

**LOYOLA UNIVERSITY CHICAGO**

**CONFINED SPACE**

**STANDARD OPERATING PROCEDURE**



*Preparing people to lead extraordinary lives*

**FEBRUARY 2024**

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## 1.0 INTRODUCTION

### 1.1 PURPOSE

This document provides guidance to help prevent injuries while working within a confined space. This includes the responsibilities of all parties involved to ensure proper confined space identification, preparation, authorization, and communication before and during the confined space entry and confined space work. These procedures apply to anyone (including, but not limited to personnel, contractors, groups providing services) who may enter a confined space. This program should be reviewed on an annual basis.

### 1.2 REGULATORY

Occupational Safety and Health Administration (OSHA) 1910.146 for general workplace settings and OSHA 1926 Subpart AA (1926.1201) for construction.

[1910.146 - Permit-required confined spaces | Occupational Safety and Health Administration \(osha.gov\)](https://www.osha.gov/1910.146)

29 CFR 1910.146 - Permit-Required Confined Spaces

29 CFR 1910.146 Appendix A – Permit-Required Confined Space Decision Flow Chart

29 CFR 1910.146 Appendix B – Procedures for Atmospheric Testing

29 CFR 1910.146 Appendix F – Rescue Team or Rescue Service Evaluation Criteria (Non-Mandatory)

29 CFR 1926 Subpart AA - Confined Spaces in Construction

#### Additional References

National Fire Protection Association (NFPA) 350-2022 - Standard on Life Safety Rope and Equipment for Emergency Services

American National Standards Institute/American Society of Safety Professionals (ANSI/ASSP) Z117.1-2022 - Safety Requirements for Confined Spaces

## 2.0 DEFINITIONS

**Attendant:** An individual stationed outside one or more permit spaces who monitors the authorized entrants and who performs all attendant's duties assigned by this procedure. The attendant may render assistance as needed to entrants inside the space without entering the space.

**Blanking or Blinding:** The absolute closure of a pipe, line, or duct by fastening a solid plate (such as a spectacle blind or a skillet blind) that completely covers the bore and that can withstand the maximum pressure of the pipe, line, or duct with no leakage beyond the plate.

**Calibration or Recalibration:** A laboratory or bench-top resetting of alarm points, spans and zeros, if applicable, according to manufacturer specifications. Calibration or re-calibration shall

be conducted by a factory authorized service center, a factory trained technician, or a trained university technician.

**Confined Space:** OSHA defines a confined space as any space that is:

1. Large enough for an employee to enter and perform work.
2. Has limited or restricted means for entry or exit.
3. Is not designated for continuous occupancy.

Entry into a confined space is defined as the action by which a person passes through a limited opening into a restricted or potentially hazardous work area. Entry is considered to occur as soon as any part of the entrant's body breaks the plane of the entry point into the confined space. Restricted entry and exit are a physical configuration that requires the use of hands for support or contortion of the body to enter or exit from a confined space.

Examples of confined spaces include, but are not limited to, vats, tanks, boilers, pits, manholes, tunnels, sewers, crawl spaces, pipelines, etc. Open ditches or trenches can also be confined spaces if entry or exit is limited.

Confined space hazards include, but are not limited to, mechanical entrapment, engulfment, atmospheric gas, temperature extremes, dust, excessive noise, slick or wet surfaces, falling objects or hazards, electrical shock, poor lighting, or work created hazards. There are two (2) classifications for confined spaces, Permit Required Confined Space and Non-permit Required Confined Space. The differences are detailed in a separate section of this procedure.

**Emergency:** Any occurrence (including the failure of hazard control or monitoring equipment) or event internal or external to the permit space that could endanger entrants.

**Engulfment:** The surrounding and effective capture of a person by a liquid or a finely divided (flowable) solid substance that can be aspirated to 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:** Any person who enters a confined space.

**Entry:** The action by which a person passes through an opening into a permit-required 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 written or printed document that is provided by the employer to allow and control entry into a confined space and contains the information specified in 29 CFR 1910.146(f).

**Entry Supervisor:** The person responsible for determining if acceptable entry conditions are present at a permit space where entry is planned, for authorizing entry, overseeing entry operations and for terminating entry.

**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:

- (1) Flammable gas, vapor, or mist in excess of 10 percent of its lower flammable limit (LFL);
- (2) Airborne combustible dust at a concentration that meets or exceeds its LFL;
- (3) Atmospheric oxygen concentration below 19.5 percent or above 23.5 percent;
- (4) 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 Substances, of this part and which could result in employee exposure in excess of its dose or permissible exposure limit;
- (5) Any other atmospheric condition that is immediately dangerous to life or health.

**Hot Work:** "Hot work" means riveting, welding, flame cutting or other fire or spark-producing operation.

**Intrinsically Safe:** Equipment that is explosion proof and will not produce sparks or other ignition sources.

**Immediately Dangerous to Life and Health (IDLH):** Any condition that poses an immediate or delayed threat to life, or which is likely to result in acute or immediately severe health effects or that would interfere with an individual's ability to escape unaided from a confined space.

**Lockout-Tagout:** The placement of a lockout device on an energy isolating device, in accordance with an established procedure, ensuring that the energy isolating device and the equipment being controlled cannot be operated until the lockout device is removed. The key for any lock used for lockout shall remain with the person working within the confined space.  
Note: The difference between lock out and tag out is the device used. The lockout device stops employees from operating the equipment while the tagout device informs them that the equipment should not be operated.

**Prohibited condition:** Any condition in a permit space that is not allowed by the permit during the period when entry is authorized.

**Rescue service:** The personnel designated to rescue employees from permit spaces.

**Retrieval system:** The equipment (including a retrieval line, chest or full-body harness, wristlets, if appropriate, and a lifting device or anchor) used for non-entry rescue of persons from permit spaces.

**Testing:** The process by which the hazards that may confront entrants of a permit space are identified and evaluated. Testing includes specifying the tests that are to be performed in the permit space.

### **3.0 TRAINING**

Per OSHA 29 CFR 1926.1207(a), "an employer must provide training to each employee whose work is regulated by this standard, at no cost to the employee, and ensure that the employee possesses the understanding, knowledge, and skills necessary for the safe performance of the duties assigned under this standard. This training must result in an understanding of the hazards in the permit space and the methods used to isolate, control or in other ways protect employees from these hazards, and for those employees not authorized to perform entry rescues, in the dangers of attempting such rescues."

Training required by this section must be provided to each affected employee:

- (1) In both a language and vocabulary that the employee can understand;
- (2) Before the employee is first assigned duties under this standard;
- (3) Before there is a change in assigned duties;
- (4) Whenever there is a change in permit space entry operations that presents a hazard about which an employee has not previously been trained; and
- (5) Whenever there is any evidence of a deviation from the permit space entry procedures required by 29 CFR 1926.1204(c) or there are inadequacies in the employee's knowledge or use of these procedures.

The training must establish employee proficiency in the duties required by this standard and must introduce new or revised procedures, as necessary, for compliance with this standard.

(d) The employer must maintain training records to show that the training required by paragraphs (a) through (c) of this section has been accomplished. The training records must contain each employee's name, the name of the trainers, and the dates of training. The documentation must be available for inspection by employees and their authorized representatives for the period the employee is employed by that employer.

Training certificates should be kept by the employee's Supervisor.

#### **4.0 PERMIT REQUIRED AND NON-PERMIT REQUIRED CONFINED SPACE**

There are two types of confined spaces regarding workplace safety: "permit-required" and "non-permit" confined spaces. A professional must assess the hazards and determine if the space will need a permit to enter.

**Permit-Required Confined Space (PRCS):** This is a space where the hazards are controlled, but still present. These spaces are usually Immediately Dangerous to Life and Health (IDLH). The term IDLH is defined by the US National Institute for Occupational Safety and Health (NIOSH) as exposure to airborne contaminants that is "likely to cause death or immediate or delayed permanent adverse health effects or prevent escape from such an environment " (e.g., smoke or other poisonous gases or vapors of sufficiently high concentrations, typically at or above the permissible exposure level (PEL). These hazards could affect the ability of a worker to leave the space without assistance.

Permit required confined space is regulated by OSHA 29 CFR 1910.146. A permit-required confined space is defined by having any of the following:

- Contains or potentially contains a hazardous atmosphere.
- Contains material that has the possibility of engulfing someone.
- Has a configuration where someone could get trapped or asphyxiated by inwardly converging walls or by a floor that slopes downward and tapers to a smaller cross-section.
- Contains any other recognized serious safety and health hazard.

Once a professional designates an area a permit required confined space, signage will be placed on the exterior of the space.

**See Appendix A for examples of signage used to denote a confined space.**

To reduce the risk of injury in a permit required confined space, a competent person (a person who has training and experience) is necessary to inspect the area daily and determine the appropriate safety measures. Although all steps are important, monitoring the air quality before and during entry, as well as during work operations is a critical step. Additional safety measures include personal protective equipment, adequate ventilation, monitoring equipment, and safety equipment (should workers need to be rescued).

#### **4.1 WORK PERMIT AND ENTRY TICKET SYSTEM**

A worker shall never enter a permit required confined space without the permission of the Entry Supervisor/competent person. A work permit and an entry ticket must be completed for every permit required confined space entry. The entry ticket must be posted outside of the confined space and remain there until the work is completed for each shift. A new permit and ticket are required each day and for each shift of work.

The Entry Supervisor or his designee must keep a copy of the completed permit on file for a minimum of one year so it may be reviewed when the program is reviewed. It should contain at least the following information, but is not limited to the following information:

- The time, date, and length of time the permit is valid for.
- The name(s) of the worker(s) that are authorized to enter the confined space.
- The name(s) of the attendant(s).
- The name of the entry supervisor.
- The location and description of the confined space.
- The scope of the work that is to be done in the confined space.
- The acceptable entry conditions.
- The measures used to isolate the permit space and to eliminate or control permit space hazards before entry.
- Possible hazards that may be encountered inside and outside the space.
- Possible hazards that may develop during the work activity.
- The details of any atmospheric testing done of the confined space - when, where, results, and date monitoring equipment was last calibrated. Calibration must be verified, and a bump test done before each use. Ideally, calibration would be done immediately prior to confined space entry but if this is not possible, equipment manufacturer's guidelines for the frequency of calibration must be followed.
- Hazard control measures, including the use of mechanical ventilation, work procedures, personal protective equipment needed and any other precautions that must be followed by every worker who is going to enter the confined space.
- Means of communication between the persons working in the confined space and the attendant.
- The rescue and emergency services that can be summoned and the means (such as the equipment to use and the numbers to call) for summoning those services.
- An emergency plan and the protective equipment and emergency equipment to be used by any person, other than a rescue service, who responds to an emergency in the confined space.

- A signature of a worker who did the confined space air testing. The signature on the permit would indicate that adequate precautions are being taken to control the anticipated hazards.
- Authorization signature by the Entry Supervisor certifying that the space has been rigorously evaluated, prepared, and it is safe for entry and work.

If the confined space needs to be evacuated for any reason, the work permit shall be immediately cancelled. If the confined space needs to be reentered after the conditions have been corrected, a new work permit shall be issued. The cancelled work permit shall be kept for a minimum of one year to be reviewed during the annual review of the confined space program.

**See Appendix B for an example of a confined space entry permit.**

## **4.2 EQUIPMENT**

Equipment may include but is not limited to the following equipment listed below. Proper maintenance of equipment is critical to ensure safe entry into a space. Proper lighting is crucial to ensure the work area can be seen. All equipment that will be used in any confined space must be intrinsically safe and approved for confined space work.

- Gas-detection equipment
- Ventilating equipment
- Communication equipment if necessary
- PPE to be used when engineering controls such as ventilation equipment is not practical
- Lighting
- Signs and barricades to prevent unauthorized entry
- Ladders to provide for safe access to and egress from the space
- Rescue and emergency equipment

## **4.3 PERSONAL PROTECTIVE EQUIPMENT (PPE)**

Personal protective equipment is not limited to the items referenced below since additional items may be necessary based on conditions within the confined space. All PPE must meet the current applicable ANSI and or NIOSH standards.

**Head Protection:** Protective headgear is vital in confined spaces, where the potential for head injuries is high. It is important to find the best fit and to continually check your headgear for any damage that can compromise its effectiveness.

According to OSHA, protective helmets or hard hats should:

- Resist penetration
- Absorb the shock of a blow
- Protect against electrical shock
- Be water-resistant and slow-burning
- Have clear instructions explaining proper adjustment and replacement of the suspension and headband

Hard hats are not to be worn backwards unless the hard hat is designed to be worn in that manner.



**Eye protection** such as safety glasses, safety goggles and face shields protect the user from impact hazards at various angles. Safety goggle frames must be properly fitted to the wearer's face to form a protective seal around the eyes. Workers who wear prescription glasses must also wear eye protection, whether in conjunction with their prescription glasses or using safety glasses that incorporate those prescription lenses.

**Hearing protection** if noise levels are expected to be high, in which case wearing earplugs or earmuffs can help prevent hearing loss. If excessive noise is expected the work area should be evaluated with a sound level meter.

**Gloves:** Working in confined spaces and hazardous locations often means working with your hands. Factors influencing the type of gloves you may use include:

- Type of chemicals handled, if applicable
- Type of contact (total immersion, splash, etc.) and duration of contact
- Area requiring protection (hand only, forearm or arm)
- Grip requirements (dry, wet, or oily)
- Thermal protection
- Size and comfort
- Abrasion/resistance requirements

Gloves are made from a wide variety of materials to protect against various workplace hazards. They include leather gloves, those made of canvas, metal mesh, fabric and coated fabric gloves, chemical and liquid-resistant gloves, and insulating rubber gloves. Protective gloves should be inspected before each use to ensure that they are not torn, punctured, or ineffective in any way.

**Foot and leg protection** to guard against slips, the dangers of electrical or chemical hazards, extreme heat, or the impact of heavy or sharp objects.

**Respirators** shall be necessary for locations with potentially hazardous gases or a lack of oxygen. If a respirator is necessary, the type shall be determined based on atmospheric conditions. Workers must be trained, medically cleared, and fit tested prior to wearing a respirator. Additionally, respirators must be inspected before and after every use to ensure the mask is in good condition and all parts are intact.

There are various types and levels of respiratory protection, including:

- Disposable paper dust mask.
- Filtering Face piece respirator to filter out particles such as dust, as well as certain types of mist, and fumes.
- Air Purifying Respirators work by removing gases, particles, vapors, aerosols (droplets and solid particles), or a combination of these contaminants from the air using filters, cartridges, or canisters.
- Air-supplied respirators, which bring in breathable air from an outside source.
- Self-contained breathing apparatuses (SCBA) that provide breathable air from a portable air tank worn on the user's back.

A **full-body harness** is one of the most important items of PPE that a worker can wear. A body harness is defined by OSHA as "straps which may be secured about the employee in a manner that will distribute the fall arrest forces over at least the thighs, pelvis, waist, chest and

shoulders with a means for attaching the harness to other components of a personal fall protection system.”

A full-body safety harness is used as part of a personal fall arrest system (PFAS), which is usually connected to a shock-absorbing lanyard or lifeline and secured to an anchor point. A full-body harness connected to an anchor serves as a lifeline and is required for working in many confined spaces.

#### **4.4 VENTILATION**

Mechanical ventilation is a positive engineering control action that may be taken and to reduce the hazards of adverse atmospheric conditions inside a confined space. Hazards can be controlled using continuous forced-air ventilation. Natural ventilation usually is not sufficiently reliable to serve as a primary means of control.

OSHA states in 29 CFR 1910.146, "An employee may not enter the space until the forced air ventilation has eliminated any hazardous atmosphere". If a properly calibrated and bump tested gas detector indicates there is an atmospheric hazard, no entry is permitted. An elevated level of oxygen can be highly explosive (greater than 23.5%), a decreased level of oxygen (less than 19.5%), levels of carbon monoxide (greater than 50 ppm), an LEL equal to or greater than 10%, or hydrogen sulfide (greater than 20 ppm) may be deadly. When any of these conditions are present, ventilation of the confined space is required. OSHA 29 CFR 1910.146(c)(5)(ii)(E)(2) states, "The forced air ventilation shall be so directed as to ventilate the immediate areas where an employee is or will be present within the space and shall continue until all employees have left the space". Additionally, OSHA 29 CFR 1910.146(c)(5)(ii)(E)(3) states "The air supply for the forced air ventilation shall be from a clean source and may not increase the hazards in the space".

#### **4.5 DUTIES OF PERSONNEL**

##### **Entry Supervisor**

1. Know the hazard(s) and potential hazards that may be encountered during entry. Information shall include, but not limited to: mode, signs/symptoms, and consequences of the exposure.
2. Ensures and verifies that rescue services are available and that the means to summon is operable.
3. List the names of all the entrants and attendants for each entry on the Entry Permit. If the Entry Supervisor enters the confined space, he/she must be listed as an entrant on the Entry Permit.
4. Ensure that all entrants have been trained in Confined Space Entry procedures, including self-rescue techniques to exit from the confined space.
5. Verifies, by checking, that all tests specified by the permit have been conducted and recorded.
6. Ensure that the work permit has been completed.

7. Ensure that the permit space is isolated. If isolation of the permit space is not feasible because the space is large or part of a continuous system, entry conditions shall be continuously monitored in areas where authorized entrants are working.
8. Verifies, by checking, that all procedures and equipment specified by the permit are in place before endorsing the permit and allowing entry to begin.
9. Sign the Entry Permit. Permits are not valid unless signed by the Entry Supervisor.
10. Terminate the entry and cancel the permit, as required by 29 CFR 1910. 146.(e)(5).
11. Remove unauthorized individuals who enter or attempt to enter the permit space during entry operations.
12. Determines whenever responsibility for a permit space entry operation is transferred and at intervals dictated by the hazards and operations performed within the space, that entry operations remain consistent with the terms of the entry permit and that acceptable entry conditions are maintained.
13. Document on the Entry Permit any incidents or circumstances requiring review of the confined space entry program.
14. When work is completed sign, remove, and file the canceled entry permit and all attachments.
15. If the permit space must be evacuated for any reason, the entry supervisor shall:
  - a. Order the entrants to exit the confined space. (The Attendant may also order that the confined space be evacuated for any reason at any time).
  - b. Note the unacceptable condition(s) on the entry permit.
  - c. Cancel the entry permit.
  - d. Retain the canceled Entry Permit with all attachments for annual review.
  - e. Correct the unacceptable condition if re-entry is planned. Document the corrective action.
  - f. Verify the conditions in the confined space are acceptable if re-entry is planned.
  - g. Issue a new Entry Permit before allowing re-entry.

**Attendant:**

1. Prior to the worker's entry into the confined space, the location of the nearest functional telephone shall be determined and verification of the working condition of the two-way radio or other means of communications in case of an emergency.
2. Know the hazard(s) that may be encountered during entry. Information shall include, but not limited to: mode, signs/symptoms, consequences of the exposure, and is aware of possible behavioral effects of hazard exposure in authorized entrants.
3. Continuously maintains an accurate count of authorized entrants in the permit space, ensures that there is a means to accurately identify who is in the permit space, records the names of any additional entrants on the entry roster, and records all times of entry and exit of each entrant on the entry roster.

4. Remains outside of the permit space during operations until relieved by another duly qualified and trained attendant.
5. Communicates with entrants as necessary to monitor status and to alert entrants of the need to evacuate the space, if necessary.
6. Monitors activities inside and outside the space to determine if it is safe for entrants to remain in the space and orders entrants to evacuate the space immediately under any of the following conditions:
  - a. If the attendant detects a prohibited condition.
  - b. If the attendant detects the behavioral effects of hazard exposure in an authorized entrant.
  - c. If the attendant detects a situation outside the space that could endanger the authorized entrants.
  - d. If the attendant cannot effectively and safely perform his duties.
  - e. An evacuation alarm is sounded.
7. Notify the Entry Supervisor immediately after taking the emergency action required, of the emergency, unusual situations, or conditions.
8. Summon rescue and other emergency services as soon as the attendant determines that authorized entrants may need assistance to escape from permit space hazards.
9. Takes the following actions when unauthorized persons approach or enter a permit space while authorized entry is under way:
  - a. Warn the unauthorized persons that they must stay away from the permit space.
  - b. Advise the unauthorized persons that they must exit immediately if they have entered the permit space.
  - c. Inform the authorized entrants and the Entry Supervisor if unauthorized persons have entered the permit space.
10. Performs non-entry rescues as specified by the employer's rescue procedure.
11. Performs no duties that will interfere with the attendant's primary duty to monitor and protect the entrants. An Attendant shall not be assigned any other duties or responsibilities other than those specifically outlined within this procedure.

## **Entrants**

1. Know the hazard(s) that may be encountered during entry. Information shall include, but not limited to, mode, signs/symptoms, and consequences of the exposure.
2. Properly use equipment as required by paragraph 29 CFR 1926.146(d)(4).
  - a. Testing and monitoring equipment needed to comply with paragraph 29 CFR 1926.146(d)(5);
  - b. Ventilating equipment needed to obtain acceptable entry conditions;
  - c. Communications equipment necessary for compliance with paragraphs 29 CFR 1926.146(h)(3) and 29 CFR 1926.146(i)(5);

- d. Personal protective equipment insofar as feasible engineering and work practice controls do not adequately protect employees;
  - e. Lighting equipment needed to enable employees to see well enough to work safely and to exit the space quickly in an emergency;
  - f. Barriers and shields as required by 29 CFR 1926.146(d)(3)(v);
  - g. Equipment, such as ladders, needed for safe ingress and egress by authorized entrants;
  - h. Rescue and emergency equipment needed to comply with 29 CFR 1926.146 (d)(9), except to the extent that the equipment is provided by rescue services; and
  - i. Any other equipment necessary for safe entry into and rescue from permit spaces.
3. Communicating with the attendant continuously to enable the attendant to monitor entrant status and to enable the attendant to alert entrants of the need to evacuate the space.
  4. Alert the attendant whenever:
    - a. The entrant recognizes any warning sign or symptom of exposure to a dangerous situation.
    - b. The entrant detects a prohibited condition.
  5. Exit from the permit space as soon as possible when:
    - a. An order to evacuate is given by the attendant or the entry supervisor.
    - b. The entrant recognizes any warning sign or symptom of exposure to a dangerous situation.
    - c. The entrant detects a prohibited condition.
    - d. An evacuation alarm is activated.
  6. After the entry is completed, ensure that the confined space is clear and free of hazards. This includes, but is not limited to, the following:
    - a. Removal of tools, equipment, and debris from the confined space at the completion of the job.
    - b. Confirm that all blinds are removed, all valves properly opened or closed, lines are properly reconnected, all locks and/or tags are removed, and the space is completely ready to be returned to service.
    - c. Clean the surrounding area.

**Non-Permit Required Confined Space (NPRCS):** This is a space where the hazards are “eliminated.”

Permit-required confined spaces can be extremely dangerous for workers while non-permit confined spaces are not considered life-threatening, but still may present potential hazards. This does not mean precautionary steps should not be taken before entering a non-permit space. Safety is essential no matter what the conditions are and because there is still the possibility of an injury occurring, only authorized personnel should enter the space.

**See Appendix C for a chart which illustrates the differences between the two types of spaces.**

A permit-required confined space can be reclassified as a non-permit space if the potential hazards are eliminated. This means the following:

- The permit space has been tested and inspected and the lack of actual or potential atmospheric hazards existing within the space has been confirmed. The permit space may be reclassified as a non-permit confined space for as long as the non-atmospheric hazards remain eliminated or isolated.
- The entry employer must eliminate or isolate the hazards without entering the space, unless it can demonstrate that this is infeasible. If it is necessary to enter the permit space to eliminate or isolate hazards, such entry must be performed under 29 CFR 1926.1204 through 29 CFR 1926.1211. If testing and inspection during that entry demonstrate that the hazards within the permit space have been eliminated or isolated, the permit space may be reclassified as a non-permit confined space for as long as the hazards remain eliminated or isolated. The entry employer must document the basis for determining that all hazards in a permit space have been eliminated or isolated, through a certification that contains the date, the location of the space, and the signature of the person making the determination. The certification must be made available to each employee entering the space or to that employee's authorized representative.
- If hazards arise within a permit space that has been reclassified as a non-permit space under paragraph (g) of 29 CFR 1926.1203, each employee in the space must exit the space. The entry employer must then reevaluate the space and reclassify it as a permit space as appropriate in accordance with all other applicable OSHA standards.

**Note:** For the purpose of confined space classification, atmospheric hazards cannot be considered "eliminated" through forced air ventilation only. Once a confined space is reclassified, it can remain non-permit for as long as the non-atmospheric hazards remain eliminated or isolated.

## **5.0 PROCEDURES FOR CONFINED SPACE ENTRY**

The purpose of these procedures is to ensure that entry into any confined space is planned and documented to identify and control hazards. The procedures cover entry method selection, planning and documentation of entry into a permit-required confined space (PRCS) or a non-permit required confined space (NPRCS). These procedures apply to anyone who may enter a confined space.

1. PRCS and NPRCS: Speak with a competent person who shall determine if the confined space requires a permit to enter. Inform those employees who have not been trained to keep away during the entry activities by using appropriate signs and barricades to prevent entry. Once an entrance cover to any confined space is removed, the opening shall be promptly guarded by a railing, temporary cover, or other temporary barrier that will prevent an accidental fall through the opening and/or that will protect each employee working in the space from foreign objects entering the space.
2. For a PRCS, obtain a copy of the signed entry permit and hazard assessment. Review any hazards associated with the space. Entry permits must be renewed on a daily

and/or shift basis. Completed forms must be kept at or near the entrance of the space during entry.

3. PRCS: Ensure proper Personal Protective Equipment (PPE), communications equipment, and potential retrieval equipment is present and in good working condition.
4. PRCS and NPRCS: Authorized and trained personnel should lockout-tagout any hazardous energy that an entrant could be exposed to.
5. PRCS and NPRCS: Conduct continuous air monitoring utilizing a multi-gas air monitor (meter) checking atmospheric hazards, including, but not limited to, toxic contaminants, oxygen deficient or enriched environments, and/or flammable vapors. The attendant shall monitor the air quality before and during entry, as well as during the performance of the work.

**NOTE:** The list below contains the most common atmospheric conditions. The most current regulatory standards should be referenced for atmospheric conditions not listed below.

Oxygen – between 19.5% and 23.5%

Lower Explosive Limit or Lower Flammable Limit (LEL or LFL) – flammable gas, vapor, or mist must be less than 10%. Airborne combustible dust must be at a concentration less than the LFL. It is the responsibility of the person conducting the monitoring to confirm that the right correction factor has been applied to the gas that is being sampled to ensure that the LEL reading is calculated properly. (Note: OSHA uses the term LFL, but most gas detection equipment manufactures use the term LEL)  
Toxic gases: Must be below the permissible exposure limit (PEL), threshold limit value (TLV) or time-weighted average (TWA) of a substance.

Hydrogen Sulfide – less than 20 parts per million (ppm)

Carbon Monoxide – less than 50 parts per million (ppm)

It may be necessary, though, to conduct a full permit-required confined-space entry to test the atmosphere if it cannot be adequately tested from outside. In an unoccupied space, once the atmosphere has been tested and it is determined that the only hazard is an atmospheric hazard that can be controlled through the use of forced-air ventilation, the rest of the requirements are relaxed—the only requirement being that the atmosphere of that unoccupied space must be tested periodically. While entrants are within a confined space, it must be monitored continuously, usually in 15-minute intervals.

If a hazardous atmosphere is detected at any time during the entry, the following are required:

- Each employee must leave the space immediately.
- The space must be evaluated to determine how the hazardous atmosphere developed.

- Steps must be taken to protect the employees from the hazardous atmosphere before a subsequent entry takes place. Once the Entry Supervisor satisfies the requirements for reentering the confined space, certification must be completed before anyone enters the confined space. The certification consists of the date, location of the space and signature of the person providing the certification.

6. PRCs: Potential hazards

a. Asphyxiation may occur because:

1. Certain chemicals, chemical reactions, or biological processes that can absorb or replace oxygen within the space (inert gases e.g., nitrogen).
2. Welding processes can deplete oxygen in the confined space and elevate the carbon monoxide levels.
3. Metal oxidation (rusting) inside a closed vessel that may deplete oxygen from the atmosphere.
4. Improper or inadequate ventilation that can allow toxic or asphyxiation gases to quickly accumulate to dangerous levels within the space.

b. Gases or dusts present a fire and/or explosion hazard and:

1. May come from residues in the confined space.
2. May enter from upstream or downstream components.
3. May be introduced by compressed welding gases (acetylene, oxygen, etc.).
4. May be introduced by liquid or gaseous releases from inside or outside the confined space.

c. Toxic substances or atmospheres:

1. May be introduced from inside or outside the space
2. May cause damage through inhalation, ingestion, or direct skin contact.
3. Exposure effects may vary from mild to fatal.
4. May be generated from procedures or materials used during the entry.

d. Electric shock can occur if electrical energy to the space is not properly disconnected and locked out and tagged out, or if equipment used in the space is improperly grounded or insulated. Electrical shock can also occur from the use of tools or equipment not approved for use in a space based on conditions within the space.

e. Physical injuries can occur because of:

1. Slippery conditions within the space.
2. Falling objects.
3. Contact with hot metal or corrosive chemicals.
4. Poor lighting.
5. Cave-in when working in a trench or excavation

7. PRCs: The confined space entry permit should be checked to ensure that the information on the permit corresponds with the information on the hazard assessment.

8. PRCs and NPRCS: A signed and approved hot work permit is required for any spark or flame-producing activities to be done in the space.

9. PRCs and NPCRS: Notify the Entry Supervisor and wait for authorization to enter the confined space. Entry is allowed once authorization is given.



10. PCRS and NPRCS: The two-person rule applies to all confined space entries; that is, every confined space entry requires the presence of at least two qualified persons: for NPRCS entries, the minimum qualification is that both workers are current in the training required at the attendant level (standing watch outside the confined space and conducting monitoring activities) or entrant level (the person going into the confined space) . All PRCS entries must be supervised by a trained confined space Entry Supervisor and carried out by workers who are current in the training required at the attendant or entrant level.

All Entry Supervisors must be thoroughly familiar with the confined space entry procedures and shall be responsible for ensuring that all entries are conducted according to this procedure.

The use of the space, internal configuration, size of the openings, contents, constructions materials, internal mechanical devices, unique characteristics, and hazards are all factors that must be known and understood by all entrants before entering a confined space.

## **6.0 COMMUNICATION**

There are a variety of methods of acceptable communication, but any communication must result in the rapid, clear transmission of messages between workers, even while wearing respiratory protection equipment. Continuous electronic voice communication is the only method available to entrants that provides the level of comfort needed to relieve fears of entry.

Radio equipment operates most efficiently when the transmitter and receiver are on the same plane, without obstruction and in line-of-site. Most confined spaces are metal or concrete with re-bar, which do not easily allow radio signals to penetrate. This is known to create dead spots or reduce signal strength due to bounce resulting in messages that are garbled or not received. Radio equipment is usually effective when used by safety attendants outside spaces to maintain contact with their base or, in the event of a problem, to call for a rescue team. Radio communication between the exterior and interior of a confined space can be erratic at times but in most cases, it is the most viable option.

As with all electronic equipment, it must be electrically shielded, extremely rugged, resistant to chemicals, and environmentally sealed. Most importantly, as many confined spaces are classified as being explosive, the possibility of the equipment being the cause of an explosion must be eliminated. Equipment should therefore be Intrinsically Safe approved by an accredited test facility (e.g., Underwriters Laboratories) for the explosive substances that may be encountered during a confined space entry.

## **7.0 RESCUE PLAN**

When working in confined spaces, an important question to consider is what to do if someone becomes injured, incapacitated or trapped in a space and has to be rescued.

**911 should be called in the event of an emergency.** The Shift Supervisor and Campus police should also be contacted.

Rescue and descent devices are used to retrieve workers who are experiencing difficulties and must return to a safe location. These devices can either be automatic, user-controlled or

controlled by a co-worker and will require various amounts of additional training to be used safely and effectively.

A lightweight and easy-to-use portable one-piece tripod should be used. The tripod should be able to handle an emergency and should be strong/durable enough to accommodate different scenarios such as fall arrest, rescue, etc.

The following steps will help guide through preparing for and executing a confined space rescue in a timely manner.

**1. Conduct rescue drills:** One of the best ways to prepare is to practice. Rescue drills provide personnel with the experience of working through different scenarios to familiarize themselves with situations they could encounter in confined spaces. Conducting rescue drills helps prepare teams for working in confined spaces, and when necessary, rescuing coworkers.

**2. Rescues fall into two categories:** There are time-sensitive and non-time-sensitive rescues. Time-sensitive or “emergency” rescues typically involve oxygen-deficient atmospheres where there is a small window of time, typically six minutes, to get someone out. Non-time-sensitive rescues have an atmosphere with sufficient oxygen levels and, therefore, the rescue is not as time-sensitive and can be conducted without the use of supplemental oxygen (e.g., someone breaking their ankle and a team will need to go into the confined space).

**3. Every entrant must wear a full body harness:** Anyone entering a confined space will be required to wear a full body harness with a retrieval line. If a rescue is necessary, lifting equipment may be necessary to remove a person from the confined space. The lifting equipment will need to attach to a full body harness via the retrieval line.

**4. Confined space should be surveyed in the event of a rescue:** The work permit should highlight the parameters of the confined space. Knowledge of the confined space will aid in the event of a rescue and help to determine the proper tools and techniques for getting someone out in a rescue situation.

**5. Survey the Confined Space Openings:** Along with surveying confined spaces, it is also important to survey and assess openings. Surveying openings provides an assessment of how much room workers and/or rescuers will have to enter a confined space, and what types of equipment they will be able to bring with them.

**5. First Responders/Rescue teams:** It is important to remember that first responders are the first line of defense for a rescue, but a team will need to be ready until they can arrive or in the event they are delayed. Regardless of the confined space or opening, a rescue team needs to be prepared and ready to respond in a timely manner if someone is injured, trapped, or incapacitated. Anyone that participates in confined space rescues must have additional training to safely perform these duties.

Appendix A  
Examples of Confined Space Signs



**Appendix B**

**Loyola University Chicago Confined Space Entry Permit – Page 1**

**CONFINED SPACE IDENTIFICATION/EQUIPMENT No:** \_\_\_\_\_

**Date:** \_\_\_\_\_

**WORK DESCRIPTION:**

\_\_\_\_\_

**ATTENDANT’S NAME (Please Print)** \_\_\_\_\_

**Meter No:** \_\_\_\_\_

**ATTENDANT’S NAME (Please Print)** \_\_\_\_\_

**Meter No:** \_\_\_\_\_

**ATTENDANT’S NAME (Please Print)** \_\_\_\_\_

**Meter No:** \_\_\_\_\_

\_\_\_\_\_

**SAFETY ATTENDANT’S INSTRUCTIONS**

**ALL SAFETY ATTENDANTS MUST:**

Read and sign page 2 of this form to indicate that you understand the instructions, duties, and responsibilities of the assigned attendant’s role.

Enter the names of all personnel identified as “entrants” for this confined space. Enter the date of the entrant’s last Confined Space training (initial or refresher). Maintain a current status of each entrant by placing the time in the In and Out spaces provided by each name.

ENTRANT’S NAME	DATE OF LAST TRAINING	TIME		TIME	
		IN	OUT	IN	OUT

**ATMOSPHERIC READINGS MUST BE DOCUMENTED BELOW  
AT A MINIMUM OF EVERY 2 HOURS**

TIME	O <sub>2</sub>	LEL	TIME	O <sub>2</sub>	LEL	TIME	O <sub>2</sub>	LEL

**RETAIN WITH CONFINED SPACE ENTRY PERMIT**

## Appendix B

### Loyola University Chicago Confined Space Entry Permit – Page 2

#### Attendant's Duties and Responsibilities:

1. Prior to the worker's entry into the confined space, the location of the nearest functional telephone shall be determined and verification of the working condition of the two-way radio or other means of communications in case of an emergency.
2. Know the hazard(s) that may be encountered during entry. Information shall include, but not limited to: mode, signs/symptoms, consequences of the exposure, and is aware of possible behavioral effects of hazard exposure in authorized entrants.
3. Continuously maintains an accurate count of authorized entrants in the permit space, ensures that there is a means to accurately identify who is in the permit space, records the names of any additional entrants on the entry roster, and records all times of entry and exit of each entrant on the entry roster.
4. Remains outside of the permit space during operations until relieved by another duly qualified and trained attendant.
5. Communicates with entrants as necessary to monitor status and to alert entrants of the need to evacuate the space, if necessary.
6. Monitors activities inside and outside the space to determine if it is safe for entrants to remain in the space and orders entrants to evacuate the space immediately under any of the following conditions:
  - a. If the attendant detects a prohibited condition.
  - b. If the attendant detects the behavioral effects of hazard exposure in an authorized entrant.
  - c. If the attendant detects a situation outside the space that could endanger the authorized entrants.
  - d. If the attendant cannot effectively and safely perform his duties.
  - e. An evacuation alarm is sounded.
7. Notify the Entry Supervisor immediately after taking the emergency action required, of the emergency, unusual situations, or conditions.
8. Summon rescue and other emergency services as soon as the attendant determines that authorized entrants may need assistance to escape from permit space hazards.
9. Takes the following actions when unauthorized persons approach or enter a permit space while authorized entry is under way:
  - a. Warn the unauthorized persons that they must stay away from the permit space.
  - b. Advise the unauthorized persons that they must exit immediately if they have entered the permit space.
  - c. Inform the authorized entrants and the Entry Supervisor if unauthorized persons have entered the permit space.
10. Performs non-entry rescues as specified by the employer's rescue procedure.
11. Performs no duties that will interfere with the attendant's primary duty to monitor and protect the entrants. An Attendant shall not be assigned any other duties or responsibilities other than those specifically outlined within this procedure.













**My signature on this form indicates that I have read and understand the instructions, duties and responsibilities of the assigned attendant's role.**

PRINTED ATTENDANT NAME \_\_\_\_\_ DATE \_\_\_\_\_

ATTENDANT SIGNATURE \_\_\_\_\_

## Appendix C

### Differences between Permit Required and Non-Permit Required Confined Spaces

	Permit-Required Confined Spaces	Non-Permit Confined Spaces
Contains or has the potential to contain a hazardous atmosphere		
Contains a material that has the potential for engulfing an entrant		
Could trap or asphyxiate an entrant with inwardly converging walls		
Could trap or asphyxiate an entrant with a floor that slopes downward and tapers to a smaller cross-section		
Contains any other recognized serious safety or health hazard		
Contains hazards capable of causing death or serious physical harm		

## Appendix D

### Example of a Typical Tripod used for Confined Space Entry Decent and Rescue

