

C-15. **CONFINED SPACE ENTRY**

I. **PURPOSE**

To establish minimum requirements for defining pre-entry testing; entry into, and work within confined spaces. This procedure establishes for NCI-Frederick a confined space entry program that complies with 29 CFR 1910.146.

II. **DEFINITIONS**

Attendant - A trained individual stationed outside a permit required confined space that monitors the activity of confined space entrants. All attendants must have completed training on confined space entry operations. Exhibit C-16-2 provides an outline of training topics covered for confined space entry and evaluation.

Confined Space - A space defined by the concurrent existence of the following conditions:

- Large enough and configured so that an employee can enter and perform assigned work.
- Limited access or egress for the removal of a suddenly disabled employee due to the location and/or size of the opening(s).
- Not designed for continuous occupancy.

Confined spaces may include, but are not limited to, storage tanks, boilers, ventilation ducts, sewers, underground utility vaults, pipelines, and other open-top spaces deeper than 4 feet, such as pits, trenches, vaults and tanks.

Note: Confined spaces have been further defined at 29 CFR 1910.146 as "non-permit required confined spaces" and "permit required confined spaces".

Entrant - An Employee authorized to enter a confined space. All entrants shall have completed training on confined space entry operations, including NCI-Frederick's confined space entry program. Exhibit C-16-2 provides an outline of the training topics to be covered for confined space entry and evaluation.

Hazardous Atmosphere -

- An atmosphere presenting a threat of causing death, injury, acute illness, or disablement due to the presence of flammable and/or explosive, hazardous, or otherwise injurious or incapacitating substances.
- An atmosphere containing gas or vapor at a concentration greater than 10 percent of its lower flammability limit (LFL).
- An atmosphere containing combustible dust at a concentration that meets or exceeds its LFL. (Note: This concentration may be approximated when the dust obscures vision at a distance of 5 feet or less).
- An atmosphere containing a hazardous substance (e.g. hydrogen sulfide, carbon monoxide, 1,1,1-trichloroethane) in concentrations greater than the Occupational Safety and Health Administration (OSHA) - Permissible Exposure Limit (PEL) or other applicable exposure limits.
- An atmosphere containing oxygen at a concentration of less than 19.5 percent by volume.
- An atmosphere containing oxygen at a concentration greater than 23.5 percent by volume.
- Any airborne contamination that is immediately dangerous to life or health (IDLH).

Non-permit required confined spaces - Confined spaces that are verified to contain no atmospheric hazards (and must not have the potential to contain a hazardous atmosphere) or contain only physical hazards that can be locked and/or tagged out.

Permit Required Confined Space - A confined space that has one or more of the following conditions:

- Contains or has the potential to contain a hazardous atmosphere.
- Contains a material that has the potential for engulfing an entrant.

- Has an internal configuration such that an entrant could be trapped or asphyxiated (e.g., inwardly converging walls or floor which slopes downward to a smaller cross-section).
- Contains any other recognized series safety or health hazard (e.g., mechanical hazards, steam pipes, high temperatures, and electrical hazards).

III. RESPONSIBILITIES

A. EHS

1. Identifies permit-required confined spaces and defines standards for permit-required confined space entry.
2. Classifies confined spaces as permit-required or not.
3. Conducts and documents safety training for individuals entering confined spaces.
4. Approves personal protective equipment for use in permit-required confined spaces.
5. Posts a danger sign near each entrance to identified permit-required confined spaces. This sign will be posted in a conspicuous location and contain the following information:

DANGER -- PERMIT REQUIRED CONFINED SPACE
DO NOT ENTER

or;

UNAUTHORIZED ENTRY PROHIBITED

HAZARD DESCRIPTION (i.e. potential oxygen deficiency)

or;

DANGER

CONFINED SPACE

ENTER BY PERMIT ONLY

6. Reviews and revises (as needed) this procedure annually. The review shall be documented and should include a review of canceled entry permits (Exhibit C-16-1), training status of individuals, accidents, calibration status of monitoring equipment, and condition of rescue equipment. A copy of the review shall be submitted to the Records Management Office in accordance with Section E-1 Occupational Health, Safety and Environmental Compliance Recordkeeping.

B. Supervisor

1. Does not permit entry into a permit-required confined space until all provisions of this procedure have been met.
2. Ensures only trained employees enter permit-required confined spaces or perform the duties of an attendant or observer in such an entry.
3. Informs employees of the hazards of a specific confined space.
4. Conducts sampling and analysis of the permit-required confined space atmosphere.
5. Issues and posts a Confined Space Entry Permit (Exhibit C-16-1) prior to entry and sends a copy to EHS to retain for 1 year after its expiration date.
6. Terminates entry and cancels the Confined Space Entry Permit (Exhibit C-16-1) when entry operations are completed or if a new hazard is identified.

C. Employees

Follow permit-required Confined Space Entry procedures and safety precautions.

D. Confined Space Entrants

1. Understand the hazards associated with entry of a permit-required confined space prior to entering the space.

2. Properly use testing and monitoring equipment, ventilation, lighting, ladders, rescue and emergency equipment, and other equipment necessary for entry and rescue.
3. Communicate and maintain communications with attendant to enable attendant to monitor his/her status and communicate the need to evacuate the space.
4. Alert the attendant and immediately exit the confined space when:
 - a. experiencing signs or symptoms of exposure to a hazardous atmosphere or other dangerous situation.
 - b. detecting a hazardous atmosphere.
5. Immediately exiting the confined space when an order to evacuate is given by the attendant, supervisor, or EHS.

E. Attendants

1. Understand the hazards associated with entry of a permit-required confined space prior to monitoring the entry into a confined space.
2. Observe entrant(s) activities inside the confined space for behavioral effects of exposure to a hazardous atmosphere or other dangerous situations.
3. Ensure that the Confined Space Entry Permit (Exhibit C-16-1) identifies the names of any individual entering the confined space.
4. Remain outside the confined space while the space is occupied until relieved by another trained attendant (Note: The Confined Space Entry Permit shall be updated to reflect the change in attendants).
5. Communicate and maintain communication with entrant(s) to monitor his/her status and communicate the need to evacuate the space, if necessary.

6. Continuously monitor conditions inside and outside the space to determine that the work inside the space can safely proceed.
7. Order an evacuation of the confined space when:
 - a. a hazardous atmosphere is detected.
 - b. a situation outside the confined space occurs that could endanger entrant(s).
 - c. Behavioral changes are observed in entrant(s) that may be indicative of exposure to a hazardous atmosphere or other dangerous situation.
 - d. the attendant cannot safely and effectively meet his/her responsibilities.
8. Request emergency services when assistance is required to evacuate the confined space during an emergency.
9. Prohibit non-authorized employees (i.e., employees not authorized as entrants on the Permit) from entering the confined space.
10. Perform no other duties that interfere with the attendant's responsibilities.

IV. **PROCEDURE**

A. Pre-Entry

Before an employee enters the space, the internal atmosphere shall be tested, with a calibrated direct-reading instrument, for oxygen content, for flammable gases and vapors, and for potential toxic air contaminants, in that order. Any employee, who enters the space, or that employee's authorized representative, shall be provided an opportunity to observe the pre-entry testing required by this paragraph.

1. Lines which may convey hazardous substances (e.g., flammable liquids, corrosive materials, etc.), asphyxiants (e.g., nitrogen) or steam into the confined space will be

disconnected, blinded, or blocked off by other positive means to prevent the development of hazardous atmosphere within the space. The disconnection or blind will be so located or done in such a manner that inadvertent reconnection of the line or removal of the blind is effectively prevented.

2. The space will be emptied, flushed, ventilated, or otherwise purged of hazardous substances or asphyxiants to the extent feasible.
3. Lockout/Tagout procedures (Chapter C-15) of this manual will be used as appropriate to secure sources of electrical, mechanical, hydraulic, pneumatic, chemical, thermal or other energy.
4. When entrance covers are removed the entry point(s) to the space will be guarded with a standard railing (guardrail, mid-rail, and toe board) to prevent an accidental fall and objects from entering the space.
5. The air will be tested with calibrated direct reading device(s) to determine whether a hazardous atmosphere exists. Specifically, the following conditions will be monitored in the order given:
 - a. Oxygen content.
 - b. Flammable gases and vapors.
 - c. Potential toxic air contaminants.
6. Initially, air sampling probes will be attached to poles or lowered into confined spaces from a remote position as to prevent an exposure. Prior to entry, confined spaces will be tested for oxygen content, flammable gases and vapors, and potential toxic air contaminants. After initial remote testing, all areas within the confined space shall be tested prior to beginning general work.
 - a. First, a test for oxygen content, followed by flammable gases and vapors, and potential toxic air contaminants will be made with a probe near

the entry point. A cover will be removed only after the initial test has been completed and a hazardous atmosphere is not detected.

- b. Second, the balance of the space will be tested, from the top to the bottom for oxygen content, flammable gases and vapors, and potential toxic air contaminants. Special attention will be paid to any lines, ductwork, vents, or pipes within the space. In addition, depressions and irregular surfaces will be monitored to detect that presence of gases and vapors that are heavier than air.

- 7. A Confined Space Entry Permit (Exhibit C-16-1) will be completed including all test results and kept posted at the work site for the duration of the work. Affected employees will be afforded an opportunity to review and record the testing results. Copies of the Confined Space Entry Permit are to be sent to EHS and retained for a minimum of 1 year after its expiration date.
- 8. If tests indicate a hazardous atmosphere, an attempt will be made to remove the hazard by ventilating the space.

B. Entry Into and Work within Confined Spaces That Do Not Contain Hazardous Atmospheres

NOTE: IF A HAZARDOUS ATMOSPHERE IS NOT DETECTED WITHIN THE SPACE, AS DEMONSTRATED BY TESTS PERFORMED IN ACCORDANCE WITH PRE-ENTRY PROCEDURES, AND IF NO HAZARDOUS ATMOSPHERE IS LIKELY TO DEVELOP, AND IF NO PHYSICAL HAZARDS ARE PRESENT, THEN WORK WITHIN THE SPACE MAY PROCEED SUBJECT TO THE FOLLOWING PROVISIONS.

- 1. Additional testing, in accordance with pre-entry procedures, will be conducted with sufficient frequency to ensure that the development of a hazardous atmosphere does not occur while the space is occupied and during the performance of any operation, including cutting and welding, disturbing of accumulated sludge or use of hazardous substances. As a minimum, testing shall be performed once/hour and the results documented on the

Confined Space Entry Permit (Exhibit C-16-1).

2. To the extent feasible, provisions will be made to facilitate entry and exit.
 3. Adequate illumination shall be provided, based on the task being performed.
 4. Where it is not feasible to provide for ready exit from confined spaces equipped with automatic fire suppression systems containing hazardous or oxygen-displacing gases, or total foam flooding systems, such systems will be deactivated. Where it is not practical or safe to deactivate such systems, supplied air respirators will be selected and used in accordance with Respiratory Protection Program procedures.
 5. No source of ignition or work involving the use of flame, arc or spark will be introduced until the space has been tested for the presence of flammable gases and vapors and measurements taken to ensure that a hazardous atmosphere does not exist. If welding is to occur, a Hot Work Permit (Chapter C-18) is to be obtained, and an appropriate fire extinguisher and welding blanket are to be kept within reach.
 6. Tanks, vessels, or other confined spaces with side and top openings will be entered from side openings when feasible. NOTE: Side openings are those within 3-1/2 feet of the bottom of the space to be entered.
 7. Employees working in confined spaces which have previously contained substances corrosive to the skin or substances which can be absorbed through the skin will be provided with, and wear, appropriate personal protective clothing.
- C. Entry Into and Work Within Confined Spaces Containing or Potentially Containing a Hazardous Atmosphere:

THE REQUIREMENTS OF THIS SECTION APPLY TO ENTRY INTO AND WORK WITHIN A CONFINED SPACE WHEN:

1. A NON-HAZARDOUS ATMOSPHERE CAN NOT BE ENSURED THROUGH THE IMPLEMENTATION OF THE APPLICABLE PRE-ENTRY REQUIREMENTS.
2. DUE TO THE EXISTENCE OF AN EMERGENCY, IT IS NOT FEASIBLE TO ENSURE THAT A HAZARDOUS ATMOSPHERE WILL NOT BE CREATED.

UNAUTHORIZED ENTRY INTO A CONFINED SPACE CONTAINING A HAZARDOUS ATMOSPHERE IS EXPRESSLY PROHIBITED.

1. Equipment Required:
 - a. Self-Contained Breathing Apparatus (SCBA) or supplied airline respirator with 5 minute escape cylinder for rescue.
 - b. Safety harness.
 - c. Harness with attached lifeline of at least one half inch in diameter and two thousand pound test.
 - d. Appropriate respiratory protection for entrants.
2. When entry will be made through a top opening, the following requirements will also apply.
 - a. The safety harness that suspends a person in an upright position will be used.
 - b. A hoisting device or other effective means will be provided for lifting employees out of the space.
3. Appropriate, approved respiratory equipment will be provided and worn by entrants. SCBAs will not be worn when the size or location of SCBA restricts access or egress.

4. The free end of the lifeline will be outside the entry opening and securely attached to an anchor.
5. At least one trained employee will be assigned the responsibilities of the attendant to monitor from the outside of the confined space all activities and be prepared to provide assistance to entrants in case of emergency. The attendant will have no other duties. At least one additional trained employee who may have other duties will be within sight or call of the attendant.
6. The attendant will have appropriate, approved respiratory protective equipment (SCBA or airline respirator with 5-minute escape pack) available for immediate use.
7. The attendant may enter the confined space in case of emergency, after extrication from outside the confined space has failed and only after alerting another attendant of the existence of an emergency, need to notify a rescue squad, and of the attendant's intent to enter the confined space after donning a SCBA or airline respirator with 5-minute escape pack and other necessary personal protective equipment (e.g., acid or solvent resistant coveralls).
8. If extrication from outside the confined space fails, the attendant dons SCBA or airline respirator with 5-minute escape cylinder and any additional required personal protective equipment specified in the Confined Space Entry Permit, and removes entrant(s) from the space to a place of "fresh air". Extrication will only be attempted by the attendant after emergency notification has been made and another attendant has assumed the responsibilities of the attendant. (Note: The "new" attendant shall have the rescue equipment specified in the Authorization Form).
9. An effective means of communication between entrants while inside a confined space and the attendant will be provided and used whenever respiratory protective equipment is required and/or whenever employees inside a confined space are out of sight of the attendant.

V. NCI-Frederick SUBCONTRACTORS

- A. OSHA regulation 29 CFR 1910.146(c)(8) establishes requirements for an employer that contracts with another employer to perform work in a permit-required confined space. When bids are requested by SAIC from contractors or subcontractors, the following information must be placed in all applicable contractor or subcontractor bid packages (requests for proposals).
1. The proposal involves work in permit-required confined spaces as defined at 29 CFR 1910.146(b). The subcontractor is responsible for having a written confined space entry program, trained employees, all necessary monitoring and rescue equipment, and for performing all work in accordance with 29 CFR 1910.146 and all other regulations applicable to their work. The subcontractor shall submit a copy of subcontractor's confined space entry program and copies of employee's confined space entry training certificates in advance of project start-up to EHS for examination.
 2. In accordance with 29 CFR 1910.146(c)(8) the following information is to be provided by FME to prospective subcontractors expected to perform work at NCI-Frederick involving confined spaces:
 - a. The workplace contains and the project involves entry into permit required confined spaces. Contractors/Subcontractors representatives shall only enter permit required confined spaces in accordance with Contractor's/Subcontractor's written confined space entry program, 29 CFR 1910.146, and all other regulations applicable to the work being performed.
 - b. A description of the permit required confined space(s) and NCI-Frederick's experience (if any) with the identified confined space(s) is provided as an attachment to this request for proposal.

- c. A copy of NCI-Frederick's written confined space entry program is provided to this request for proposal. SAIC's confined space entry program was developed for the purpose of assigning responsibilities, establishing safe practices and mandatory safety procedures, and to provide for contingencies that may arise while operations are being conducted at NCI-Frederick facilities.
 - d. The COTR responsible for coordinating entry operations with the contractor/subcontractor and joint SAIC/subcontractor debriefing at the conclusion of entry operations on procedure followed and hazards detected or created is (insert the name of the responsible individual). He/she can be reached by telephone at (insert responsible individuals' telephone number).
3. The information provided in this request for proposal was developed for use by subcontractors at NCI-Frederick in accordance with 29 CFR 1910.146(c)(8). SAIC-Frederick disclaims responsibility for any other use of this information other than the express purpose for which it is intended and assumes no liability for the use of this information for any other purpose. The information and evaluations presented reflect professional judgments subject to the accuracy and completeness of information available when the information was compiled.

VI. REFERENCES

29 CFR 1910.146 - Permit-Required Confined Spaces

Exhibit C-16-1. Confined Space Entry Permit

Date and Time Issued: _____ Date and Time Expires: _____
 Job site/Space I.D.: _____ Job Supervisor: _____
 Equipment to be worked on: _____ Work to be performed: _____
 Stand-by personnel: _____

1. Atmospheric Checks: Time _____ persons:
 Oxygen _____%
 Explosive _____% L.F.L.
 Toxic _____PPM
2. Tester's signature _____
3. Source Isolation (No Entry): N/A Yes No
 Pumps or lines blinded, () () ()
 disconnected, or blocked () () ()
4. Ventilation Modification: N/A Yes No
 Mechanical () () ()
 Natural Ventilation only () () ()
5. Atmospheric check after isolation and ventilation:
 Oxygen _____% > 19.5%
 Explosive _____% L.F.L. < 10%
 Toxic _____ PPM < 10 PPM H₂S
 Time _____
 Tester's signature _____
6. Communication procedures: _____

7. Rescue procedures: _____

8. Entry, standby, and backup Yes No
 Successfully completed
 required training?
 Is it current? () ()
9. Equipment: N/A Yes No
 Direct reading gas monitor-
 tested? () () ()
 Safety harnesses and life-
 lines for entry and
 stand-by persons? () () ()
 Hoisting equipment? () () ()
 Powered communications? () () ()
 SCBAs for entry and standby
 persons? () () ()
 Protective Clothing? () () ()
 All electric equipment listed
 Class I, Division I, Group
 D and Non-sparking tools: () () ()
10. Periodic atmospheric tests:
 Oxygen ___% Time ___ Oxygen ___% Time ___
 Oxygen ___% Time ___ Oxygen ___% Time ___
 Explosive ___% Time ___ Explosive ___% Time ___
 Explosive ___% Time ___ Explosive ___% Time ___
 Toxic ___% Time ___ Toxic ___% Time ___
 Toxic ___% Time ___ Toxic ___% Time ___

We have reviewed the work authorized by this permit and the information contained here-in. Written instructions and safety procedures have been received and are understood. Entry cannot be approved if any squares are marked in the [No] column. This permit is not valid unless all appropriate items are completed.

Permit Prepared By: (Supervisor) _____

Approved By: (Unit Supervisor) _____

Reviewed By: (CS Operations Personnel: _____
 (Printed Name) (Signature)

This permit to be kept at job site. Return job site copy to Safety Office following job completion.

Exhibit C-16-2. Training Outline Confined Space Entry and Evaluation

- A. Introduction/Overview
 - 1. Accident Statistics
 - 2. Requirements of 29 CFR 1910.146 (Permit-Required Confined Spaces)
 - 3. NCI-Frederick Confined Space Entry Program
- B. Confined Spaces, Regulatory and Policy Requirements
 - 1. Definitions
 - 2. Confined Spaces
 - 3. Non-Permit confined Spaces
 - 4. Permit Required Confined Spaces
 - 5. NCI-Frederick Confined Space Program
- C. Confined Space Hazards Overview
- D. Evaluation and Pre-Entry Procedures
- E. Personal Protective Equipment
- F. Confined Space Entry Permit
- G. Responsibilities of Entrants, Attendants, and supervisors
- H. Rescue Procedures