorized entrants throughout the duration of the entry. If necessary, SHE shall be contacted to help determine a means of positive communication. This may be accomplished by two-way radios, coded lifeline signals, relay, etc.
- 4.1.1.7 Before any personnel are allowed PRCS entry, a trained person shall test the PRCS atmosphere in the following order:
 - 4.1.1.7.1 Oxygen content to ensure the level is not below 19.5% or above 23.5%.
 - 4.1.1.7.2 Flammable gases and vapors to ensure the LEL is less than 10%, but any reading above 0% LEL requires additional investigation to determine the cause of the deviation above 0% LEL. Do not enter the space if above 0% LEL without additional investigation.
 - 4.1.1.7.3 Carbon monoxide (CO) content to ensure CO content is below 25 parts per million (ppm).
 - 4.1.1.7.4 Potential toxic air contaminants. (Monitoring devices shall be calibrated according to manufacturers' recommendations and labeled with the calibration date.)
- 4.1.1.8 Deviation of readings from normal atmospheric conditions (21% oxygen, 0% LEL, 0 ppm carbon monoxide, potential toxic air contaminant) shall be investigated to determine the cause.

4.1.1.9 Entry into oxygen-deficient atmospheres is prohibited. If toxic vapors, fumes, or mist are suspected in a confined space, SHE shall be contacted for appropriate testing. Entry into confined space where the contaminant level exceeds the TLV or PEL without proper protective equipment is prohibited.

4.1.2 Confined Space Hazard Identification and Control Process – Base Operating Contractor Departmental Responsibilities

4.1.2.1 Identify all confined spaces in the area.

4.1.2.2 Provide SHE with an updated list of all confined spaces in the area. The list will include the following:

NOTE: SHE will forward the list of confined spaces to the AEDC Fire Department and AEDC/SE.

4.1.2.2.1 Title and/or number of the confined space HA.

4.1.2.2.2 Confined space entry procedure number.

4.1.2.2.3 Identification number of the confined space. (See Annex B; Recommended Identification Numbering System for Confined Spaces.)

4.1.2.2.4 Confined space custodian information. This is normally the supervisor or assigned representative; usually the individual authorizing entry.

4.1.2.3 Review and update/revise the department's confined space list every two years; sooner if a new confined space is determined to exist in the department's area, or a listed confined space no longer exists.

4.1.2.4 Identify the hazards in each confined space. Each jobsite shall be evaluated and all exposed employees shall be informed of the existence, location and danger posed by the confined spaces. (See Section 5.0.)

4.1.2.5 Classify each confined space as permit-required or non-permit-required on the HA for the confined space.

4.1.2.6 Develop confined space entry procedures using the required standardized format and the requirements listed in Section 4.1.4 below. A safety office review of the entry procedure is required. The confined space entry procedure shall be kept at the point of entry while the confined space is occupied.

4.1.2.7 Determine how the confined space will be controlled and secured against inadvertent entry.

4.1.2.8 Ensure that all entry into the department's confined spaces will be strictly controlled by the master work permit issuing official and the area supervisor, manager or his/her assigned representative.

4.1.2.9 Review hazards of the confined space, the confined space HA, confined space signs, and the confined space entry procedures annually. The requirement to review confined space entry procedures annually may be satisfied by reviewing and updating the procedure each time it is used to enter a confined space. If changes are made i.e. new hazards introduced, change in configuration of points of protection, etc, the entry procedure shall be forwarded to SHE for review and coordination. The confined space list shall be updated if changes are noted.

4.1.2.10 Revise the confined space HA procedures as needed.

4.1.3 Base Operating Contractor Confined Space Hazard Analysis

4.1.3.1 Confined space HA must be completed.

4.1.3.2 SHE review of the HA is required.

4.1.4 Confined Space Entry Procedures

4.1.4.1 Each department/area will mandate the use of written confined space entry procedures consistent with OSHA standards.

4.1.4.2 When an individual or crew plans to access a confined space not under their organization's control, Form GC-1732 Master Work Permit shall be obtained from the department having jurisdiction over that confined space. The department with jurisdictional control and responsibility for that confined space shall issue and complete the confined space entry procedure down to, and including, the signature block for the individual authorizing entry. [See SHE Standard B1, Master Work Permit.]

4.1.4.3 If personnel from more than one employer (i.e., Base Operating Contractor or outside contractor) will be working in or near a confined space, procedures shall be implemented to coordinate entry operations so that employees of one employer do not endanger the employees of any other employer.

NOTE: In the situation above, an approved Master Work Permit may be required for each group of employees. (See SHE Standard B1.)

4.1.4.4 The confined space entry procedure shall be maintained at the entrance to the space while the space is open.

4.1.4.5 When the nature of the confined space activity requires use of several attendants and/or entrants, a confined space authorized personnel roster shall be utilized to monitor personnel entering and exiting the space. This document shall be added to the entry procedure(s).

4.1.4.6 Operational support including multiple crafts, or other organizations, may work under the same Confined Space Entry Procedure.

NOTE: When working under a common entry procedure, the individual authorizing entry and/or the supervisor (or assigned representative) of entrants have the utmost responsibility to ensure all procedure requirements are met prior to and during entry.

4.1.5 Permit Required Confined Space Entry Permits

4.1.5.1 A permitting system meeting the intent of OSHA standards is required. Permits shall be maintained at the entrance to the space while the space is open.

4.1.5.1.1 Entry permits may be incorporated into the entry procedures or as a separate document (e.g. Form GC-77).

4.1.5.1.2 A confined space HA to identify hazard of the space shall be completed prior to issuing an entry permit.

4.1.5.2 Entry permits shall be cancelled by the issuer when work requiring the entry is complete, conditions in the space are not consistent with the acceptable entry conditions of the permit, or the permit has expired.

4.1.5.3 Entry permits shall incorporate a means for entrants to provide feedback on the entry process and problems encountered (e.g. Form GC-141). The issuer shall ensure identified discrepancies are resolved in a manner that effectively protects entrants and/or future entrants.

4.1.5.4 Permits (with entrant's feedback) shall be kept on file for one year after the date permit is cancelled.

4.1.6 Confined Space Signs

4.1.6.1 A danger sign (Annex B) shall be posted at the confined space entry designating the space as a PRCS unless the conditions cited in Paragraph 4.1.1.5 are met.

4.1.6.2 The confined space entry sign should include the confined space entry procedure number, the identification number of the confined space, the custodian of the confined space, and the phone number of the custodian of the confined space.

4.1.7 Confined Space Classification or Reclassification

4.1.7.1 Each confined space shall be classified as permit required or non-permit required upon completion of a thorough evaluation and analysis of the space.

4.1.7.2 If the confined space hazards can be removed through hazard elimination, the space may be reclassified as a non-permit required confined space.

4.1.7.3 During the reclassification process the individual authorizing entry is required to verify that all confined space hazards have been eliminated.

4.1.7.4 The PRCS signage will remain as is, although the space has been re-classified as a non-permit, but the work instruction will verify the reclassification.

4.1.8 Gas Cutting, Burning, and Welding

See SHE Standard C5 Welding and Cutting additional information.

4.1.8.1 Burning and welding in confined spaces creates unusual hazards and a detailed analysis shall be made for each specific case to ensure a safe work environment.

- 4.1.8.2 All welding and cutting operations conducted in confined spaces shall be adequately ventilated to prevent the accumulation of toxic materials or possible oxygen deficiency. All air introduced into the confined space (makeup air, replacement air, ventilation, etc.) shall be clean and respirable.
- 4.1.8.3 When burning, welding, or heating operations are required in a confined space, a mechanical method of ventilation i.e. blower or local exhaust ventilation method such as exhaust hood shall be provided to ensure adequate ventilation.
- 4.1.8.4 Oxygen shall never be used for ventilation.
- 4.1.8.5 When sufficient ventilation cannot be obtained without blocking the means of access to the confined space, employees in the confined space shall be protected by supplied-air respiratory equipment. In circumstances for which it is impossible to provide such ventilation, airline respirators or hose masks approved for this purpose by the National Institute for Occupational Safety and Health shall be used.
- 4.1.8.6 When burning or welding is required in any confined space, the gas cylinders and welding machines shall be located outside of the space.
- 4.1.8.7 When arc welding is suspended for any substantial period of time, such as during lunch or overnight, all electrodes shall be removed from the holders. The holders shall be carefully located so that accidental contact cannot occur, and the machine shall be disconnected from the power source.
- 4.1.8.8 Gas welding or cutting torch valves shall be closed and the gas supply to the torch positively shut off at a point outside the confined space. All hoses shall be removed when not in use for a substantial period of time, such as during breaks, lunch hour, or overnight.

4.1.9 Equipment

- 4.1.9.1 SCBA shall be used only when the employee can safely enter the opening with the SCBA attached. When SCBA is not practical, airline-supplied breathing apparatus, with escape air supply, shall be used in environments classified as potentially IDLH. No employee shall enter an IDLH atmosphere at any time unless the space has been properly evaluated and all necessary PPE is in use.
- 4.1.9.2 Pneumatically driven power equipment with non-sparking tools shall be used when the potential for fire and/or explosive gases are present. Only breathable-grade air shall be used with pneumatic tools.
- 4.1.9.3 When line power is used for tools or lighting, ground-fault circuit interrupters (GFCIs) are required. Low voltage battery power sources are preferable. When batteries, generators rated below 5 kilowatts, and isolation transformers are used, ground-fault interrupters are not required.
- 4.1.9.4 Explosion-proof electrical fixtures shall be used in potentially flammable atmospheres.
- 4.1.9.5 To facilitate non-entry rescue, retrieval systems shall be used when an authorized entrant enters a permit space, unless the retrieval equipment would increase the overall risk of entry or would not contribute to the rescue of the entrant. (See retrieval system definition.)
- 4.1.9.6 When conditions exist within a confined space that expose an entrant to environmental conditions that have a possibility of becoming IDLH, a 30-minute SCBA or a combination airline respirator with a 5-minute escape pack shall be immediately available for rescue. (See Paragraph 4.1.9.1 above.)

4.1.10 Outside Contractors/Users/Non-AEDC Personnel

The department having jurisdiction over a confined space shall ensure the following actions are completed: isolate, LOTO, and de-energize all sources of energy and perform initial atmospheric checks using approved Base Operating Contractor confined space work instructions prior to the first entry. Only after it has been rendered safe to enter shall the confined space be turned over to the outside contractor.

4.2 Responsibilities

4.2.1 Department Director

Ensure departments under their jurisdiction maintain compliance with the provisions of this standard and applicable OSHA requirements.

4.2.2 Supervisors/Managers/Assigned Representatives Responsible (Asset Owners)

- 4.2.2.1 Ensure all confined spaces under their jurisdiction are identified; maintain a list of those spaces.
- 4.2.2.2 Ensure the list of all confined spaces is forwarded to SHE.
- 4.2.2.3 Ensure completion of a HA for each confined space in their assigned area.
- 4.2.2.4 Develop and maintain confined space entry procedures and mandate their use.
- 4.2.2.5 Review the confined space HA and entry procedures annually; update as needed.
- 4.2.2.6 Ensure danger signs are posted and maintained at PRCS entry locations.
- 4.2.2.7 Ensure entry procedures are closed after work is completed.
- 4.2.2.8 Successfully complete initial, area specific, and/or refresher confined space training.
- 4.2.2.9 Ensure affected personnel have been trained and qualified in confined space entry and understand how to operate related safety equipment. This includes initial, area-specific, and refresher training as required, for entrants, attendants, supervisors, and individuals authorizing entry. Training also includes those individuals responsible for authoring confined space SSHAs and work procedures. (See Section 5.0.)
- 4.2.2.10 Ensure all AEDC and non-AEDC personnel assigned to enter confined spaces are briefed and trained on the hazards, safety control measures, and rescue procedures specific to the confined spaces prior to entry.
NOTE: Base Operating Contractor employee training may be verified via PeopleSoft. Outside contractor/non-AEDC personnel shall provide evidence of successfully completing confined space training.
- 4.2.2.11 Maintain documentation of confined space training for personnel under their jurisdiction.
- 4.2.2.12 Provide entry procedures and applicable work clearances to the AEDC work force as well as user and outside contractor employees.
- 4.2.2.13 Ensure non-AEDC personnel entry is consistent with the area's work procedures and SSHAs.
- 4.2.2.14 Serve primarily as the individual authorizing entry for confined space entry.
- 4.2.2.15 Maintain proficiency in area system control measures such as lock-out/tagout requirements, Kirk Key interlock systems, maintenance, and operational lock strategies for securing hazardous energy sources and isolation of toxic, asphyxiating, or volatile gases and materials.
- 4.2.2.16 Maintain specialty safety equipment i.e. gas monitoring analyzers, GFICs, two-way radios, head sets, retrieval device, tripod, system lockout hardware, recovery apparatuses, etc.
- 4.2.2.17 Contact SHE for special confined space entry permits.

4.2.3 Individuals Authorizing Entry

- 4.2.3.1 Maintain jurisdictional control of the confined space and may designate an individual authorizing entry.
- 4.2.3.2 Have adequate knowledge of the hazards and countermeasures for the confined space to be entered plus a complete understanding of the SSHA and procedure requirements for that space.
- 4.2.3.3 Ensure all entrants and attendants have required OSHA confined space training. See section 4.3 for training requirements
- 4.2.3.4 Inform entrants and attendants (Base Operating Contractor, Air Force, and non-AEDC personnel) of the hazards of the confined space, OSHA requirements, and the requirements of this standard.
- 4.2.3.5 Apprise entrants/supervisor of the precautions and/or procedures implemented for their protection.
- 4.2.3.6 Coordinate any work that may be done in or near the confined space.
- 4.2.3.7 Ensure the confined space entry procedure for the space is completed and signed off as applicable to include the individual authorizing entry signature prior to allowing entry.
- 4.2.3.8 Ensure entry operations are consistent with all procedures through the duration of the entry.
- 4.2.3.9 Contact AEDC Fire Department for coordination and approval of AF Form 592 USAF Hot Work Permit and/or standby rescue response when required.

- 4.2.3.10 Ensure the AEDC Fire Department is contacted whenever a PRCS entry is to take place and coordinates with the fire department when dedicated standby is no longer required.
- 4.2.3.11 Contact SHE for special health analytical support and analysis as required by procedure or permit.
- 4.2.3.12 Cancel entry procedures when the assigned task is complete or a situation(s) arise that are inconsistent with entry procedures.
- 4.2.3.13 May also serve as the authorized attendant or authorized entrant, but not at the same time.
- 4.2.3.14 Contact SHE for support as necessary.
- 4.2.3.15 Successfully complete initial, area specific, and/or refresher confined space training. (See section 5.0.)

4.2.4 Authorized Attendants

- 4.2.4.1 Conduct a pre-entry briefing with all entrants.
- 4.2.4.2 Monitor confined space activities through the duration of the entry from outside of the space or until relieved by another trained attendant.
- 4.2.4.3 Understand the hazards of the confined space and be able to recognize behavioral effects of potential exposures.
- 4.2.4.4 Do not perform other duties that interfere with their primary duty to monitor and protect the safety of authorized entrants.
- 4.2.4.5 Maintain effective line-of-site or continuous communication with authorized entrant(s) for the duration of the entry. Two-way radios, non-verbal methods, or special CCTV cameras may be necessary in some case.
- 4.2.4.6 Maintain an accurate count of confined space entrants via entry procedure documentation.
- 4.2.4.7 Ensure a communication network i.e. telephone or two-way radio is readily available between the authorized attendant and AEDC Fire Department through the duration of the entry.
- 4.2.4.8 Make initial call/radio check with the AEDC Fire Department prior to entry by anyone, including SHE personnel.
- 4.2.4.9 Make final call/radio check upon completion of work after all entrants have exited the confined space.
- 4.2.4.10 In the event of an emergency, notify the AEDC Fire Department via 911 call or two-way radio and provide the following information: Exact location of the confined space, number of occupants in the confined space, and the associated hazard(s) in the confined space.
- 4.2.4.11 Cease entry operations and order evacuation under the following circumstances: Observe a condition not allowed in the space, detects behavioral effects of a hazard overexposure, detect a condition outside of the space that could endanger the entrant(s), or the attendant must leave the entry point.
- 4.2.4.12 Do not enter the confined space under any circumstances.
- 4.2.4.13 Assist in rescue operations that can be performed outside of the confined space.
- 4.2.4.14 Successfully complete initial, area specific, and/or refresher confined space training per Section 5.0 of this standard.

4.2.5 Authorized Entrants

- 4.2.5.1 Become familiar with potential hazards associated with the area confined spaces and the hazards associated with those spaces.
- 4.2.5.2 Understand the proper use of required equipment such as oxygen analyzers and combustible gas detection equipment, two-way radio, retrieval devices, etc.
- 4.2.5.3 Attend pre-entry briefing.
- 4.2.5.4 Assure all entry requirements on the confined space entry procedure, and any related procedures, are accomplished prior to entering the confined space.
- 4.2.5.5 Maintain continuous communication with the authorized attendant.

- 4.2.5.6 Exit confined space whenever ordered to evacuate, warning signs or symptoms of exposure are detected, a prohibited condition is detected, or an evacuation alarm is activated.
- 4.2.5.7 Successfully complete initial, area specific, and/or refresher confined space training in accordance with Section 5.0 of this standard.

4.2.6 Other Supervision/Managers/Supervisors of Entrants

NOTE: This is the supervisor, manager, or supervisor of entrants who does not have jurisdictional control of the confined space i.e. is not the owner of the space.

- 4.2.6.1 Obtain any available information regarding hazards and entry procedures from the supervisor having jurisdiction for the confined space. Inform the supervisor having jurisdiction any time procedures other than those normally used to enter the space are to be incorporated into the confined spaced entry.
- 4.2.6.2 Coordinate entry operations (i.e., work clearance) and responsibilities with the supervisor having jurisdiction for the confined space.
- 4.2.6.3 Implement the measures necessary to prevent unauthorized entry.
- 4.2.6.4 Ensure entrants and attendants under their jurisdiction have received confined space safety training in accordance with Section 5.0 of this standard.
- 4.2.6.5 Provide equipment needed for entry into the space.
- 4.2.6.6 Provide the attendant for the permit required confined space.
- 4.2.6.7 Work with the supervisor having jurisdiction of the confined space to develop and implement any additional procedures and/or practices necessary for safe PRCS operation. This includes but is not limited to the following: Specifying acceptable entry conditions, isolating the permit space, purging, ventilating, etc. the space to eliminate or control atmospheric hazards, and verifying that conditions are acceptable for entry throughout the duration of an authorized entry.
- 4.2.6.8 Ensure entrants complete and return confined space entry procedures to the supervisor having jurisdiction of the confined space.

4.2.7 Authorized Non-AEDC Entrants

Non-AEDC entrants shall comply with all procedures related to a PRCS.

4.2.8 AEDC Fire Department

- 4.2.8.1 Provide rescue response for all confined space emergencies.
- 4.2.8.2 Perform standby services when requested or required by procedure.
- 4.2.8.3 Conduct mock rescue attempts at AEDC confined space areas annually.
- 4.2.8.4 Perform rescue support for confined space emergencies. The HA is coordinated with the AEDC Fire Department to determine need for and type of standby necessary. The following type standbys are provided when indicated on the HA, the confined space entry procedure, or requested by SHE:
 - 4.2.8.4.1 Standby – The AEDC Fire Department provides the standby until an emergency call is received. At that time, the standby ceases and the fire department responds to the emergency.
 - 4.2.8.4.2 Dedicated Standby – The AEDC Fire Department provides the standby and does not leave until the confined space work has been completed and the individual authorizing entry releases them, or all entrants have evacuated the confined space. Prior coordination with the fire department is required before each dedicated standby.

4.2.9 Base Operating Contractor Safety, Health and Environmental (SHE)

- 4.2.9.1 Provide assistance and advice in the preparation of confined space HA and procedures.
- 4.2.9.2 Review confined space hazard analyses and confined space entry procedures.
- 4.2.9.3 Approve confined space entry permits in special or unique situations.

- 4.2.9.4 Provide initial confined space training to Base Operating Contractor employees, AEDC DOD civilians and military, and to non-AEDC personnel as directed by management.
- 4.2.9.5 Provide initial and refresher confined space training.
- 4.2.9.6 Audit confined space entry procedures for compliance with OSHA 1910.146 and this standard.
- 4.2.9.7 Forward department listings of confined spaces to the AEDC Fire Department.

5.0 Training

5.3.1 General Training Requirements for AEDC Personnel

- 5.3.1.1 All personnel assigned to authorize confined space entry, serve as entrants and attendants, provide rescue response, or write confined space HAs and entry procedures shall receive initial and area-specific confined space training. New or transferred employees shall receive training, which consists of an orientation of all hazards and countermeasures for specific PRCs controlled by the organization.
- 5.3.1.2 SHE provides initial confined space training to AEDC Base Operating Contractor, DOD civilians and military personnel. Refresher training is accomplished via computer-based Confined Space training every two years. Documented area specific training for Base Operating Contractor personnel is also required.
- 5.3.1.3 A record of training for non-AEDC personnel may consist of a letter or other documentation from their employer stating that they have had the required OSHA confined space training.
- 5.3.1.4 Training shall be completed before any confined space duties are assigned, there is a change in assigned duties, when a change presents a new hazard to the employee, or if the employee demonstrates inadequacies in knowledge of the hazards or use of procedures.

5.3.2 AEDC Fire Department Rescue Personnel

- 5.3.2.1 Fire department rescue personnel shall receive initial confined space training that meets the requirements of CFR 1910.146 Permit-Required Confined Spaces.
- 5.3.2.2 In addition, annual confined space rescue training for rescue response personnel shall include the following: simulated rescue operations in which mannequins or personnel are removed through representative openings; mock/simulated rescue response activities and attempts once every 12 months from representative permit-required spaces; rescue equipment; cardiopulmonary resuscitation (CPR) and basic first aid (certification required).

5.3.3 Non-AEDC Personnel (Users/Outside Contractors/Visitors/etc.)

Non-AEDC personnel shall provide a letter or other documentation from their employer stating that they have had the required OSHA confined space training. This documentation will be given to the individual authorizing entry.

6.0 Inspections/Audits

SHE will conduct spot audits of confined space entry procedures for compliance with this standard and OSHA 1910.146.

7.0 REFERENCES

AEDC Safety, Health, and Environmental Standards
ANSI/ASSE Z117.1, Safety Requirements for Confined Spaces
OSHA Code of Federal Regulations 1910.146 Permit-Required Confined Spaces
National Safety Council. *Complete Confined Space Handbook*. John F. Rekus. 2008

8.0 ANNEXES

Annex A Confined Space Sign
Annex B Recommended Identification Numbering System for Confined Spaces

9.0 SUPPLEMENT

NFAC A321-0801-XSP B5 Confined Spaces

ANNEX A
DANGER SIGN

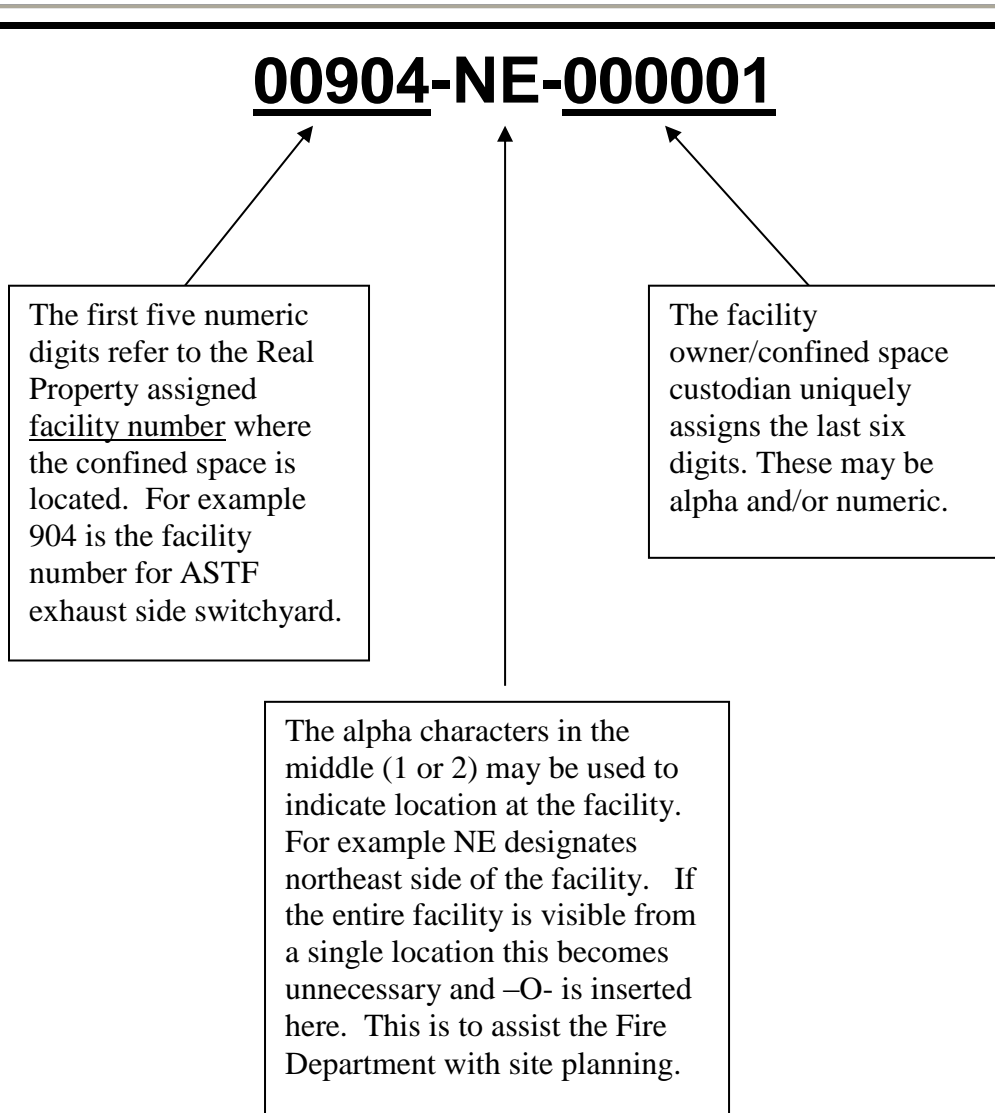


NOTES: The ANSI/NEMA Z535 series of standards were revised in 2006, 2007 and 2011. Neither OSHA, AFOSH Standard 91-501, nor the Base Operating Contractor Performance Work Statement requires compliance with the new series; however, signs which comply with the new ANSI standards are acceptable.

See AEDC Safety, Health and Environmental Standard B3 Control of Hazardous Areas Using Safety Signs, Tags, and Barricades for additional information and examples.

ANNEX B
RECOMMENDED IDENTIFICATION NUMBERING SYSTEM FOR CONFINED SPACES

To be placed on Confined Space Signs and referenced on the Confined Space Entry Procedure



A321-0801-XSP B5 Confined Spaces Supplement

This supplement has been approved for the NFAC Site.

Review: This supplement will be reviewed and updated using the same cycle as AEDC Safety, Health, and Environmental (SHE) Standard B5 Confined Spaces.

References: AEDC SHE Standard B5 Confined Spaces
NASA Ames Procedural Requirements APR 1700.1 Chapter 26 “Confined Space Entry”

Scope:

This supplement is for Confined Spaces, incorporating requirements and objectives of OSHA 1910.146 and other nationally recognized national consensus standards implemented at NFAC.

This standard applies to all NFAC confined spaces and outlines evaluation, hazard assessment, and employee training requirements and responsibilities necessary to prevent occupational injuries and illnesses associated with confined space work activities. For outside contractor personnel, training requirements are established and provided by their management.

This supplement applies to all personnel conducting operations, maintenance, testing and support at NFAC, NASA AMES.

NFAC Worksite Application:

NFAC will follow the local NASA Ames Procedural Requirements APR 1700.1 Chapter 26 “Confined Space Entry.”

NFAC notifies NASA Ames Dispatch on monthly bases that NFAC performs Non-Permit Confined Space entry daily. This applies only during normal working hours Monday through Friday 6am-4pm. Dispatch is given a minimum of three NFAC phone numbers to call if rescue services are unavailable. In this case, NFAC will evacuate all personnel from Confined Spaces until rescue services become available. Qualified personnel are allowed to enter Non-Permit Confined Spaces without calling Dispatch. They must still complete a Non-Permit Entry Form and Safe Plan of Action. Any permit-required entries require that Dispatch be notified before entry begins. Non-Permit Entries after hours or weekends require Dispatch be notified before entry begins.

Requirements/Responsibilities:

- I. NFAC Site Management shall ensure this supplement is followed.
- II. NFAC Supervisor and Test Directors shall
 1. Ensure supplement is followed.
 2. Ensure that the customer and staff follow all confined space rules.
 3. Ensure that confined spaces have been evaluated.
- III. NFAC Safety Engineer/Management Designee shall
 1. Assess all Confined Spaces under NFAC control.
 2. Ensure all staff are trained /medically cleared prior to confined space entry.
 3. Verify vendors and customers are trained /medically cleared prior to confined space entry.
 4. Provide annual training to staff on confine space or utilized NASA Ames Code Q Training.
 5. Maintain confined space gas monitoring equipment.
 6. Notify on a monthly basis to NASA Ames Dispatch of Non-Permit Confine Space Entries at NFAC.
- IV. NFAC Staff shall
 1. Follow all confine space entry rules.
 2. Maintain their annual training and annual medical clearance for confined space entry.