LA-UR-16-24403
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Title: Confined Space Evaluation Student Manual, #19613

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Intended for: Training

Issued: 2016-08-29 (rev.2)

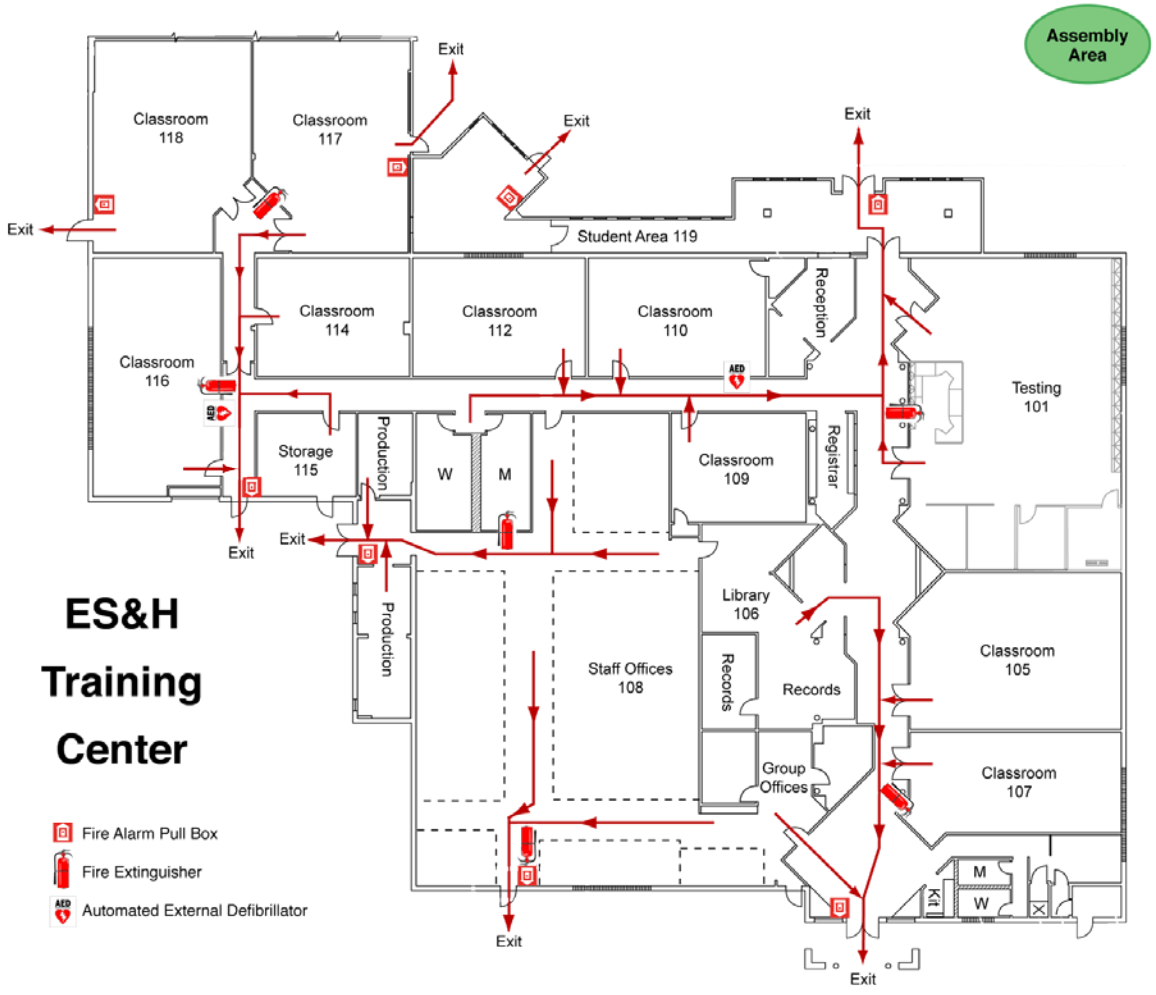
Confined Space Evaluation

Student Manual

#19613

June 2016

Los Alamos NATIONAL LABORATORY
EST. 1943
Operated by Los Alamos National Security, LLC for the NNSA



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COURSE 19613
June 2016
LA-UR-16-
Controlled Document Number: ConSp_Eval_19613_SM,R2.0

Contents

Introduction 1
Course Overview 1
Course Objectives 1
Program Lead 1
Target Audience 1
Course Limitations 1

Module 1: What Are Confined Space Evaluators, and What Do They Do? 2
Module Overview 2
Module Objectives 2
Roles and Responsibilities of Confined Space Evaluators and Knowledgeable Persons 2

Module 2: What Is a Confined Space? 4
Module Overview 4
Module Objectives 4
OSHA Regulations and LANL Procedures 4
Confined Space Recognition 4
Confined Space Evaluation 5
Three Criteria of a Confined Space 5
OSHA Interpretations 6

Module 3: Permit-Required Confined Spaces 8
Module Overview 8
Module Objectives 8
Permit-Required Confined Space Evaluation 8
Primary Hazards—Examples and Interpretations from LANL and OSHA 10
Permit-Required Confined Space Control (Identification, Posting, Tagging, Preventing Entry) 10
LANL Confined Space Information System 12

Module 4: Additional Considerations 27
Module Overview 27
Module Objectives 27
Methods for Mitigating Hazards Associated with Confined Spaces 27
Natural Ventilation 28
Documenting the Anticipated Work in the Evaluation and How It Impacts Evaluation 28
Confined Space Evaluations for Unusual Circumstances 28
Conveyances as They Relate to Confined Space Hazards 29
CO_2 in Soils Getting into Spaces Belowground 29
Fall Protection and Confined Space 29
Field Evaluating and Posting a Confined Space 30
Other Considerations 30

Appendix A: Acronyms and Terms 31
Acronyms 31
Terms and Definitions 32

Appendix B: OSHA Confined Space Interpretations* 37
Bodily Enter 37
Entry 37
Human Occupancy 38
Introduced Hazards: Welding 39
Limited or Restricted Means for Entry and Exit 39
Atmosphere 42
Fall Hazard: Other Confined Space Hazards 43
Ability to Self-Rescue (Basis for Primary and Secondary Hazard) 43
Water in a Confined Space 44
Lockout/Tagout, Isolation, and Reclassifying a Confined Space 44
C5 Alternate Entry Procedure: Lockout/Tagout Isolation 45
C5 Alternate Entry Procedure: Data 46
Atmospheric Hazard, Primary Hazard, Secondary Hazard, and PRCSs 46
Ventilation: “Safe for Entry” 47
Four Feet Deep 48

Appendix C: Confined Space Decision Logic 51

Introduction

Course Overview

Many workplaces contain spaces that are considered to be “confined” because their configuration hinders the activities of employees who must enter into, work in, and exit from them. In general, the permit-required confined spaces (PRCSs) Occupational Safety and Health Administration (OSHA) standard requires that Los Alamos National Laboratory (LANL) evaluate the workplace to determine if any spaces are PRCSs. The standard specifies strict procedures for the evaluation and atmospheric testing of a space before and during an entry by workers. The OSHA PRCS standard provides for alternative (less stringent than full-permit) entry procedures in cases where the only hazard in a space is atmospheric and the hazard can be controlled by forced air.

At LANL, all confined spaces or potential confined spaces on LANL-owned or -operated property must be identified and evaluated by a confined space evaluator accompanied by a knowledgeable person. This course provides the information needed by confined space evaluators to make judgements about whether a space is a confined space, and if so, whether the space will require a permit for entry.

Course Objectives

When you have completed this course, you will be able to recognize

- how to identify, evaluate, document, and post a confined space.

Program Lead

This course was developed under the direction and technical oversight of the Occupational Safety and Hygiene Program, which is the functional program owner for this training.

Target Audience

This course is intended for people who evaluate spaces pertaining to OSHA 29 Code of Federal Regulations (CFR) 1910.146.

Course Limitations

This course covers only information pertaining to the identification, evaluation, documentation, and posting of confined spaces. This course is not intended to address the permit-required confined space entry process.

Module 1: What Are Confined Space Evaluators, and What Do They Do?

Module Overview

The Occupational Safety and Health Administration (OSHA) regulation requires the employer to evaluate the workplace to determine if any spaces are permit-required confined spaces. At Los Alamos National Laboratory (LANL), the confined space evaluator and the knowledgeable person perform this determination.

Module Objectives

When you have completed this manual, you will be able to recognize

- the roles and responsibilities of the confined space evaluator and
- the roles and responsibilities of the knowledgeable person.

Roles and Responsibilities of Confined Space Evaluators and Knowledgeable Persons

The LANL Confined Space Program (CSP) created the roles of *confined space evaluator* and *knowledgeable person* to carry out the tasks of evaluating spaces and assigned responsibilities to each as prescribed in the P101-27 document and presented here.

The job of the confined space evaluator (CSE) is to first determine whether a space is a confined space. If it is a confined space, then the CSE must determine if it is a permit-required confined space. If it is a permit-required confined space (PRCS), then the CSE must determine whether full-permit entry rules apply or less restrictive alternative entry rules apply. The CSE then fills out the evaluation form and enters the information into the LANL Confined Space Information System.

To be a confined space evaluator, you must

- be approved by the Industrial Hygiene and Safety Division (IHS);
- have academic credentials or work experience in a relevant discipline, such as industrial hygiene or industrial safety;
- have experience or training in conducting confined space entries; and
- complete training from IHS to establish proficiency in evaluating confined spaces.

The knowledgeable person is a worker who is identified by the responsible line manager and is knowledgeable about the actual or potential hazards present in or adjacent to a confined space, the functions of the confined space, and the work conducted in the confined space.

The role of the knowledgeable person is to

- provide information on the actual or potential hazards present in or adjacent to a confined space, the functions of the confined space, and the work conducted in the confined space.

The role of the confined space evaluator includes the following tasks:

- Reviews and approves the Confined Space Program for subcontractors when required.
- Completes and stays up to date with courses in Curriculum 4459, *Confined Space Evaluator Training*.
- Provides confined space evaluations, assistance with confined space entry permits (including the C5 Alternate Entry Procedure, and the C7 Temporary Reclassification*)* only if the evaluator is up to date with all training for a confined space evaluator.
- Identifies, evaluates, documents, and posts confined spaces.
- Enters completed confined space evaluations into the CSIS.
- Develops air-monitoring and inspection data that substantiate using the C5 Alternate Entry Procedure.
- Evaluates the PRCS and completes Form 1620, Confined Space Evaluation.
- Reevaluates the PRCS when the entry supervisor or entrant/attendant finds errors in the completed confined space evaluation.
- Reevaluates the space entered using the C5 Alternate Entry Procedure or a C7 Temporary Reclassification to determine how a hazardous atmosphere or any other primary hazard or prohibited condition was introduced or occurred during entry. Measures must be implemented to protect the entrant(s) before subsequent entry occurs. Invites the IHS confined space program lead or subject matter expert to any meeting.
- Includes authorized workers who were involved with the confined space entry in reassessing the hazards and controls when a prohibited condition occurs. Invites the IHS confined space program lead or subject matter expert to any meeting.

Module 2: What Is a Confined Space?

Module Overview

The Preamble to the OSHA Final Rule on permit-required confined spaces states “In order for a space to be considered a permit-required confined space, it must first be a confined space.” This module presents basic information on confined spaces.

Module Objectives

When you have completed this module you will be able to recognize

- confined space terms and definitions,
- OSHA interpretations of confined space terms, and
- the process for recognizing and evaluating NPCSs.

OSHA Regulations and LANL Procedures

The OSHA regulation for permit-required confined spaces is 29 CFR 1910.146, Permit-Required Confined Spaces. There is also a regulation for Confined Spaces in Construction (29 CFR 1926 Subpart AA). The LANL procedure is P101-27, Confined Spaces.

The OSHA regulation requires the employer to evaluate the workplace to determine if any spaces are permit-required confined spaces. The regulation provides definitions and interpretations but provides little else as to who is to perform the evaluations and how. The LANL Confined Space Program (CSP) created the roles of *confined space evaluator* and *knowledgeable person* to carry out the tasks of evaluating spaces and assigned responsibilities to each as prescribed in the P101-27 document and presented here.

Confined Space Recognition

Confined spaces can be located below or aboveground. Confined spaces can be found in almost any workplace. A confined space, despite its name, is not necessarily small. Examples of possible confined spaces include silos, vats, hoppers, utility vaults, tanks, sewers, pipes, access shafts, truck or rail tank cars, aircraft wings, boilers, diked areas, manholes, manure pits, and storage bins. But although the space may be a vault, tank, shaft, etc., it is not automatically an OSHA-defined confined space. All suspect spaces must be responsibly evaluated to determine if they are confined spaces and then to determine if they are permit-required confined spaces.

Confined Space Evaluation

A CSE who is accompanied by a knowledgeable person must evaluate confined spaces. The evaluation must specify one of the following three possible classifications:

- the space is not a confined space,
- the space is an NPCS, or
- the space is a PRCS.

First, the CSE first must determine if the space is a confined space at all. Second, if the space is confined, the CSE must determine if the confined space is a PRCS.

To determine if the space is confined, use the following definition of terms and interpretations. A complete list of confined space terms and definitions is included in Appendix A. A comprehensive compilation of OSHA Interpretations is presented in Appendix B. A confined space decision logic is found in Appendix C.

Three Criteria of a Confined Space

Confined space means a space that

1. is large enough and so configured that an employee can bodily enter and perform assigned work;
2. has limited or restricted means for entry or exit (for example, tanks, vessels, silos, storage bins, hoppers, vaults, and pits are spaces that may have a limited means of entry); and
3. is not designed for continuous employee occupancy.

If all three of the following questions can be answered “YES,” the space is a confined space.

1. Taking into consideration the smallest worker likely to enter the space, is the space large enough for the worker to enter with his/her entire body and then be able to perform work?
2. Is the means of entry or exit in any way limited or restricted?
3. Is the space NOT designed for continuous occupancy?

Note: *The OSHA standard for confined spaces in construction does not include “and perform assigned work” in the definition of a confined space. The preamble indicates that the phrase is not needed and is potentially confusing because the particular task assigned is irrelevant when determining if the above definition has been met (for spaces in either construction or general industry).*

Nonpermit confined space (NPCS) – meets the three criteria for a confined space but does not contain or, with respect to atmospheric hazards, have the potential to contain any primary hazard.

OSHA Interpretations

Large enough to bodily enter and perform work.

a. The smallest sized hole likely to be entered by a worker at LANL is 14 inches in diameter. It is unlikely that a worker would enter a smaller opening. (LANL)

b. Can the smallest person likely to enter the space completely enter with his/her entire body and still have the ability to complete anticipated work in the space? If so it is large enough to bodily enter. (OSHA interpretations)

Limited egress (restricted means for entry or exit).

a. OSHA notes that **doorways** and other **portals** through which a person can walk are not to be considered a limited means for entry or exit. However, a space containing such a door or portal may still be deemed a confined space if an entrant's ability to escape in an emergency would be hindered. (OSHA Preamble)

b. Limited egress. If an **access door** or portal is too small to allow an employee to **walk through upright and unimpeded**, it will be considered one that restricts an employee's ability to escape. A standard door is one in which a person passing through the plane of the door is not forced to enter or exit in a posture that might slow self-rescue or make rescue more difficult (i.e., stoop or bend over and/or step over a raised threshold). (LOI OSHA 10-27-95 Mr. Sharpe, pp. 38-39)

c. Is the door to the space difficult to open (e.g., from differential air pressure)? If so, it has limited egress. (weight and swing of the door - LOI OSHA 10-27-95 Mr. Sharpe)

d. Doors that are not blocked open and that could close and not be opened from the inside are considered to have limited egress. (OSHA)

e. The path by which the entrant must travel out of a space to reach an area of safety must not present a physical barrier that would impede self-rescue. (LOI OSHA 10-22-93 Robert Bee)

f. If an employee must bend down to avoid striking the top of an opening or step over a raised threshold, OSHA would consider the opening as restrictive to entry or exit. The intent of the standard is to ensure that workers can exit a space quickly in emergency-type situations. (LOI OSHA 10-27-95 Mr. Sharpe, pp. 38-39)

g. If the door to the space has a raised threshold greater than 7.5 inches, it has limited egress. This height is the maximum height of an OSHA compliant step. (LANL)

h. If the space can be entered only with a ladder, it has limited egress. (OSHA Federal Register Vol. 59 No. 213 page 55208, #1 pp. 38-39)

i. If the space is accessed using an OSHA-compliant stairs, it does not have limited egress unless a hazard in the space would not allow for an exit using the stairs. (OSHA Federal Register Vol. 59 No. 213 page 55208, #1 pp. 38-39)

j. Does the space have a full-sized door? If so, it does not have limited egress if there are no other issues with egress in the space. (OSHA Federal Register Vol. 59 No. 213 page 55208, #2 pp. 38-39)

k. Open-topped spaces **4 feet deep or greater** are considered to have limited egress unless they are equipped with an OSHA compliant stairs and regarded as confined or enclosed spaces for which hazard training is required (training requirement is from Safety and Health Regulations for Construction 1926.21. This particular training requirement does not apply to General Industry (Construction Outreach Program p. 45, see also definition #4, OSHA Instruction CPL 2.100 May 5, 1995)

l. If the space is more than 5 feet deep, a mechanical assistance device is required to extract the worker for a permit entry. (This would indicate that OSHA definitely considers “5 feet” to be restricted exit.) (OSHA 1910.146)

m. Is the distance or time necessary to exit the space excessive (e.g., 50 feet)? If so, it has limited egress. (OSHA Interpretations #3 p. 55)

Not meant for continuous human occupancy.

a. Can a worker safely be in the space when the space is operational? If not, it is not meant for continuous human occupancy. (OSHA Preamble)

b. Is the space listed on LANL’s list of confined spaces located in Section B of the confined space evaluation form (e.g., manhole or pit)? If so, it is likely not to be designed for continuous human occupancy. (LANL)

c. Did the architect design the space for continuous human occupancy? Does it have lighting and ventilation? If so, it is likely meant for continuous human occupancy. (LOI OSHA 10-22-93 Robert Bee)

d. Is there a feature in the space that you can identify that was specifically included to make the space safe for human occupancy?

e. Does the space contain an immediately dangerous to life or health (IDLH) condition? If so, it is not meant for continuous human occupancy. The IDLH definition (National Institute of Occupational Safety and Health [NIOSH]) is *a condition that poses an immediate threat to life would cause irreversible adverse health effects or that would impede an individual’s ability to escape. (OSHA)*

Nonpermit Confined Space

“Nonpermit confined space” means 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.

Module 3: Permit-Required Confined Spaces

Module Overview

All confined spaces on LANL-owned or -operated property must be identified and evaluated by a confined space evaluator to determine if the space is a PRCS.

This module presents information necessary for determining if a confined space is a PRCS.

Module Objectives

When you have completed this module, you will be able to recognize

- PRCS terms and definitions;
- the process for recognizing, evaluating, and controlling PRCSs; and
- the LANL PRCS program information system.

Permit-Required Confined Space Evaluation

To determine if the confined space is a PRCS, the space must meet the definition of a PRCS and the hazard must be a primary hazard. A comprehensive list of confined space terms and definitions is included in Appendix A. A compilation of OSHA interpretations is presented in Appendix B. The term *primary hazard* was developed and defined by LANL to use to determine if a confined space is a PRCS. This term was derived from an OSHA interpretation. In Appendix B, see “Ability to Self-Rescue (Basis for Primary and Secondary Hazard).” A confined space decision logic is shown in Appendix C.

Permit-required confined space (PRCS) – meets the three criteria (of a confined space) AND has one or more of the following primary hazard characteristics: (1) contains or has the potential to contain a hazardous atmosphere, (2) contains a material that has the potential for engulfing an entrant, (3) has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor that slopes downward and tapers to a smaller cross section, and (4) contains any other recognized serious safety or health hazard.

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

- Flammable gas, vapor, or mist in excess of 10% of its lower flammable limit (LFL).
- Airborne combustible dust at a concentration that meets or exceeds its LFL.

***Note**: This concentration may be approximated as a condition in which the dust obscures vision at a distance of 5 feet (1.52 meters) or less.*

- Atmospheric oxygen concentration below 19.5% or above 23.5%.
- Atmospheric concentration of any substance for which a dose or a permissible exposure limit is published in Subpart G, *Occupational Health and Environmental Control*, or in Subpart Z, *Toxic and Hazardous Substance*s, of this Part and which could result in employee exposure in excess of its dose or permissible exposure limit.

  ***Note:** An atmospheric concentration of any substance that is not capable of causing death, incapacitation, impairment of ability to self-rescue, injury, or acute illness due to its health effects is not covered by this provision.*

- Any other atmospheric condition that is immediately dangerous to life or health.

  ***Note:** For air contaminants for which OSHA has not determined a dose or permissible exposure limit, other sources of information, such as Material Safety Data Sheets that comply with the Hazard Communication Standard, Section 1910.1200 of 29 CFR 1910, published information, and internal documents can provide guidance in establishing acceptable atmospheric conditions.*

Primary hazard – any serious physical or health hazard that can cause the death, injury, or illness of an entrant and can prevent an entrant's ability to self-rescue from a confined space. Examples include oxygen deficiency, toxic gas greater than the permissible exposure limit (PEL), flammable atmosphere, entrapment, engulfment, and hazardous energy. If the space does not have a primary hazard, the space is not a PRCS. The term *primary hazard* was developed and defined by LANL to determine if a confined space is a PRCS. This term was derived from an OSHA interpretation. In Appendix B, see "Ability to Self-Rescue (Basis for Primary and Secondary Hazard)."

Secondary hazard – any physical or health hazard that is unlikely to cause death, serious injury, or illness to entrants and that would not prevent the entrant's ability to self-rescue from the confined space. Examples MAY include asbestos; noise; slips, trips, and falls; lighting; insects; snakes; and falling objects.

Actual – hazards that will exist during the entry.

Potential – hazards that *could* occur during the entry.

Inherent – hazards that are already there before work starts.

Introduced – hazards that are added by the type of work being performed.

Entrapment hazard – generally an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor that slopes downward and tapers to a smaller cross section. Refer to pages 14 and 20.

Engulfment hazard – generally a liquid or fine, flowable solid substance that could plug the respiratory system or that could exert enough force to cause death by strangulation crushing or constriction. Refer to page 14.

Other recognized serious safety or health hazards – refer to page 11.

Primary Hazards—Examples and Interpretations from LANL and OSHA

a. Does the space have poor natural ventilation? If so, does it have the potential for a hazardous atmosphere such as oxygen deficiency? (OSHA)

b. What types of spaces have poor natural ventilation? Spaces located underground, particularly with closed tops. Spaces underground with temperatures that are typically colder than the outside air. Spaces aboveground that are sealed for extended periods of time. Spaces that are deep relative to the surface area exposed to the air. If in doubt, check the air quality with a calibrated meter and ventilate. (LANL)

c. What types of spaces have good natural ventilation? Aboveground structures that are heated or cooled or that are designed with openings for natural ventilation. (LANL)

d. How much ventilation is required for the space? This is dependent on the atmospheric hazard in the space. LANL recommends at least 12 air changes before entry where there is a potential for an atmospheric hazard and at least an air change rate of 20 air changes per hour. It is recommended each worker be provided with at least 50 cfm of air for extended worker periods in the space. Check the rated ventilation capacity of the fan and correct for length of ductwork and number of 90-degree bends in the configuration. (LANL)

e. Attics and crawl spaces do not normally contain primary hazards if the electrical is up to code (e.g., no open splices) and there are no hazards introduced, such as standing water or hazardous chemicals. (OSHA)

f. Noise: Is the noise level anticipated from the work conducted in the space expected to interfere with emergency communication, such as a worker's shouting for help or an attendant shouting to an entrant to exit the space? If so, the noise is a primary hazard. The evaluation form lists noise levels above 115 dBA as a potential primary hazard. (LANL)

g. Heat stress: Is the work in the space likely to create conditions that exceed the TLV for heat stress? If so, this may be a primary hazard. (LANL)

Note: *Examples of hazards are listed on page 13 and in the exercises that accompany this course.*

Permit-Required Confined Space Control (Identification, Posting, Tagging, Preventing Entry)

The entry into a PRCS by unauthorized workers must be prevented, and the entry into PRCSs by authorized workers must be controlled. These measures are accomplished by a combination of posting signage, educating the workforce, permanently closing off PRCSs, administering an effective permit program, and evaluating the program annually.

If there are permit spaces in the workplace, the employer must inform exposed employees of the existence, location, and danger posed by the spaces. This can be accomplished by posting danger signs or by another equally effective means. The following language, or other similar language, would satisfy the requirements for such a sign:

Alternative methods, such as additional training, may be used where they are truly effective in warning all employees who could reasonably be expected to enter the space. This requirement can be met in many ways. A space can combine permanent closing—placing physical barriers on the space, such as bolting and locking the space—with supplemental training and posting of the space. It is the employer's obligation to ensure that alternative methods are at least as effective as a sign.

In some cases, employers may have to provide training, in addition to signs, to protect employees who do not speak English or who have difficulty understanding or interpreting signs. If a space has a locked entry cover, panel, or access door that can be opened only with special tools, signs may be unnecessary if the employer ensures that all affected employees are informed about the space and know that it is not to be opened without taking proper precautions, including temporary signs to restrict unexpected or unknowing entry.

A confined space evaluator must tag all spaces evaluated on LANL-owned or -operated property with a CSP number that uniquely identifies the space. Where a confined space has more than one opening, all openings into the one space should have the same CSP number. This CSP number must correlate with all documentation associated with the space.

The confined space evaluator must post the appropriate warning sign(s) at or near the entry to the NPCS or PRCS or must ensure that the responsible associate director (RAD) or facility operations director (FOD) posts the space. The RAD and/or FOD should maintain a list of those confined spaces that cannot be posted. For evaluated spaces that are determined not to be confined spaces, a sign stating "not a confined space" may be posted at the entry.

LANL Confined Space Information System

A confined space evaluator completes a Form 1620, *Confined Space Evaluation*, and enters the information into the Confined Space Information System.

General Information and Location

A confined space program number (CSP#) is the identification number of the space. If the space being evaluated is required to be labeled with a CSP#, obtain the CSP# from the confined space program lead.

The location description must be as concise and descriptive as possible so as to allow the space to be easily located.

The primary contact should be an individual who knows the most about the space.

Type and Function

This is basically a physical description of the space. It is not adequate or acceptable to simply mark a check box. Use descriptive details to describe the size and shape of the space. DO NOT WRITE “See IWD.”

An understanding of the function of the space will give indications about the hazards involved, e.g., a sewer would likely involve atmospheric and engulfment hazards, and a plenum might have moving parts or rotating equipment such as louvers or fans. Describing anticipated work within the space would also give some indication of the hazards associated with the work. Changing belts in a plenum will consistently have many physical hazards associated with the job.

The physical dimensions must be measured and recorded on the evaluation.

The physical dimensions might play a role in determining what type of rescue may be required or effective, and the dimensions are required for space ventilation calculations. For instance, if the space is a PRCS and it is more than 5 feet deep vertically, you should note this on the evaluation because OSHA requires a mechanical device to be available to retrieve personnel from vertical-type PRCSs more than 5 feet deep.

Confined Space Determination

To determine if the space is confined, review the information presented earlier in this manual.

The kind of space may be contingent on certain conditions about the space. If any conditions can change or be eliminated, these conditions must be described.

An example might be a false floor. In some facilities, floor panels may exist throughout an entire room or building and can be removed to access utilities. The depth of the space may vary from 2 to 3 feet. If one panel is removed, the space can be entered, is essentially a crawlspace throughout, and meets the three criteria to be a confined space. If all the panels in the area to be worked are removed, then the entry and exit criteria are no longer applicable and the space may no longer be considered a confined space.

Hazard Identification

The hazards of the space must be considered, as well as hazards present in the immediate vicinity of the space that may affect entry operations. The typical work done in the space and the following several categories of hazards need to be considered:

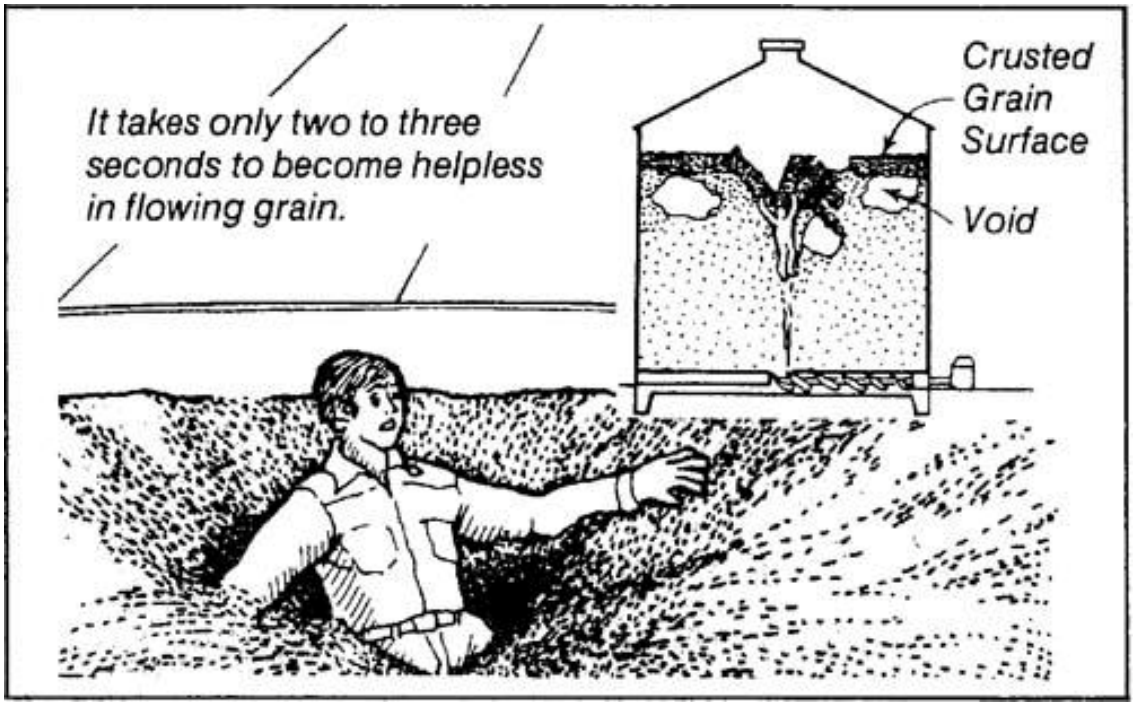
- Atmospheric issues (oxygen, flammable and toxic gases, and/or vapors)
- Contents (current, previous, and residue of cleaning materials)
- Potential energy
- Environment in the space
- Configuration of the space
- Nature of the work
- External hazards
- Miscellaneous hazards (e.g., animals and insects, noise, radiation)

Actual, potential, inherent, or introduced hazards must be described completely. Hazards in confined spaces must be identified, explained, and determined to be primary or secondary. The following hazards should be considered:

- Poor air quality: The amount of oxygen may be insufficient for the worker to breathe. The atmosphere might contain a poisonous substance that could make the worker ill or even cause the worker to lose consciousness. Natural ventilation alone will often not be sufficient to maintain breathable quality air.
- Dust: Could be a visibility problem or an explosion hazard.
- Chemical exposures due to skin contact or ingestion as well as inhalation of “bad” air.
- Fire hazard: An explosive/flammable atmosphere may exist because of flammable liquids and gases and combustible dusts, which if ignited would lead to fire or explosion.
- Process-related hazards, such as residual chemicals, release of contents of a supply line, and release of contents of a pressurized line.
- Noise: Noise within a confined space can be amplified because of the design of the space. Excessive noise cannot only damage hearing, but can also affect communication, such as causing a shouted warning to go unheard.

- Safety hazards, such as moving parts of equipment, structural hazards, entanglement, slips, falls.
- Slick/wet surfaces: Slips and falls can occur on wet surfaces, causing injury or death to workers. Also, a wet surface will increase the likelihood and severity of electric shock in areas where electrical circuits, equipment, and tools are used.
- Radiation.
- Temperature extremes including atmospheric and surface.
- Shifting or collapse of bulk material.
- Barrier failure resulting in a flood or release of free-flowing solid.
- Uncontrolled energy, including, but not limited to electrical shock.
- Visibility and lighting.
- Poor air quality caused by ongoing work: welding, painting, and other odors.
- Falling objects: Workers in confined spaces should be aware of the possibility of falling objects, especially in spaces that have topside openings and where work is being done above the worker.
- Worker fall from elevation. (May be a hazard of the space but does not make a space a confined space or a confined space a permit-required confined space).
- Biological hazards.
- Entrapment by an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor that slopes downward and tapers to a smaller cross-section.
- Engulfment, i.e., surrounding and effective capture of a person by a liquid or finely divided (flowable) solid substance that can be aspirated to cause death by filling or plugging the respiratory system or that could exert enough force on the body to cause death by strangulation, constriction, or crushing. The situation is usually due to loose, granular materials, such as grain, sand, and coal, stored in bins and hoppers . Look for crusting and bridging below a worker or for flooding of confined space by water or sewage flow.
- External connections to the space: These connections will help identify issues that will need to be isolated during entry preparations. Hazards outside confined spaces that may affect the entry can include vehicular or pedestrian traffic, toxic gases, hot substances, liquids, and fine solids, which must be prevented from entering the confined space through piping or other conveyance systems. See “Conveyances” in Module 4.

Entrapment hazard – Baghouse



Engulfment hazard – Grain

Permit-Required Confined Space Reclassification

If the permit space poses no actual or potential atmospheric hazards and if all hazards within the space are eliminated without entry into the space, the permit space may be reclassified as a NPCS for as long as the nonatmospheric hazards remain eliminated. A written certification that contains the date, the location of the space, and the signature of the person making the determination shall be made available to each employee entering the space. *This is documented using Form 1620, Confined Space Entry Permit, which, must be signed by the entry supervisor and be available for review at the entry site.*

Control of atmospheric hazards through forced-air ventilation does not constitute an elimination of the hazards.

Permit-Required Confined Space Alternate Entry Procedure

Where the employer can *prove* that the **only** primary hazard present in a confined space is an actual or potential atmospheric hazard that can be *controlled* through ventilation alone, the employer can use *alternate entry procedures*. In other words, rescue arrangements specific to the entry do not have to be made. Because fewer workers are needed for alternate entry, employers may try to apply this section, even when it is not justified.

It is extremely important that any employer who attempts to use alternate entry procedures follow the requirements of Paragraph c(5) of 1910.146.

The employer must do the following to use alternate entry procedures:

1. *Demonstrate* that the only hazard posed by the space is an actual or potential hazardous atmosphere. This means that any hazards involving high noise levels; lockout-tagout; drowning; high heat or cold; slips, trips, or falls; or any other hazard must be *eliminated.*
2. *Demonstrate* that continuous forced-air ventilation *alone* is sufficient for safe entry.
3. Develop *monitoring and inspection data* to support #1 and #2 above. **If initial entry into the space is necessary to collect such data, the entrant must follow the complete permit program.**
4. Make available the data collected to each employee who enters the space to prove that the space qualifies for alternate entry procedures.

Even with alternate entry procedures, the following requirements must be met before entry:

1. The internal atmosphere must be tested for oxygen content, flammable gases and vapors, and potential toxic air contaminants to ensure that there is NO hazardous atmosphere in the space.

2. Continuous forced-air ventilation must be used in the area where the employee will be present to control any hazardous atmosphere and be used for duration of entry.
3. The air within the space must be periodically tested to ensure that ventilation is preventing the accumulation of a hazardous atmosphere. The entrant must immediately leave the area if a hazardous atmosphere is detected. ***Note:*** *Although OSHA requires only periodic monitoring in this case, employees working alone—especially in sewers or other areas that are parts of a continuous system—should be constantly monitored using personal atmospheric monitoring equipment that sounds an audible alarm when dangerous conditions occur.*
4. The employer must provide documentation that the above measures have been taken. At LANL Form 1620, Confined Space Entry Permit is used.

"Toxic" atmospheres are those containing gases, vapors, or fumes known to have poisonous physiological effects. Sometimes effects are delayed. For example, carbon disulfide at low concentrations may exhibit no immediate sign of exposure but can cause permanent and cumulative brain damage as a result of repeated "harmless" exposure. At high concentrations, it can kill quickly.

Confined Space Hazards Control

Once hazards are identified, institute appropriate measures to eliminate, reduce, or control confined space hazards. Remember, acceptable entry conditions must be attained before entry, and those same safe conditions must be maintained throughout the duration of an entry. Controls could be in the categories of isolation, engineering, administrative, and personal protective equipment.

The CSE consults with the knowledgeable person to understand the exact work, hazards, and controls needed in the confined space. In the confined space evaluation, under descriptions, describe what work will require the item selected.

Confined Space Ventilation

General dilution or forced-air ventilation is one of the most common engineering controls used for atmospheric hazards in confined spaces. Forced-air ventilation blows out oxygen-deficient or contaminated atmospheres and replaces harmful vapors with clean, fresh air. If the atmosphere is found to lack oxygen or contain toxic gases and vapors, the space must be ventilated before entry. An air-powered ventilator placed at the top of the opening can blow breathable air into the space. Just because air is blowing into a space does not mean that the work areas are being effectively ventilated. Toxic gases that float at the top or sink to the bottom of a space or that "hide" in "dead areas" may be not be ventilated properly. Never assume that the space is safe until it is monitored again. Ventilation should continue while the employee is working in the space. A trained person must determine whether the air must be blown or sucked and how the ventilation should be conducted.

The air intake should be placed in an area that will draw in fresh air only. Ventilation should be continuous where possible because in many confined spaces, the hazardous atmosphere will form again when the flow of air is stopped.

The forced-air ventilation should ventilate the immediate areas where an employee is or will be present within the space and should continue until all employees have left the space.

When forced-air ventilation is used, the space should be ventilated until the atmosphere is within the acceptable ranges and maintained until all entrants have left the space. Forced-air ventilation must be maintained for the duration of entry when a C5 Alternate Entry procedure is used.

How much ventilation is required for the space is dependent on the atmospheric hazard in the space. LANL recommends at least 12 air changes before entry where there is a potential for an atmospheric hazard and at least an air change rate of 20 air changes per hour. It is recommended that each worker be provided with at least 50 cfm of air for extended worker periods in the space. Check the rated ventilation capacity of the fan and correct for length of ductwork and number of 90-degree bends in the configuration. (LANL)

Welding, cutting, burning, and continuous brazing generate hazardous fumes and dusts that can be more effectively removed by local exhaust ventilation systems at or near the point of generation.

Administrative Controls

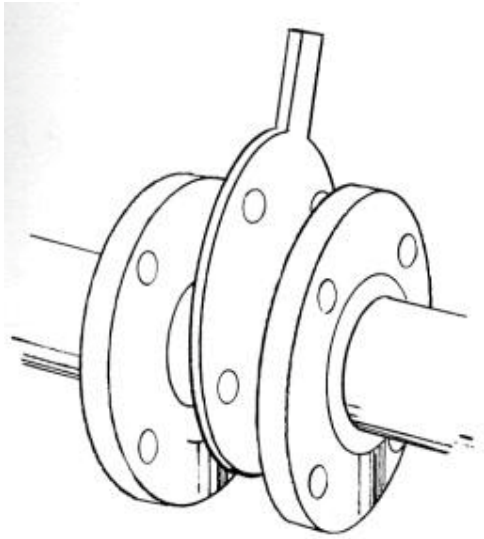
Administrative controls eliminate or reduce the exposure to the hazard through changes in the work practice (e.g., rotating workers, reducing the amount of worker exposure, and housekeeping). Confined spaces should be cleaned/decontaminated of hazardous materials to the extent feasible before entry. Cleaning/decontamination should be the preferred method of reducing exposure to hazardous materials. Where this is not practicable, entry personnel should wear personal protective equipment (PPE) to provide appropriate protection against the hazards that may be present.

Isolation

Isolation means the process by which a permit 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; a double block-and-bleed system; lockout or tagout of all sources of energy; or blocking or disconnecting all mechanical linkages. Substances must be prevented from entering the confined space through piping. The method used often involves disconnecting the piping or putting solid plates to block off the piping from the confined space. If valves are used to isolate the piping, a special double-block system must be used so that nothing can leak into the confined space.

When identifying “isolation” for the space, do not select multiple choices to alter and isolate the space. You must describe the alteration and isolation for each type of work performed in the space.

Double block and bleed—A method used to isolate a confined space from a line, duct, or pipe by closing two in-line valves in a piping system and opening a valve between them that is vented to a safe location.



Skillet blind: Example of blinding or blanking

Blinding or Blanking—Closing a pipe, line, or duct by inserting a solid plate or cap that completely covers the bore and that is capable of withstanding the maximum pressure of the pipe, line, or duct without allowing leakage into the space.

Personal Protective Equipment – Respiratory Protection

PPE is used to protect workers *only* after all other feasible means have been used to control or eliminate hazards.

In some situations, a respirator will also be needed. A respirator can allow the employee to breathe without inhaling toxic gases or particles. The two basic types of respirators are **air purifying,** which filters dangerous substances from the air; and **air supplying,** which delivers a supply of safe breathing air from a tank or an uncontaminated source. For potential IDLH atmospheres, an air-line respirator can be used only if the worker has a rescue bottle.

Air-purifying respirators can filter dangerous substances from the air, but they provide no protection in an oxygen-deficient environment and should **not** be used when working in a confined space with the potential for an IDLH atmosphere. Only air-supplying respirators should be used in confined spaces that have low oxygen levels or high levels of toxic gases. These respirators can supply the employee with safe breathing air from a tank [self-contained breathing apparatus (SCBA)] or an uncontaminated source nearby (supplied air respirator).

Respiratory protection is needed whenever

- an emergency exists and entry cannot be delayed. Assume that an IDLH atmosphere exists.
- there is an inert atmosphere or testing shows that an IDLH condition exists and additional ventilation cannot reduce concentrations to safe levels.
- current testing indicates atmosphere to be safe, but unsafe conditions could reasonably be expected to develop at any time.

In the OSHA regulation on permit-required confined spaces, an IDLH condition is defined as follows:

Any condition that poses an immediate or delayed threat to life or that would cause irreversible adverse health effects or that would interfere with an individual's ability to escape unaided from a permit space. ***Note:*** *Some materials, such as hydrogen fluoride gas and cadmium vapor, may produce an immediate transient effect that, even if severe, may pass without medical attention but is followed by sudden, possibly fatal collapse 12–72 hours after exposure. Until collapse, the victim may "feel normal" from recovery from transient effects. Such materials in hazardous quantities are considered to be "immediately dangerous to life or health." [29 CFR 1910.146]*

As part of their current respiratory protection standard [29 CFR 1910.134(g)(3)], OSHA requires that a standby person be present with suitable rescue equipment when SCBA or hose masks with blowers are used in atmospheres that are IDLH. Furthermore, appropriate retrieval equipment must be used when that equipment would contribute to the rescue of the employee(s) and would not increase the overall risk resulting from entry.

Protection from Hazardous Configurations (Entrapment)

A hazardous configuration or entrapment hazard exists when the permit space has an internal configuration such that an entrant can be trapped or asphyxiated by inwardly converging walls or by a floor that slopes downward and tapers to a smaller cross section. Common examples include hoppers and cyclones. The best practice is to eliminate the hazardous configuration by redesign or to control the hazard by installing an effective barrier or guard to prevent a worker from falling and becoming trapped.

Fall Protection

Personal fall protection would not eliminate the fall hazard but rather would control the hazard.

Confined Space Training

Training courses for confined space workers vary, depending on the involvement of the worker. Refer to LANL's written confined space program or the requirements for the three training curricula as shown in UTrain for the most current information. A worker must be enrolled in curriculum #693, #8808, or #8809 to enter a confined space.

Curriculum #693 – CONFINED SPACE ENT/ATT NOT USING NON-ENT RESC GEAR

- Course #40439, *Confined Space Entrant/Attendant Live*
- Course #20367, *Confined Space Worker Refresher (Self-Study)* for retraining *(as needed)*
- Course #55707, *Confined Space Air Monitoring Instrumentation-ALTAIR 5*

Curriculum #8808 – CONFINED SPACE ENTRY SUPERVISOR TRNG

- Course #40439, *Confined Space Entrant/Attendant Live*
- Course #20367, *Confined Space Worker Refresher (Self-Study)* for retraining (as needed)
- Course #26941, *Confined Space Entry Supervisor (Self-Study*)
- Course #40438, *Confined Space Non-Entry Rescue Gear Training*
- Course #55707, *Confined Space Air Monitoring Instrumentation-ALTAIR 5*

Curriculum #8809 – CONFINED SPACE ENT/ATTEND USING NON-ENT RESC GEAR

- Course #40439, *Confined Space Entrant/Attendant Live*
- Course #20367, *Confined Space Worker Refresher (Self-Study)* for retraining (as needed)
- Course #40438, *Confined Space Non-Entry Rescue Gear Training*
- Course #55707, *Confined Space Air Monitoring Instrumentation-ALTAIR 5*

Curriculum #4459 – CONFINED SPACE EVALUATOR TRAINING

- Course #40439, *Confined Space Entrant/Attendant Live*
- Course #20367, *Confined Space Worker Refresher (Self-Study)* for retraining (as needed)
- Course #55707, *Confined Space Air Monitoring Instrumentation-ALTAIR 5*
- Course #19613, *Confined Space Evaluation*

Additional training may be required for confined space workers who use or will potentially use instrumentation or equipment associated with PRCS entry. Such equipment or instrumentation includes, but is not limited to ventilation equipment, PPE, and specialized tools or equipment used exclusively for entering or working in PRCSs.

Other Equipment

Other equipment includes anything that likely will be needed for entry. For example, when you evaluate the space and see an old rusted ladder built into the space, you might recommend that a portable ladder be considered.

Confined Space Rescue Planning and Response Mode

An emergency in a confined space can kill an entrant in a matter of minutes. To facilitate rescue without having a rescuer enter a space, OSHA requires the use of "nonentry" rescue, retrieval systems, or methods, such as tripods and winches to lift unconscious or injured entrants out of a space that is more than 5 feet deep.

Why is it important for a confined space evaluator to understand rescue requirements for PRCSs? Entry into a PRCS requires that a professional rescue team at least be available to provide a successful rescue should something go wrong. Therefore, it is essential that the hazards be thoroughly assessed and identified, along with the work to be performed to allow an informed decision on how fast a rescue team must respond to the location.

A mechanical device shall be available to retrieve personnel from vertical type permit spaces more than 5 feet (1.52 m) deep. [1910.146(k)(3)(ii)]

Where entry must be made for rescue, OSHA allows rescue to be performed either with the facility's trained in-house rescuers or by contracts with to an outside rescue service.

Nonpermit Confined Space (NPCS): No rescue response planning specific to the confined space entry is required. If hazards are introduced into the confined space, the space will then be a PRCS.

Confined Space C5 Alternate Entry Procedure: No rescue response planning specific to the confined space entry is required.

Confined Space C7 Temporary Reclassification Certification: No rescue response planning specific to the confined space entry is required.

Rescue Requiring Onsite Standby: The type of rescue you will use is LANL's designated onsite standby rescue service if any one of the following conditions applies to your PRCS:

- Entrants are required to use SCBA.
- An obvious IDLH hazard exists.
- Entrants are expected to have difficulty with self-rescue.
- Nonentry rescue cannot be effectively used.

Arrangements for standby on-site rescue service must be made at least 72 hours in advance of the PRCS entry to allow for entry site inspection and planning. To effect a rescue in a timely manner, the rescue team must prepare before the entry by assessing the hazards, deciding on a strategy, making assignments to team members, and pre-rigging necessary equipment. No PRCS entry requiring onsite service may occur until the designated onsite standby service grants final approval on the permit and the rescue team is on site. To arrange for rescue services from LANL's designated rescue provider, contact the subcontract technical representative (STR) at Logistics-Maintenance Subcontract Management. If a situation should arise that the LANL designated rescue subcontractor cannot address, call 911.

Rescue Not Requiring Onsite Standby: The type of rescue you will use is PRCS (not requiring onsite standby rescue services) if all of the following conditions apply to your PRCS:

- None of the conditions for onsite standby rescue exists.
- The attendant must have the necessary nonentry rescue gear ready and be capable of using the gear in an emergency to extract an incapacitated entrant in a timely manner.
- The attendant must be able to call 911 to summon emergency services to the site.
- The Los Alamos Fire Department (LAFD) must be staffed at 50% or greater.
- The attendant must have a rescue plan as prescribed in P101-27, Section 3.

Rescue Plan for Nonentry Rescue Equipment (Retrieval System): If a situation should arise that the PRCS attendant cannot address, contact 911. When adequate emergency responders are not available, stop confined space entries.

Steps to rescue:

1. Call 911, and request emergency responders at your exact location.
2. If the nonentry rescue equipment will not work for the entrant or has failed, maintain communication with the entrant and await emergency responders.
3. If the entrant can be rescued using the nonentry rescue equipment, begin cranking him/her out of the confined space.
4. If you have a boom (davit arm), you can move the entrant away from the confined space entrance once he/she has cleared the top.
5. Once the davit arm and entrant are no longer over the confined space, lock the winch and tend to the entrant.
6. If you are using a tripod, follow steps 1–3; however, you will need to operate the winch while moving the entrant away from the opening.
7. Await emergency responders' arrival.

From P101-27, Rev. 4 (3.1.2.c): Step 6 associated with performing a PRCS entry is to login at the FOD to ensure that work will be stopped if the LAFD force drops below 50%.

[see Memo #FP-DO-10-037, *Transmittal of Los Alamos National Laboratory (LANL) Facility Operations Director (FOD) Actions upon Notification of Less than 50% Available Los Alamos Fire Department (LAFD) Staffing].*

This is a synopsis of the abovementioned memo: If/when LAFD staffing falls below 50%, LANL emergency operations should be notified. Emergency operations then sends out a page to the FODs. The FODs should know if, where, and what kind of confined space entries are occurring. Each FOD has a response plan for emergencies. FODs will terminate confined space entries if an extraction team is not available."

Why would nonentry rescue gear not be able to be used effectively?

- Obstructions could prevent a clear rescue path.
- Any portion of the entry is horizontal.
- More than one person will enter (only one person per system).
- The equipment cannot be set up because of obstructions or small area.
- The area that would be used to set up nonentry rescue gear will not support the weight of the gear plus an individual being rescued.

Rescue Onsite: Requires that a rescue team be staged at an entry site, ready to immediately perform an entry and rescue in the event of an emergency affecting an entrant. Normally used where self-rescue or nonentry rescue is not possible.

Retrieval System: The equipment (including a retrieval line, chest or full-body harness, wristlets or anklets if appropriate, and a lifting device or anchor) used for nonentry rescue of persons from PRCSs.

Self-Rescue: Situation where if the identified hazards (actual or possible) reached emergency action levels, entrants could still exit on their own, unassisted. This situation is most often associated with hazards that do not have an acute danger or immediate health effects.

If the space is a PRCS and it is more than 5 feet deep vertically, you should note this on the evaluation because OSHA requires a mechanical device to be available to retrieve personnel from vertical-type PRCSs more than 5 feet deep. [1910.146(k)(3)(ii)]

A full body harness and lifeline must be used when entering a PRCS unless using them would increase the overall risk of entry and would not contribute to the rescue of the entrant.

Confined Space Communications

Communications between entrants and attendant must enable the attendant to monitor the entrant's status and enable the attendant to alert entrants of the need to evacuate the space. For practical purposes, this means it must be possible to establish two-way communications at any time.

Voice, visual signals, tactile signals, a hard-wired communications system, handheld radios, and a cell phone are all methods for consideration.

Communication between the attendant and the rescue service is required for a PRCS. The attendant must understand the emergency services that can be summoned and the means for summoning them.

Confined Space Air Monitoring

The CSE should conduct air monitoring at the time of the evaluation and record the results on the Form 1620, *Confined Space Evaluation*.

The most common hazard in a confined space is a hazardous atmosphere. This hazard primarily deals with the air in the confined space and includes *oxygen-deficient, oxygen-enriched, and flammable or toxic atmospheres.*

Before entering the area, workers must always test for the oxygen content of the air, then flammable or explosive gases or vapors, and finally toxic chemicals such as carbon monoxide or hydrogen sulfide. This sampling should be done with a remote monitor on a wand attached to the toxic gas meter. The monitor should be able to reach the lowest point in the confined space. Oxygen monitoring should be done first because the explosive gas monitor will not be accurate if there is an oxygen deficiency.

An oxygen-deficient atmosphere (not enough oxygen in the space) has less than 19.5% of available oxygen. Any confined space with less than 19.5% oxygen should not be entered without an approved SCBA or supplied air hose with an escape pack.

Chemical reactions, sewage, or other decomposing organic matter, such as domestic waste and plant life, can lower the oxygen level in a confined space. The work being done in the space or certain chemical reactions can also lower the oxygen level. To have a safe working environment in a confined space, the oxygen level must be between 19.5% and 23.5%. Any level below 19.5% is dangerous and will affect the worker's health and safety. At the elevation of Los Alamos, levels below 13% can cause unconsciousness and levels below 10% can quickly cause death.

An oxygen-enriched atmosphere (above 23.5%) will cause flammable materials, such as clothing and hair, to burn violently when ignited. Consequently, never use pure oxygen to ventilate a confined space. Ventilate with normal, clean, outside air.

Toxic gases and vapors come from a wide variety of sources. Sewage and other rotting organic materials may produce gases such as hydrogen sulfide, carbon dioxide, ammonia, and methane. Other toxic substances may have been spilled or dumped into a sewer system. According to OSHA, if toxic chemicals are present that exceed OSHA's PEL and can cause death or serious illness or if any other chemical is present that can immediately endanger the workers' lives or health, the atmosphere is considered to be hazardous.

It is important to remember that some gases or vapors are heavier than air and will settle at the bottom of the confined space. Also, some gases are lighter than air and will be found around the top of the confined space. Thus, during the sampling process it will be necessary to test all areas (top, middle, and bottom) of the confined space.

Gas	Molecular Weight	Weight Relative to Air
Hydrogen (H_2)	2.02	Lighter than Air
Helium	4.00	
Methane	16.04	
Ammonia	17.03	
Water	18.02	
Hydrogen Fluoride	20.01	
Neon	20.18	
Acetylene	26.04	
Hydrogen Cyanide	27.03	
Carbon Monoxide	28.01	
Nitrogen (N_2)	28.01	
Ethylene	28.05	
Air (Typical)	28.97	Air
Hydrogen Sulfide	34.08	Heavier than Air
Carbon Dioxide	44.01	
Propane	44.10	
Butane	58.12	
Chlorine (Cl_2)	70.90	
Sulfur Hexafluoride	146.06	

In sewers or other areas that are part of a continuous system where new hazards may enter at any time, *continuous* air monitoring must be conducted.

Be certain to follow manufacturers' guidelines regarding instrument calibration and pre-use calibration (bump) checks, including zeroing the instrument in clean air. Consult manufacturer guidance if temperature, pressure, or humidity within the confined space is expected to differ significantly from conditions at the time of calibration.

Module 4: Additional Considerations

Module Overview

This module presents basic level information on additional confined spaces considerations.

Module Objectives

When you have completed this module, you will be able to recognize

- methods for mitigating confined space hazards,
- unusual confined space hazards, and
- how to field evaluate and post a confined space.

Methods for Mitigating Hazards Associated with Confined Spaces

The following methods for mitigating hazards associated with confined spaces are in the order of *most* preferred to least preferred:

1. Eliminate space (e.g., weld plate over entrance)
2. Do not enter space—perform work from outside space (e.g., raise sump pump out of pit).
3. Reconfigure space so that it is no longer a confined space.

a. Enlarge entrance.
b. Replace ladder with OSHA-compliant stairs.
c. Make opening too small to bodily enter.
d. Make confined space less than 4 feet deep. (OSHA 1910.146 does not use “4 feet” to define a confined space. The mitigation factor would be “restricted entry or egress.”)
e. Make space suitable for continuous human occupancy (e.g., install permanent ventilation and lighting).

4. Eliminate hazards in space by using C7 Temporary Reclass procedure.

a. Where exposure to the moving parts can be permanently controlled through physical guarding, these hazards would not trigger the classification of the space as a permit space. (LOI OSHA 10-27-95, Mr. Sharpe)

5. Control atmospheric hazards using C5 Alternate Entry procedure.
6. Enter using a confined space permit with nonentry rescue.
7. Enter using a confined space permit with entry rescuer standing by.

Natural Ventilation

Convective Flow Due to Stack Effect: One way to ventilate a building that is hotter or colder on the inside than outside is to use what is known as “stack effect.” Because of the temperature difference, the air inside the building is either more or less dense than the air outside. If there is an opening high in the building and another low in the building, a natural flow will be caused. If the air in the building is warmer than the outside, this warmer air will float out the top opening and be replaced with cooler air from outside. If the air inside is cooler than that outside, the cooler air will drain out the low opening, being replaced with warmer air from outside.

One common use for stack effect would be nighttime flushing of a building's interior to cool it for the next day.

The rate at which air flow depends on several factors, including inside and outside air temperatures, the area of the openings, and the height difference between the top and bottom openings.

The 1997 American Society of Heating, Refrigeration, and Air-Conditioning Engineers *ASHRAE Handbook - Fundamentals* gives the following relationship:

Q = 60 * Cd * A * sqrt(2 * g * (Hn - Hb) * ((Ti - To) / Ti)),

where Q = flow rate in cubic feet per minute, Cd = 0.65 (for unobstructed openings), A = opening area, square feet, Ti = indoor temperature (Rankine), To = outdoor temperature (Rankine), Hn = height of “neutral pressure point” (for simple systems, assume halfway between top and bottom openings), Hb = height of bottom opening, and g = gravity.

For a more complete discussion of this, and especially of unusual situations, see the discussion in the *ASHRAE Handbook - Fundamentals.*

Documenting the Anticipated Work in the Evaluation and How It Impacts Evaluation

If the space is a PRCS or the anticipated work in the space will make the space a PRCS, then documenting the hazards in context with the work will have an impact on how an entrant develops a rescue plan and makes the entry.

Confined Space Evaluations for Unusual Circumstances

Off-Normal Use: The space is normally used for one single purpose, such as to grease a pump, which has no hazard associated with it and is so reflected in the evaluation. However, for a one-time use other than the normal use, such as painting the space, which would present a new set of hazards, a new evaluation will usually need to be developed. In such a case, the evaluation will be developed but not entered into the system.

Short Duration Space: This evaluation follows the same process as for off-normal use. If a confined space is created for a short period of time and the space must be entered, an evaluation must be developed. If the space will not exist for very long (e.g., less than a week), the evaluation would not be entered into the system.

Conveyances as They Relate to Confined Space Hazards

Unlike attics, crawlspaces of the traditional multifamily or commercial building generally contain utility service lines (i.e., water, natural gas, fuel oil, sewage, steam, and electric power) that pass through them. If these utility services do not terminate at end-use equipment in the crawlspace, the inherent hazards of the material flowing through the service lines do not have to be considered in the permit space determination, unless there is a reasonable probability of a rupture or leak where the contents of the piping would cause a serious safety or health hazard. (LOI OSHA 10-27-95, Mr. Sharpie) However, if the entrant manipulates the valves or brings a cutter device into the space, the hazard in the conveyance comes into play when determining a primary hazard for PRCS consideration.

CO_2 in Soils Getting into Spaces Belowground

Carbon dioxide (CO_2) is present in the atmosphere at 0.035% (Aerias 2005; CCOHS 2005). In terms of worker safety, OSHA has set a PEL for CO_2 of 5000 parts per million (ppm) over an 8-hour workday, which is equivalent to 0.5% by volume of air. (ACGIH 2005 TLV = 5,000 ppm TWA)

High concentrations of CO_2 in confined areas can be potentially dangerous. Carbon dioxide may act as an oxygen displacer in confined spaces and cause many reactions. These reactions include, but are not limited to dizziness, disorientation, suffocation, and, under certain circumstances, death. High concentrations of CO_2 may also affect the ventilation rate or produce narcotic effects when the oxygen concentration remains in normal ranges. National Institute for Occupational Safety and Health (NIOSH) has established an IDLH limit of 40,000 ppm for CO_2.

Accumulation in pits and wells occurs because CO_2 is denser than air and may slowly accumulate. Outdoor exposure can occur where CO_2 is venting from belowground sources, such as limestone deposits, biological activity, mining operations, natural gas production, and magmatic emissions.

Fall Protection and Confined Space

Specific fall protection requirements were not included in the PRCS standard. Fall protection and ladder safety requirements are addressed in Walking–Working Surfaces, 29 CFR 1910, Subpart D and the General Duty Clause of the Occupational Safety and Health Act. Therefore, if the described potential fall hazard were the exclusive hazard within this pit, a permit program would not be required when these regulations are followed. [From a letter of interpretation (LOI) dated 2-23-99]

Field Evaluating and Posting a Confined Space

The confined space evaluator should consult with a knowledgeable person as necessary. Contact whomever necessary for access to space (building manager, users, and surrounding operations) and an understanding of its uses.

Prepare a field kit with various supplies, such as signs, labels, scraper, wire brush, and knife (such as a multitool knife). The advantage of having a field kit is that you can evaluate and post the space on the spot, without the need for a return visit.

Be prepared to conduct air monitoring. DO NOT open manholes and stand over them. Always back away and conduct air monitoring from a distance.

Do not go into a space that you suspect may have a primary hazard. Treat it as a PRCS and follow the LANL CSP program.

Obtain as much information as possible. Evaluations are entered into an electronic database that can be searched, sorted, etc. This database has required fields that must be filled to meet minimum quality criteria. Information is available online for easy access to LANL users.

Other Considerations

During entry into an NPCS, if a primary hazard or any other serious issue that places the entrant(s) at unnecessary risk occurs during entry, the entrant(s) must evacuate the space immediately, terminate entry, and close off the space and/or bring it to a safe condition. The entrant(s) must contact a confined space evaluator to reevaluate the space and review the entry operation before reentry occurs.

Is the space a PRCS? Is it more than 5 feet deep vertically? You should note this information on the evaluation because OSHA requires that a mechanical device be available to retrieve personnel from vertical-type PRCSs more than 5 feet deep.

Appendix A: Acronyms and Terms

Acronyms

ACGIH	American Conference of Governmental Industrial Hygienists
ANSI	American National Standards Institute
ASHRAE	American Society of Heating, Refrigeration, and Air Conditioning Engineers
CFR	Code of Federal Regulations
CGA	Compressed Gas Association
CSE	confined space evaluator
CSP	Confined Space Program
FOD	facility operations director
IDLH	immediately dangerous to life or health
IHS	Industrial Hygiene and Safety Division
LAFD	Los Alamos Fire Department
LANL	Los Alamos National Laboratory
LFL	lower flammability limit
LOI	letter of interpretation
NIOSH	National Institute of Occupational Safety and Health
NPCS	nonpermit confined space
OSHA	Occupational Health and Safety Administration
PEL	permissible exposure limit
PPE	personal protective equipment
PRCS	permit-required confined space
RAD	responsible associate director
SCBA	self-contained breathing apparatus
STR	subcontract technical representative
TLV	threshold limit value

Terms and Definitions

Acceptable entry conditions. The conditions that must exist in a confined space to allow entrant(s) to safely enter and work in the space. In all cases, it must be the safest reasonable condition achievable.

Attendant. An authorized worker stationed outside one or more PRCSs who monitors authorized entrants and performs all the duties assigned to attendants in the CSP.

Authorized workers. Any worker, including affiliates, visitors, vendors, contractors, and subcontractors and their workers, who is designated by his/her responsible line manager and is trained to perform specific duties (i.e., confined space entry supervisor, entrant, attendant, and rescue team member).

Blinding or blanking. Closing a pipe, line, or duct by inserting a solid plate or cap that completely covers the bore and that is capable of withstanding the maximum pressure of the pipe, line, or duct without allowing leakage into the space.

Confined Space. A space that

1. is large enough and is configured so that a worker can bodily enter and perform assigned work,
2. has limited access or egress, and
3. is not designed for continuous worker occupancy. A confined space is either a PRCS or an NPCS.

Confined space entry supervisor. A supervisor who is responsible for and has the authority to

1. determine whether acceptable entry conditions are present in a PRCS before authorizing entry,
2. oversee the confined-space operation, and
3. terminate entry as required by the CSP.

Note: *The confined space entry supervisor also may serve as an attendant or an entrant, as long as the confined space entry supervisor is trained and equipped for each role as required by the CSP.*

Confined space evaluator (CSE). A worker approved by Deployed ESH Services who has academic credentials or work experience in a relevant discipline, such as industrial hygiene or industrial safety, has experience or training in conducting confined space entries, and has received training from the Confined Space Program Lead/subject matter expert to establish proficiency in evaluating confined spaces.

Confined Space Information System. LANL electronic system containing completed Form 1620, Confined Space Evaluations, and listings of authorized CSEs and Confined Space Entry Supervisors.

Double block and bleed. A method used to isolate a confined space from a line, duct, or pipe by closing two in-line valves in a piping system and opening a valve between them that is vented to a safe location.

Emergency. Any incident or event inside or outside the confined space that presents immediate and significant danger to the entrant(s).

Energy source. Hazardous energy sources associated with machinery, equipment, or systems, such as electricity or motive sources.

Engulfment. The surrounding and effective capture of a person by a liquid or a finely divided (flowable) solid substance, aspiration of which can cause death by filling or plugging the respiratory system or that can exert enough force on the body to cause death by strangulation, constriction, or crushing.

Entrant. An authorized worker who enters a confined space and performs work.

Entrapment. A confined space that has an internal configuration, such as inwardly converging walls or a floor that slopes downward and tapers to a smaller cross section, that could trap an entrant. Entrapment also means capture by moving equipment parts, such as belts, pulleys, and gears.

Entry. The intentional or accidental action by which a person passes through an opening into a confined space. Entry includes ensuing work activities in that space and is considered to have occurred as soon as any part of the entrant's body breaks the plane of an opening into the space.

Entry permit. The document that allows and controls entry into a PRCS under defined conditions for a stated purpose during a specified time.

Hazardous atmosphere. An atmosphere that may expose entrants to the risk of death, incapacitation, impairment of ability to self-rescue, injury, or acute illness from any of the following: flammable gas, vapor, or mist in excess of 10% of its lower flammability limit (LFL); airborne combustible dust at a concentration that meets or exceeds its LFL; atmospheric oxygen concentration below 19.5% or above 23.5%; a concentration of a substance that could result in entrant exposure in excess of OSHA's PEL or the American Conference of Governmental Industrial Hygienists' (ACGIH's) TLV (including ceiling and short-term-exposure-limit values), whichever is more stringent; or any other atmospheric condition that is IDLH. ***Note:*** *An atmospheric concentration of any substance that is not capable of causing death, incapacitation, impairment of ability to self-rescue, injury, or acute illness due to its health effects is not covered by this definition.*

Immediately dangerous to life or health (IDLH). Any condition that poses an immediate or delayed threat to life that would cause irreversible adverse health effects or that would interfere with an entrant's ability to escape unaided from a confined space.

Inerting. Rendering the atmosphere in a confined space nonflammable, nonexplosive, or otherwise chemically nonreactive by displacing or diluting the original atmosphere with an inert gas such as argon or nitrogen. ***Note:*** *Inerting produces a hazardous atmosphere.*

Isolation. The process by which a permit 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; a double block and bleed system; lockout or tagout of all sources of energy; or blocking or disconnecting all mechanical linkages.

Knowledgeable person. A person who has authorized access to the space and is knowledgeable of the actual or potential hazards present in or adjacent to a confined space, the functions of the confined space, and the work conducted in the confined space.

Lockout/tagout. A procedure applied to machinery or equipment that includes the use of locks and tags to prevent death or injury of entrant(s) from an unexpected, uncontrolled release of energy (see P101-3, *Lockout/Tagout for Hazardous Energy Control*).

Lower flammability limit (LFL). The minimum concentration of fuel vapor, gas in a fuel vapor, or gaseous oxidant mixture (usually expressed as percent by volume) over which propagation of a flame will occur on contact with an ignition source.

Motive source. Powered machinery using energy sources other than electricity, such as compressed air, vacuum, water, steam, hydraulic fluid, and internal combustion.

Nonentry rescue. A rescue that is accomplished without entering the confined space by using a retrieval system. This retrieval system is referred to as Non-Entry Rescue Gear.

Nonpermit confined space (NPCS). A confined space that does not contain or, with respect to atmospheric hazards, have the reasonable potential to contain, a primary hazard.

Oxygen-deficient atmosphere. An atmosphere that contains less than 19.5% oxygen by volume.

Oxygen-enriched atmosphere. An atmosphere that contains more than 23.5% oxygen by volume.

Permit-required confined space (PRCS). A confined space that has one or more of the following inherent or introduced primary hazard characteristics:

- contains or has the potential to contain a hazardous atmosphere,
- contains a material that has the potential to engulf an entrant,
- has an internal configuration that could entrap or asphyxiate an entrant, or
- contains any other recognized serious safety or health hazards (primary hazards).

Primary hazard. Any hazard that can cause the death, injury, or sudden illness of an entrant and can prevent an entrant's ability to self-rescue from a confined space. These hazards can be inherent in (intrinsic) or introduced into the confined space. ***NOTE:*** *The term "primary hazard" was developed and defined by LANL to determine if a confined space is a PRCS. This term was derived from an OSHA interpretation. In Appendix B, see "Ability to Self-Rescue (Basis for Primary and Secondary Hazard)."*

Prohibited condition. Any condition in a confined space that is not allowed by the permit for the period during which entry is authorized.

Purging. A method by which gases, vapors, or other air contaminants are displaced from a confined space.

Remote location. A location within a PRCS that is greater than 50 feet to the exit.

Rescue on site. Requires that a rescue team be staged at an entry site, ready to immediately perform an entry and rescue in the event of an emergency affecting an entrant. Normally required where self-rescue or non-entry rescue is not possible.

Retrieval system. The equipment (including a retrieval line, chest or full-body harness, wristlets or anklets if appropriate, and a lifting device or anchor) used for nonentry rescue of persons from PRCSs.

Secondary hazards. Any physical or health hazard, e.g., asbestos or lead at levels below the OSHA PEL, that is unlikely to cause death, serious injury, or illness to entrants and that would not prevent the entrant's ability to self-rescue from the confined space. These hazards can be inherent in (intrinsic) or introduced into the confined space. Depending on circumstances, examples might include asbestos, noise, slips/trips/falls, lighting, insects, snakes, falling objects.

Self-rescue. Situation where if the identified hazards (actual or possible) reached emergency action levels, the entrant(s) could still exit on their own, unassisted. This situation is most often associated with hazards that do not have an acute danger or immediate health effects.

Supplied-air breathing equipment. Atmosphere-supplying respirators that provide a respirable atmosphere to the wearer independent of the ambient air. The breathing atmosphere must be supplied from an uncontaminated source and must conform to Compressed Gas Association, Grade D purity levels. This equipment includes air-line respirators, self-contained breathing apparatus, and a combination of air-line and SCBA.

Toxic atmospheres. "Toxic" atmospheres contain gases, vapors, or fumes known to have poisonous physiological effects. Sometimes effects are delayed. For example, carbon disulfide at low concentrations may exhibit no immediate sign of exposure, but it can cause permanent and cumulative brain damage as a result of repeated "harmless" exposure. At high concentrations, it can kill quickly.

Appendix B: OSHA Confined Space Interpretations*

Bodily Enter

Scenario: The access to aircraft fuel cells (tanks) are approximately 12 inches wide but many feet in length. Workers remain outside the tank but have their upper extremities and, on occasion, their head extending into the tank to perform the required tasks. The aircraft fuel tank will be drained of its contents, purged of vapor, and monitored for gases and vapors.

Question: Would these tanks be considered *confined spaces* as defined by OSHA's Permit-required confined spaces standard, 29 CFR 1910.146.

Reply: If it is possible for the employee to fit his or her entire body within the tanks, then they would be confined spaces under §1910.146. On the other hand, if an employee cannot enter the tanks with his or her entire body due to the size of the tanks' diameters, then the tanks would not be considered confined spaces. An employee may still be injured or killed as a result of some atmospheric hazard within such a tank; however, the permit-required confined spaces standard is not intended to address all locations that pose atmospheric hazards. Please be advised that the procedures to protect workers from atmospheric hazards within these tanks would be required by other OSHA standards, such as Subpart Z of Part 1910 General Industry Standards. 2008 - 03/05/2008 - Determining whether an aircraft fuel tank is considered a confined space.

Question. In terms of permit-required confined space entry, does “body” include all extremities (hands, feet, arms and legs) or does it indicate just the head and torso?

Reply. The term “body” refers to any part of the anatomy including all extremities. 1999 - 10/20/1999 - PRCS entry: the term “body” includes all extremities.

Entry

3. Definition of Entry. While the standard defines the process of "entry" into a confined space as beginning with the insertion of any part of the body into that space, it defines as confined spaces only those areas that can contain the whole body, and not cabinets or control panels which are accessed by simply reaching in to turn a valve or a switch. This is stated explicitly in the preamble to the final rule (page 4477 column 2 of the final 1910.146 standard). OSHA Instruction CPL 2.100 May 5, 1995 Directorate of Compliance Programs. Subject: Application of the Permit-Required Confined Spaces (PRCS) Standard, 29 CFR 1910.146.

*Interpretations have been taken from several OSHA LOIs and OSHA compliance directive CPL 2.100. Interpretations have been “bunched” together under a heading such as “Bodily Enter”; the numbering system of the original document was retained for ease of reference back to the original.

Human Occupancy

This is in response to your letter of April 25, 1994, seeking an explanation from the Occupational Safety and Health Administration (OSHA) of the “not designed for continuous human occupancy” component in the definition of the term “confined space.” Please accept our apology for the delay in this response.

The proposed rule (F.R., Vol. 54, No. 106, June 5, 1989, pg. 24089) provided the initial clarification of OSHA's intent on this subject when we stated “In addition, OSHA proposes paragraph (b)(10)(iii) to make it clear that the work areas covered by this standard are unsuitable, by nature for continuous employee occupancy, because those spaces were created to contain such things as degreasers, sawdust, and sewage, not to accommodate people.”

In the preamble of the final rule (F.R., Vol. 58, No. 9, January 14, 1993, pg. 4478), OSHA discusses comments sent to the docket and the slight differences between our definition of confined space and that of the American National Standards Institute (ANSI) definition. Although the distinction between the “primary function” (ANSI) and the “design” (OSHA) of a space may seem inconsequential, OSHA believes that the final rule's definition properly places the focus on the design of the space, which is the key to whether a human can occupy the space under normal operating conditions. Thus, if a space is truly designed for human occupancy, then the primary function of the space is irrelevant. 1995 - 06/22/1995 - Explanation from OSHA of the “not designed for continuous human occupancy” component if the definition of the term “confined space.”

Response to Question No.2 regarding “Is not designed for continuous employee occupancy” component of the definition of confined space:

The preamble of the (PRCS) at page 4478 reflects OSHA's position: “**OSHA believes that the final rule's definition properly places the focus on the design of the space, which is the key to whether a human can occupy the space under normal operating conditions.**” If, when the space was originally designed or subsequently redesigned, the designer took into consideration that humans would be entering the space and provided for the human occupancy (such as: provided ventilation, lighting, sufficient room to accomplish the anticipated task, etc.), then the space would be designed for employee occupancy. 1993 – 10/22/1993 – Permit Required Confined Space Standard as it applies to certain operations.

Introduced Hazards: Welding

If a PRCS has been reclassified to a nonpermit confined space, would welding or torch work be allowed in the space?

Answer

Yes, as long as the protective measures of Subpart Q – Welding, Cutting and Brazing prevent a hazard from developing. In this case the welding standard 1910.252 addresses the hazards of welding in a confined space and therefore prevails over the 1910.146 standard as long as no other hazards are present.

You are reminded that all the protective measures of other standards are applicable to the work in this space. You are specifically directed to the following paragraphs of the Subpart Q[1910.252(a)(4)(i), 1910.252(b)(4)(i) to (vii), 1910.252(c)(4), 1910.252(c)(9), and 1910.252(c)(10)]. 1996 - 01/11/1996 - Permit-required confined spaces and control of hazardous energy; vehicle LOTO.

Limited or Restricted Means for Entry and Exit

Question 1. **Roll-Off Container**: This equipment consists of a rectangular open-topped body (typically 20-25 ft. Length x 7-8 ft. Width and 4-5 ft. Depth), steel construction, typically used for storage of waste, debris, material, etc. and varies in size--20/30/40 cubic yard capacity. Two configurations are used: Doors at one end and no doors.

Response. An open-top roll-off refuse container would be considered a confined space when the second element in the standard's definition (“has limited or restricted means for entry and exit”) would apply. When the doors are in a secured open position, the containers described above would not be considered a confined space either on or off the transport vehicle. For those open top roll-off containers that do not have doors, the use of a temporary stair meeting the specifications for a fixed industrial stair, securely installed, would provide an unrestricted means of entry or exit. 1995 - 10/23/1995 - Determining whether certain spaces routinely would be considered confined spaces by applying the (PRCS) standard's definition.

Question 2. **Dump Truck Bed**: The beds vary in depth from 4–5 feet. However, as material (such as soil) is loaded, the depth diminishes. The rear door swings up and can be placed in this position during entry.

Response. The bed of a dump truck or trailer is similar to the roll-off container and as such would be classified as a confined space if it so configured that the second element in the standard's definition (Has limited or restricted means for entry or exit) would apply. The question, we believe, is whether a 4–5-foot tailgate door with the hinge point at the top of the side rails, in a raised position, constitutes a restriction to entry or exit. We believe that it does constitute a restriction unless it is secured in the open position. Although certain aspects of work practice are not at issue in this letter, we believe a note of caution is in order concerning your statement that the door swings up and can be placed in this position during entry. A top hinged door, which can swing down and strike an employee causing injury must be positively secured to prevent the door from accidentally closing. 1995 - 10/23/1995 - Determining whether certain spaces routinely would be considered confined spaces by applying the (PRCS) standard's definition.

Question 3. **Truck Trailer**: This is a typical tractor/trailer configuration: The trailer used by our company is 40 ft. length x 8 ft. Width x 8 ft. Height and is equipped with two doors at the rear of the unit.

Response. A typical tractor/trailer of the type described above with the doors in the open position would not be considered a confined space. When the doors are in the (secured) closed position, it would be considered a confined space since the doors of the trailer typically cannot be opened from the inside. 1995 - 10/23/1995 - Determining whether certain spaces routinely would be considered confined spaces by applying the (PRCS) standard's definition.

Question 4. **High Velocity Vacuum**: Trade names: Vactor, Guzzler, Supersucker (See attached literature). Entry into the tank unit. The door is located at the rear of the truck, and swings up from the bottom, and is secured in this position during entry.

Response. Based on the literature provided, it appears that the baghouse would be considered a confined space. The tank compartment would also be a confined space if the entry/exit point is restrictive. 1995 - 10/23/1995 - Determining whether certain spaces routinely would be considered confined spaces by applying the (PRCS) standard's definition.

Question #3 Under what circumstances might **dikes** be considered confined spaces and, further, when would they be permit spaces?

As a containment structure, the design of a dike will determine whether it falls within the definition of PRCS standard. A dike formed of mounded or sloped earth to a height of 4–6 feet would not normally represent a restricted means for entry or exit. Conversely a dike formed of a vertical block or concrete wall of the same height would constitute a restricted means for entry or exit.

The determination of whether a diked area determined to be a confined space would constitute a PRCS would have to be determined based on the hazard(s) present. For example, the potential hazard of engulfment or the potential of a hazardous atmosphere from a heavier-than-air gas or vapor would have to be considered in making the determination. 1995 - 10/27/1995 - Determining whether certain spaces meet the definition of a “confined space” according to the Permit-Required Confined Spaces standard.

1. Under what circumstances will stairs or ladders constitute a limited or restricted means of egress under the standard?

Ladders, and temporary, movable, spiral, or articulated stairs will usually be considered a limited or restricted means of egress. Fixed industrial stairs that meet OSHA standards will be considered a limited or restricted means of egress when the conditions or physical characteristics of the space, in light of the hazards present in it, would interfere with the entrant's ability to exit or be rescued in a hazardous situation. OSHA Instruction CPL 2.100 May 5, 1995 Directorate of Compliance Programs Subject: Application of the Permit-Required Confined Spaces (PRCS) Standard, 29 CFR 1910.146.

2. Does the fact that a space has a door mean that the space does not have limited or restricted means of entry or exit and, therefore, is not a “confined space”?

A space has limited or restricted means of entry or exit if an entrant's ability to escape in an emergency would be hindered. The dimensions of a door and its location are factors in determining whether an entrant can easily escape; however, the presence of a door does not in and of itself mean that the space is not a confined space. For example, a space such as a baghouse or crawlspace that has a door leading into it, but also has pipes, conduits, ducts, or equipment or materials that an employee would be required to crawl over or under or squeeze around in order to escape, has limited or restricted means of exit. A piece of equipment with an access door, such as a conveyor feed, a drying oven, or a paint spray enclosure, will also be considered to have restricted means of entry or exit if an employee has to crawl to gain access to his or her intended work location. Similarly, an access door or portal that is too small to allow an employee to walk upright and unimpeded through it will be considered to restrict an employee's ability to escape. OSHA published a technical amendment to the preamble in Federal Register / Vol. 59, No. 213 / Friday, November 4, 1994, page 55208. OSHA Instruction CPL 2.100 May 5, 1995 Directorate of Compliance Programs Subject: Application of the Permit-Required Confined Spaces (PRCS) Standard, 29 CFR 1910.146.

3. Can the distance an employee must travel in a space such as a tunnel, to reach a point of safety be a determinant for classifying a space as a confined space?

Yes. The determination would most likely be a function of the time of travel to the point of safety. OSHA Instruction CPL 2.100 May 5, 1995 Directorate of Compliance Programs Subject: Application of the Permit-Required Confined Spaces (PRCS) Standard, 29 CFR 1910.146.

4. How will OSHA assess a space that is entirely open on one plane, such as a pit, in determining whether a space has limited or restricted means for entry or exit?

In determining whether a space has limited or restricted means for entry or exit, OSHA will evaluate its overall characteristics to determine if an entrant's ability to escape in an emergency would be hindered. Thus, a pit, shaft, or tank that is entirely open on one plane can be considered a confined space if the means for entering the space (stairway, ladderway, etc.) are narrow or twisted, or otherwise configured in such a way as to hinder an entrant's ability to quickly escape (See question No. 1 of this section). Similarly, the pit, shaft, or tank itself may be confining because of the presence of pipes, ducts, baffles, equipment or other factors that would hinder an entrant's ability to escape. OSHA Instruction CPL 2.100 May 5, 1995 Directorate of Compliance Programs Subject: Application of the Permit-Required Confined Spaces (PRCS) Standard, 29 CFR 1910.146.

Question: Is a trap door or access panel considered a “portal through which a person can walk?” (This is referring to a portal that requires an employee to bend to enter.) Answer: No. If an employee must bend down to avoid striking the top of an opening or step over a raised threshold, OSHA would consider the opening as restrictive to entry or exit. That is because the intent of the standard is to ensure that workers can exit a space quickly in emergency-type situations. 1995 – 10-27-95 – Applying Permit-Required Confined Spaces (PRCS) standard to a workplace that is a multi-family residential commercial building.

Question No.1 has four sub-questions all seeking specification for the performance term “has limited or restricted means for entry or exit” which we believe can be answered by the following concept: The path by which the entrant must travel out of a space to reach an area of safety must not present a physical barrier which would impede self-rescue. 1993 – 10/22/1993 – Permit Required Confined Space Standard as it applies to certain operations.

Atmosphere

If a confined space has an atmospheric concentration of a Subpart Z contaminant over its permissible exposure limit (PEL); but it is not capable of causing death, incapacitation, impairment of ability to self-rescue, injury, or acute illness; would this atmosphere meet the definition of a “hazardous atmosphere”?

Response: The preamble to the Permit Required Confined Space Standard (Federal Register January 14, 1993, Volume 58, No. 9, page 4474) clearly states that an atmosphere that contains a substance at a concentration exceeding a permissible exposure limit intended solely to prevent long-term adverse health effects is not considered to be a hazardous atmosphere on that basis alone. Therefore, if the atmosphere is above the PEL, then it would not automatically be classified as a “hazardous atmosphere.” 1999 - 03/26/1999 - A confined space atmosphere above a PEL is not always a “hazardous atmosphere”.

Fall Hazard: Other Confined Space Hazards

Specifically your question is, “Whether a fall from 21 feet into a pit constitutes a serious hazard under the standard, therefore requiring a permit program to enter the space?” This question was further refined by telephone conversation with Mr. John Duncan with the State of Indiana to mean: “Would a pit, which meets the definition as a confined space, also meet the definition of a permit required confined space, if the only hazard is a potential fall from 21 feet while descending on a ladder within the pit?”

Specific fall protection requirements were not included in the PRCS standard. Fall protection and ladder safety requirements are addressed in Walking-Working Surfaces, 29 CFR 1910, Subpart D, and the General Duty Clause of the Occupational Safety and Health Act. Therefore, if the described potential fall hazard is the exclusive hazard within this pit, a permit program would not be required. 1999 - 02/23/1999 - Applicability of 1910.146 to fall hazards into pits.

Ability to Self-Rescue (Basis for Primary and Secondary Hazard)

10. The definition of permit-required confined space contains the phrase “any other recognized serious safety and health hazard” as one of its hazard characteristics that would result in a confined space being classified as a permit space. The “Types of Hazards” listing in the Confined Space Hazards section of OSHA's Confined Space Entry Course No. 226 identifies hazards. Does the mere presence of a non-specified hazards such as physical hazards (e.g. grinding, agitators, steam, mulching, falling/tripping, other moving parts); corrosive chemical hazards; biological hazards; and other hazards (i.e., electrical, rodents, snakes, spiders, poor visibility, wind, weather, or insecure footing), which do not pose an immediate danger to life or health or impairment of an employee's ability to escape from the space constitute a hazard which would invoke this characteristic?

ANSWER: When a hazard in a confined space is immediately dangerous to life or health, the “permit space” classification is triggered. The list referenced above is only illustrative of the general range of confined space hazards that could, but not necessarily always, constitute a hazard that would present an immediate danger to life or health, such that “permit space” protection would be required. **The determination of whether the resulting exposure to a hazard in a confined space will impair the employee's ability to perform self-rescue is the aspect that must be addressed by the employer.** In order for **“serious safety and health hazard”** to be **recognized** as being an impairment to escape, its severity potential for resulting physical harm to an employee must be considered. OSHA Instruction CPL 2.100 May 5, 1995 Directorate of Compliance Programs Subject: Application of the Permit-Required Confined Spaces (PRCS) Standard, 29 CFR 1910.146. Also see page 43 of this course manual.

Water in a Confined Space

11. Does the mere presence of water in a confined space such as a manhole trigger the application of the PRCS standard in order to work in that space?

ANSWER: No…the mere presence of water alone would not be a basis for applying the PRCS standard; there must be a quantity sufficient either to endanger the life of the entrant or to interfere with escape from the space. Water in combination with other hazards conditions could trigger the application of the permit space provisions of the PRCS standard. For example, a small quantity of water (perhaps as much as 2 to 3 inches deep) in the confined space may not trigger the PRCS classification; however, if the water conceals trip and fall hazards such as abandoned machine pads or floor holes and openings, the combination of these conditions may very well cause the confined space to be classified as a permit space. OSHA Instruction CPL 2.100 May 5, 1995 Directorate of Compliance Programs Subject: Application of the Permit-Required Confined Spaces (PRCS) Standard, 29 CFR 1910.146.

Lockout/Tagout, Isolation, and Reclassifying a Confined Space

The following questions are from a letter of interpretation associated with 29 CFR 1910.147, The control of hazardous energy (lockout/tagout):

Q 1. Is compliance with the Lockout/Tagout Standard 29 CFR 1910.147, sufficient to demonstrate that possible energization is no longer a hazard and that, as a consequence, a permit-required confined space can be classified as a non-permit required confined space?

R. A permit-required confined space can be reclassified as a non-permit-required confined space if it does not contain any actual or potential hazardous atmosphere and all hazards within the space are eliminated. For the purpose of reclassifying a permit-required confined space, which has potential energy sources in it, the methods which must be utilized are dependent upon what types of energies must be eliminated.

Compliance with OSHA's Lockout Tagout Standard is considered to eliminate electro-mechanical hazards. However compliance with the requirements of the Lockout/Tagout Standard is not considered to eliminate hazards created by flowable materials such as steam, natural gas, and other substances that can cause hazardous atmospheres or engulfment hazards in a confined space. In a permit-required confined space these types of hazards will be considered eliminated only by the use of the techniques described in the definition of the term “isolation”. The definition of the term “isolation” is in paragraph (b) of 29 CFR 1910.146. The techniques listed in the definition are blanking, blinding, misaligning or removing sections of lines or pipes and a double block and bleed system. 1995 - 08/28/1995 - The Lockout/Tagout Standard.

C5 Alternate Entry Procedure: Lockout/Tagout Isolation

Q 2. Does the implementation of an appropriate lockout procedure that blocks out a potentially hazardous atmosphere allow an employer to treat a confined space as not having a potential for an atmospheric hazard?

R. No. As indicated in the response to the first question flowable materials, which can cause either a hazardous atmosphere or an engulfment hazard, can only be eliminated by the use of the techniques described in the definition of the term “isolation.” Continuous ventilation used to insure that a hazardous atmosphere is not created is considered to be a control method rather than elimination of the atmospheric hazard. It is important that the distinction between elimination and control be understood. 1995 - 08/28/1995 - The Lockout/Tagout Standard.

Q 3. For permit-required confined spaces that have been reclassified as non-permit-required confined spaces, can continuous monitoring be used to ensure that atmospheric hazards remain eliminated?

R. Such a procedure should not be necessary if the atmospheric hazard is eliminated. In order for a permit-required confined space, with an actual or potential atmospheric hazard, to be reclassified as a non-permit-required confined space the atmospheric hazard must be eliminated. 1995 - 08/28/1995 - The Lockout/Tagout Standard.

Q 4. Under paragraphs (c)(5)(i) and (c)(5)(ii) of 29 CFR 1910.146 can continuous monitoring be used in lieu of continuous forced air ventilation if no hazardous atmospheric is detected?

R. No. The entire basis for the permitting the alternate entry procedures, described in paragraph (c)(5) of 29 CFR 1910.146, is that any actual or potential hazardous atmosphere will be controlled by continuous ventilation. This is of particular significance since among other things the alternative procedures do not require the presence of an attendant during entry operations. Entrants could be severely injured or killed if a hazardous atmosphere does develop and there will be no one available to aid them in getting out of the space. 1995 - 08/28/1995 - The Lockout/Tagout Standard. *NOTE: The LANL program (P101-27, R4) requires both an attendant and continuous force air ventilation (until all workers have left the space) for C5 Alternate Entries.*

C5 Alternate Entry Procedure: Data

7. What type of documentation will OSHA look for if an employer uses the alternate procedure of paragraph (c)(5)?

The data must demonstrate that there are **no** nonatmospheric hazards and that the ventilation will keep the air inside the permit space safe for entry. This should include initial data in the form of: - Volume of the space to be entered; - Capacity and configuration of the ventilation equipment to be used; - Identified atmospheric hazards and potential hazards; - The sampling results from routine testing of the space from the time ventilating has begun through final determination of acceptable entry conditions; and - Atmospheric hazards created by work in the space. OSHA Instruction CPL 2.100 May 5, 1995 Directorate of Compliance Programs. Subject: Application of the Permit-Required Confined Spaces (PRCS) Standard, 29 CFR 1910.146.

Atmospheric Hazard, Primary Hazard, Secondary Hazard, and PRCSs

Where employees are exposed to atmospheric or other toxic hazards that do not present an immediate danger of death or disability that would render the employee unable to escape from the confined space (e.g., air contaminants such as arsenic or asbestos), OSHA's health standards for those hazards apply rather than 1910.146, and employees must be appropriately protected in accordance with those health standards. The PRCS standard is intended to protect employees against specific short-term, acute hazards (not exposures at or below the permissible exposure limits); other standards address a broader range of health and safety concerns. As noted in the definition of "hazardous atmosphere" relating to atmospheric concentration of any substance for which a **dose** or **permissible exposure limit** is published in Subparts "G" and "Z", any substance that is not capable of causing death, incapacitation, impairment of ability to self-rescue, injury, or acute illness due to health effects is not covered by the PRCS standard. OSHA Instruction CPL 2.100 May 5, 1995 Directorate of Compliance Programs. Subject: Application of the Permit-Required Confined Spaces (PRCS) Standard, 29 CFR 1910.146.

If a confined space has an atmospheric concentration of a Subpart Z contaminant over its Permissible Exposure Limit (PEL); but it is not capable of causing death, incapacitation, impairment of ability to self-rescue, injury, or acute illness; would this atmosphere meet the definition of a "hazardous atmosphere"?

Response: The preamble to the Permit-Required Confined Space standard (Federal Register January 14, 1993, Volume 58, No. 9, page 4474) clearly states that an atmosphere that contains a substance at a concentration exceeding a permissible exposure limit intended solely to prevent long-term adverse health effects is not considered to be a hazardous atmosphere on that basis alone. Therefore, if the atmosphere is above the PEL, then it would not automatically be classified as a "hazardous atmosphere". 1999 - 03/26/1999 - A confined space atmosphere above a PEL is not always a "hazardous atmosphere."

Ventilation: "Safe for Entry"

6. How will an employer determine a "safe for entry" level for contaminants under the provisions of paragraph (c)(5)?

OSHA is willing to accept as the minimal "safe for entry" level, that which is **50%** of the flammable or toxic substance that would constitute a hazardous atmosphere. The two examples footnoted on page 4488 of the preamble to the final rule are: (1) The LFL for methane is a concentration of 5 percent by volume. Ten percent of this value is 0.5 percent, a concentration which would be considered hazardous by definition. Under the guideline the measured concentration of methane cannot exceed 0.25 percent after ventilation in order for the procedures specified in paragraph (c)(5)(ii) of the final rule to be acceptable. (2) The 8-hour time weighted average PEL for chlorine, under Table Z-1, is 1.0 parts per million. This concentration of chlorine would be considered hazardous by the definition of "hazardous atmosphere". Under the guideline, the measured concentration of chlorine cannot exceed 0.5 parts per million after ventilation in order for the procedures specified in paragraph (c)(5)(ii) of the final rule to be acceptable. **Entry under (c)(5) would not be acceptable if hazards in the space quickly increased if the ventilation were to stop. Sufficient time must be available for an entrant to safely exit the space if the ventilation stops.** OSHA Instruction CPL 2.100 May 5, 1995 Directorate of Compliance Programs Subject: Application of the Permit-Required Confined Spaces (PRCS) Standard, 29 CFR 1910.146.

Question 1: What constitutes "continuous forced air ventilation" as found in 29 CFR 1910.146(c)(5)(ii)(E)?

Reply: "Continuous forced air ventilation" means a delivery system or device that provides positive pressure for the space where the employees are working. When continuous forced-air ventilation is used during the entries that follow the alternative procedures and authorized under 29 CFR1910.146(c)(5)(i)(A) through (F), the following conditions must be met: First, no employee may enter the permit space until the forced-air ventilation has eliminated any hazardous atmosphere found within the space. Second, the ventilation must be directed to ventilate the immediate areas where an employee is or will be present within the space and must continue until all employees have left the space. Third, the air supply for the ventilation must be from a clean source and must not increase the hazards in the space. These provisions ensure that the atmosphere within the permit space remains safe during the entire entry operation. 2005 - 11/17/2005 - Clarification of "continuous forced air ventilation" for PRCS entry work.

Question 2: Does the use of a portable blower fan to clear the air during maintenance periods satisfy the OSHA requirement?

Reply: A portable blower fan could be used as the continuous forced-air ventilation, provided that it does remove any hazardous atmosphere. This depends on several factors such as but not limited to the size and configuration of the permit space including the number of and distance between openings such as access doors or vents and the blower capacity, such as cubic feet per meter (CFM) of the fan itself. In addition, the fan must be approved for use in the particular hazardous location. 2005 - 11/17/2005 - Clarification of “continuous forced air ventilation” for PRCS entry work.

Four Feet Deep

Construction Safety and Health Outreach Program	**U.S. Department of Labor** OSHA Office of Training and Education May 1996

OSHA's General Industry Regulation, §1910.146 *Permit-required confined spaces*, contains requirements for practices and procedures to protect employees in general industry from the hazards of entry into permit-required confined spaces. This regulation does *not* apply to construction.

OSHA's Construction Safety and Health Regulations Part 1926 do not contain a permit-required confined space regulation. Subpart C, §1926.21 *Safety training and education* specifies training for personnel who are required to enter confined spaces and defines a “confined or enclosed space.” These requirements are shown below.

§1926.21 Safety training and education. (Partial)

“(b)(6)(i) All employees required to enter into confined or enclosed spaces shall be instructed as to the nature of the hazards involved, the necessary precautions to be taken, and in the use of protective and emergency equipment required. The employer shall comply with any specific regulations that apply to work in dangerous or potentially dangerous areas.

(ii) For purposes of paragraph (b)(6)(i) of this section, “confined or enclosed space” means any space having a limited means of egress, which is subject to the accumulation of toxic or flammable contaminants or has an oxygen deficient atmosphere. Confined or enclosed spaces include, but are not limited to, storage tanks, process vessels, bins, boilers, ventilation or exhaust ducts, sewers, underground utility vaults, tunnels pipelines, and open top spaces more than 4 feet in depth such as pits, tubs, vaults, and vessels. “

OSHA's Construction Regulations also contain requirements dealing with confined space hazards in underground construction (Subpart S), underground electric transmission and distribution work (§1926.956), excavations (Subpart P), and welding and cutting (Subpart J).

Further guidance may be obtained from American National Standard ANSI Z117.1-2009, *Safety Requirements for Confined Spaces*. This standard provides minimum safety requirements to be followed while entering, exiting and working in confined spaces at normal atmospheric pressure. This standard does not pertain to underground mining, tunneling, caisson work or other similar tasks that have established national consensus standards.

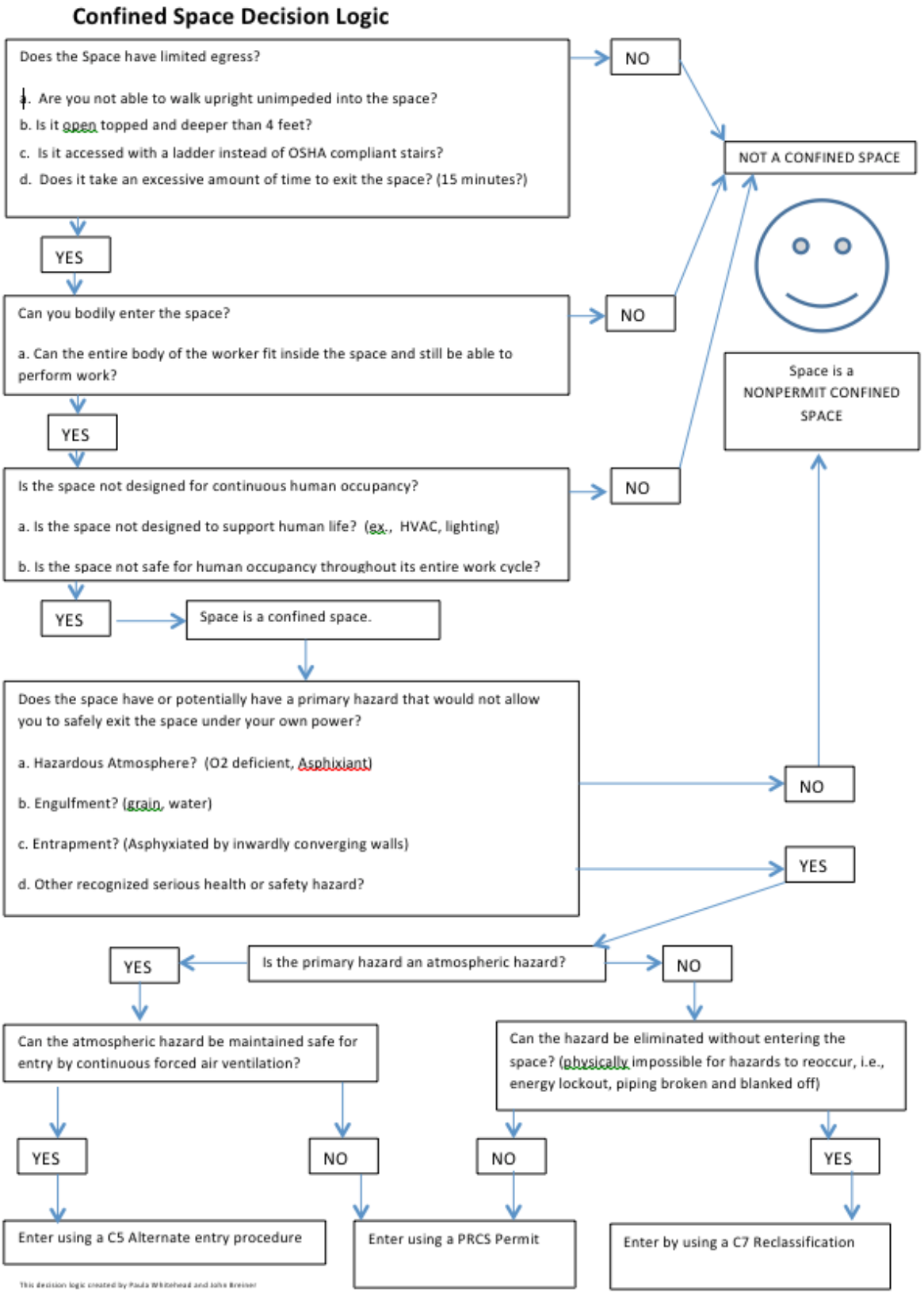
Note: *This is the source reference of the so-called "4-foot" depth thing that for some interpreters makes a vertical space an NPCS.*

Notes. . . .

Appendix C: Confined Space Decision Logic

Confined Space Decision Logic

Appendix B: Confined Space Interpretations



LAST PAGE OF THIS MANUAL

Confined Space Evaluation

Course #19613

Case 1
Hands-On Exercise

Concrete Vault

June 2016

Los Alamos
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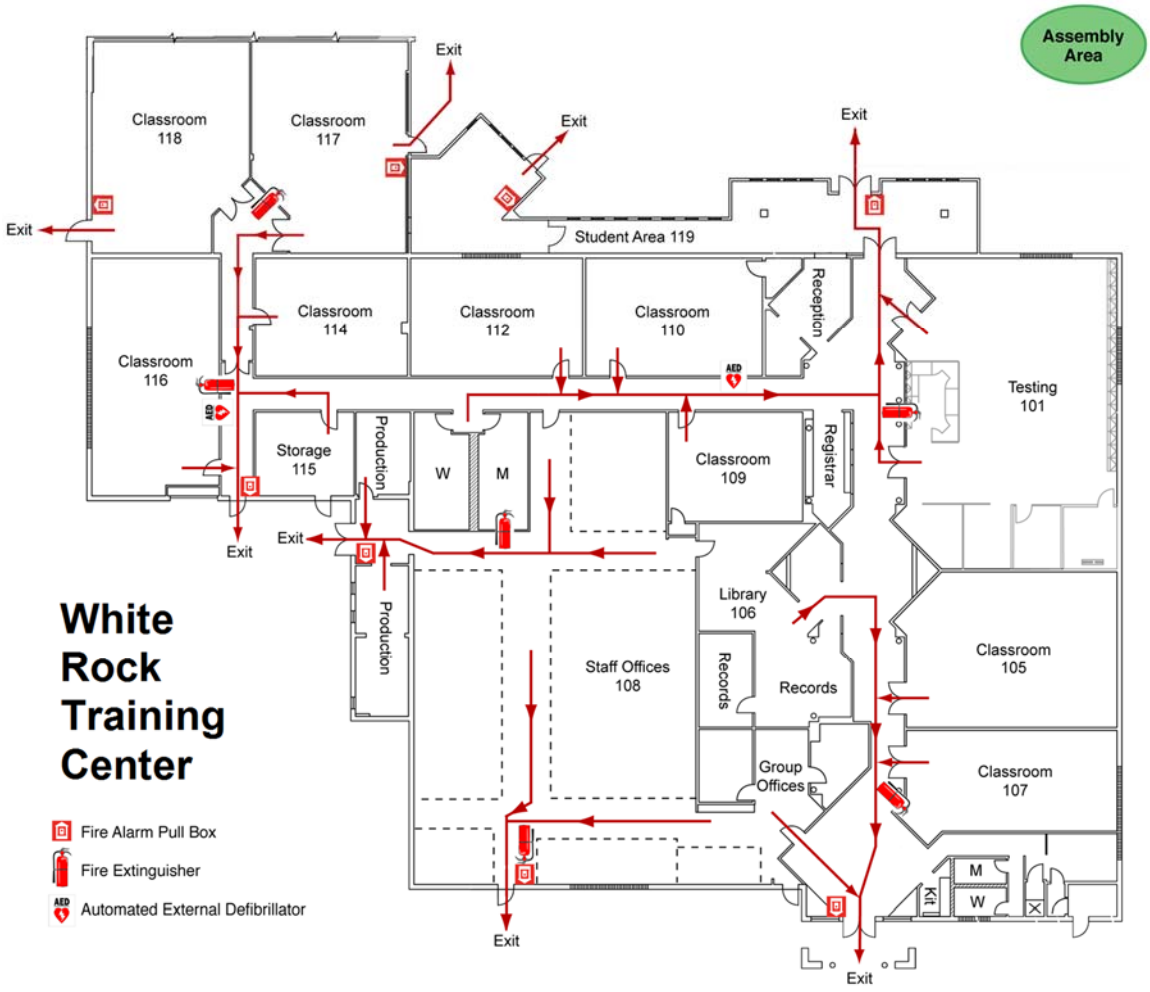

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Editor/Compositor: Lisa Rothrock

Course Number: 19613
June 2016
LA-UR-
Controlled Document Number: ConSp_Eval_19613_HO,R2.0

Confined Space, Case 1, Hands-On Exercise
Concrete Vault

Introduction

This exercise allows the participant to practice skills used to perform the following tasks:

- Evaluate a confined space
- Evaluate hazards associated with a permit-required confined space (PRCS)
- Complete a confined space evaluation
- Negotiate the LANL confined space information system

During the exercise, you will evaluate a space. You will be required to answer some questions and complete an evaluation form.

The answers to the numbered questions for the activities are found on the answer sheet to be handed out at the end of class.

Objectives

- Recognize the process and criteria for determining if a space is a confined space.
- Recognize the hazards associated with a confined space.
- Recognize isolation, elimination, and control strategies for hazards associated with a confined space.
- Recognize the process and criteria for determining if a confined space is a PRCS.
- Recognize the process and criteria for determining if a C5 alternate entry procedure applies to a PRCS.
- Recognize the process and criteria for determining if a C7 reclassification applies to a PRCS.
- Recognize the criteria for a PRCS rescue.
- Recognize training, communications, and air monitoring requirements for a PRCS.

Disclaimer

Some information used in this classroom exercise is derived from a real space. None of the information presented by or derived from this exercise is intended for use outside the classroom during an actual permit-required confined space entry. This material is to be used for training purposes only and may not accurately reflect conditions associated with a real confined space. Any confined space at LANL is to be addressed according to the provisions of the Confined Space Program.

Completion of this class does not guarantee competency of the student and does not confer “qualified” or “authorized” status.

Case 1: Vault

Purpose

This exercise trains students to evaluate a confined space and complete a confined space evaluation.

Materials

1. Course manual: Confined Space Evaluation #19613
2. Form 1620 - Confined Space Evaluation

Student Instructions

1. Read the Confined Space scenario.
2. Follow the directions, make considerations, or answer questions.
3. Fill out Form 1620 as required.

Scenario

You are a confined space evaluator; your boss asks you to go to Technical Area 3 (TA-3) to evaluate a suspected confined space. A description of the confined space follows.

The space is a concrete vault 10 ft square and 10 ft deep (10 ft x 10 ft x 10 ft). The top is covered with heavy grating, with one 3-ft-x-3-ft section removable for entry. A vertical ladder is built into the wall. The top 12 in. of the vault extends above grade.

A 6-in.-diameter, steel-pipe, municipal water line and an 8-in.-diameter, steel-pipe, municipal water line with three valves are located inside the vault. From this vault, water flow can be controlled and the pipes can be drained if needed.

The vault is located 30 ft away from a two-lane road that is heavily traveled by cars and trucks.

PHOTOGRAPHS are located at the back of this handout.

1a. CONSIDER: What type of a space is this? What are the design and function of the space?

1b. DIRECTION: Complete Section B of Form 1620.

2a. CONSIDER: Is this a confined space?

2b. DIRECTION: Complete Section C of Form 1620.

3a. CONSIDER: All of the following 30-point hazard inspection criteria.
Do any of these hazards exist?
Does the existence of the hazard pose a risk?
Are the hazards primary or secondary?
Are there any hazards outside the space that may pose a risk to entrants?
Are there any hazards not represented on this list?

Something to Think About

Just because one of these "hazards" exists in the space does not automatically expose an entrant to a dangerous, health-threatening situation. For example, an electrical component in a space does not expose the entrant to the risk of electrocution unless there are exposed electrical circuits.

INSPECTION CRITERIA

Check all that apply to the space.

____ 1. Does the space contain or potentially contain a hazardous atmosphere?
____ 2. Does the space contain any chemicals or chemical residues?
____ 3. Does the space contain any flammable/combustible substances?
____ 4. Does the space contain or potentially contain any decomposing organic matter?
____ 5. Does the space have any pipes that bring chemicals into it?
____ 6. Does the space have any materials that can trap or potentially trap, engulf, or drown an entrant?
____ 7. Is vision obscured to 5 ft or less by dust?
____ 8. Does the space contain any mechanical equipment?
____ 9. Does the space have converging walls, sloped floors, or a tapered floor to smaller cross sections that could trap or asphyxiate an entrant?
____ 10. Does the tank or vessel contain rusted interior surfaces?
____ 11. Does the space contain thermal hazards (e.g., cold or hot)?
____ 12. Does the space contain excessive noise levels that could damage hearing or interfere with communication with an attendant?
____ 13. Does the space present any slip, trip, or fall hazards?

____ 14. Are any operations being conducted near the space opening that could present a hazard to the entrant?
____ 15. Are there any hazards from falling objects?
____ 16. Do lines under pressure service the space?
____ 17. Will cleaning solvents or paints be used in the space?
____ 18. Will welding, cutting, brazing, riveting, scraping, or sanding be performed in the space?
____ 19. Is electrical equipment located in or required for use in the space?
____ 20. Does the space have poor natural ventilation that would allow an atmospheric hazard to develop?
____ 21. Are there any corrosives that could irritate the eyes in the space?
____ 22. Do any conditions prevent an entrant's self-rescue from the space?
____ 23. Are any substances used in the space that could present acute hazards?
____ 24. Is mechanical ventilation needed to maintain a safe environment?
____ 25. Is air monitoring necessary to ensure that the space is safe for entry, despite a potentially hazardous atmosphere?
____ 26. Does the space have a vertical drop greater than 5 feet?
____ 27. Will residues be scraped off the interior surfaces of the vessel?
____ 28. Are nonsparking tools required to remove residues?
____ 29. Does the space restrict mobility to the extent that it could trap an entrant?
____ 30. Is respiratory protection required because of a hazard that would make it a permit space?

3b. DIRECTION: Complete Section D of Form 1620, and describe in detail any primary or secondary hazards.

4a. CONSIDER: Is this a PRCS?

4b. DIRECTION: Complete Section E of Form 1620.

4c. ANSWER THIS QUESTION: Is there any possibility of using a C5 Alternate Entry procedure? Why or why not?

4d. DIRECTION: If a C5 Alternate Entry procedure can be used to enter this PRCS, mark the box in Section E of Form 1620.

4e. ANSWER THIS QUESTION: Is there any possibility of using a C7 Temporary Reclassification? Why or why not?

4f. DIRECTION: If a C7 Temporary Reclassification can be used, mark the box in Section E of Form 1620.

5. DIRECTION: Complete Section G of Form 1620. Describe any methods needed for isolating hazards from the space, eliminating hazards, or controlling hazards.

6. DIRECTION: Complete Section H of Form 1620.

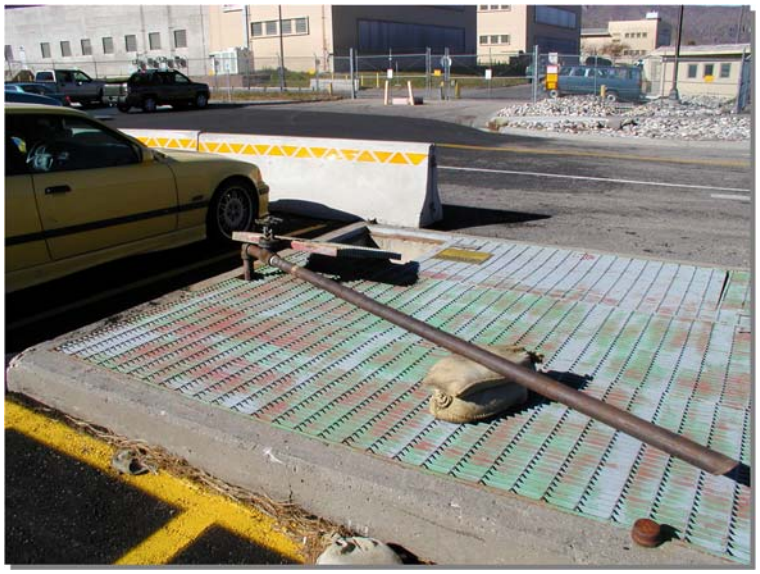
7. DIRECTION: Complete Section I of Form 1620.

8. DIRECTION: Complete Section J of Form 1620.

9. DIRECTION: Complete Section K of Form 1620.

10. DIRECTION: Complete Section L of Form 1620.

Case 1: Vault



Case 1: Vault

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Form 1620, Confined Space Evaluation

Form 1620

Los Alamos NATIONAL LABORATORY EST.1943

Confined Space Evaluation

A) General Information and Location

Date	CSP #	TA	Building	Room	Other	
Owning organization		Primary contact		Z #	Organization	Telephone

Action ☐ Add new space ☒ Re-evaluate/update ☒ New location/owner ☒ Archive (explain below)

Location description

B) Type and Function (Mark all that apply and describe selections as necessary.)

☐ Manhole	☐ Tunnel	☐ Pit	☐ Elevator shaft	☐ Cyclone
☒ Tank	☒ Vault	☒ Trap	☒ Mixer	☒ Oven
☒ Duct	☒ Well	☒ Bin	☒ Caisson	☒ Furnace
☒ Silo	☒ Hopper	☒ Fan housing	☒ Sump	☒ Vat
☒ Lift station	☒ Plenum	☒ Crawl space	☒ Boiler	☒ Trench
				☒ Other_____

Additional description

Opening position ☐ Vertical (through top/bottom) ☒ Horizontal (through side) | Number of openings

Opening size and shape ☐ Square ☒ Round

Expected frequency and duration of entry | Is the space transportable or mobile? ☐ Yes ☒ No

Description of confined space function

Description of anticipated work within the confined space

C) Confined Space Determination (Mark all that apply and comment as necessary.)

The Space

☐ Is large enough and so configured that an employee can bodily enter and perform assigned work?

☒ Has limited or restricted means for entry or exit?

☒ Is not designed for continuous employee occupancy?

Note: If all three above conditions are not met: (1)Explain reasoning below, and (2) proceed to Section E and indicate that the space is not a confined space

Comment(s)

Configuration conditionality or contingency? Explain

Form 1620 (6/12) Page 1 of 4

D) Hazard Identification (Mark all that apply and describe all primary and secondary hazard selections in writing.)

Primary Hazards (existing or reasonable potential to exist)

- ☐ Oxygen deficiency (<19.5%)
- ☐ Oxygen enrichment (>23.5%)
- ☐ Flammable atmosphere (>10% LFL)
- ☐ Toxic gas/vapor/fume/aerosol (>PEL or TLV)
- ☐ Cryogen use/storage
- ☐ Heat stress or hot surfaces
- ☐ Cold stress
- ☐ Noise (>115 dBA,)
- ☐ High radiation area (Contact RP1 for Rad Permit)
- ☐ Airborne radioactivity area (Contact RP1 for Rad Permit)
- ☐ Nonionizing radiation (>PEL or TLV, RF/MW/Laser/UV/IR)
- ☐ Entrapment
- ☐ Engulfment
- ☐ Hazardous energy sources
  - ☐ Motive/Mechanical
  - ☐ Electrical
  - ☐ Pressurized gases/fluids
- ☐ Remote location (>50 feet to exit)
- ☐ Other serious safety or health hazard (specify below)

Description(s)

Secondary Hazards (Existing or reasonable potential to exist)

- ☐ Noise (>85 dBA, 8-hr TWA)
- ☐ Ionizing radiation (Airborne or external) (Contact RP-1)
- ☐ Nonionizing radiation (<PEL or TLV)
- ☐ Spark- or Flame-producing work
- ☐ Slips/Trips/Falls
- ☐ Lighting (Vision)
- ☐ Pedestrian and traffic hazards
- ☐ Asbestos (<PEL)
- ☐ Toxic gas/vapor/fume/aerosol (<PEL or TLV)
- ☐ Falling objects
- ☐ Sharp surfaces or protrusions
- ☐ Vibration
- ☐ Other chemical hazards
- ☐ Insects, snakes, vermin
- ☐ Other _____

Description(s)

Other entry-related issues (e.g., security, adjacent operations)

E) Confined Space Classification (Mark only one in upper section, and if applicable, only one alternate entry method.)

- ☐ **Not a Confined Space:** Does not meet ALL THREE criteria in Section C. Proceed to end and sign the evaluation.
- ☐ **Nonpermit Confined Space:** Meets all three criteria in Section C, but no primary hazards are identified in Section D.
- ☐ **Permit-Required Confined Space:** Meets all three criteria in Section C and an actual or potential primary hazard identified in Section D.

- ☐ **Permit-Required Confined Space/Potential for C5 Alternate Entry Procedure:** Meets all three criteria in Section C; only an actual or potential atmospheric primary hazard exists, and continuous ventilation alone is sufficient to maintain the space safe for entry.
  Complete Confined Space C5 Alternate Entry Procedure.
- ☐ **Permit-Required Confined Space/Potential for C7 Temporary Reclassification Certification:** Meets all three criteria in Section C; no actual or potential atmospheric primary hazard exists, and all primary hazards can be eliminated without entry and will not reoccur during the entry.
  The space can be reclassified to a nonpermit confined space for duration of entry. Supervisor completes C7 Temporary Reclassification Certification.

F) Posting (Mark all that apply and comment as necessary.)

- ☐ Not a confined space (posting optional)
- ☐ Nonpermit confined space
- ☐ Permit-required confined space

CSP # tag posted? ☐ Yes ☐ No

- ☐ Other posted warning signs (specify below)

Comment(s)

Form 1620 (06/12)

SAVE PRINT CLEAR FORM

Page 2 of 4

G) Isolation, Elimination, and Control Methods (Mark all that apply and describe all selections in writing.)

- Alteration and Isolation

☐ Blinding/Blanking	☐ Lockout/tagout (LO/TO)	☐ Inerting
☐ Double block and bleed	☐ Line breaking	☐ Other _____
☐ Electrical grounding (GFCI)	☐ Purging	☐ Other _____

Description(s)

- Engineering and Substitution

☐ Forced-air ventilation	☐ Explosion-proof equipment	☐ Shielding
☐ Exhaust ventilation	☐ Low-voltage lighting	☐ Insulated tools
☐ Pneumatic substitution	☐ Guarding	☐ Other _____

Description(s)

- PPE

☐ Fresh-air breathing equipment	☐ Head protection	☐ Other _____
☐ Chemical protective clothing	☐ Eye/Face protection	☐ Other _____
☐ Air-purifying respirator	☐ Hearing protection	☐ Other _____

Description(s)

- Administrative Controls

☐ Other work permits	☐ Multiple work shift procedures	☐ Other _____
☐ Inspection/verification	☐ Alternate entry procedures	☐ Other _____

Description(s)

H) Expected Training Requirements (Mark all that apply and describe selections as necessary.)

Note: *Training may be required depending on the existing or potential hazards present in or around the confined space or due to the work performed in the space. Training needs during entry operations may vary.*

☒ *Introduction to hazard communication*	
☒ *Confined entrant/attendant Live*	☐ *Asbestos awareness*
☐ *Lockout/tagout procedures*	☐ *Pressure safety orientation*
☐ *LANL electrical safety program*	☐ *Respirators: Air-purifying*
☐ *Electrical injury mechanisms*	☐ *Other _____(specify below)*
☐ *Hazard-specific safety training (e.g., noise, lead, beryllium).*	☐ *Other _____(specify below)*
☐ *Confined space entrant/attendant hands on*	

Specific training

I) Other Equipment (Mark all that apply.)

☐ Ladder	☐ Traffic cones
☐ Battery flashlight or lantern	☐ Barriers (vehicle/pedestrian) and signs
☐ Supplemental power	☐ Fire extinguisher
☐ Other _____	☐ Other _____

STOP HERE IF NONPERMIT CONFINED SPACE. SIGN EVALUATION BELOW

Form 1620 (06/12) Page 3 of 4

SAVE PRINT CLEAR FORM

J) Anticipated Rescue Planning and Response Mode ***(Must select a mode and justify rescue stand-by mode. Describe other selections as necessary.)***

☐ Rescue Available		
☐ Nonentry rescue equipment (specify below), or ☐ Not applicable or not feasible (describe below).		
☐ Chest or full-body harness	☐ Fixed-point retrieval	☐ Horizontal system
☐ Wristlets or anklets	☐ Tripod	☐ Other _____
☐ Mechanical winch	☐ Boom	☐ Other_____
Comment(s)		
☐ Rescue Stand-By (on-site)		

K) Communications Equipment and Procedures (Mark all that apply.)

Entry Operations	
☐ Voice or visual (work will not interfere?)	☐ Wire system
☐ Rope signals (establish procedure)	☐ Wireless system (faraday shielding issue?)
☐ Personal Alert Safety System (PASS)	☐ Radio/PASS combination
☐ Other _____	
Rescue Service Notification	
☐ Telephone ☐ Cellular phone ☐ Two-way Radio ☐ Other _____	

L) Recommended Air Monitoring (Mark all that apply and describe as necessary.)

☐ Air monitoring required (specify below), or ☐ not required (justify below)				
☐ % 0_2	☐ % LFL	☐ H_2S	☐ CO	☐ CO_2
☐ Other _____	☐ Other _____		☐ Other _____	
☐ Prior to entry	☐ Continuous during entry	☐ Periodic during entry? (specify) _____		
Other considerations (e.g. location, interference's)				
Air sampling/monitoring performed during evaluation? (Attach Form 1619, *Supplemental Air-Monitoring Data Sheet and Attendant/Entrant Log*, if necessary to record results.)				

Confined Space Evaluator	Signature	Z#	Date

RETURN COMPLETED EVALUATION TO IHS AT CSP, MS K403.

M) Notes

Form 1620 (06/12) Page 4 of 4

Confined Space Evaluation

Course #19613

Case 2
Hands-On Exercise

Steel Tank Containment

June 2016

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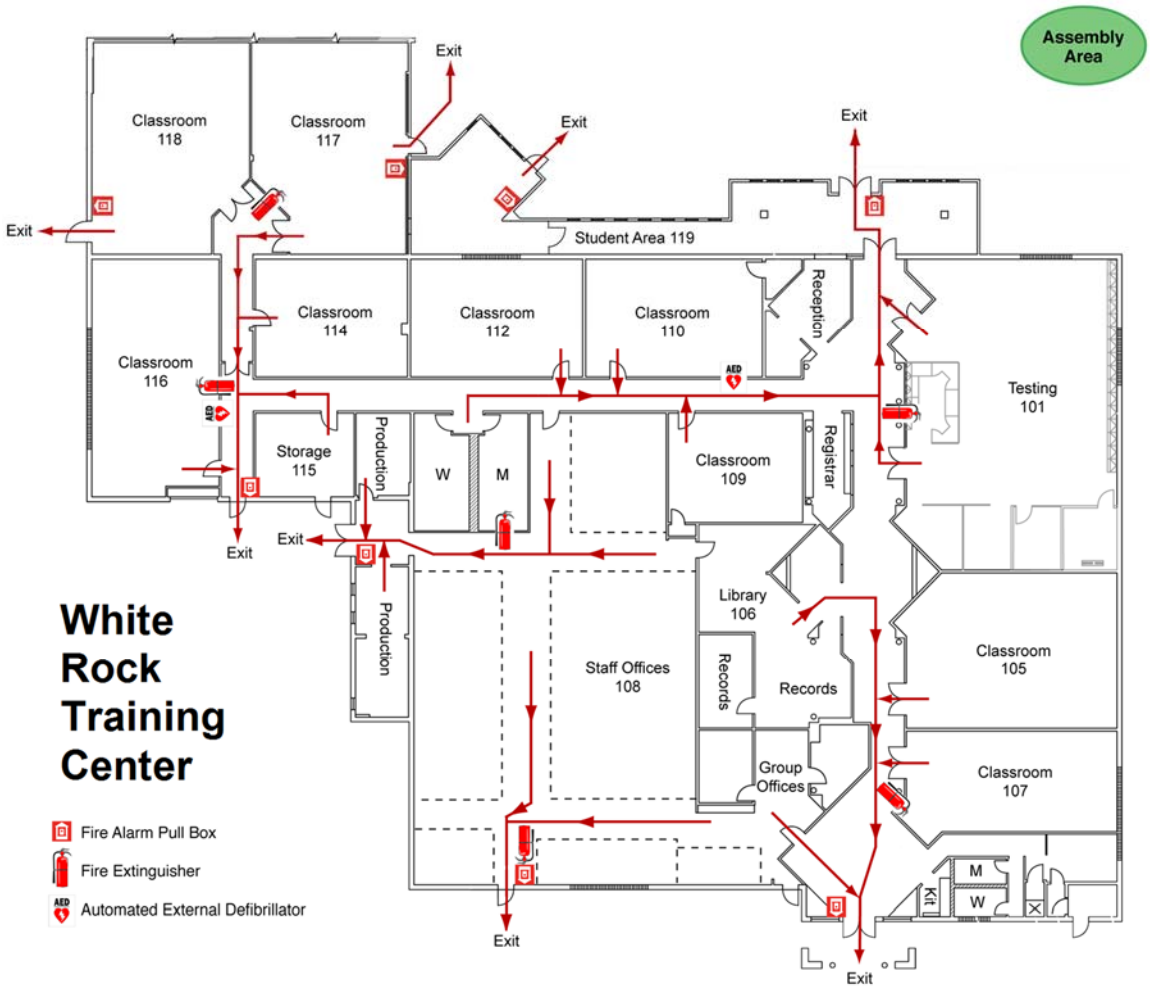

Central Training-Institutional Training Services Group Leader: Cindy Dutro
Instructional Designer: Mike Chochoms
Technical Advisor: John Breiner
Editor/Compositor: Lisa Rothrock

Course Number: 19613
June 2016
LA-UR-16-
Controlled Document Number: ConSp_Eval_19613_HO,R2.0

Confined Space, Case 2, Hands-On Exercise Steel Tank Containment

Introduction

This exercise allows the participant to practice skills used to perform the following tasks:

- Evaluate a confined space
- Evaluate hazards associated with a permit-required confined space (PRCS)
- Complete a confined space evaluation
- Negotiate the LANL confined space information system

During the exercise, you will evaluate a space. You will be required to answer some questions and complete an evaluation form.

The answers to the numbered questions for the activities are found on the answer sheet to be handed out at the end of class.

Objectives

- Recognize the process and criteria for determining if a space is a confined space.
- Recognize hazards associated with a confined space.
- Recognize isolation, elimination, and control strategies for hazards associated with a confined space.
- Recognize the process and criteria for determining if a confined space is a PRCS.
- Recognize the process and criteria for determining if a C5 alternate entry procedure applies to a PRCS.
- Recognize the process and criteria for determining if a C7 reclassification applies to a PRCS.
- Recognize the criteria for a PRCS rescue.
- Recognize training, communications, and air monitoring requirements for a PRCS.

Disclaimer

Some information used in this classroom exercise is derived from a real space. None of the information presented by or derived from this exercise is intended for use outside the classroom during an actual permit-required confined space entry. This material is to be used for training purposes only and may not accurately reflect conditions associated with a real confined space. Any confined space at LANL is to be addressed according to the provisions of the Confined Space Program.

Completion of this class does not guarantee competency of the student and does not confer “qualified” or “authorized” status.

Case 2: Steel Tank Containment

Purpose

This exercise trains students to evaluate a confined space and complete a confined space evaluation.

Materials

1. Confined Space Evaluation course manual
2. Form 1620 - Confined Space Evaluation
3

Student Instructions

1. Read the Confined Space scenario.
2. Follow the directions or answer questions.
3. Fill out Form 1620 as required.

Scenario

You are a confined space evaluator; your boss asks you to go to Technical Area 63 (TA-63) to evaluate a suspected confined space. A description of the confined space follows.

A containment area surrounds a 10,000-gallon, aboveground steel tank. The tank is located inside a rubber containment. The containment walls are 4 ft high and are located about 8 ft away from the tank.

You are not evaluating the tank. You are evaluating the space between the tank and the containment wall.

Rainwater has been found inside the containment.

PHOTOGRAPHS are located at the back of this handout.

1a. CONSIDER: What type of space is this? What are the design and function of the space?

1b. DIRECTION: Complete Section B of Form 1620.

2a. CONSIDER: Is this a confined space?

2b. DIRECTION: Complete Section C of Form 1620.

3a. CONSIDER: All of the following 30-point hazard inspection criteria.
Do any of these hazards exist?
Does the existence of the hazard pose a risk?
Are the hazards primary or secondary?
Are there any hazards outside the space that may pose a risk to entrants?
Are there any hazards not represented on this list?

Something to Think About

Just because one of these "hazards" exists in the space does not automatically expose an entrant to a dangerous, health-threatening situation. For example, an electrical component in a space does not expose the entrant to the risk of electrocution unless there are exposed electrical circuits.

INSPECTION CRITERIA

Check all that apply to the space.

____ 1. Does the space contain or potentially contain a hazardous atmosphere?
____ 2. Does the space contain any chemicals or chemical residues?
____ 3. Does the space contain any flammable/combustible substances?
____ 4. Does the space contain or potentially contain any decomposing organic matter?
____ 5. Does the space have any pipes that bring chemicals into it?
____ 6. Does the space have any materials that can trap or potentially trap, engulf, or drown an entrant?
____ 7. Is vision obscured to 5 ft or less by dust?
____ 8. Does the space contain any mechanical equipment?
____ 9. Does the space have converging walls, sloped floors, or a tapered floor to smaller cross sections that could trap or asphyxiate an entrant?
____ 10. Does the tank or vessel contain rusted interior surfaces?
____ 11. Does the space contain thermal hazards (e.g., cold or hot)?
____ 12. Does the space contain excessive noise levels that could damage hearing or interfere with communication with an attendant?
____ 13. Does the space present any slip, trip, or fall hazards?

____ 14. Are any operations being conducted near the space opening that could present a hazard to the entrant?
____ 15. Are there any hazards from falling objects?
____ 16. Do lines under pressure service the space?
____ 17. Will cleaning solvents or paints be used in the space?
____ 18. Will welding, cutting, brazing, riveting, scraping, or sanding be performed in the space?
____ 19. Is electrical equipment located in or required for use in the space?
____ 20. Does the space have poor natural ventilation that would allow an atmospheric hazard to develop?
____ 21. Are there any corrosives that could irritate the eyes in the space?
____ 22. Do any conditions prevent an entrant's self-rescue from the space?
____ 23. Are any substances used in the space that could present acute hazards?
____ 24. Is mechanical ventilation needed to maintain a safe environment?
____ 25. Is air monitoring necessary to ensure that the space is safe for entry, despite a potentially hazardous atmosphere?
____ 26. Does the space have a vertical drop greater than 5 feet?
____ 27. Will residues be scraped off the interior surfaces of the vessel?
____ 28. Are nonsparking tools required to remove residues?
____ 29. Does the space restrict mobility to the extent that it could trap an entrant?
____ 30. Is respiratory protection required because of a hazard that would make it a permit space?

3b. DIRECTION: Complete Section D of Form 1620, and describe in detail any primary or secondary hazards.

4a. CONSIDER: Is this a PRCS?

4b. DIRECTION: Complete Section E of Form 1620.

4c. ANSWER THIS QUESTION: Is there any possibility of using a C5 Alternate Entry procedure? Why or why not?

4d. DIRECTION: If a C5 Alternate Entry procedure can be used to enter this PRCS, mark the box in Section E of Form 1620.

4e. ANSWER THIS QUESTION: Is there any possibility of using a C7 Temporary Reclassification? Why or why not?

4f. DIRECTION: If a C7 Temporary Reclassification can be used, mark the box in Section E of Form 1620.

5. DIRECTION: Complete Section G. Describe any methods needed for isolating hazards from the space, eliminating hazards, or controlling hazards.

6. DIRECTION: Complete Section H of Form 1620.

7. DIRECTION: Complete Section I of Form 1620.

8. DIRECTION: Complete Section J of Form 1620.

9. DIRECTION: Complete Section K of Form 1620.

10. DIRECTION: Complete Section L of Form 1620.

Case 2: Steel Tank Containment

Case 2: Steel Tank Containment

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Form 1620, Confined Space Evaluation

Form 1620

Los Alamos NATIONAL LABORATORY EST.1943

Confined Space Evaluation

A) General Information and Location

Date	CSP #	TA	Building	Room	Other	
Owning organization		Primary contact		Z #	Organization	Telephone
Action ☐ Add new space ☐ Re-evaluate/update ☐ New location/owner ☐ Archive (explain below)						
Location description						

B) Type and Function (Mark all that apply and describe selections as necessary.)

☐ Manhole	☐ Tunnel	☐ Pit	☐ Elevator shaft	☐ Cyclone
☐ Tank	☐ Vault	☐ Trap	☐ Mixer	☐ Oven
☐ Duct	☐ Well	☐ Bin	☐ Caisson	☐ Furnace
☐ Silo	☐ Hopper	☐ Fan housing	☐ Sump	☐ Vat
☐ Lift station	☐ Plenum	☐ Crawl space	☐ Boiler	☐ Trench
				☐ Other_____

Additional description		
Opening position ☐ Vertical (through top/bottom) ☐ Horizontal (through side)		Number of openings
Opening size and shape		☐ Square ☐ Round
Expected frequency and duration of entry		Is the space transportable or mobile? ☐ Yes ☐ No
Description of confined space function		
Description of anticipated work within the confined space		

C) Confined Space Determination (Mark all that apply and comment as necessary.)

The Space

☐ Is large enough and so configured that an employee can bodily enter and perform assigned work?

☐ Has limited or restricted means for entry or exit?

☐ Is not designed for continuous employee occupancy?

Note: If all three above conditions are not met: (1)Explain reasoning below, and (2) proceed to Section E and indicate that the space is not a confined space

Comment(s)

Configuration conditionality or contingency? Explain

Form 1620 (6/12)

Page 1 of 4

D) Hazard Identification (Mark all that apply and describe all primary and secondary hazard selections in writing.)

Primary Hazards (existing or reasonable potential to exist)

- ☐ Oxygen deficiency (<19.5%)
- ☐ Oxygen enrichment (>23.5%)
- ☐ Flammable atmosphere (>10% LFL)
- ☐ Toxic gas/vapor/fume/aerosol (>PEL or TLV)
- ☐ Cryogen use/storage
- ☐ Heat stress or hot surfaces
- ☐ Cold stress
- ☐ Noise (>115 dBA,)
- ☐ High radiation area (Contact RP1 for Rad Permit)
- ☐ Airborne radioactivity area (Contact RP1 for Rad Permit)
- ☐ Nonionizing radiation (>PEL or TLV, RF/MW/Laser/UV/IR)
- ☐ Entrapment
- ☐ Engulfment
- ☐ Hazardous energy sources
  - ☐ Motive/Mechanical
  - ☐ Electrical
  - ☐ Pressurized gases/fluids
- ☐ Remote location (>50 feet to exit)
- ☐ Other serious safety or health hazard (specify below)

Description(s)

Secondary Hazards (Existing or reasonable potential to exist)

- ☐ Noise (>85 dBA, 8-hr TWA)
- ☐ Ionizing radiation (Airborne or external) (Contact RP-1)
- ☐ Nonionizing radiation (<PEL or TLV)
- ☐ Spark- or Flame-producing work
- ☐ Slips/Trips/Falls
- ☐ Lighting (Vision)
- ☐ Pedestrian and traffic hazards
- ☐ Asbestos (<PEL)
- ☐ Toxic gas/vapor/fume/aerosol (<PEL or TLV)
- ☐ Falling objects
- ☐ Sharp surfaces or protrusions
- ☐ Vibration
- ☐ Other chemical hazards
- ☐ Insects, snakes, vermin
- ☐ Other _____

Description(s)

Other entry-related issues (e.g., security, adjacent operations)

E) Confined Space Classification (Mark only one in upper section, and if applicable, only one alternate entry method.)

- ☐ **Not a Confined Space:** Does not meet ALL THREE criteria in Section C. Proceed to end and sign the evaluation.
- ☐ **Nonpermit Confined Space:** Meets all three criteria in Section C, but no primary hazards are identified in Section D.
- ☐ **Permit-Required Confined Space:** Meets all three criteria in Section C and an actual or potential primary hazard identified in Section D.

- ☐ **Permit-Required Confined Space/Potential for C5 Alternate Entry Procedure:** Meets all three criteria in Section C; only an actual or potential atmospheric primary hazard exists, and continuous ventilation alone is sufficient to maintain the space safe for entry.
  Complete Confined Space C5 Alternate Entry Procedure.
- ☐ **Permit-Required Confined Space/Potential for C7 Temporary Reclassification Certification:** Meets all three criteria in Section C; no actual or potential atmospheric primary hazard exists, and all primary hazards can be eliminated without entry and will not reoccur during the entry.
  The space can be reclassified to a nonpermit confined space for duration of entry. Supervisor completes C7 Temporary Reclassification Certification.

F) Posting (Mark all that apply and comment as necessary.)

- ☐ Not a confined space (posting optional)
- ☐ Nonpermit confined space
- ☐ Permit-required confined space

CSP # tag posted? ☐ Yes ☐ No

- ☐ Other posted warning signs (specify below)

Comment(s)

Form 1620 (06/12)

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Page 2 of 4

G) Isolation, Elimination, and Control Methods (Mark all that apply and describe all selections in writing.)

- ☐ Blinding/Blanking
- ☐ Double block and bleed
- ☐ Electrical grounding (GFCI)
- ☐ Lockout/tagout (LO/TO)
- ☐ Line breaking
- ☐ Purging
- ☐ Inerting
- ☐ Other _____
- ☐ Other _____

Description(s)

J) Anticipated Rescue Planning and Response Mode ***(Must select a mode and justify rescue stand-by mode. Describe other selections as necessary.)***

- ☐ Rescue Available
- ☐ Non-entry rescue equipment (specify below), or
- ☐ Not applicable or not feasible (describe below).

Description(s)

- ☐ Chest or full-body harness
- ☐ Wristlets or anklets
- ☐ Mechanical winch
- ☐ Fixed-point retrieval
- ☐ Tripod
- ☐ Boom
- ☐ Horizontal system
- ☐ Other _____
- ☐ Other _____

Comment(s)

- Engineering and Substitution
  - ☐ Forced-air ventilation
  - ☐ Exhaust ventilation
  - ☐ Pneumatic substitution
  - ☐ Explosion-proof equipment
  - ☐ Low-voltage lighting
  - ☐ Guarding
  - ☐ Shielding
  - ☐ Insulated tools
  - ☐ Other _____

Description(s)

K) Communications Equipment and Procedures (Mark all that apply.)

- PPE

Entry Operations

- ☐ Voice or visual (work will not interfere?)
- ☐ Rope signals (establish procedure)
- ☐ Personal Alert Safety System (PASS)
- ☐ Other _____
- ☐ Wire system
- ☐ Wireless system (faraday shielding issue?)
- ☐ Radio/PASS combination

Description(s)

Rescue Service Notification

- ☐ Telephone
- ☐ Cellular phone
- ☐ Two-way Radio
- ☐ Other _____

L) Recommended Air Monitoring (Mark all that apply and describe as necessary.)

- Administrative Controls
  - ☐ Other work permits
  - ☐ Inspection/verification
  - ☐ Other _____
- ☐ Multiple work shift procedures
- ☐ Alternate entry procedures
- ☐ Other _____

- ☐ Air monitoring required (specify below), or
- ☐ not required (justify below)
- ☐ % O_2
- ☐ % LFL
- ☐ H_2S
- ☐ CO
- ☐ Other _____
- ☐ CO_2
- ☐ Other _____

Description(s)

- ☐ Prior to entry
- ☐ Continuous during entry
- ☐ Periodic during entry? (specify) _____

Other considerations (e.g. location, interference's)

H) Expected Training Requirements (Mark all that apply and describe selections as necessary.)

Note: *Training may be required depending on the existing or potential hazards present in or around the confined space or due to the work performed in the space. Training needs during entry operations may vary.*

- ☒ *Introduction to hazard communication*
- ☒ *Confined entrant/attendant Live*
- ☐ *Lockout/tagout procedures*
- ☐ *LANL electrical safety program*
- ☐ *Electrical injury mechanisms*
- ☐ *Hazard-specific safety training (e.g., noise, lead, beryllium).*
- ☐ *Confined space entrant/attendant hands on*

Specific training

- ☐ *Asbestos awareness*
- ☐ *Pressure safety orientation*
- ☐ *Respirators: Air-purifying*
- ☐ *Other* _____ *(specify below)*
- ☐ *Other* _____ *(specify below)*

Air sampling/monitoring performed during evaluation? (Attach Form 1619, Supplemental Air Monitoring Data Sheet and Attendant/Entrant Log, if necessary to record results.)

Confined Space Evaluator	Signature	ZH	Date

RETURN COMPLETED EVALUATION TO IHS AT CSP, MS K403.

I) Other Equipment (Mark all that apply.)

- ☐ Ladder
- ☐ Battery flashlight or lantern
- ☐ Supplemental power
- ☐ Other _____
- ☐ Traffic cones
- ☐ Barriers (vehicle/pedestrian) and signs
- ☐ Fire extinguisher
- ☐ Other _____

M) Notes

STOP HERE IF NONPERMIT CONFINED SPACE. SIGN EVALUATION BELOW

Confined Space Evaluation

Course #19613

Case 3
Hands-On Exercise

Steam Pipe Vault

June 2016

Los Alamos
NATIONAL LABORATORY
EST. 1943

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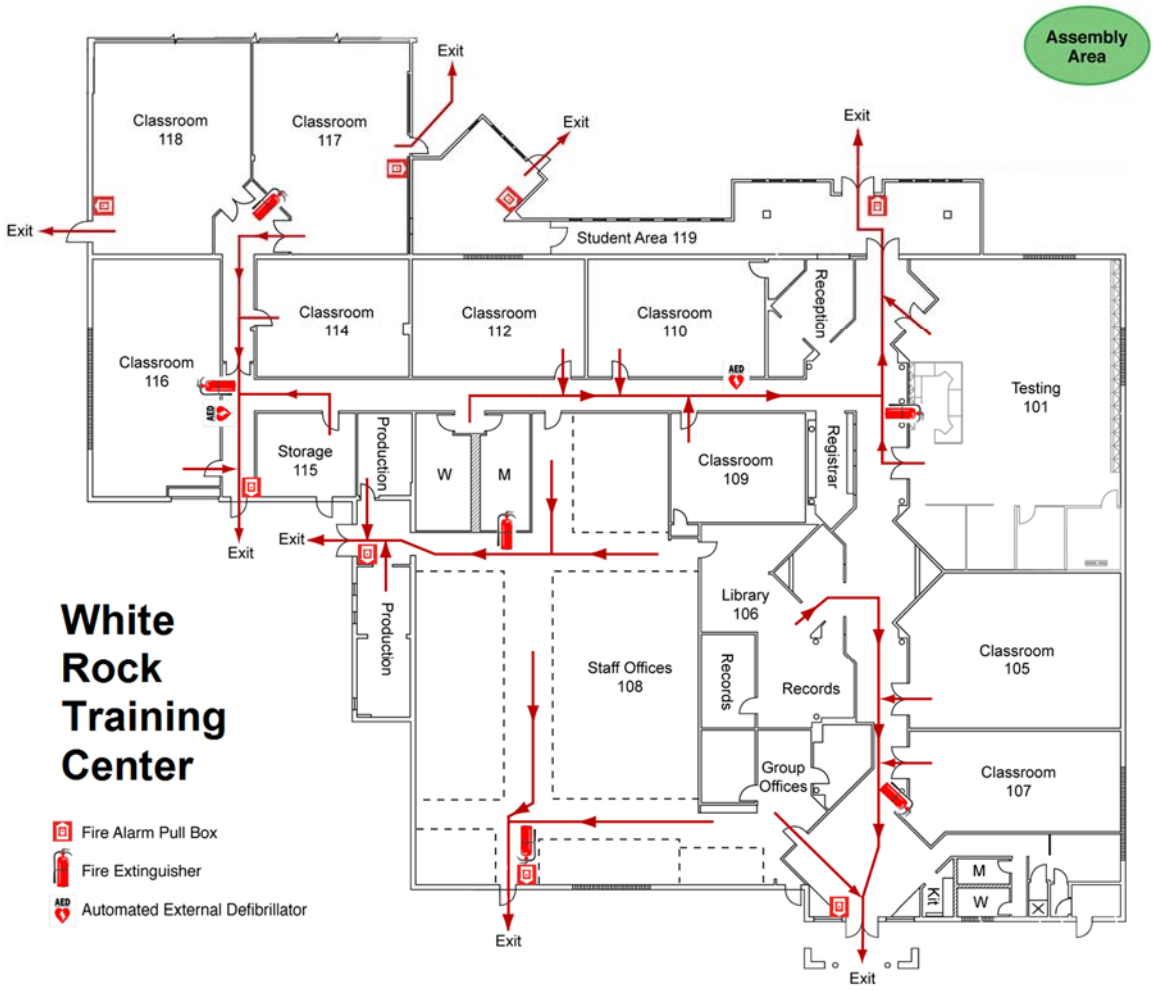

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Course Number: 19613
June 2016
LA-UR-16
Controlled Document Number: ConSp_Eval_19613_HO,R2.0

Confined Space, Case 3, Hands-On Exercise Steam Pipe Vault

Introduction

This exercise allows the participant to practice skills used to perform the following tasks:

- Evaluate a confined space
- Evaluate hazards associated with a permit-required confined space (PRCS)
- Complete a confined space evaluation
- Negotiate the LANL confined space information system

During the exercise, you will evaluate a space. You will be required to answer some questions and complete an evaluation form.

The answers to the numbered questions for the activities are found on the answer sheet to be handed out at the end of class.

Objectives

- Recognize the process and criteria for determining if a space is a confined space.
- Recognize hazards associated with a confined space.
- Recognize isolation, elimination, and control strategies for hazards associated with a confined space.
- Recognize the process and criteria for determining if a confined space is a PRCS.
- Recognize the process and criteria for determining if a C5 alternate entry procedure applies to a PRCS.
- Recognize the process and criteria for determining if a C7 reclassification applies to a PRCS.
- Recognize the criteria for a PRCS rescue.
- Recognize training, communications, and air monitoring requirements for a PRCS.

Disclaimer

Some information used in this classroom exercise is derived from a real space. None of the information presented by or derived from this exercise is intended for use outside the classroom during an actual permit-required confined space entry. This material is to be used for training only and may not accurately reflect conditions associated with a real confined space. Any confined space at LANL is to be addressed according to the provisions of the Confined Space Program.

Completion of this class does not guarantee competency of the student and does not confer “qualified” or “authorized” status.

Case 3: Steam Pipe Vault

Purpose

This exercise trains students to evaluate a confined space and complete a confined space evaluation.

Materials

1. Confined Space Evaluation course manual
2. Form 1620 - Confined Space Evaluation

Student Instructions

1. Read the Confined Space scenario.
2. Follow the directions, make considerations, or answer questions.
3. Fill out Form 1620 as required

Scenario

You are a confined space evaluator; your boss asks you to go to Technical Area 4 (TA-4) to evaluate a suspected confined space. A description of the confined space follows.

The space is a concrete vault that has a steam pipe located in it.

The vault is 10 ft square and 10 ft deep. The top is covered with heavy grating, with one 3-ft-x-3-ft section removable for entry. A ladder is vertical and built into the wall. The top 12 in. of the vault extends above grade.

A large pipe that carries steam to heat the building is located inside the containment.

PHOTOGRAPHS are located at the back of this handout.

1a. CONSIDER: What type of space is this? What are the design and function of the space?

1b. DIRECTION: Complete Section B of Form 1620.

2a. CONSIDER: Is this a confined space?

2b. DIRECTION: Complete Section C of Form 1620

3a. CONSIDER: All of the following 30-point hazard inspection criteria.
Do any of these hazards exist?
Does the existence of the hazard pose a risk?
Are the hazards primary or secondary?
Are there any hazards outside the space that may pose a risk to entrants?
Are there any hazards not represented on this list?

Something to Think About

Just because one of these "hazards" exists in the space does not automatically expose an entrant to a dangerous, health-threatening situation. For example, an electrical component in a space does not expose the entrant to the risk of electrocution unless there are exposed electrical circuits.

INSPECTION CRITERIA

Check all that apply to the space.

____ 1. Does the space contain or potentially contain a hazardous atmosphere?
____ 2. Does the space contain any chemicals or chemical residues?
____ 3. Does the space contain any flammable/combustible substances?
____ 4. Does the space contain or potentially contain any decomposing organic matter?
____ 5. Does the space have any pipes that bring chemicals into it?
____ 6. Does the space have any materials that can trap or potentially trap, engulf, or drown an entrant?
____ 7. Is vision obscured to 5 ft or less by dust?
____ 8. Does the space contain any mechanical equipment?
____ 9. Does the space have converging walls, sloped floors, or a tapered floor to smaller cross sections that could trap or asphyxiate an entrant?
____ 10. Does the tank or vessel contain rusted interior surfaces?
____ 11. Does the space contain thermal hazards (e.g., cold or hot)?
____ 12. Does the space contain excessive noise levels that could damage hearing or interfere with communication with an attendant?
____ 13. Does the space present any slip, trip, or fall hazards?

____ 14. Are there any operations conducted near the space opening that could present a hazard to the entrant?
____ 15. Are there any hazards from falling objects?
____ 16. Do lines under pressure service the space?
____ 17. Will cleaning solvents or paints be used in the space?
____ 18. Will welding, cutting, brazing, riveting, scraping, or sanding be performed in the space?
____ 19. Is electrical equipment located in or required for use in the space?
____ 20. Does the space have poor natural ventilation that would allow an atmospheric hazard to develop?
____ 21. Are there any corrosives that could irritate the eyes in the space?
____ 22. Do any conditions prevent an entrant's self-rescue from the space?
____ 23. Are any substances used in the space that could present acute hazards?
____ 24. Is mechanical ventilation needed to maintain a safe environment?
____ 25. Is air monitoring necessary to ensure that the space is safe for entry, despite a potentially hazardous atmosphere?
____ 26. Does the space have a vertical drop greater than 5 feet?
____ 27. Will residues be scraped off the interior surfaces of the vessel?
____ 28. Are nonsparking tools required to remove residues?
____ 29. Does the space restrict mobility to the extent that it could trap an entrant?
____ 30. Is respiratory protection required because of a hazard that would make it a permit space?

3b. DIRECTION: Complete Section D of Form 1620, and describe in detail any primary or secondary hazards.

4a. CONSIDER: Is this a PRCS?

4b. DIRECTION: Complete Section E of Form 1620.

4c. ANSWER THIS QUESTION: Is there any possibility of using a C5 Alternate Entry procedure? Why or why not?

4d. DIRECTION: If a C5 Alternate Entry procedure can be used to enter this PRCS, mark the box in Section E of Form 1620.

4e. ANSWER THIS QUESTION: Is there any possibility of using a C7 Temporary Reclassification? Why or why not?

4f. DIRECTION: If a C7 Temporary Reclassification can be used, mark the box in Section E of Form 1620.

5. DIRECTION: Complete Section G. Describe any methods for isolating hazards from the space, eliminating hazards, or controlling hazards.

6. DIRECTION: Complete Section H of Form 1620.

7. DIRECTION: Complete Section I of Form 1620.

8. DIRECTION: Complete Section J of Form 1620.

9. DIRECTION: Complete Section K of Form 1620.

10. DIRECTION: Complete Section L of Form 1620.

Case 3: Steam Pipe Vault

Case 3: Steam Pipe Vault

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Form 1620, Confined Space Evaluation

Form 1620

Los Alamos NATIONAL LABORATORY EST.1943

Confined Space Evaluation

A) General Information and Location

Date	CSP #	TA	Building	Room	Other	
Owning organization		Primary contact		Z #	Organization	Telephone

Action ☐ Add new space ☐ Re-evaluate/update ☐ New location/owner ☐ Archive (explain below)

Location description

B) Type and Function (Mark all that apply and describe selections as necessary.)

☐ Manhole	☐ Tunnel	☐ Pit	☐ Elevator shaft	☐ Cyclone
☐ Tank	☐ Vault	☐ Trap	☐ Mixer	☐ Oven
☐ Duct	☐ Well	☐ Bin	☐ Caisson	☐ Furnace
☐ Silo	☐ Hopper	☐ Fan housing	☐ Sump	☐ Vat
☐ Lift station	☐ Plenum	☐ Crawl space	☐ Boiler	☐ Trench
				☐ Other_____

Additional description

Opening position ☐ Vertical (through top/bottom) ☐ Horizontal (through side) | Number of openings

Opening size and shape ☐ Square ☐ Round

Expected frequency and duration of entry | Is the space transportable or mobile? ☐ Yes ☐ No

Description of confined space function

Description of anticipated work within the confined space

C) Confined Space Determination (Mark all that apply and comment as necessary.)

The Space

☐ Is large enough and so configured that an employee can bodily enter and perform assigned work?

☐ Has limited or restricted means for entry or exit?

☐ Is not designed for continuous employee occupancy?

Note: If all three above conditions are not met: (1)Explain reasoning below, and (2) proceed to Section E and indicate that the space is not a confined space

Comment(s)

Configuration conditionality or contingency? Explain

Form 1620 (6/12)

Page 1 of 4

D) Hazard Identification (Mark all that apply and describe all primary and secondary hazard selections in writing.)

Primary Hazards (existing or reasonable potential to exist)

- ☐ Oxygen deficiency (<19.5%)
- ☐ Oxygen enrichment (>23.5%)
- ☐ Flammable atmosphere (>10% LFL)
- ☐ Toxic gas/vapor/fume/aerosol (>PEL or TLV)
- ☐ Cryogen use/storage
- ☐ Heat stress or hot surfaces
- ☐ Cold stress
- ☐ Noise (>115 dBA,)
- ☐ High radiation area (Contact RP1 for Rad Permit)
- ☐ Airborne radioactivity area (Contact RP1 for Rad Permit)
- ☐ Nonionizing radiation (>PEL or TLV, RF/MW/Laser/UV/IR)
- ☐ Entrapment
- ☐ Engulfment
- ☐ Hazardous energy sources
  - ☐ Motive/Mechanical
  - ☐ Electrical
  - ☐ Pressurized gases/fluids
- ☐ Remote location (>50 feet to exit)
- ☐ Other serious safety or health hazard (specify below)

Description(s)

Secondary Hazards (Existing or reasonable potential to exist)

- ☐ Noise (>85 dBA, 8-hr TWA)
- ☐ Ionizing radiation (Airborne or external) (Contact RP-1)
- ☐ Nonionizing radiation (<PEL or TLV)
- ☐ Spark- or Flame-producing work
- ☐ Slips/Trips/Falls
- ☐ Lighting (Vision)
- ☐ Pedestrian and traffic hazards
- ☐ Asbestos (<PEL)
- ☐ Toxic gas/vapor/fume/aerosol (<PEL or TLV)
- ☐ Falling objects
- ☐ Sharp surfaces or protrusions
- ☐ Vibration
- ☐ Other chemical hazards
- ☐ Insects, snakes, vermin
- ☐ Other _____

Description(s)

Other entry-related issues (e.g., security, adjacent operations)

E) Confined Space Classification (Mark only one in upper section, and if applicable, only one alternate entry method.)

- ☐ **Not a Confined Space:** Does not meet ALL THREE criteria in Section C. Proceed to end and sign the evaluation.
- ☐ **Nonpermit Confined Space:** Meets all three criteria in Section C, but no primary hazards are identified in Section D.
- ☐ **Permit-Required Confined Space:** Meets all three criteria in Section C and an actual or potential primary hazard identified in Section D.

- ☐ **Permit-Required Confined Space/Potential for C5 Alternate Entry Procedure:** Meets all three criteria in Section C; only an actual or potential atmospheric primary hazard exists, and continuous ventilation alone is sufficient to maintain the space safe for entry.
  Complete Confined Space C5 Alternate Entry Procedure.
- ☐ **Permit-Required Confined Space/Potential for C7 Temporary Reclassification Certification:** Meets all three criteria in Section C; no actual or potential atmospheric primary hazard exists, and all primary hazards can be eliminated without entry and will not reoccur during the entry.
  The space can be reclassified to a nonpermit confined space for duration of entry. Supervisor completes C7 Temporary Reclassification Certification.

F) Posting (Mark all that apply and comment as necessary.)

- ☐ Not a confined space (posting optional)
- ☐ Nonpermit confined space
- ☐ Permit-required confined space

CSP # tag posted? ☐ Yes ☐ No

- ☐ Other posted warning signs (specify below)

Comment(s)

Form 1620 (06/12)

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Page 2 of 4

G) Isolation, Elimination, and Control Methods (Mark all that apply and describe all selections in writing.)

- Alteration and Isolation
  - ☐ Blinding/Blanking
  - ☐ Double block and bleed
  - ☐ Electrical grounding (GFCI)
  - ☐ Lockout/tagout (LO/TO)
  - ☐ Line breaking
  - ☐ Purging
  - ☐ Inerting
  - ☐ Other _____
  - ☐ Other _____

Description(s)

- Engineering and Substitution
  - ☐ Forced-air ventilation
  - ☐ Exhaust ventilation
  - ☐ Pneumatic substitution
  - ☐ Explosion-proof equipment
  - ☐ Low-voltage lighting
  - ☐ Guarding
  - ☐ Shielding
  - ☐ Insulated tools
  - ☐ Other _____

Description(s)

- PPE
  - ☐ Fresh-air breathing equipment
  - ☐ Chemical protective clothing
  - ☐ Air-purifying respirator
  - ☐ Head protection
  - ☐ Eye/Face protection
  - ☐ Hearing protection
  - ☐ Other _____
  - ☐ Other _____
  - ☐ Other _____

Description(s)

- Administrative Controls
  - ☐ Other work permits
  - ☐ Inspection/verification
  - ☐ Multiple work shift procedures
  - ☐ Alternate entry procedures
  - ☐ Other _____
  - ☐ Other _____

Description(s)

H) Expected Training Requirements (Mark all that apply and describe selections as necessary.)

Note: *Training may be required depending on the existing or potential hazards present in or around the confined space or due to the work performed in the space. Training needs during entry operations may vary.*

- ☒ *Introduction to hazard communication*
- ☒ *Confined entrant/attendant Live*
- ☐ *Lockout/tagout procedures*
- ☐ *LANL electrical safety program*
- ☐ *Electrical injury mechanisms*
- ☐ *Hazard-specific safety training (e.g., noise, lead, beryllium).*
- ☐ *Confined space entrant/attendant hands on*
- ☐ *Asbestos awareness*
- ☐ *Pressure safety orientation*
- ☐ *Respirators: Air-purifying*
- ☐ *Other _____(specify below)*
- ☐ *Other _____(specify below)*

Specific training

I) Other Equipment (Mark all that apply.)

- ☐ Ladder
- ☐ Battery flashlight or lantern
- ☐ Supplemental power
- ☐ Other _____
- ☐ Traffic cones
- ☐ Barriers (vehicle/pedestrian) and signs
- ☐ Fire extinguisher
- ☐ Other _____

STOP HERE IF NONPERMIT CONFINED SPACE. SIGN EVALUATION BELOW

SAVE PRINT CLEAR FORM

J) Anticipated Rescue Planning and Response Mode ***(Must select a mode and justify rescue stand-by mode. Describe other selections as necessary.)***

☐ Rescue Available
☐ Nonentry rescue equipment (specify below), or ☐ Not applicable or not feasible (describe below).

☐ Chest or full-body harness	☐ Fixed-point retrieval	☐ Horizontal system
☐ Wristlets or anklets	☐ Tripod	☐ Other _____
☐ Mechanical winch	☐ Boom	☐ Other_____

Comment(s)

☐ Rescue Stand-By (on-site)

K) Communications Equipment and Procedures (Mark all that apply.)

Entry Operations

☐ Voice or visual (work will not interfere?)	☐ Wire system
☐ Rope signals (establish procedure)	☐ Wireless system (faraday shielding issue?)
☐ Personal Alert Safety System (PASS)	☐ Radio/PASS combination
☐ Other _____	

Rescue Service Notification

☐ Telephone ☐ Cellular phone ☐ Two-way Radio ☐ Other _____

L) Recommended Air Monitoring (Mark all that apply and describe as necessary.)

☐ Air monitoring required (specify below), or ☐ not required (justify below)

☐ % 0_2	☐ % LFL	☐ H_2S	☐ CO	☐ CO_2
☐ Other _____	☐ Other _____		☐ Other _____	

☐ Prior to entry ☐ Continuous during entry ☐ Periodic during entry? (specify) _____

Other considerations (e.g. location, interference's)

Air sampling/monitoring performed during evaluation? (Attach Form 1619, *Supplemental Air-Monitoring Data Sheet and Attendant/Entrant Log*, if necessary to record results.)

Confined Space Evaluator	Signature	Z#	Date

RETURN COMPLETED EVALUATION TO IHS AT CSP, MS K403.

M) Notes

Form 1620 (06/12) Page 4 of 4

Confined Space Evaluation

Course #19613

Case 4
Hands-On Exercise

Air Conditioner

June 2016

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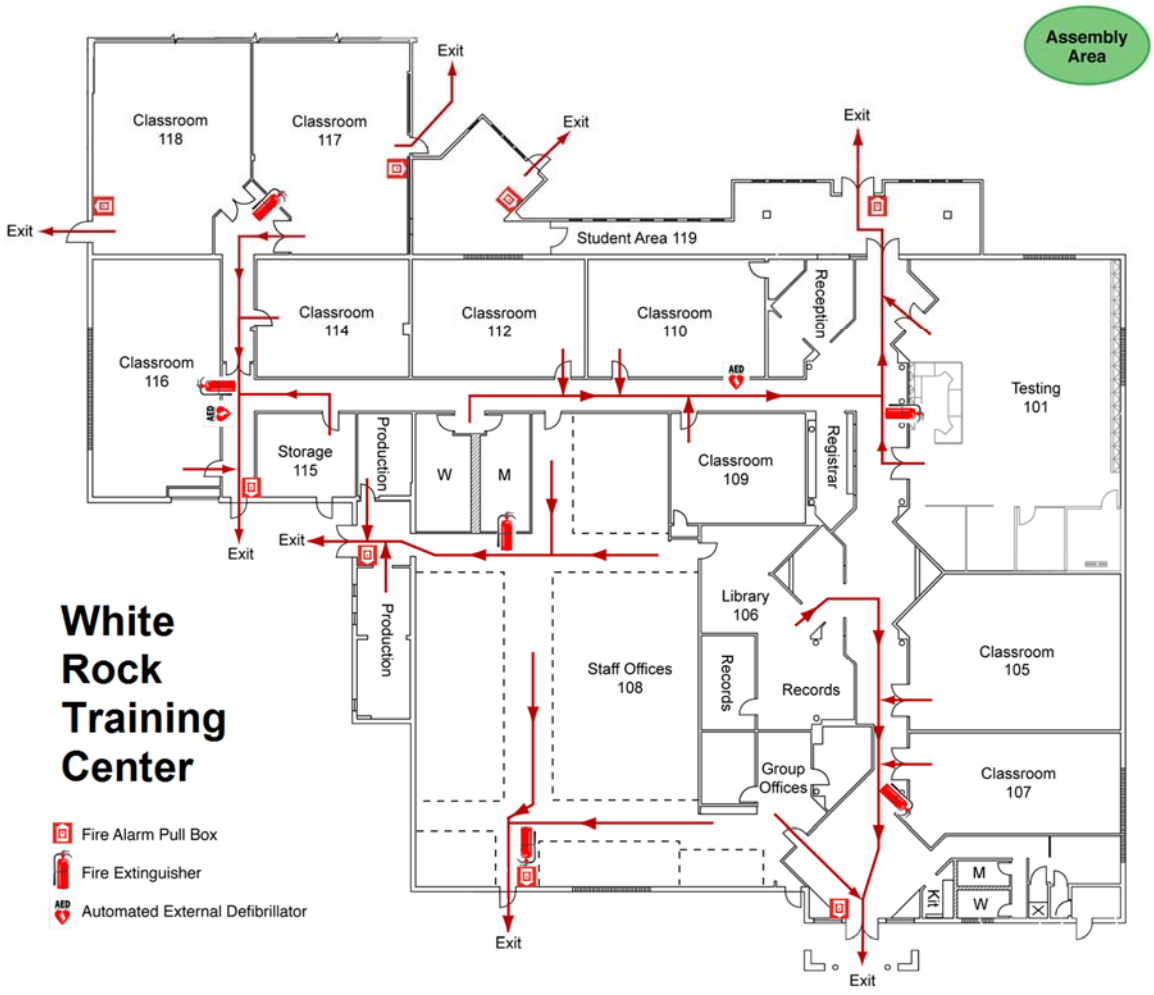

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Editor/Compositor: Lisa Rothrock

Course Number: 19613
June 2016
LA-UR-16-
Controlled Document Number: ConSp_Eval_19613_HO,R2.0

Confined Space, Case 4, Hands-On Exercise Air Conditioner

Introduction

This exercise allows the participant to practice skills used to perform the following tasks:

- Evaluate a confined space
- Evaluate hazards associated with a permit-required confined space (PRCS)
- Complete a confined space evaluation
- Negotiate the LANL confined space information system

During the exercise, you will evaluate a space. You will be required to answer some questions and complete an evaluation form.

The answers to the numbered questions for the activities are found on the answer sheet to be handed out at the end of class.

Objectives

- Recognize the process and criteria for determining if a space is a confined space.
- Recognize hazards associated with a confined space.
- Recognize isolation, elimination, and control strategies for hazards associated with a confined space.
- Recognize the process and criteria for determining if a confined space is a PRCS.
- Recognize the process and criteria for determining if a C5 alternate entry procedure applies to a PRCS.
- Recognize the process and criteria for determining if a C7 reclassification applies to a PRCS.
- Recognize the criteria for a PRCS rescue.
- Recognize training, communications, and air monitoring requirements for a PRCS.

Disclaimer

Some information used in this classroom exercise is derived from a real space. None of the information presented by or derived from this exercise is intended for use outside the classroom during an actual permit-required confined space entry. This material is to be used for training only and may not accurately reflect conditions associated with a real confined space. Any confined space at LANL is to be addressed according to the provisions of the Confined Space Program.

Completion of this class does not guarantee competency of the student and does not confer “qualified” or “authorized” status.

Case 4: Air Conditioner

Purpose

This exercise trains students to evaluate a confined space and complete a confined space evaluation.

Materials

1. Confined Space Evaluation course manual
2. Form 1620 - Confined Space Evaluation

Student Instructions

1. Read the Confined Space scenario.
2. Follow the directions, make considerations, or answer questions.
3. Fill out Form 1620 as required

Scenario

You are a confined space evaluator; your boss asks you to go to Technical Area 3 (TA-3) to evaluate a suspected confined space. A description of the confined space follows.

The space is an air conditioning unit. The panel removed to access the motor is 40 in. by 25 in. A fan motor and associated wiring are located inside. The work might include changing the fan belt. There is no more to the space than is seen in the photographs, and it is doubtful that a worker could insert the entire body into the space.

PHOTOGRAPHS are located at the back of this handout.

1a. CONSIDER: What type of a space is this? What are the design and function of the space?

1b. DIRECTION: Complete Section B of Form 1620.

2a. CONSIDER: Is this a confined space?

2b. DIRECTION: Complete Section C of Form 1620.

3a. CONSIDER: All of the following 30-point hazard inspection criteria.
Do any of these hazards exist?
Does the existence of the hazard pose a risk?
Are the hazards primary or secondary?
Are there any hazards outside the space that may pose a risk to entrants?
Are there any hazards not represented on this list?

Something to Think About

Just because one of these "hazards" exists in the space does not automatically expose an entrant to a dangerous, health-threatening situation. For example, an electrical component in a space does not expose the entrant to the risk of electrocution unless there are exposed electrical circuits.

INSPECTION CRITERIA

Check all that apply to the space.

____ 1. Does the space contain or potentially contain a hazardous atmosphere?
____ 2. Does the space contain any chemicals or chemical residues?
____ 3. Does the space contain any flammable/combustible substances?
____ 4. Does the space contain or potentially contain any decomposing organic matter?
____ 5. Does the space have any pipes that bring chemicals into it?
____ 6. Does the space have any materials that can trap or potentially trap, engulf, or drown an entrant?
____ 7. Is vision obscured to 5 ft or less by dust?
____ 8. Does the space contain any mechanical equipment?
____ 9. Does the space have converging walls, sloped floors, or a tapered floor to smaller cross sections that could trap or asphyxiate an entrant?
____ 10. Does the tank or vessel contain rusted interior surfaces?
____ 11. Does the space contain thermal hazards (e.g., cold or hot)?
____ 12. Does the space contain excessive noise levels that could damage hearing or interfere with communication with an attendant?
____ 13. Does the space present any slip, trip, or fall hazards?

____ 14. Are there any operations conducted near the space opening that could present a hazard to the entrant?
____ 15. Are there any hazards from falling objects?
____ 16. Do lines under pressure service the space?
____ 17. Will cleaning solvents or paints be used in the space?
____ 18. Will welding, cutting, brazing, riveting, scraping, or sanding be performed in the space?
____ 19. Is electrical equipment located in or required for use in the space?
____ 20. Does the space have poor natural ventilation that would allow an atmospheric hazard to develop?
____ 21. Are there any corrosives that could irritate the eyes in the space?
____ 22. Do any conditions prevent an entrant's self-rescue from the space?
____ 23. Are any substances used in the space that could present acute hazards?
____ 24. Is mechanical ventilation needed to maintain a safe environment?
____ 25. Is air monitoring necessary to ensure that the space is safe for entry, despite a potentially hazardous atmosphere?
____ 26. Does the space have a vertical drop greater than 5 feet?
____ 27. Will residues be scraped off the interior surfaces of the vessel?
____ 28. Are nonsparking tools required to remove residues?
____ 29. Does the space restrict mobility to the extent that it could trap an entrant?
____ 30. Is respiratory protection required because of a hazard that would make it a permit space?

3b. DIRECTION: Complete Section D of Form 1620, and describe in detail any primary or secondary hazards.

4a. Consider: Is this a permit required confined space?

4b. DIRECTION: Complete Section E of Form 1620.

4c. ANSWER THIS QUESTION: Is there any possibility of using a C5 Alternate Entry procedure? Why or why not?

4d. DIRECTION: If a C5 Alternate Entry procedure can be used to enter this PRCS, mark the box in Section E of Form 1620.

4e. ANSWER THIS QUESTION: Is there any possibility of using a C7 Temporary Reclassification? Why or why not?

4f. DIRECTION: If a C7 Temporary Reclassification can be used, mark the box in Section E of Form 1620.

5. DIRECTION: Complete Section G. Describe any methods for isolating hazards from the space, eliminating hazards, or controlling hazards.

6. DIRECTION: Complete Section H of Form 1620.

7. DIRECTION: Complete Section I of Form 1620.

8. DIRECTION: Complete Section J of Form 1620.

9. DIRECTION: Complete Section K of Form 1620.

10. DIRECTION: Complete Section L of Form 1620.

Case 4: Air Conditioner

Form 1620, Confined Space Evaluation

Form 1620

Los Alamos NATIONAL LABORATORY EST.1943

Confined Space Evaluation

A) General Information and Location

Date	CSP #	TA	Building	Room	Other	
Owning organization		Primary contact		Z #	Organization	Telephone

Action ☐ Add new space ☐ Re-evaluate/update ☐ New location/owner ☐ Archive (explain below)

Location description

B) Type and Function (Mark all that apply and describe selections as necessary.)

☐ Manhole	☐ Tunnel	☐ Pit	☐ Elevator shaft	☐ Cyclone
☐ Tank	☐ Vault	☐ Trap	☐ Mixer	☐ Oven
☐ Duct	☐ Well	☐ Bin	☐ Caisson	☐ Furnace
☐ Silo	☐ Hopper	☐ Fan housing	☐ Sump	☐ Vat
☐ Lift station	☐ Plenum	☐ Crawl space	☐ Boiler	☐ Trench
				☐ Other_____

Additional description

Opening position ☐ Vertical (through top/bottom) ☐ Horizontal (through side) | Number of openings

Opening size and shape ☐ Square ☐ Round

Expected frequency and duration of entry | Is the space transportable or mobile? ☐ Yes ☐ No

Description of confined space function

Description of anticipated work within the confined space

C) Confined Space Determination (Mark all that apply and comment as necessary.)

The Space

☐ Is large enough and so configured that an employee can bodily enter and perform assigned work?

☐ Has limited or restricted means for entry or exit?

☐ Is not designed for continuous employee occupancy?

Note: If all three above conditions are not met: (1)Explain reasoning below, and (2) proceed to Section E and indicate that the space is not a confined space

Comment(s)

Configuration conditionality or contingency? Explain

Form 1620 (6/12)

Page 1 of 4

D) Hazard Identification (Mark all that apply and describe all primary and secondary hazard selections in writing.)

Primary Hazards (existing or reasonable potential to exist)

- ☐ Oxygen deficiency (<19.5%)
- ☐ Oxygen enrichment (>23.5%)
- ☐ Flammable atmosphere (>10% LFL)
- ☐ Toxic gas/vapor/fume/aerosol (>PEL or TLV)
- ☐ Cryogen use/storage
- ☐ Heat stress or hot surfaces
- ☐ Cold stress
- ☐ Noise (>115 dBA,)
- ☐ High radiation area (Contact RP1 for Rad Permit)
- ☐ Airborne radioactivity area (Contact RP1 for Rad Permit)
- ☐ Nonionizing radiation (>PEL or TLV, RF/MW/Laser/UV/IR)
- ☐ Entrapment
- ☐ Engulfment
- ☐ Hazardous energy sources
  - ☐ Motive/Mechanical
  - ☐ Electrical
  - ☐ Pressurized gases/fluids
- ☐ Remote location (>50 feet to exit)
- ☐ Other serious safety or health hazard (specify below)

Description(s)

Secondary Hazards (Existing or reasonable potential to exist)

- ☐ Noise (>85 dBA, 8-hr TWA)
- ☐ Ionizing radiation (Airborne or external) (Contact RP-1)
- ☐ Nonionizing radiation (<PEL or TLV)
- ☐ Spark- or Flame-producing work
- ☐ Slips/Trips/Falls
- ☐ Lighting (Vision)
- ☐ Pedestrian and traffic hazards
- ☐ Asbestos (<PEL)
- ☐ Toxic gas/vapor/fume/aerosol (<PEL or TLV)
- ☐ Falling objects
- ☐ Sharp surfaces or protrusions
- ☐ Vibration
- ☐ Other chemical hazards
- ☐ Insects, snakes, vermin
- ☐ Other _____

Description(s)

Other entry-related issues (e.g., security, adjacent operations)

E) Confined Space Classification (Mark only one in upper section, and if applicable, only one alternate entry method.)

- ☐ **Not a Confined Space:** Does not meet ALL THREE criteria in Section C. Proceed to end and sign the evaluation.
- ☐ **Nonpermit Confined Space:** Meets all three criteria in Section C, but no primary hazards are identified in Section D.
- ☐ **Permit-Required Confined Space:** Meets all three criteria in Section C and an actual or potential primary hazard identified in Section D.

- ☐ **Permit-Required Confined Space/Potential for C5 Alternate Entry Procedure:** Meets all three criteria in Section C; only an actual or potential atmospheric primary hazard exists, and continuous ventilation alone is sufficient to maintain the space safe for entry.
  Complete Confined Space C5 Alternate Entry Procedure.
- ☐ **Permit-Required Confined Space/Potential for C7 Temporary Reclassification Certification:** Meets all three criteria in Section C; no actual or potential atmospheric primary hazard exists, and all primary hazards can be eliminated without entry and will not reoccur during the entry.
  The space can be reclassified to a nonpermit confined space for duration of entry. Supervisor completes C7 Temporary Reclassification Certification.

F) Posting (Mark all that apply and comment as necessary.)

- ☐ Not a confined space (posting optional)
- ☐ Nonpermit confined space
- ☐ Permit-required confined space

CSP # tag posted? ☐ Yes ☐ No

☐ Other posted warning signs (specify below)

Comment(s)

Form 1620 (06/12)

SAVE PRINT CLEAR FORM

Page 2 of 4

G) Isolation, Elimination, and Control Methods (Mark all that apply and describe all selections in writing.)

- Alteration and Isolation

☐ Blinding/Blanking	☐ Lockout/tagout (LO/TO)	☐ Inerting
☐ Double block and bleed	☐ Line breaking	☐ Other _____
☐ Electrical grounding (GFCI)	☐ Purging	☐ Other _____

Description(s)

- Engineering and Substitution

☐ Forced-air ventilation	☐ Explosion-proof equipment	☐ Shielding
☐ Exhaust ventilation	☐ Low-voltage lighting	☐ Insulated tools
☐ Pneumatic substitution	☐ Guarding	☐ Other _____

Description(s)

- PPE

☐ Fresh-air breathing equipment	☐ Head protection	☐ Other _____
☐ Chemical protective clothing	☐ Eye/Face protection	☐ Other _____
☐ Air-purifying respirator	☐ Hearing protection	☐ Other _____

Description(s)

- Administrative Controls

☐ Other work permits	☐ Multiple work shift procedures	☐ Other _____
☐ Inspection/verification	☐ Alternate entry procedures	☐ Other _____

Description(s)

H) Expected Training Requirements (Mark all that apply and describe selections as necessary.)

Note: *Training may be required depending on the existing or potential hazards present in or around the confined space or due to the work performed in the space. Training needs during entry operations may vary.*

☒ *Introduction to hazard communication*	
☒ *Confined entrant/attendant Live*	☐ *Asbestos awareness*
☐ *Lockout/tagout procedures*	☐ *Pressure safety orientation*
☐ *LANL electrical safety program*	☐ *Respirators: Air-purifying*
☐ *Electrical injury mechanisms*	☐ *Other* _____*(specify below)*
☐ *Hazard-specific safety training (e.g., noise, lead, beryllium).*	☐ *Other* _____*(specify below)*
☐ *Confined space entrant/attendant hands on*	

Specific training

I) Other Equipment (Mark all that apply.)

☐ Ladder	☐ Traffic cones
☐ Battery flashlight or lantern	☐ Barriers (vehicle/pedestrian) and signs
☐ Supplemental power	☐ Fire extinguisher
☐ Other _____	☐ Other _____

STOP HERE IF NONPERMIT CONFINED SPACE. SIGN EVALUATION BELOW

Form 1620 (06/12) Page 3 of 4

SAVE PRINT CLEAR FORM

J) Anticipated Rescue Planning and Response Mode ***(Must select a mode and justify rescue stand-by mode. Describe other selections as necessary.)***

☐ Rescue Available
☐ Nonentry rescue equipment (specify below), or ☐ Not applicable or not feasible (describe below).

☐ Chest or full-body harness	☐ Fixed-point retrieval	☐ Horizontal system
☐ Wristlets or anklets	☐ Tripod	☐ Other _____
☐ Mechanical winch	☐ Boom	☐ Other_____

Comment(s)

☐ Rescue Stand-By (on-site)

K) Communications Equipment and Procedures (Mark all that apply.)

Entry Operations

☐ Voice or visual (work will not interfere?)	☐ Wire system
☐ Rope signals (establish procedure)	☐ Wireless system (faraday shielding issue?)
☐ Personal Alert Safety System (PASS)	☐ Radio/PASS combination
☐ Other _____	

Rescue Service Notification

☐ Telephone ☐ Cellular phone ☐ Two-way Radio ☐ Other _____

L) Recommended Air Monitoring (Mark all that apply and describe as necessary.)

☐ Air monitoring required (specify below), or ☐ not required (justify below)

☐ % 0_2	☐ % LFL	☐ H_2S	☐ CO	☐ CO_2
☐ Other _____	☐ Other _____		☐ Other _____	

☐ Prior to entry ☐ Continuous during entry ☐ Periodic during entry? (specify) _____

Other considerations (e.g. location, interference's)

Air sampling/monitoring performed during evaluation? (Attach Form 1619, *Supplemental Air-Monitoring Data Sheet and Attendant/Entrant Log*, if necessary to record results.)

Confined Space Evaluator	Signature	Z#	Date

RETURN COMPLETED EVALUATION TO IHS AT CSP, MS K403.

M) Notes

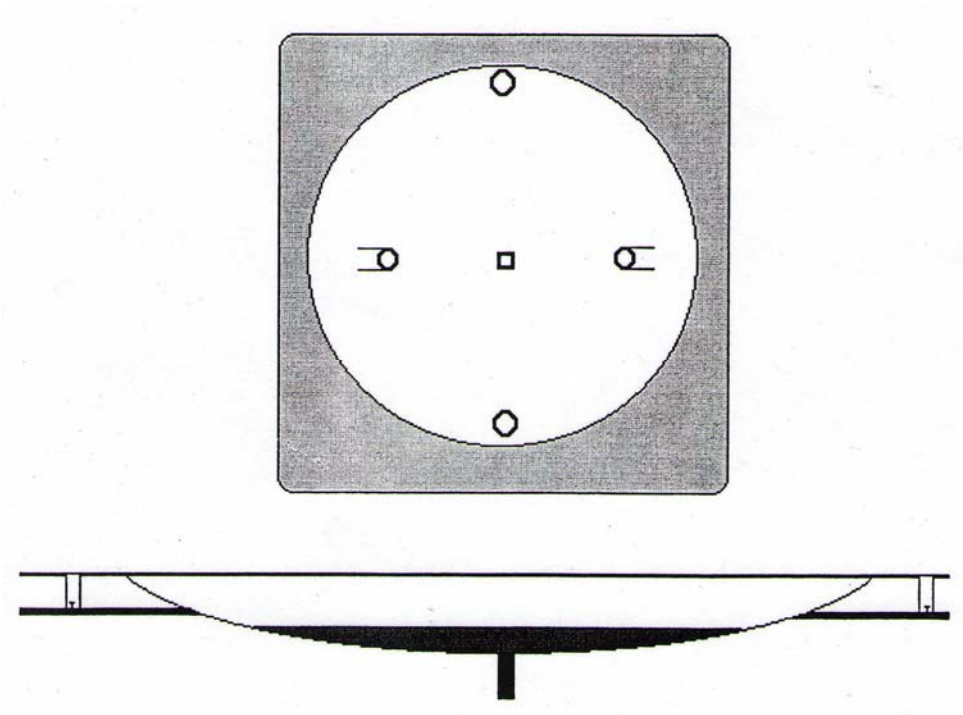
Form 1620 (06/12) Page 4 of 4

Confined Space Evaluation

Course #19613

Case 5
Hands-On Exercise

Holding Pond



June 2016

Los Alamos
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EST. 1943

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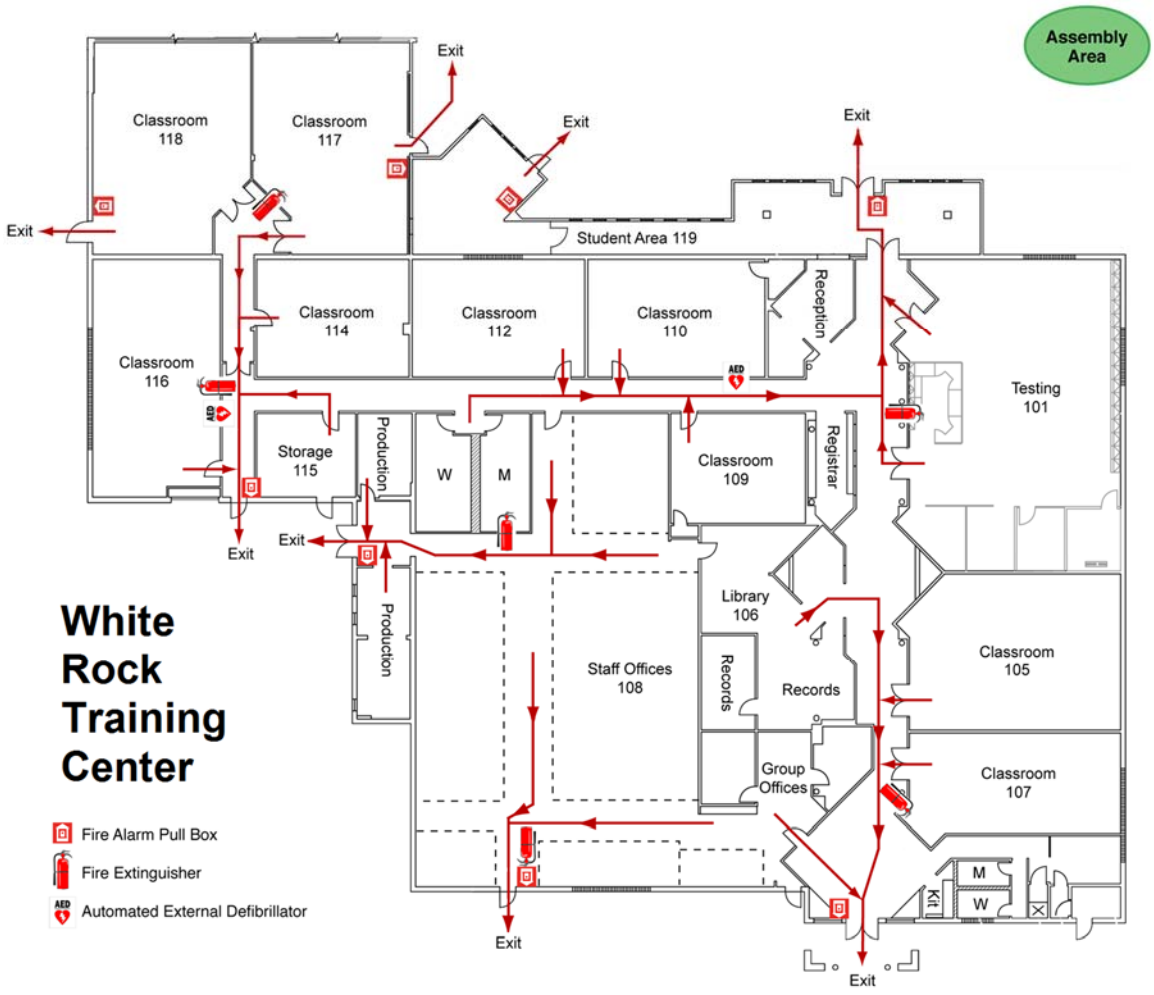


Central Training-Institutional Training Services Group Leader: *Cindy Dutro*
Instructional Designer: *Mike Chochoms*
Technical Advisor: *John Breiner*
Editor/Compositor: *Lisa Rothrock*

Course Number: 19613
June 2016
LA-UR-16-
Controlled Document Number: Crane_Incidental_Ordinary_Lift_Ex_19613_HO,R2.0

Confined Space, Case 5, Hands-On Exercise Holding Pond

Introduction

This exercise allows the participant to practice skills used to perform the following tasks:

- Evaluate a confined space
- Evaluate hazards associated with a permit-required confined space (PRCS)
- Complete a confined space evaluation
- Negotiate the LANL confined space information system

During the exercise, you will evaluate a space. You will be required to answer some questions and complete an evaluation form.

The answers to the numbered questions for the activities are found on the answer sheet to be handed out at the end of class.

Objectives

- Recognize the process and criteria for determining if a space is a confined space.
- Recognize hazards associated with a confined space.
- Recognize isolation, elimination, and control strategies for hazards associated with a confined space.
- Recognize the process and criteria for determining if a confined space is a PRCS.
- Recognize the process and criteria for determining if a C5 alternate entry procedure applies to a PRCS.
- Recognize the process and criteria for determining if a C7 reclassification applies to a PRCS.
- Recognize the criteria for a PRCS rescue.
- Recognize training, communications, and air monitoring requirements for a PRCS.

Disclaimer

Some information used in this classroom exercise is derived from a real space. None of the information presented by or derived from this exercise is intended for use outside the classroom during an actual permit-required confined space entry. This material is to be used for training only and may not accurately reflect conditions associated with a real confined space. Any confined space at LANL is to be addressed according to the provisions of the Confined Space Program.

Completion of this class does not guarantee competency of the student and does not confer “qualified” or “authorized” status.

Case 5: Holding Pond

Purpose

This exercise trains students to evaluate a confined space and complete a confined space evaluation.

Materials

1. Confined Space Evaluation course manual
2. Form 1620 - Confined Space Evaluation

Student Instructions

1. Read the Confined Space scenario.
2. Follow the directions, make considerations, or answer questions.
3. Fill out Form 1620 as required

Scenario

You are a confined space evaluator; your boss asks you to go to Technical Area 16 (TA-16) to evaluate a suspected confined space. A description of the space follows.

The space is a holding pond that is 250 ft in diameter and has the capacity to contain 4 million gallons of water. The entire surface is covered by a black tarp that is suspended at a height of 15 ft over the center of the pond when the pond is empty, gradually lowering to a height of about 4 ft at the side entrances. There are two entrances: one at the north end and one at the south end. The entrances are circular ports approximately 2 ft in diameter that lead to a surface that slopes evenly to the center at an angle of about 30 degrees. The area of the sloping surface depends on the amount of water in the pond. The pond is lined with cement, which has a thin layer of algae, and currently contains about 3 ft of water. The cement is slick, but you can move slowly up and down the slope without the need to crawl or use a rope.

Two 8-in.-diameter pipes opposite each other transfer storm water runoff into the holding pond, which has a 24-in.-diameter drain in the center. The drain has a welded grate cover that cannot be removed.

A knowledgeable person says that the work crew will use poles to retrieve detector plates located throughout the space and 5–15 ft from the water line.

1a. CONSIDER: What type of a space is this? What are the design and function of the space?

1b. DIRECTION: Complete Section B of Form 1620.

2a. CONSIDER: Is this a confined space?

2b. DIRECTION: Complete Section C of Form 1620.

3a. CONSIDER: All of the following 30-point hazard inspection criteria.
Do any of these hazards exist?
Does the existence of the hazard pose a risk?
Are the hazards primary or secondary?
Are there any hazards outside the space that may pose a risk to entrants?
Are there any hazards not represented on this list?

Something to Think About

Just because one of these "hazards" exists in the space does not automatically expose an entrant to a dangerous, health-threatening situation. For example, an electrical component in a space does not expose the entrant to the risk of electrocution unless there are exposed electrical circuits.

INSPECTION CRITERIA

Check all that apply to the space.

____ 1. Does the space contain or potentially contain a hazardous atmosphere?
____ 2. Does the space contain any chemicals or chemical residues?
____ 3. Does the space contain any flammable/combustible substances?
____ 4. Does the space contain or potentially contain any decomposing organic matter?
____ 5. Does the space have any pipes that bring chemicals into it?
____ 6. Does the space have any materials that can trap or potentially trap, engulf, or drown an entrant?
____ 7. Is vision obscured to 5 ft or less by dust?
____ 8. Does the space contain any mechanical equipment?
____ 9. Does the space have converging walls, sloped floors, or s tapered floor to smaller cross sections that could trap or asphyxiate an entrant?
____ 10. Does the tank or vessel contain rusted interior surfaces?
____ 11. Does the space contain thermal hazards (e.g., cold or hot)?
____ 12. Does the space contain excessive noise levels that could damage hearing or interfere with communication with an attendant?
____ 13. Does the space present any slip, trip, or fall hazards?
____ 14. Are there any operations conducted near the space opening that could present a hazard to the entrant?
____ 15. Are there any hazards from falling objects?
____ 16. Do lines under pressure service the space?
____ 17. Will cleaning solvents or paints be used in the space?

____ 18. Will welding, cutting, brazing, riveting, scraping, or sanding be performed in the space?
____ 19. Is electrical equipment located in or required for use in the space?
____ 20. Does the space have poor natural ventilation that would allow an atmospheric hazard to develop?
____ 21. Are there any corrosives that could irritate the eyes in the space?
____ 22. Do any conditions prevent an entrant's self-rescue from the space?
____ 23. Are any substances used in the space that could present acute hazards?
____ 24. Is mechanical ventilation needed to maintain a safe environment?
____ 25. Is air monitoring necessary to ensure that the space is safe for entry, despite a potential hazardous atmosphere?
____ 26. Does the space have a vertical drop greater than 5 feet?
____ 27. Will residues be scraped off the interior surfaces of the vessel?
____ 28. Are nonsparking tools required to remove residues?
____ 29. Does the space restrict mobility to the extent that it could trap an entrant?
____ 30. Is respiratory protection required because of a hazard that would make it a permit space?

3b. DIRECTION: Complete Section D of Form 1620, and describe in detail any primary or secondary hazards.

4a. CONSIDER: Is this a permit required confined space?

4b.DIRECTION: Complete Section E of Form 1620.

4c. ANSWER THIS QUESTION: Is there any possibility of using a C5 Alternate Entry procedure? Why or why not?

4d. DIRECTION: If a C5 Alternate Entry procedure can be used to enter this PRCS, mark the box in Section E of Form 1620.

4e. ANSWER THIS QUESTION: Is there any possibility of using a C7 Temporary Reclassification? Why or why not?

4f. DIRECTION: If a C7 Temporary Reclassification can be used, mark the box in Section E of Form 1620.

5. DIRECTION: Complete Section G. Describe any methods for isolating hazards from the space, eliminating hazards, or controlling hazards.

6. DIRECTION: Complete Section H of Form 1620.

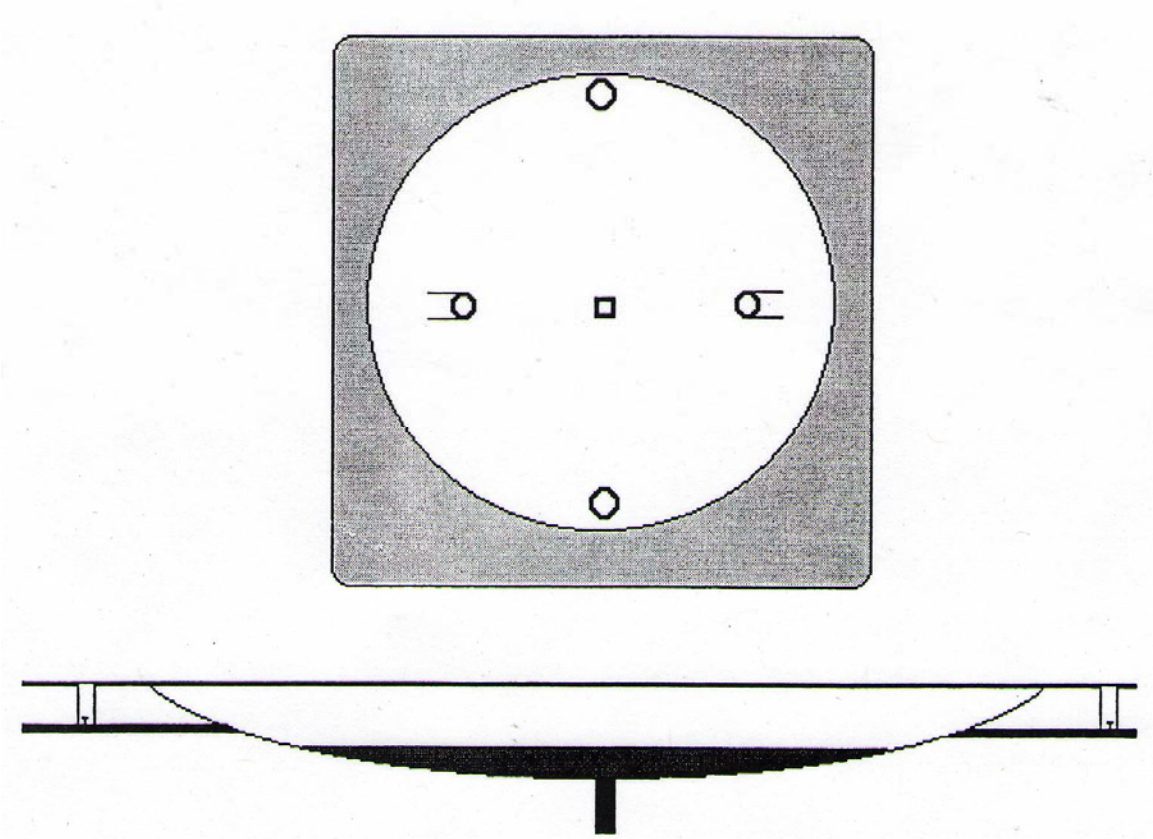
7. DIRECTION: Complete Section I of Form 1620.

8. DIRECTION: Complete Section J of Form 1620.

9. DIRECTION: Complete Section K of Form 1620.

10. DIRECTION: Complete Section L of Form 1620.

Case 5: Holding Pond



Form 1620, Confined Space Evaluation

Form 1620

Los Alamos NATIONAL LABORATORY EST.1943

Confined Space Evaluation

A) General Information and Location

Date	CSP #	TA	Building	Room	Other	
Owning organization		Primary contact		Z #	Organization	Telephone
Action ☐ Add new space ☐ Re-evaluate/update ☐ New location/owner ☐ Archive (explain below)						
Location description						

B) Type and Function (Mark all that apply and describe selections as necessary.)

☐ Manhole	☐ Tunnel	☐ Pit	☐ Elevator shaft	☐ Cyclone
☐ Tank	☐ Vault	☐ Trap	☐ Mixer	☐ Oven
☐ Duct	☐ Well	☐ Bin	☐ Caisson	☐ Furnace
☐ Silo	☐ Hopper	☐ Fan housing	☐ Sump	☐ Vat
☐ Lift station	☐ Plenum	☐ Crawl space	☐ Boiler	☐ Trench
				☐ Other_____

Additional description		
Opening position ☐ Vertical (through top/bottom) ☐ Horizontal (through side)		Number of openings
Opening size and shape		☐ Square ☐ Round
Expected frequency and duration of entry		Is the space transportable or mobile? ☐ Yes ☐ No
Description of confined space function		
Description of anticipated work within the confined space		

C) Confined Space Determination (Mark all that apply and comment as necessary.)

The Space

☐ Is large enough and so configured that an employee can bodily enter and perform assigned work?

☐ Has limited or restricted means for entry or exit?

☐ Is not designed for continuous employee occupancy?

Note: If all three above conditions are not met: (1)Explain reasoning below, and (2) proceed to Section E and indicate that the space is not a confined space

Comment(s)

Configuration conditionality or contingency? Explain

Form 1620 (6/12)

Page 1 of 4

D) Hazard Identification (Mark all that apply and describe all primary and secondary hazard selections in writing.)

Primary Hazards (existing or reasonable potential to exist)

- ☐ Oxygen deficiency (<19.5%)
- ☐ Oxygen enrichment (>23.5%)
- ☐ Flammable atmosphere (>10% LFL)
- ☐ Toxic gas/vapor/fume/aerosol (>PEL or TLV)
- ☐ Cryogen use/storage
- ☐ Heat stress or hot surfaces
- ☐ Cold stress
- ☐ Noise (>115 dBA,)
- ☐ High radiation area (Contact RP1 for Rad Permit)
- ☐ Airborne radioactivity area (Contact RP1 for Rad Permit)
- ☐ Nonionizing radiation (>PEL or TLV, RF/MW/Laser/UV/IR)
- ☐ Entrapment
- ☐ Engulfment
- ☐ Hazardous energy sources
  - ☐ Motive/Mechanical
  - ☐ Electrical
  - ☐ Pressurized gases/fluids
- ☐ Remote location (>50 feet to exit)
- ☐ Other serious safety or health hazard (specify below)

Description(s)

Secondary Hazards (Existing or reasonable potential to exist)

- ☐ Noise (>85 dBA, 8-hr TWA)
- ☐ Ionizing radiation (Airborne or external) (Contact RP-1)
- ☐ Nonionizing radiation (<PEL or TLV)
- ☐ Spark- or Flame-producing work
- ☐ Slips/Trips/Falls
- ☐ Lighting (Vision)
- ☐ Pedestrian and traffic hazards
- ☐ Asbestos (<PEL)
- ☐ Toxic gas/vapor/fume/aerosol (<PEL or TLV)
- ☐ Falling objects
- ☐ Sharp surfaces or protrusions
- ☐ Vibration
- ☐ Other chemical hazards
- ☐ Insects, snakes, vermin
- ☐ Other _____

Description(s)

Other entry-related issues (e.g., security, adjacent operations)

E) Confined Space Classification (Mark only one in upper section, and if applicable, only one alternate entry method.)

- ☐ **Not a Confined Space:** Does not meet ALL THREE criteria in Section C. Proceed to end and sign the evaluation.
- ☐ **Nonpermit Confined Space:** Meets all three criteria in Section C, but no primary hazards are identified in Section D.
- ☐ **Permit-Required Confined Space:** Meets all three criteria in Section C and an actual or potential primary hazard identified in Section D.

- ☐ **Permit-Required Confined Space/Potential for C5 Alternate Entry Procedure:** Meets all three criteria in Section C; only an actual or potential atmospheric primary hazard exists, and continuous ventilation alone is sufficient to maintain the space safe for entry.
  Complete Confined Space C5 Alternate Entry Procedure.
- ☐ **Permit-Required Confined Space/Potential for C7 Temporary Reclassification Certification:** Meets all three criteria in Section C; no actual or potential atmospheric primary hazard exists, and all primary hazards can be eliminated without entry and will not reoccur during the entry.
  The space can be reclassified to a nonpermit confined space for duration of entry. Supervisor completes C7 Temporary Reclassification Certification.

F) Posting (Mark all that apply and comment as necessary.)

- ☐ Not a confined space (posting optional)
- ☐ Nonpermit confined space
- ☐ Permit-required confined space

CSP # tag posted? ☐ Yes ☐ No

- ☐ Other posted warning signs (specify below)

Comment(s)

Form 1620 (06/12)

SAVE PRINT CLEAR FORM

Page 2 of 4

G) Isolation, Elimination, and Control Methods (Mark all that apply and describe all selections in writing.)

- Alteration and Isolation
  - ☐ Blinding/Blanking
  - ☐ Double block and bleed
  - ☐ Electrical grounding (GFCI)
  - ☐ Lockout/tagout (LO/TO)
  - ☐ Line breaking
  - ☐ Purging
  - ☐ Inerting
  - ☐ Other _____
  - ☐ Other _____

Description(s)

- Engineering and Substitution
  - ☐ Forced-air ventilation
  - ☐ Exhaust ventilation
  - ☐ Pneumatic substitution
  - ☐ Explosion-proof equipment
  - ☐ Low-voltage lighting
  - ☐ Guarding
  - ☐ Shielding
  - ☐ Insulated tools
  - ☐ Other _____

Description(s)

- PPE
  - ☐ Fresh-air breathing equipment
  - ☐ Chemical protective clothing
  - ☐ Air-purifying respirator
  - ☐ Head protection
  - ☐ Eye/Face protection
  - ☐ Hearing protection
  - ☐ Other _____
  - ☐ Other _____
  - ☐ Other _____

Description(s)

- Administrative Controls
  - ☐ Other work permits
  - ☐ Inspection/verification
  - ☐ Multiple work shift procedures
  - ☐ Alternate entry procedures
  - ☐ Other _____
  - ☐ Other _____

Description(s)

H) Expected Training Requirements (Mark all that apply and describe selections as necessary.)

Note: *Training may be required depending on the existing or potential hazards present in or around the confined space or due to the work performed in the space. Training needs during entry operations may vary.*

- ☒ *Introduction to hazard communication*
- ☒ *Confined entrant/attendant Live*
- ☐ *Lockout/tagout procedures*
- ☐ *LANL electrical safety program*
- ☐ *Electrical injury mechanisms*
- ☐ *Hazard-specific safety training (e.g., noise, lead, beryllium).*
- ☐ *Confined space entrant/attendant hands on*
- ☐ *Asbestos awareness*
- ☐ *Pressure safety orientation*
- ☐ *Respirators: Air-purifying*
- ☐ *Other _____(specify below)*
- ☐ *Other _____(specify below)*

Specific training

I) Other Equipment (Mark all that apply.)

- ☐ Ladder
- ☐ Battery flashlight or lantern
- ☐ Supplemental power
- ☐ Other _____
- ☐ Traffic cones
- ☐ Barriers (vehicle/pedestrian) and signs
- ☐ Fire extinguisher
- ☐ Other _____

STOP HERE IF NONPERMIT CONFINED SPACE. SIGN EVALUATION BELOW

SAVE PRINT CLEAR FORM

J) Anticipated Rescue Planning and Response Mode ***(Must select a mode and justify rescue stand-by mode. Describe other selections as necessary.)***

☐ Rescue Available		
☐ Nonentry rescue equipment (specify below), or ☐ Not applicable or not feasible (describe below).		
☐ Chest or full-body harness	☐ Fixed-point retrieval	☐ Horizontal system
☐ Wristlets or anklets	☐ Tripod	☐ Other _____
☐ Mechanical winch	☐ Boom	☐ Other _____
Comment(s)		
☐ Rescue Stand-By (on-site)		

K) Communications Equipment and Procedures (Mark all that apply.)

Entry Operations	
☐ Voice or visual (work will not interfere?)	☐ Wire system
☐ Rope signals (establish procedure)	☐ Wireless system (faraday shielding issue?)
☐ Personal Alert Safety System (PASS)	☐ Radio/PASS combination
☐ Other _____	
Rescue Service Notification	
☐ Telephone ☐ Cellular phone ☐ Two-way Radio ☐ Other _____	

L) Recommended Air Monitoring (Mark all that apply and describe as necessary.)

☐ Air monitoring required (specify below), or ☐ not required (justify below)				
☐ % 0_2	☐ % LFL	☐ H_2S	☐ CO	☐ CO_2
☐ Other _____	☐ Other _____		☐ Other _____	
☐ Prior to entry	☐ Continuous during entry	☐ Periodic during entry? (specify) _____		
Other considerations (e.g. location, interference's)				
Air sampling/monitoring performed during evaluation? (Attach Form 1619, *Supplemental Air-Monitoring Data Sheet and Attendant/Entrant Log*, if necessary to record results.)				

Confined Space Evaluator	Signature	Z#	Date

RETURN COMPLETED EVALUATION TO IHS AT CSP, MS K403.

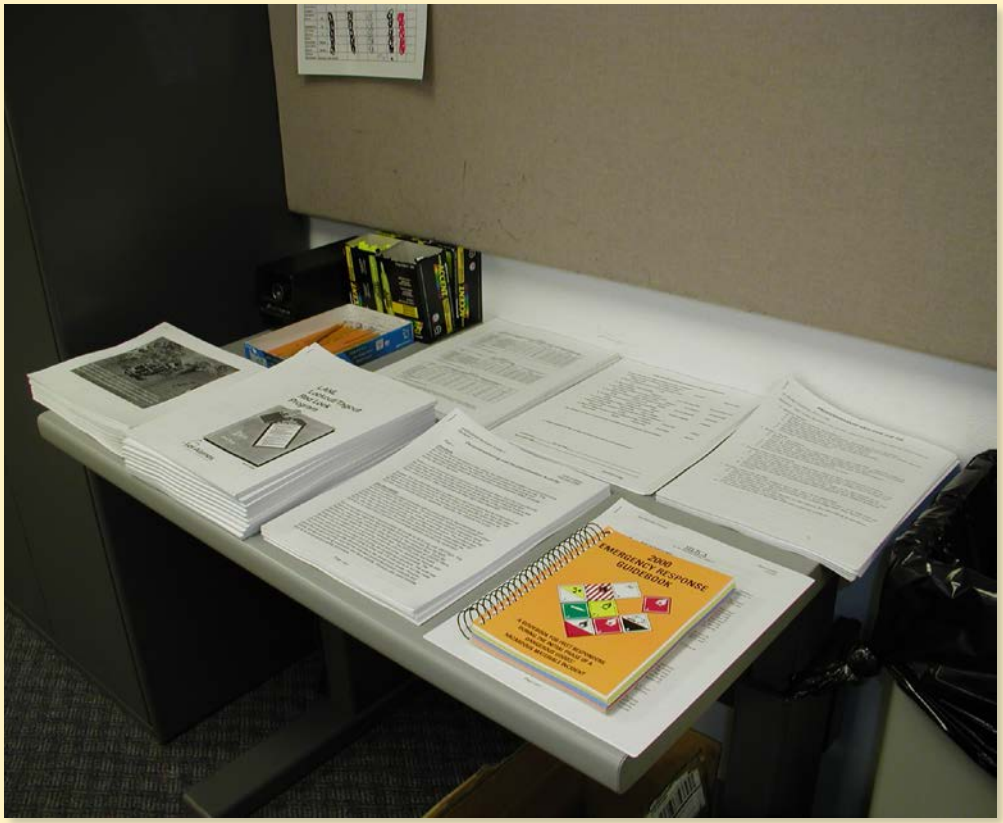
M) Notes

Form 1620 (06/12) Page 4 of 4

Welcome to the White Rock Training Center

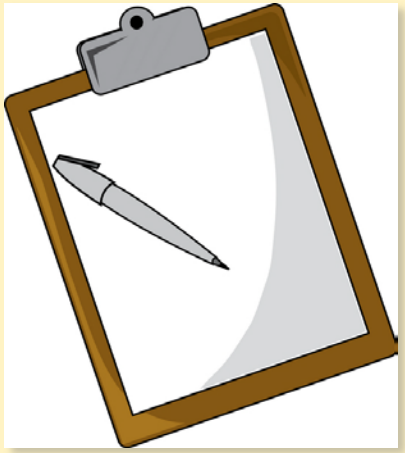
Before You Sit Down . . .

Pick up course materials when you enter the room.

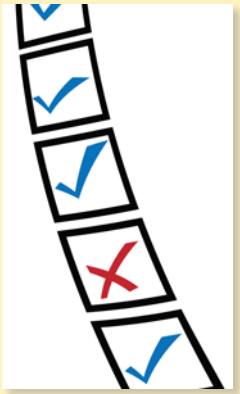


When in the Classroom . . .

- Be sure to sign the roster.
  - print your name legibly
  - sign your name
  - print your Z number

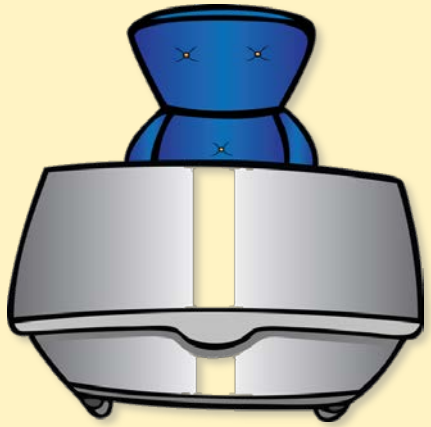


- Make sure to fill out a class evaluation. We value your feedback!



Please Be Courteous!

- So others can exit easily, always push in your chair when you take a break or leave the classroom.



- Turn off cell phones or put them on vibrate.

Cell Phones

- Your cell phone texting or conversation may interfere with the learning process of other students.

- Please take your phone calls to the student lobby and have your conversation there.

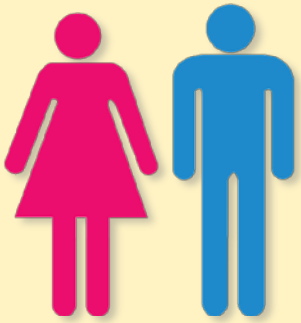
Thank you!

Yes, we're all very interested in what you're having for dinner tonight.

(Please keep phone conversations to yourself.)

Break Time

- Telephones are located in the front lobby just beyond the reception area.
- Soft drink and snack machines are located by the telephones.
- Restrooms are located off the hallway between the reception area and classrooms 114–118.



Recycle Your Aluminum Cans & Plastic Bottles

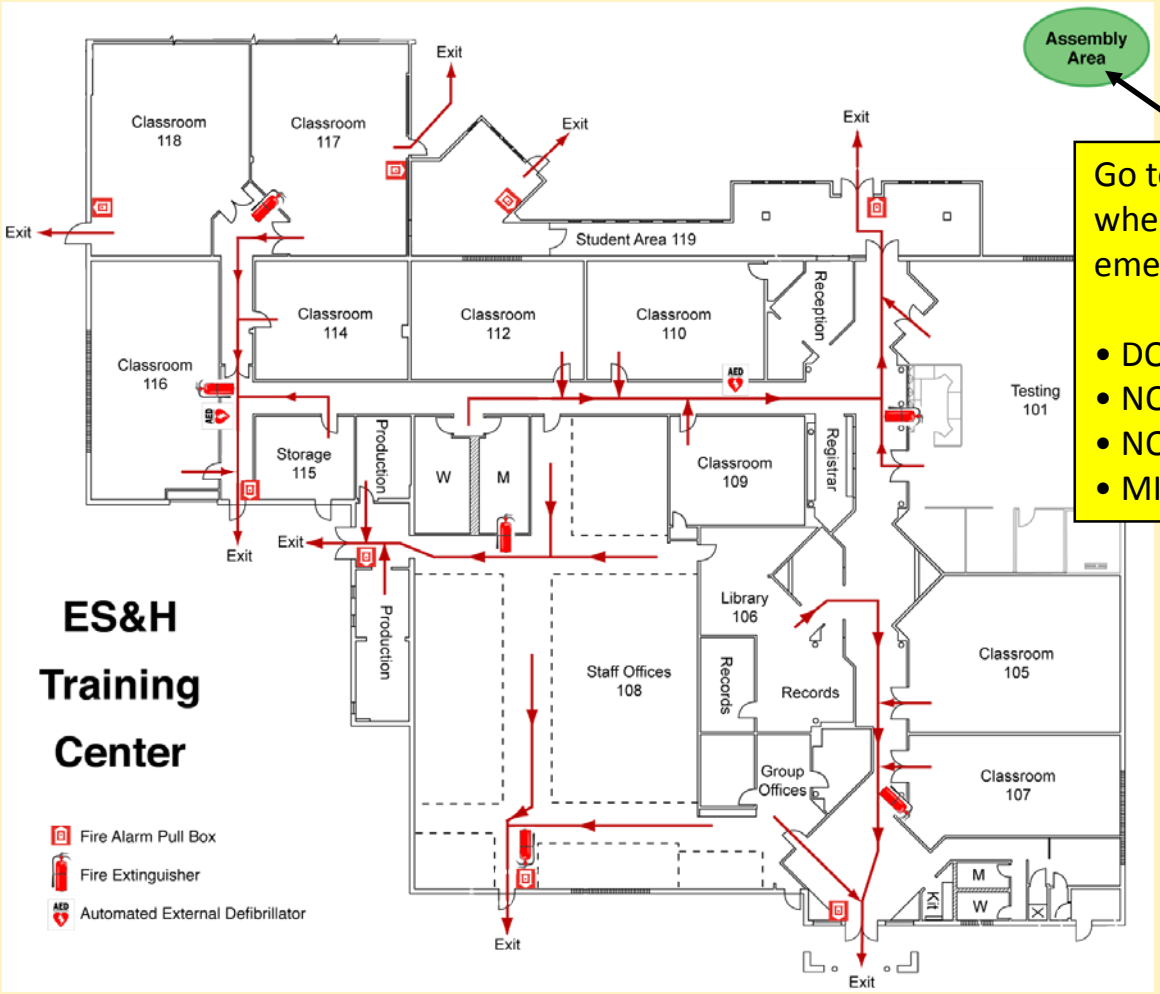
- Please put trash and recyclables in the proper receptacles located in the front lobby. Please don't leave trash at your seat.

Emergency Evacuation

- If an alarm sounds, evacuate the building and report immediately to the assembly area.

- Eating, drinking, and smoking are prohibited during evacuations and at the assembly area.

Emergency Exit Routes



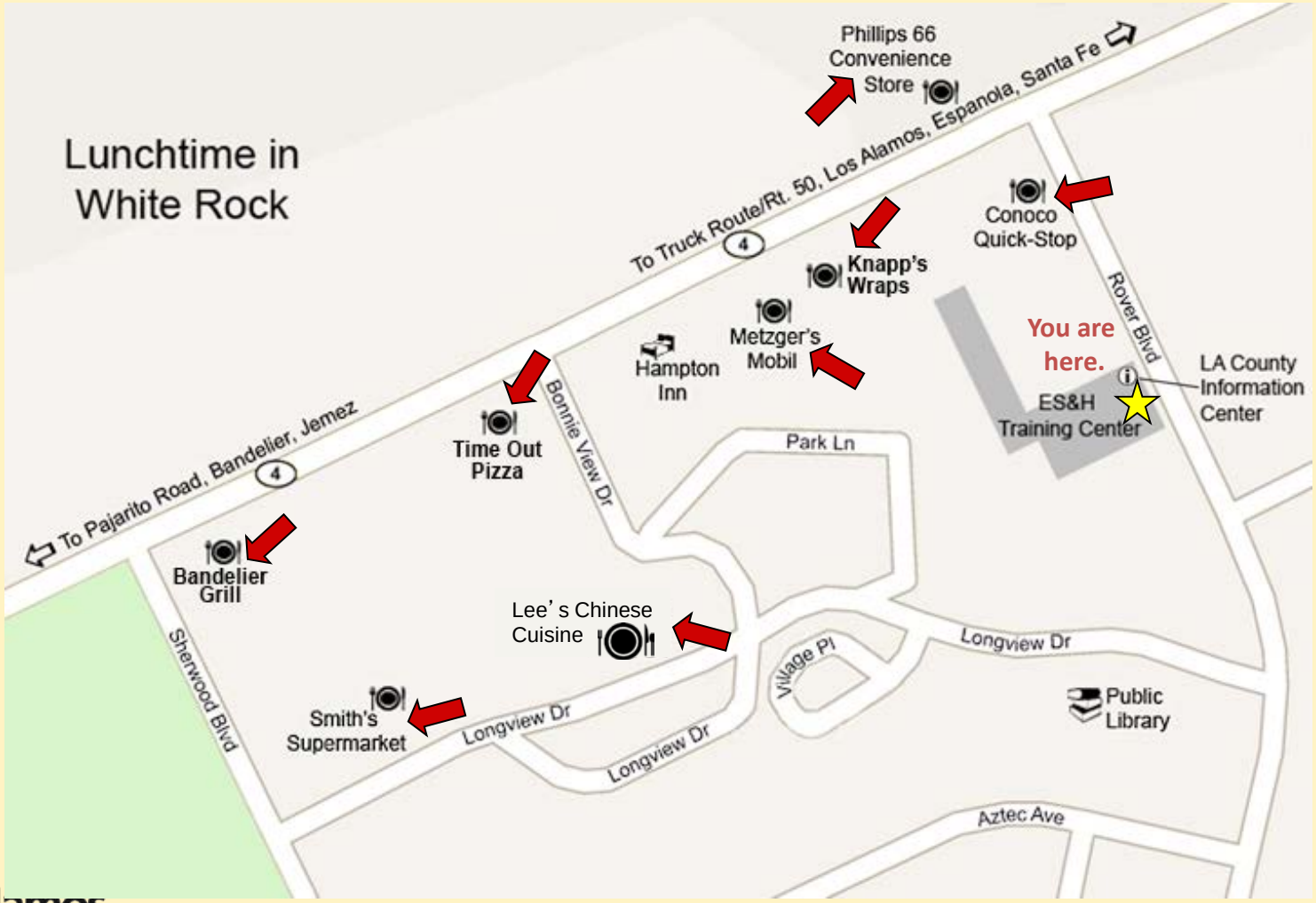
Go to the assembly area when you exit for an emergency.

- DO NOT LEAVE AREA
- NO FOOD OR DRINK
- NO SMOKING
- MINIMIZE TALKING

WRTC Evacuation Assembly Area

After exiting the building during an emergency, assemble at the grassy knoll beside the front parking lot.

Lunchtime in White Rock



Confined Space Evaluation

Other Evaluator Training Information

- Evaluators must be in curriculum #4459
- Two Required Courses
  - Course #40439, *Confined Space Entrant/Attendant Live*
  - Course#19613, *Confined Space Evaluation*
- Three Suggested (Optional) Courses
  - Course #26941, *Confined Space Entry Supervisor Self-Study*
  - Course #40438, *Confined Space Non-Entry Rescue Gear Training*
  - Course #55707, *Confined Space Air Monitoring Instrumentation—ALTAIR 5*
- Evaluators are appointed by their RLM and are authorized by their Confined Space Program Lead

Confined Space Entry Supervisor Course

Confined Space Entry Supervisor (Self-Study)

- Information needed for completing an entry permit
- Alternate entry procedures
- Confined space hazards and control measures
- Course number: 26941
- Accessed on UTrain
- 31-question quiz required for credit

You Must Be an Entry Supervisor to Sign an Entry Permit

To become a Confined Space Supervisor, you must have successfully completed the required course work and be designated by line management through a written request to the Confined Space Programs Lead. The list of current Confined Space Supervisors can be found on the LANL Confined Space web page.

Course Objective

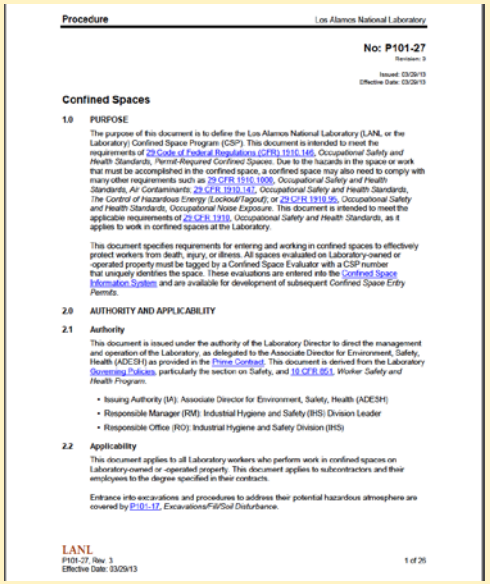
- Identify, evaluate, document, and post a confined space
- Along the way, we will
  - Review some aspects of the LANL Confined Space Program (CSP)
  - Evaluate and classify confined spaces
  - Review hazards and controls addressed on an evaluation
  - Complete CSP evaluation, Form 1620
  - Review use of the Confined Space Information System database

Course Road Map

- Determine if a space is a confined space
- Determine if a confined space is a permit-required confined space (PRCS)
- Does it need to be identified, posted, tagged, or closed off?
- Document the space with the CSIS
- Discuss rescue options
- Discuss additional weirdness, such as
  - Methods for mitigating hazards, unusual circumstances
  - Conveyances, CO_2, fall protection, signage
- Hands-on exercises – practice evaluating and filling out forms

Source Material (What is a confined space?)

- 29 CFR 1910.146
- 1910.146 Preamble and Interpretations



- LANL P101-27, *Confined Spaces*

Confined Spaces in Construction

- 29 CFR 1926 Subpart AA
- Became effective August 3, 2015
- OSHA's regulations define "construction work" as "construction, alteration, and/or repair, including painting and decorating." See 29 CFR 1926.32(g) and 29 CFR 1910.12(b).
- Regulation is very similar to general industry.

Confined Space Evaluator? Why?

The OSHA regulation requires the employer to evaluate the workplace to determine if any spaces are PRCSs. The OSHA regulation provides definitions and interpretations but provides little else as to who is supposed to do the evaluations and how. The LANL CSP created the role of “confined space evaluator” and “knowledgeable person” to carry out the tasks of evaluating spaces and assigned responsibilities to each as prescribed in the P101-27 document and presented here.

Knowledgeable Person? Evaluator?

Knowledgeable Person

- No training or experience required
- Provides access and information concerning the hazards, function, and use of the space

Evaluator

- Must be trained and experienced
- Identifies, evaluates, documents, and posts spaces
- Enters evaluations into the CSIS
- Develops data for the C5 alternate entry procedure

Confined Space Recognition

- Manholes
- Vats
- Hoppers
- Vaults
- Tanks
- Sewers
- Pipes
- Pits
- Bins
- Boilers
- Dikes
- Containers
- Shafts
- HVAC Systems

These spaces are examples of spaces that could be a confined space or a PRCS. Just because it is listed here does not automatically make it a PRCS.

Evaluation: Three Possible Outcomes

- The space is NOT a confined space
- The space is an NPCS
- The space is a PRCS

p. 6 in manual

Three Criteria of a Confined Space

- Large enough and configured so that a worker can enter and perform assigned work
- Limited or restricted means for entry or exit
- Not designed for continuous occupancy
  - Note: *The construction standard does not include "and perform assigned work" as part of the definition of a confined space because the particular task assigned is irrelevant.*

Is the Space a Confined Space?

Size	• Is the space large enough for the smallest worker to enter with his/her entire body and perform work?
Entry	• Is the means of entry or exit limited or restricted in any way?
Design	• Is the space NOT designed for continuous human occupancy (See page 6)?

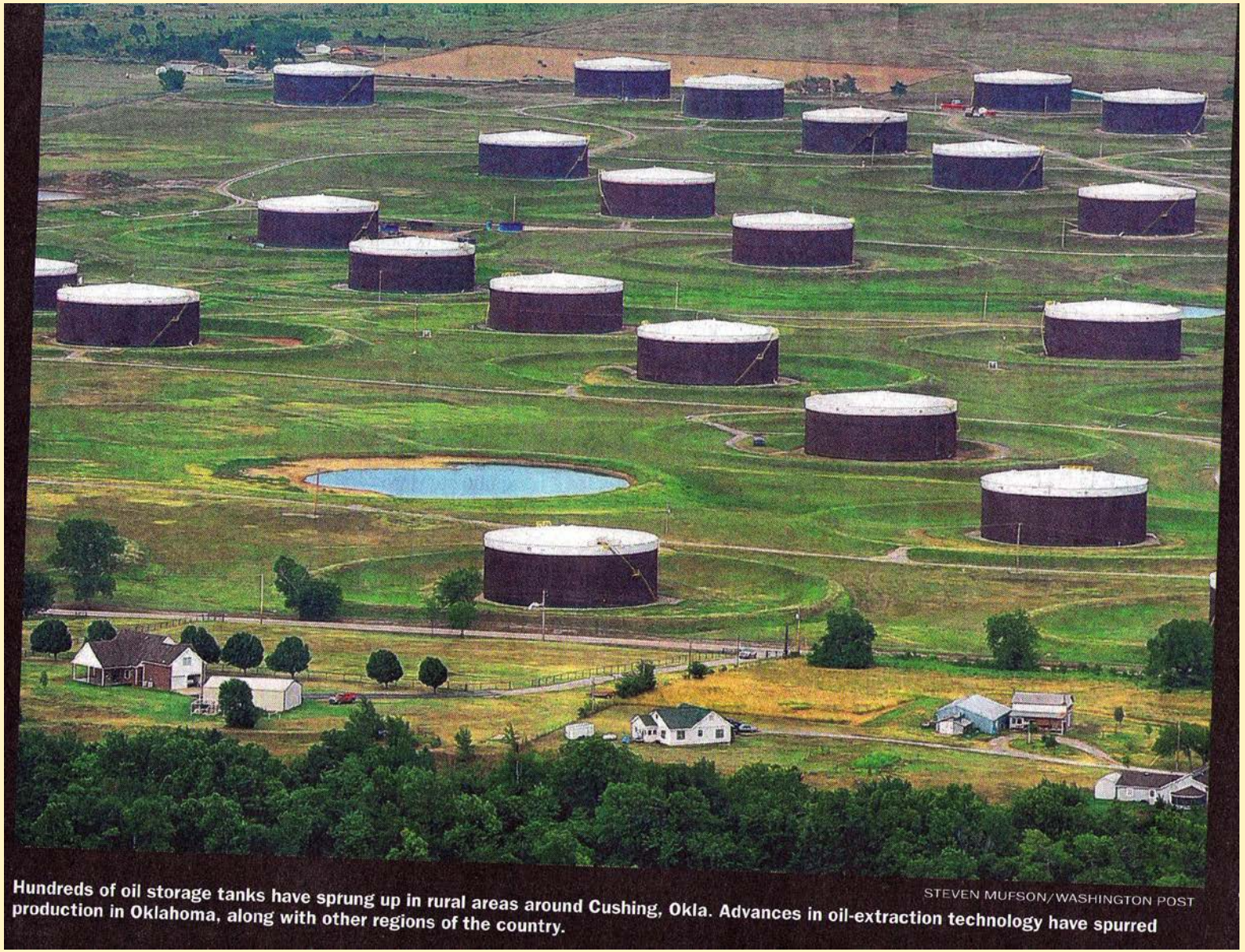
A Permit-Required Confined Space?

To be a PRCS, a space must have one or more of these hazards

- Actual or potential hazardous atmosphere
- Engulfment hazard
- Entrapment hazard
- Any other serious safety or health hazard

- Actual vs potential
- Inherent vs introduced

The hazard must be a primary hazard—any serious physical or health hazard that can cause the death, injury, or illness of an entrant and can prevent an entrant's ability to self-rescue from a confined space.



Hundreds of oil storage tanks have sprung up in rural areas around Cushing, Okla. Advances in oil-extraction technology have spurred production in Oklahoma, along with other regions of the country.

STEVEN MUFSON/WASHINGTON POST

What Do You Do with a PRCS?

- Prevent entry by unauthorized workers
- Control entry of authorized workers

How?

By a combination of posting signage, educating the workforce, permanently closing off PRCSs, administering an effective permit program, and evaluating the program annually.

The employer must inform exposed employees of the existence, location, and danger posed by the spaces.

What Do You Do with a Permit-Required Confined Space?—cont.

The employer must inform exposed employees of the

- existence of the space
- location of the space
- danger posed by the space

LANL Confined Space Information System (CSIS)

Available on LANL Confined Space Web page:

- Searchable database
- Forms
- Contacts
- Permit numbers
- Reports
- Training

It's the information about a space, i.e., the space evaluation.

We'll go over it NOW!

LANL External | phone | maps | orgs | alerts | emergency | library

LANL inside

We make safety and security integral to everything we do!

Computing | Employees | Environment | Finance | News | Safety | Science | Security | Services

Safety » IHS » Systems, Programs and Contacts » Confined Space

Industrial Hygiene and Safety

- Safety Leadership
- ALARA Center
- How to Report Safety Concern
- Security and Emergency Operations
- Industrial Hygiene and Safety
  - All Systems, Programs & Contacts
  - Asbestos

Confined Space

Build a work package

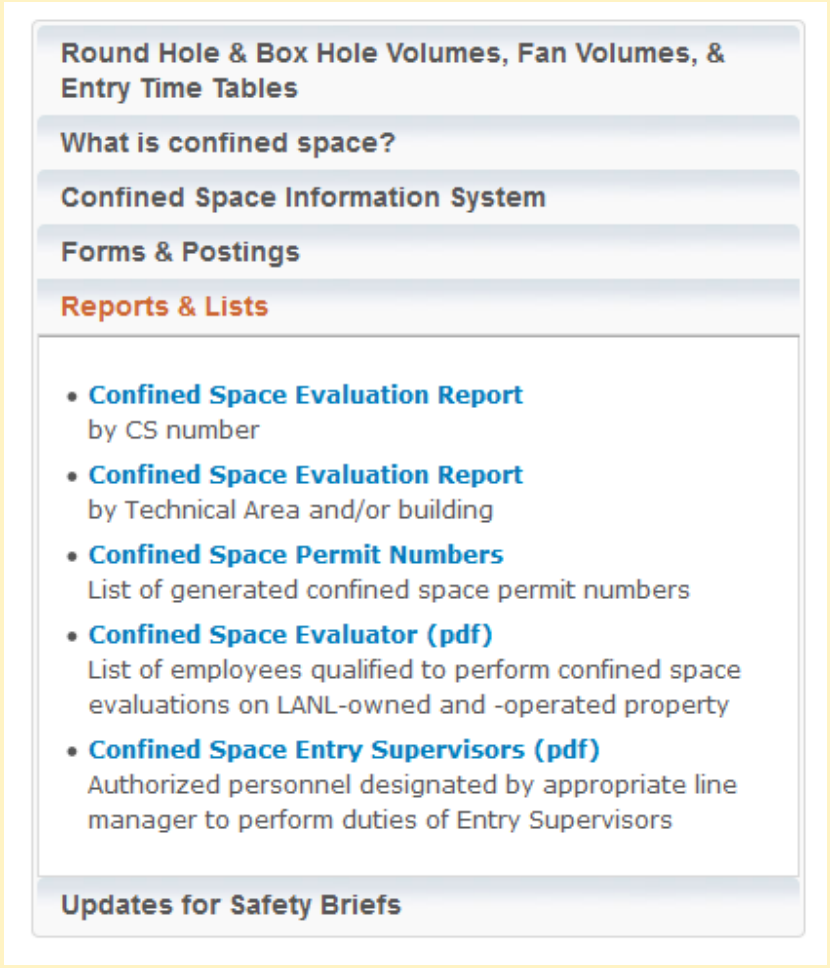
- Permit Number Generator for all Confined Space Entry Permits
- Confined Space Evaluation Report
  - by CS number
  - by TA and/or building
- 1609 - Confined Space Entry Permit

Contacts

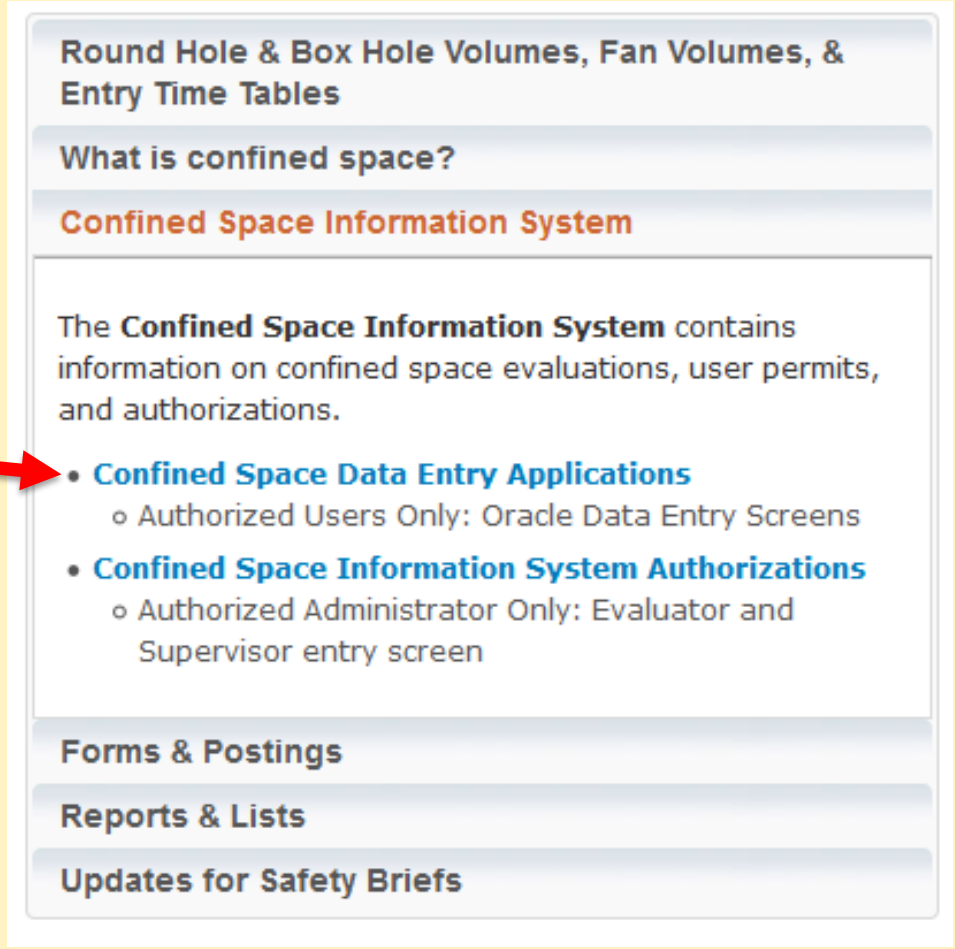
Program Lead

Round Hole & Box Hole Volumes, Fan Volumes, &

Authorized Evaluators and Entry Supervisors



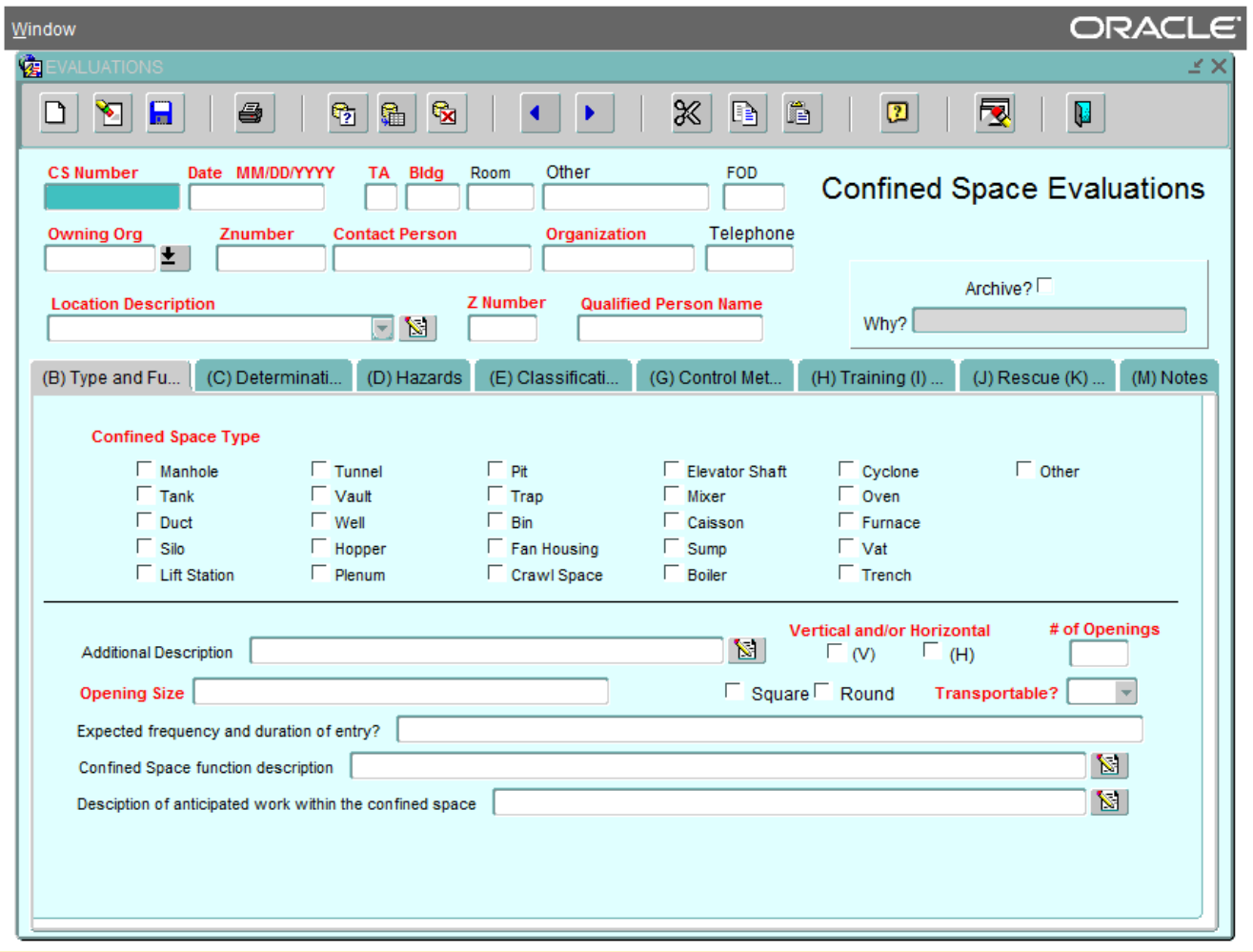
Data Entry Applications



Sections of Evaluation Form

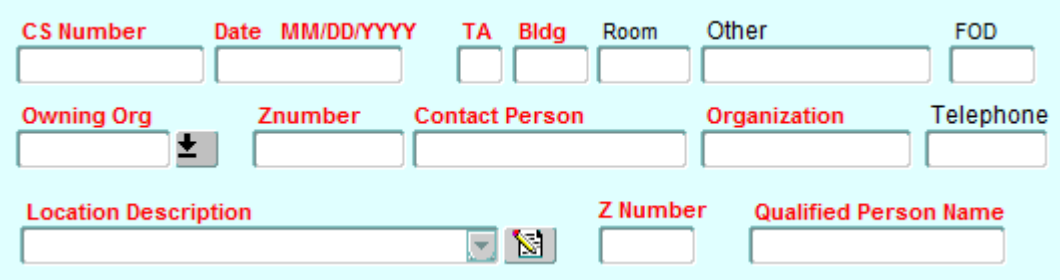
A. General Information and Location
B. Type and Function
C. Confined Space Determination
D. Hazard Identification
E. Confined Space Classification
F. Posting
G. Isolation, Elimination, and Control Methods
H. Expected Training Requirements
I. Other Equipment
J. Anticipated Rescue Planning and Response Mode
K. Communications Equipment and Procedures
L. Recommended Air Monitoring
M. Notes

Confined Space Information System



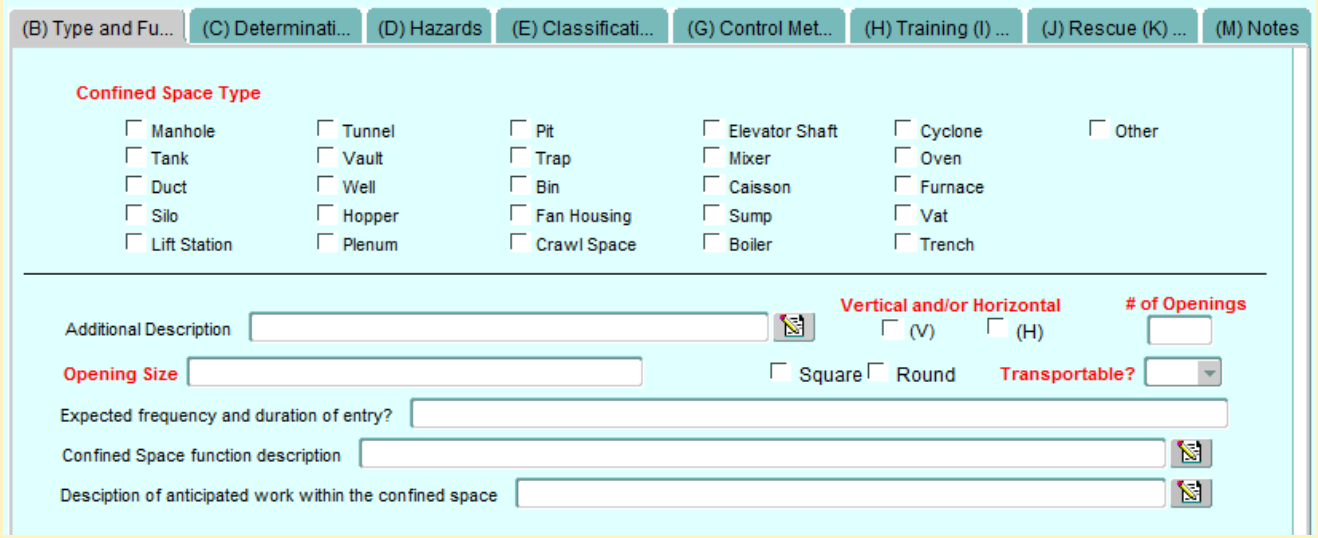
General Information and Location

- CSP Number — obtain from CS program lead
- Location — be precise
- Primary contact — person who knows about the space
- Qualified Person refers to Confined Space Evaluator
- Note that fields with red text are required



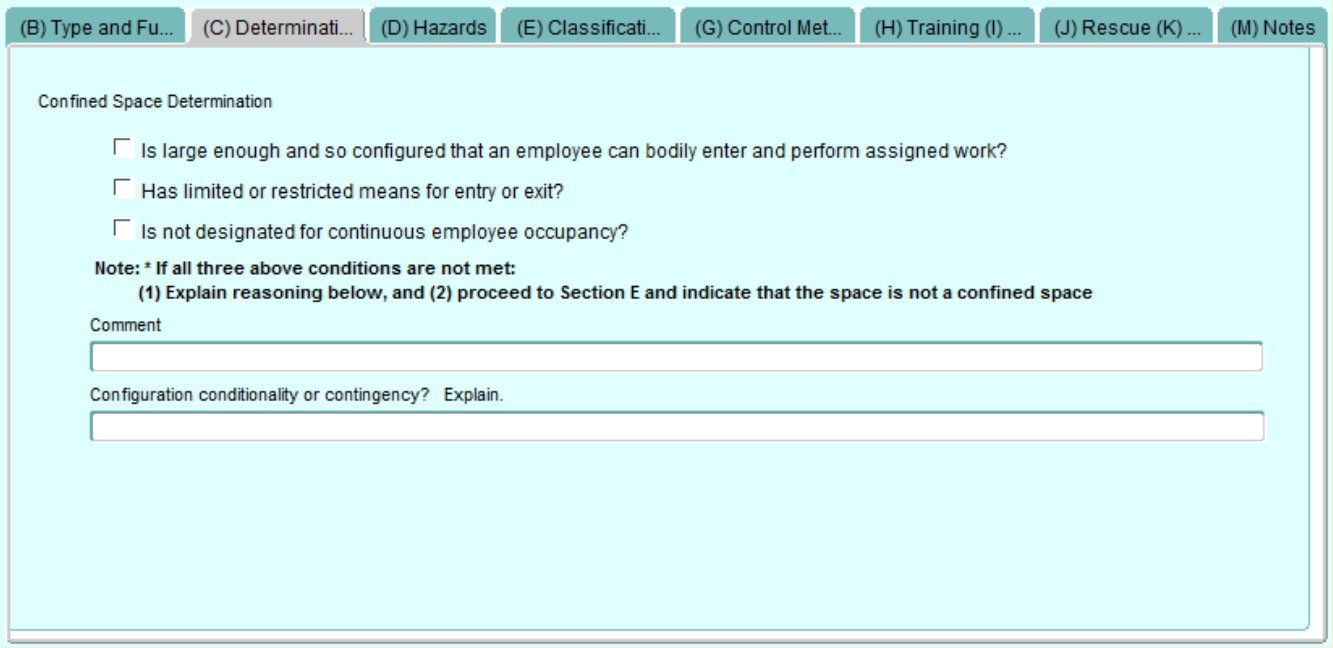
Type and Function

- Do not just mark a check box
- Do not write “see IWD”
- Need descriptive details
  - Physical dimensions?
  - Greater than 4 feet deep?



Confined Space Determination

- Three elements of confined space definition
- The kind of space may depend on certain conditions about the space.
- Describe any conditions that can change or be eliminated.



Hazard Identification

Consider:

- Hazards of space
- Hazards in immediate vicinity
- Work to be done

Categories of hazards:

- Atmospheric hazards (oxygen, flammable/toxic gases, vapors)
- Contents (current, previous, residue)
- Potential energy

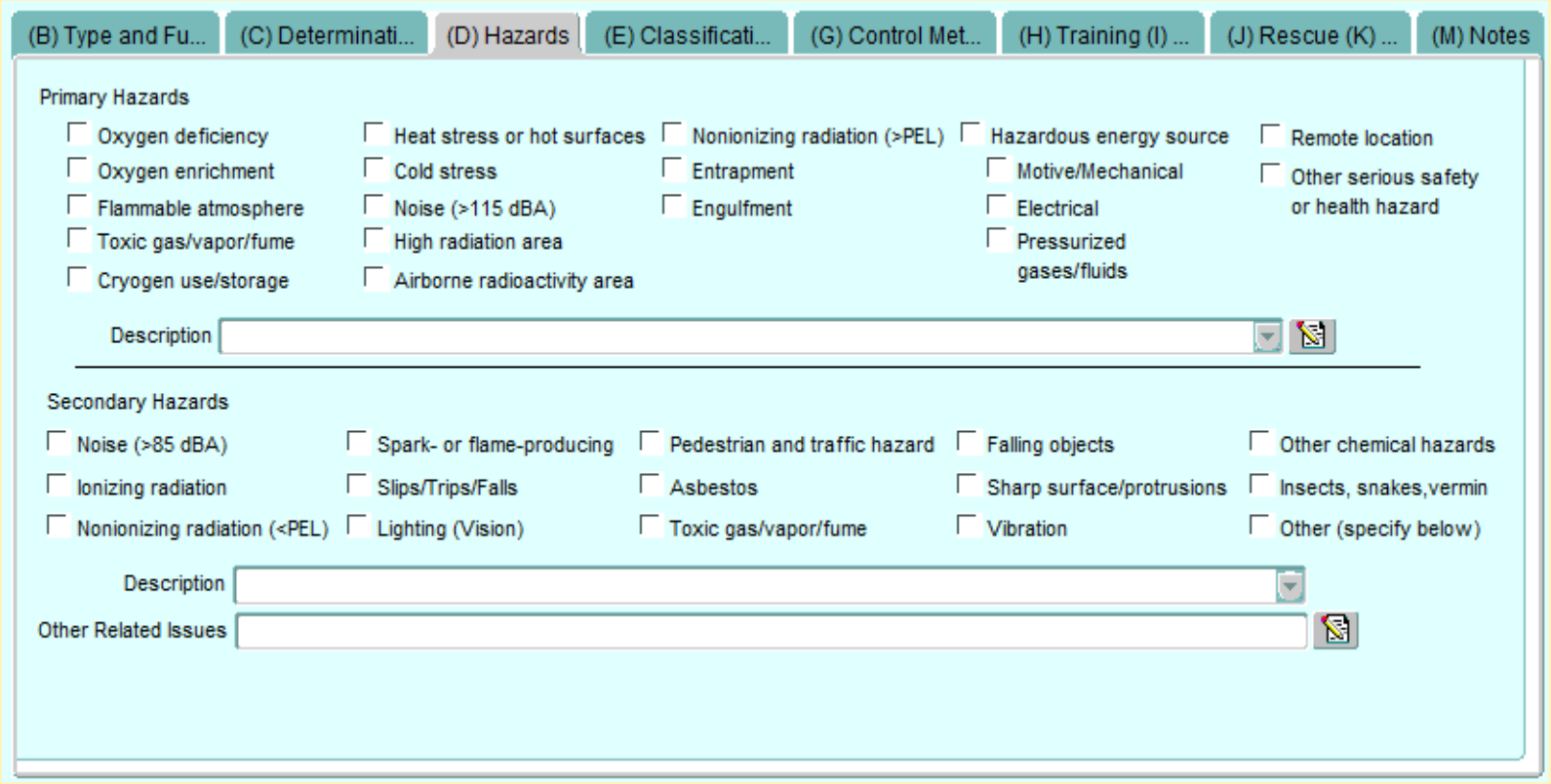
Hazard Identification—cont.

- Environment in the space
- Configuration of the space
- Nature of the work
- External hazards
- Miscellaneous hazards
  - Animals
  - Insects
  - Noise
  - Radiation

p. 13

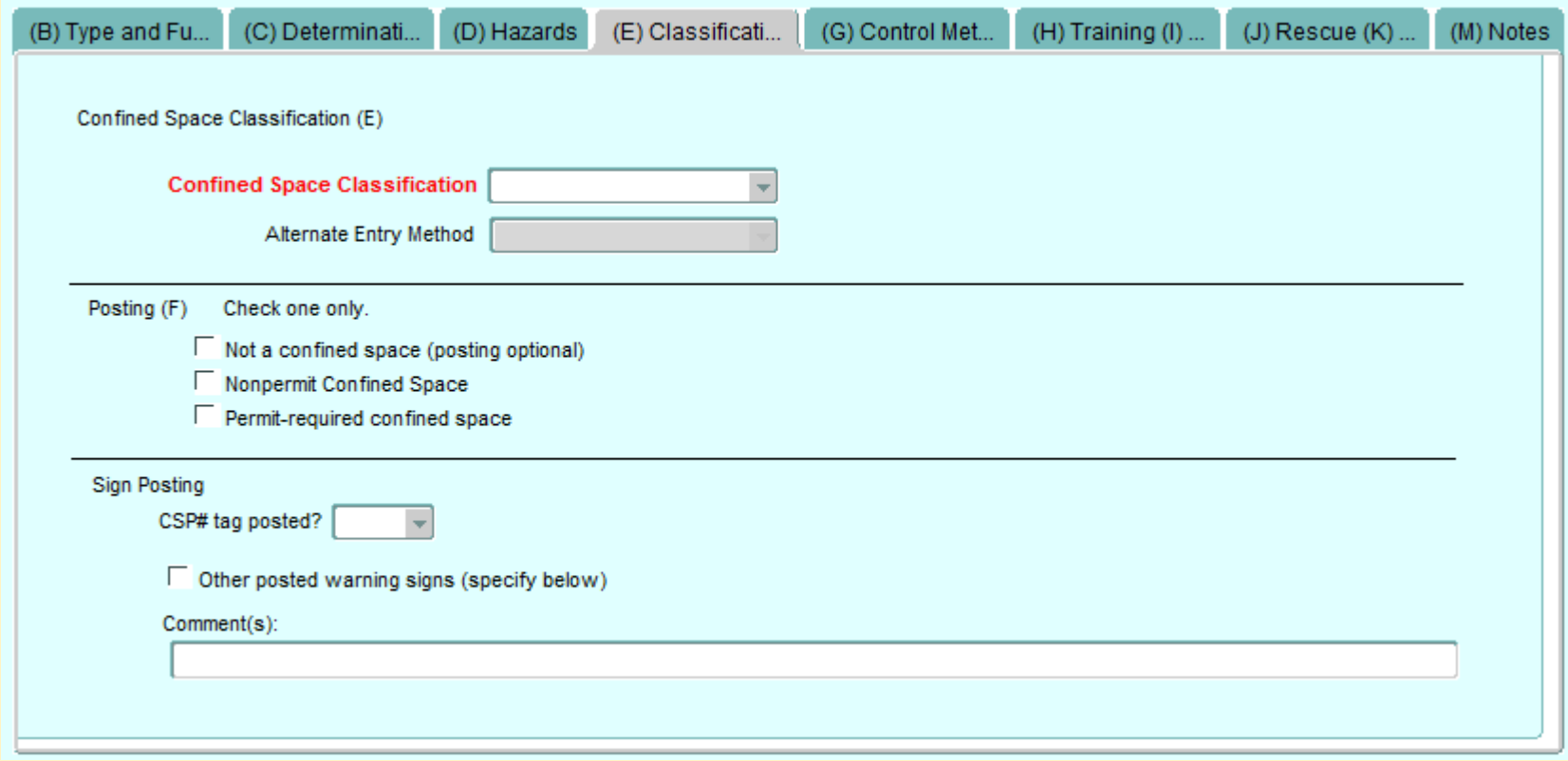
Hazard Identification—cont.

- Hazards listed are potential primary or secondary hazards; check in database only if meets definition



Confined Space Classification/Posting

- Classification in database should reflect anticipated sign posting.
- Contingent classification should be explained in Section M notes.



PRCS Reclassification (C7)

- No atmospheric hazards
- Eliminated without entry
- Written certification using Form 1609 Confined Space Entry Permit (signed by entry supervisor)

Control of atmospheric hazards through forced-air ventilation does not constitute elimination of the hazards.

PRCS Alternate Entry Procedure (C5)

- Only* hazard allowed is actual or potential atmospheric hazard
- Can be *controlled* through ventilation alone
- Written certification, using Form 1609 Confined Space Entry Permit (signed by entry supervisor)

* This means that any hazards involving high noise levels; lockout-tagout; drowning; high heat or cold; slips, trips, or falls; or any other hazard must be *eliminated.*

What Is the Advantage of Using a C5 or C7 Procedure?

Discussion

- If you are going to enter a space, determine if you can do a C5 or C7 because each offers distinct advantages. What are those advantages?

pp. 16-17

Hazard Control—Ventilation

- General dilution/forced air
- Local exhaust ventilation

What is the best method for various contaminants?

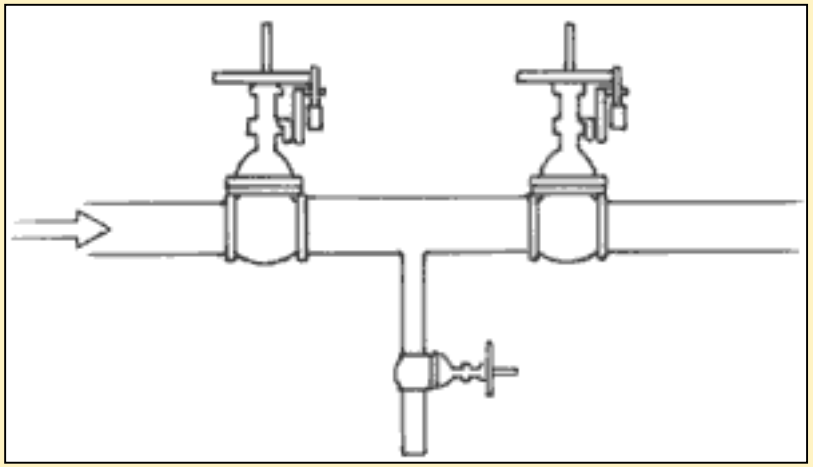
Administrative Controls

Administrative controls—Controls that eliminate or reduce exposure to the hazard through changes in the work practice:

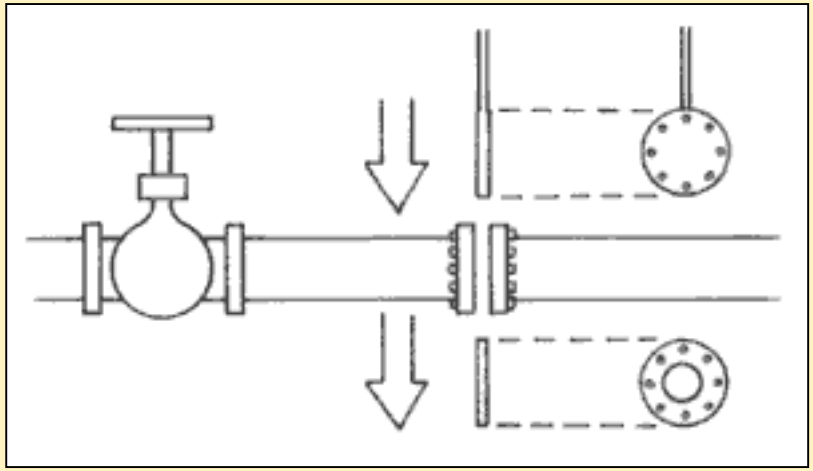
- Rotating workers
- Reducing amount of worker exposure
- Housekeeping
- Training
- Signage

Isolation

- PRCS is removed from service and is protected against the release of energy and material into the space by blanking or bleeding, misaligning or removing sections, using a double block and bleed, using lockout/tagout, or disconnecting all mechanical linkages.



Double block and bleed



Blanking

PPE — Respiratory Protection

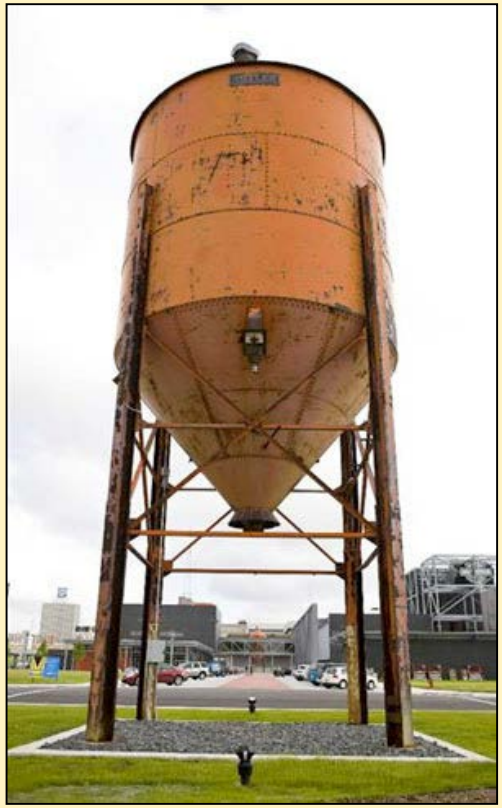
PPE is used to protect workers *only* after all other feasible means have been used to control or eliminate hazards.

Respiratory protection is needed whenever

- an emergency exists and entry cannot be delayed. Assume that an IDLH atmosphere exists.
- an inert atmosphere or testing shows that an IDLH exists and additional ventilation cannot reduce concentrations to safe levels.
- current testing indicates the atmosphere to be safe, but unsafe conditions could reasonably be expected to develop at any time.

Entrapment Protection

Examples: hoppers and cyclones

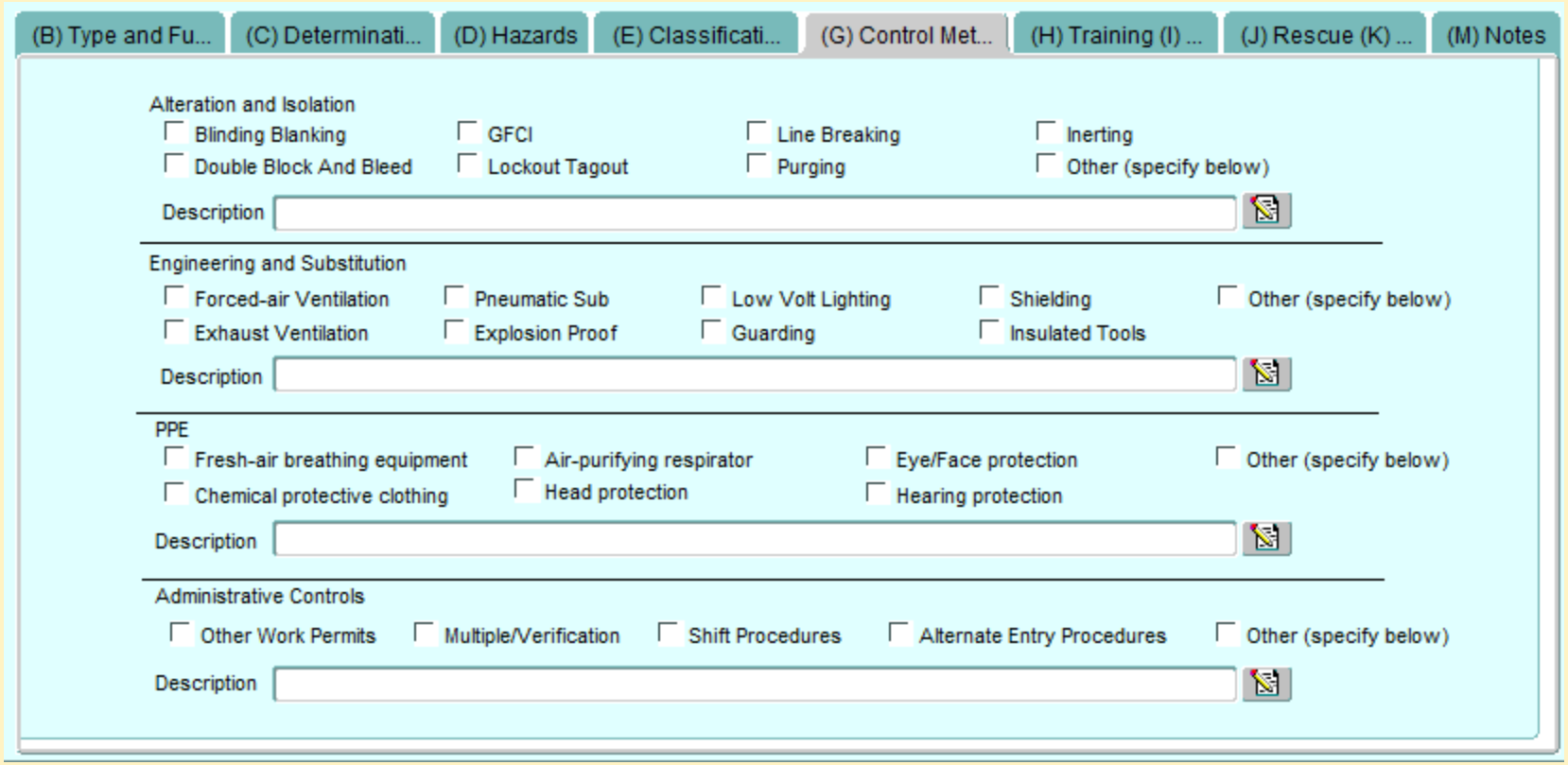


Best practice: eliminate hazard by redesigning or control by installing an effective barrier or guard to prevent falls.

Fall Protection

- Using personal fall protection would not eliminate the fall hazard but rather would control the hazard.

Hazard Controls

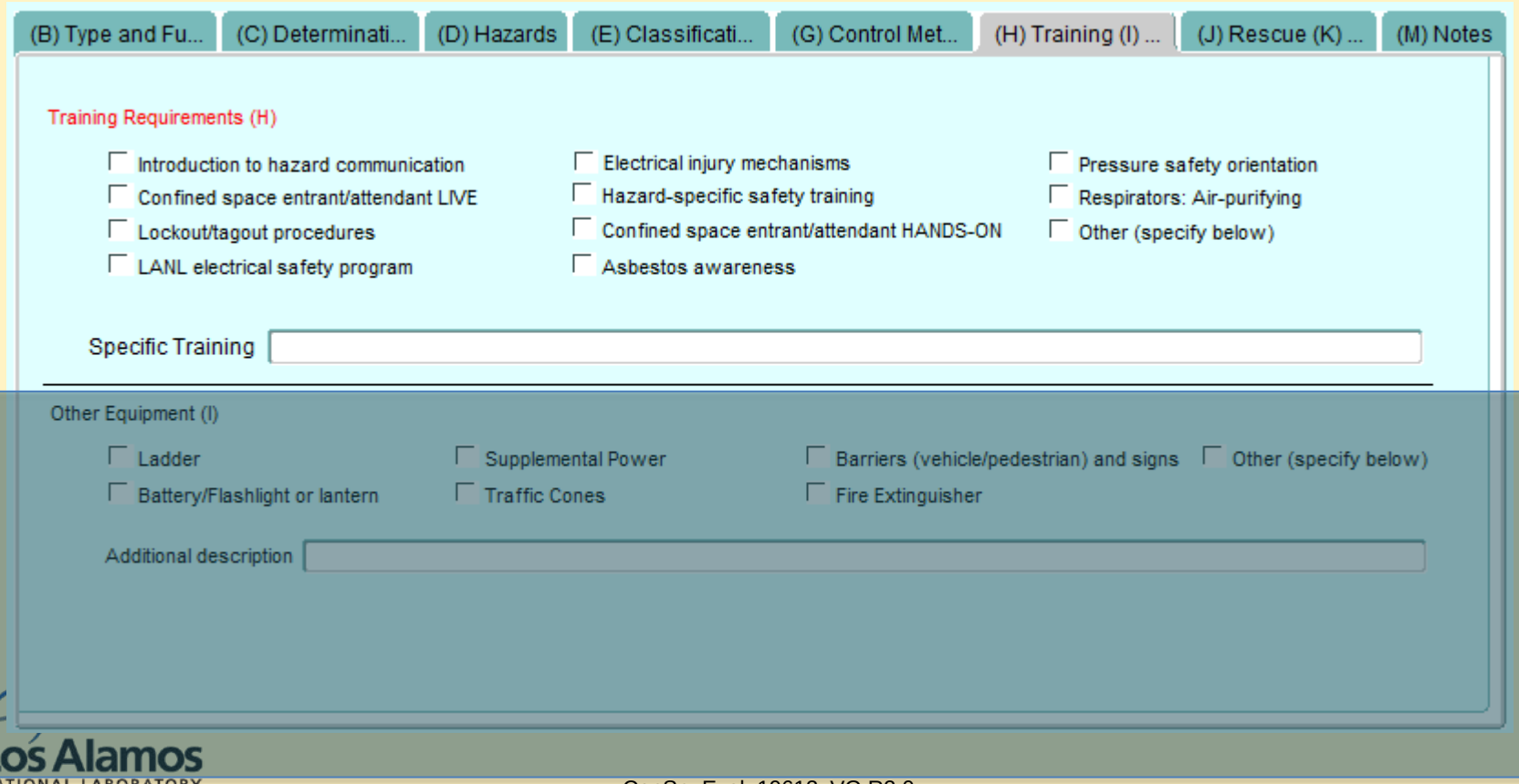


Training

- Training courses for confined space workers vary, depending on the involvement of the worker.
- Refer to LANL's written confined space program or the requirements for the three training curricula, as shown in UTrain, for the most current information.
- A worker must be in curriculum #693, #8808, or #8809 to enter a confined space.

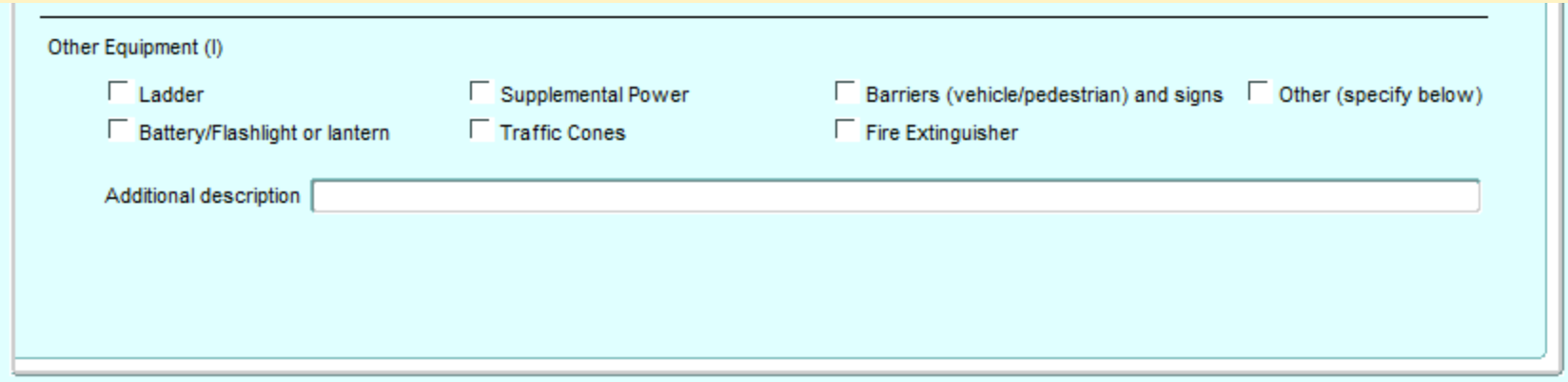
Training Requirements

- At a minimum, Confined space entrant/attendant LIVE should be checked for permit-required spaces.



Other Equipment

- Other equipment includes any other items that likely will be needed for entry.
- For example, when you evaluate the space and see an old rusted ladder built into the space, you might recommend that a portable ladder be considered.



Rescue Planning and Response Mode

- Rescue Requiring Onsite Standby: The type of rescue you will use is LANL's designated onsite standby rescue service if any one of the following conditions applies to your PRCS:

- Entrants are required to use supplied-air breathing equipment.
- An obvious IDLH hazard exists.
- Entrants are expected to have difficulty with self-rescue.
- Nonentry rescue cannot be effectively used.

Must arrange 72 hours in advance

- Rescue Not Requiring Onsite Standby:

Must rely on the attendant to extract entrant using nonentry rescue gear

Refer to pp. 22-23 for details

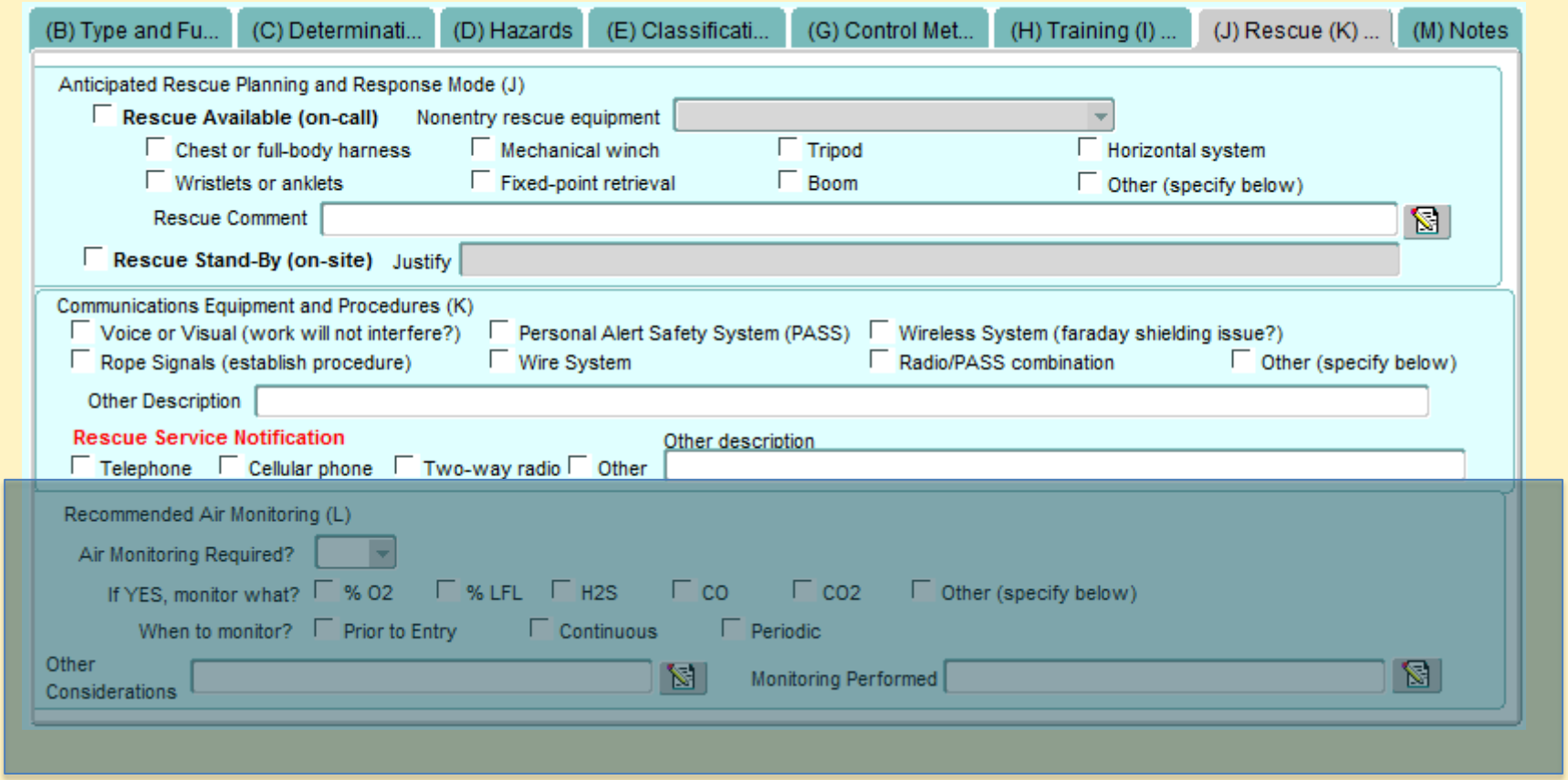
Confined Space Communications

- Communication between entrants and attendant must enable the attendant to monitor the entrants' status and enable the attendant to alert entrants of the need to evacuate the space. For practical purposes, this means that establishing two-way communications must be possible at any time.

- Voice
- Visual signals
- Tactile signals
- Hard-wired radio
- Handheld radio

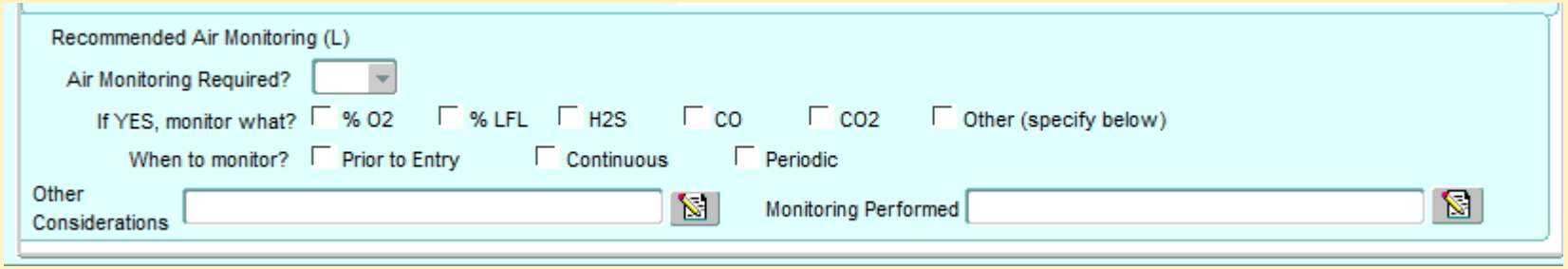
- Communication between the attendant and the rescue service is required for a PRCS.

Rescue Planning and Communications



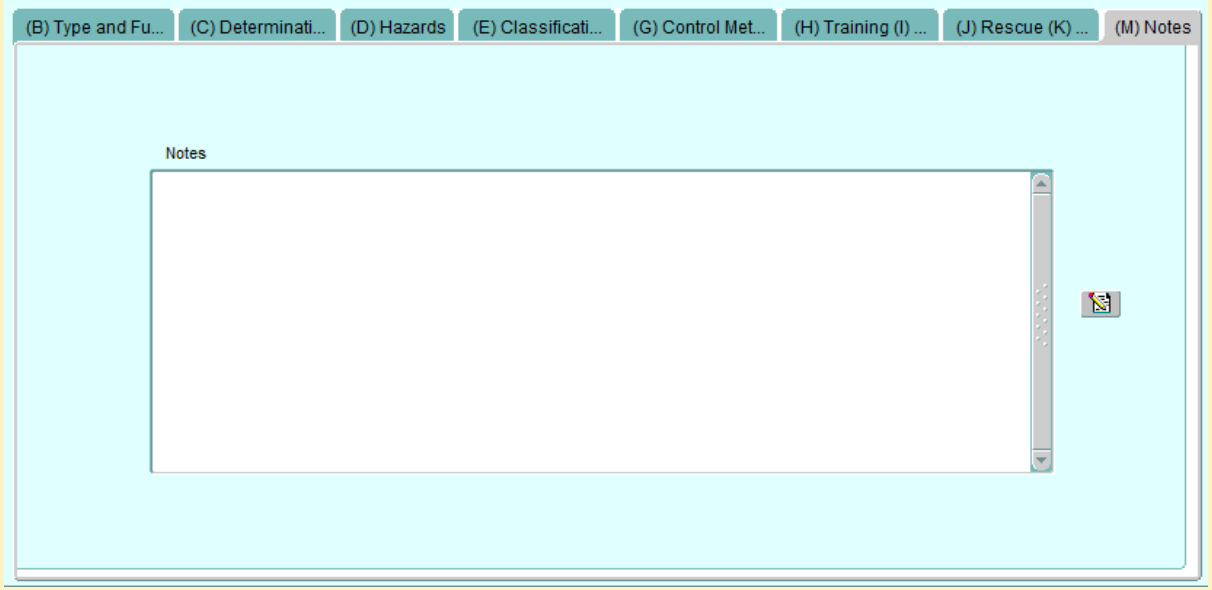
Confined Space Air Monitoring

- Conduct air monitoring
- Evaluate and document any possible hazardous atmosphere and associated monitoring requirements
- Record any air readings taken during the evaluation of the space in the “monitoring performed” field



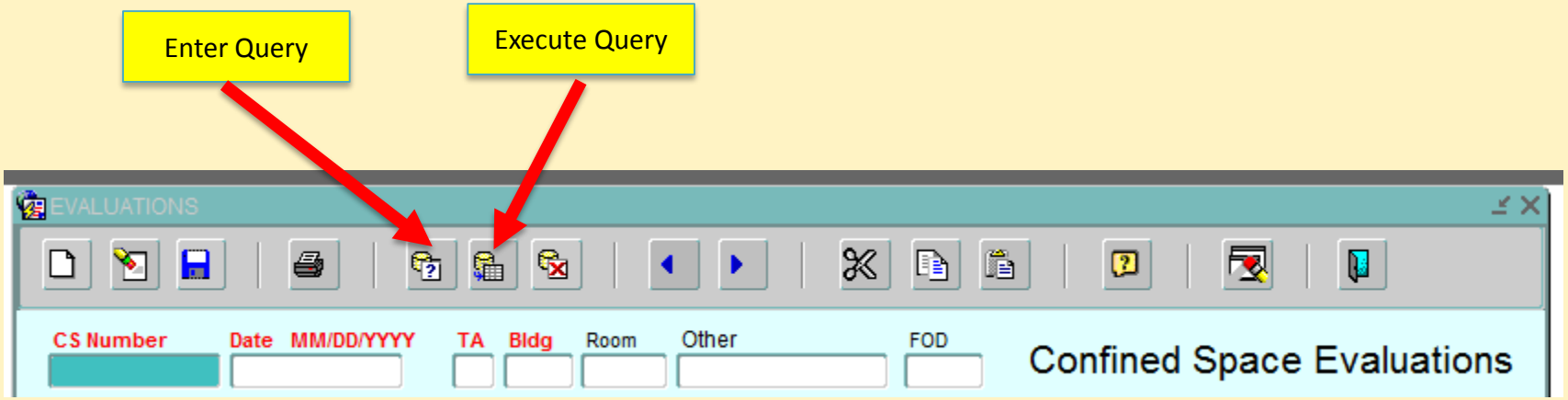
CSIS—Section M Notes

- This is the largest text field (4000 characters)
- May reference this section in other smaller comments fields
- If confined space determination is contingent on work conditions, describe in detail here.



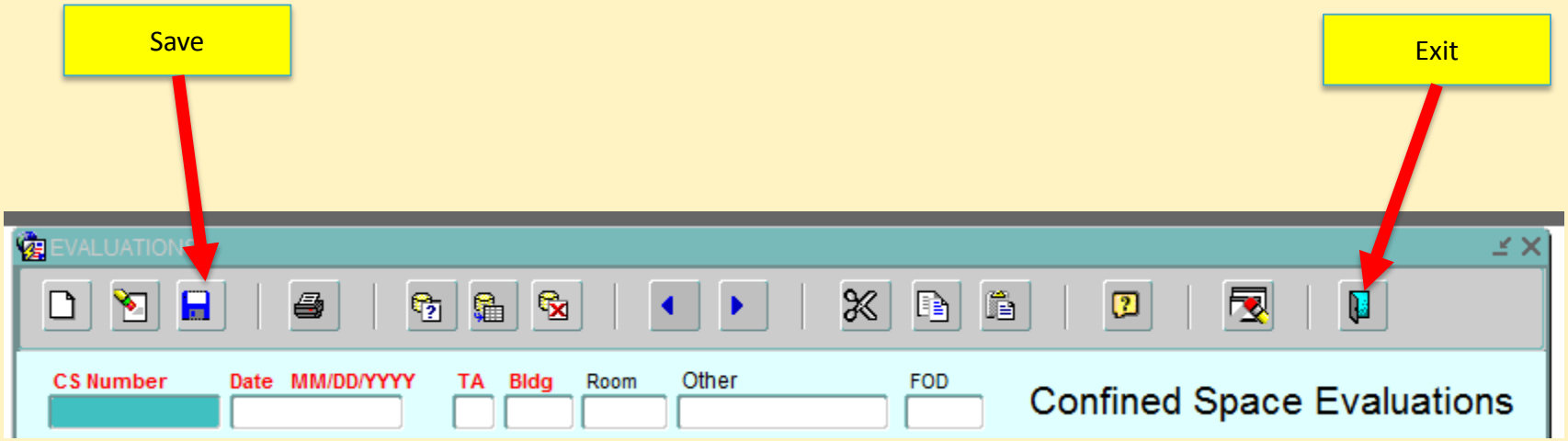
When Editing an Existing Evaluation

- First select “Enter Query”
- Enter the CS number
- Then select “Execute Query”
- After modifications are made, saving changes will then overwrite previous data.



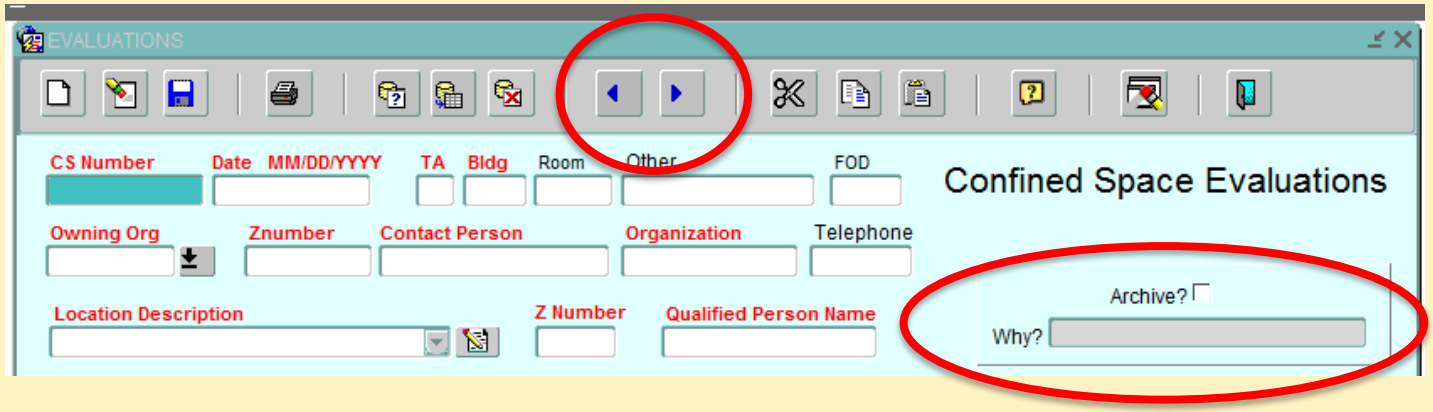
Before Logging Off…

- Be sure to save your changes!
- Select “exit” to log out of the system.



Seeing Double?

- Multiple/hybrid evaluations may be created in the system accidentally if you select “New” and then enter and save an evaluation using a CSP number already in the database (forget to query first)
  - Use blue arrow buttons to switch between evaluations with the same CS number
  - When on the “bad” evaluation, check the archive box, enter a reason, then save your changes
  - You can check to see if the unwanted evaluation was removed by selecting “print” to generate a pdf to verify that pages #s are no longer duplicated



Mitigating Hazards

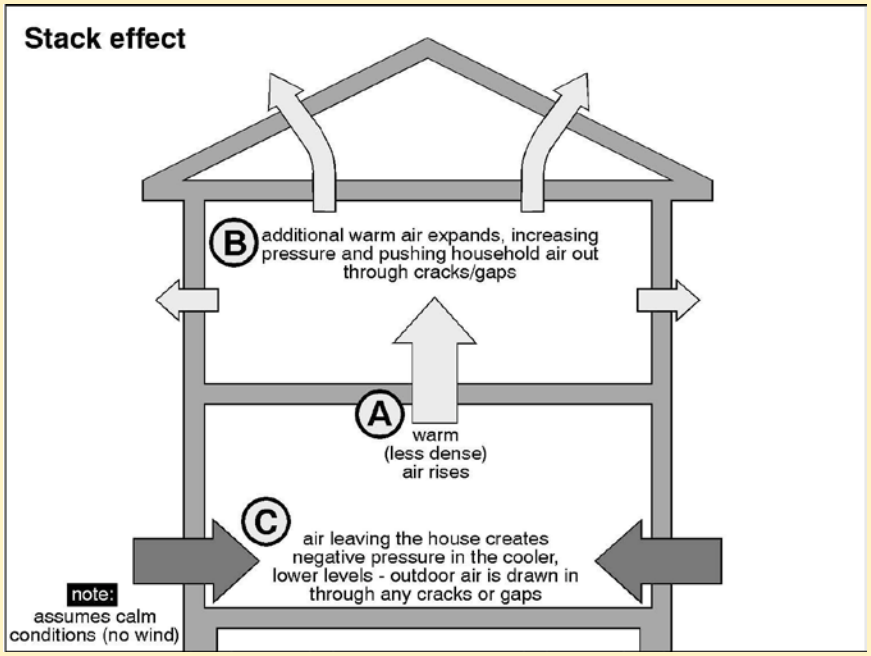
1. Eliminate space (e.g., weld plate over entrance).
2. Do not enter space—perform work from outside space (e.g., raise the sump pump out of the pit).
3. Reconfigure space so that it is no longer a confined space.
   - Enlarge entrance.
   - Replace ladder with OSHA-compliant stairs.
   - Make opening too small to bodily enter.
   - Make confined space less than 4 feet deep. (OSHA 1910.146 does not use “4 feet” to define a confined space. The mitigation factor would be “restricted entry or egress.”)
   - Make space suitable for continuous human occupancy (e.g., install permanent ventilation and lighting).

Mitigating Hazards—cont.

4. Eliminate hazards in space by using C7 procedure.
   - Where exposure to the moving parts can be permanently controlled through physical guarding, these hazards would not trigger the classification of the space as a permit space. (LOI OSHA 10-27-95, Mr. Sharpe)
5. Control atmospheric hazards using C5 procedure.
6. Enter using a confined space permit with nonentry rescue.
7. Enter using a confined space permit with entry rescuer standing by.

Natural Ventilation

- Convective flow due to stack effect



Probably will not have huge impact on a belowground-level confined space with no air inlet.

Documenting Anticipated Work

Documenting the hazards in context with the work will impact how an entrant develops a rescue plan and makes the entry.

Evaluations for Unusual Circumstances

- Off-Normal Use: The space is normally used for one single purpose, such as to grease a pump, which has no hazard associated with it and is so reflected in the evaluation. However, for a one-time use other than the normal use, such as painting the space, which would present a new set of hazards, a new evaluation will usually need to be developed. In such a case, the evaluation will be developed but not entered into the system.

- Short-Duration Space: Same process. If a confined space is created for a short period of time and the space must be entered, an evaluation must be developed. If the space will not exist for very long (e.g., less than 1 week), the evaluation will not be entered into the system.

Conveyances

- Water, natural gas, fuel oil, sewage, steam and electric power, chemicals, gases
  - If these services do not terminate at end-use equipment in the space, the inherent hazards of the material flowing through the service lines do not have to be considered in the permit space determination, unless there is reason to believe there is a reasonable probability of a rupture or leak, where the contents of the piping would cause a serious safety or health hazard. (LOI OSHA 10-27-95, Mr. Sharpie) However, if the entrant manipulates the valves or brings a cutter device into the space, the hazard in the conveyance must be considered when determining a primary hazard for PRCS consideration.

CO_2 in Soils

- Oxygen displacement

- Accumulation in pits and wells occurs because CO_2 is denser than air and may slowly accumulate. Outdoor exposure can occur, where CO_2 is venting from belowground sources, such as mining operations, natural gas production, and magmatic emissions.

Fall Protection and Confined Space

- Specific fall protection requirements are not included in the PRCS standard.
- Fall protection and ladder safety requirements addressed in 29 CFR 1910
  - *Walking–Working Surfaces*, Subpart D and the General Duty Clause of the Occupational Safety and Health Act.
- If the described potential fall hazard were the exclusive hazard within this pit, a permit program would not be required. (From a LOI dated 2-23-99)

Field Evaluating and Posting

- Bring a field kit
  - Monitoring equipment, tape measure, flashlight, CSP tags, signs, glue, etc.
- Schedule evaluation
  - With knowledgeable person, if needed
- DO air monitoring
- DO NOT go into the space
  - DO NOT expose yourself to any primary hazard while evaluating
- Be thorough—obtain as much information as possible
- Obtain signs from program lead

Activities—Confined Space Evaluation

- What you will need
  - Form 1620 - Confined Space Evaluation
  - Hands-On Exercise
- DO Case Study #1 together as a class

Then

- Split into four groups or work individually – Teacher's choice. Assign a case to each group.
- Group or individuals work on cases, then report out to the class.

Case Study #1: Concrete Vault

- Concrete vault 10 ft square x 10 ft deep
- Vertical wall attached to “ladder”

Case Study #1: Concrete Vault—cont.

- 6- and 8-in.-diameter pipes
- Road 30 ft away

Case Study #1: Concrete Vault—cont.

- Confined space?
- Look at the 32-point inspection criteria. Do any primary/secondary hazards apply?
- Permit-required confined space?
- Does C5 or C7 apply?
- Can you isolate or eliminate or control hazards?
- What kind of rescue mode would you use?

Directions

- Gather forms and exercise
- Read the scenario
- Think about the considerations
- Follow the directions
- Answer the questions
- Participate in the class discussion or presentation

Reports from Groups Should Include

- Description of the space
- Hazards? Primary? Secondary?
- NPCS or PRCS? Why?
- C5? C7? Could you use either of these?
- Can you mitigate any hazards?
- Rescue mode? Why?

Last Slide

- Course 19613, Confined Space Evaluation

Location Description

- TA-59
- Building 1
- Plenum in basement

Large Enough to Enter Bodily

- Port to a crawlspace
- 9-in.-x-4-in.-wide opening

- Storm water draining pipe
- 24-in. diameter

Large Enough to Enter Bodily—cont.

- Hot water supply
- Tank dimension: 6-ft diameter, 18 ft long
- Port dimensions: 15-in.-x-12-in.-wide oval

Limited Access/Egress

- Crawlspace access
- 21-in.-x-21-in.-wide opening

- Surplus office supplies
- 4-ft-x-6-ft-wide opening

Limited Access/Egress—cont.

- Valve pit
- 4 ft deep
- Houses steam lines

Designed for Human Occupancy

- Fan housing
- Moving parts guarded

- Seats, ventilation designed for occupancy

Designed for Human Occupancy—cont.

Limited Entry/Egress

- 260 ft long; one interior and two exterior entrances
- Pipe chase: gas, steam, water, and compressed air
- Entered as needed for inspection and maintenance

Limited Entry/Egress (cont)

- Bodily enter, occupancy, and limited access/egress?
- Primary and secondary hazards?
- Classification