



CONFINED SPACE PROGRAM

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1.0 PURPOSE

The purpose of the USC Confined Space Program is to protect the safety and health of anyone who enters a confined space for any reason, including inspection, maintenance, cleaning, emergency response or rescue. For definitions of a confined space and a permit-required confined space, refer to Section 4.0.

2.0 APPLICABILITY AND SCOPE

The procedures established in this document apply to all personnel involved in confined space entry throughout the University.

3.0 APPLICABLE REGULATIONS AND STANDARDS

| | |
|-------------|--------------------------------------------------------|
| California: | Title 8, General Industry Safety Orders, Section 5156 |
| | Title 8, General Industry Safety Orders, Section 5157 |
| | Title 8, General Industry Safety Orders, Section 5158 |
| | Title 8, Telecommunication Safety Orders, Section 8616 |
| Federal: | Title 29, Code of Federal Regulations, 1910.146 |

4.0 DEFINITIONS

Alternate Entry Procedure – a procedure that may be used to enter a Permit-Required Confined Space if the only hazard present in the space is atmospheric and is controllable by mechanical ventilation alone, and the atmosphere will not become immediately dangerous to life and health if the mechanical ventilation fails.

Attendant – a person who remains outside the confined space, verifies safe entry conditions, maintains constant communication with those inside the space, and whose primary duty is to summon help should there be any indication of endangerment to those inside the space (see Confined Space Entry Procedures).

Blanking – absolute closure of a pipeline or duct to prevent passage of any material by fastening a solid plate across the pipe.

Confined Space – an enclosed space (e.g., tank, vessel, silo, vault, pit, open-topped space more than four feet deep) having all of the following characteristics:

- large enough and so configured that an employee can enter and perform work;
- having limited or restricted means for entry or exit; and
- not designed for continuous employee occupancy.

Double Block and Bleed – closure of a line, duct or pipe by locking closed two in-line valves, and tagging or locking open a drain or vent valve in the line between the two closed valves.

Emergency Response Team – the group of individuals trained to perform emergency rescue operations who are designated by the University as the Emergency Response Team. Currently, the local Los Angeles Fire Department has agreed to provide emergency response rescue as necessary.

Entry – when ANY part of the body passes through the opening of a confined space, including when any part of the body breaks the plane of an opening into the space (e.g., the area directly above a manhole).

Entry Permit – the written or printed USC-generated document giving authorization for entry into a Permit-Required Confined Space under established conditions for a stated purpose during a specified work shift.

Entry Supervisor – the person responsible for determining whether entry conditions are acceptable at the confined space immediately prior to entry, for authorizing the entry and specific entry operations, and for terminating the entry as described in this program. (Not necessarily an actual supervisor; this is a confined space term only.)

Hazardous Atmosphere – an atmosphere that may expose employees to the risk of injury, acute illness, incapacitation, impairment of ability to self-rescue, or death.

Hot Work Permit – the University’s written authorization to perform operations capable of producing an ignition source, such as riveting, welding, cutting, burning and heating (see Hot Work Program).

Immediately Dangerous to Life or Health (IDLH) – any condition that poses an immediate or delayed threat to life, or that would cause irreversible adverse health effects or would interfere with an individual’s ability to escape unaided from a permit space.

Isolation – the process of removing from service a hazard source associated with a Permit-Required Confined Space, and completely protecting the space from inadvertent release of energy or material into the space. Means of isolation include: blanking (skillet-type metal blank between flanges); blinding; mis-aligning or removing sections of pipes, lines or ducts; a double block and bleed system; lock-out or tag-out of all sources of power; and blocking or disconnecting all mechanical linkages.

Non-Permit Confined Space – a confined space with which no inherent hazard is associated.

Permit-Required Confined Space – a confined space that has one or more of the following characteristics:

- a) contains a known or potentially hazardous atmosphere;
- b) contains a material that can engulf an entrant;
- c) configured 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; or
- d) contains any other recognized serious safety or health hazard.

Posting – A danger sign or other equally effective means to inform employees who work in an area that contains a permit-required confined space, of the existence, location and danger posed by the permit space. Note: A sign reading “DANGER -- PERMIT-REQUIRED CONFINED SPACE, DO NOT ENTER” or using other similar language would satisfy the requirement for a sign.

Retrieval System – the equipment used for non-entry rescue of persons from permit spaces (includes a retrieval line, chest or full-body harness, wristlets if appropriate, and a lifting device or anchor).

Testing – the process by which hazards or potential hazards of a Permit-Required Confined Space are identified and evaluated.

5.0 RESPONSIBILITIES

USC Environmental Health and Safety (EH&S) will oversee the administration of the Confined Space Entry Program, but ultimate responsibility for its implementation rests with each department that conducts confined space entry or hires a contractor who enters a confined space.

5.1. Employee Responsibilities

It is the responsibility of each employee affected by this program to:

- Understand the requirements of this Confined Space Entry Program;
- Annually attend Confined Space Entry training provided by EH&S, or equivalent:
 - Persons who enter confined spaces, and those assigned to the required Attendant position, must attend Confined Space Entrant and Attendant training;
 - Persons who will be assigned the position of Entry Supervisor must attend Confined Space Entry Supervisor training;
- Perform assigned duties according to the procedures listed in this Program;
- Maintain confined space safety equipment in ready-to-use condition, keeping it clean and functional per manufacturer's directions;
- Never perform a confined space entry unless all provisions of this Program are observed; and
- Immediately notify his or her supervisor of any problem or question regarding confined space work.

5.1.1. Responsibilities of the Entry Supervisor in a Permit-Required Confined Space Entry

The Entry Supervisor for each permit-required confined space will:

- Assure that the person assigned to be the Attendant has received Confined Space Entrant and Attendant training, and understands confined space hazards and standby procedures;
- Assure that all persons who will enter the confined space have received Confined Space Entrant and Attendant training;
- Minimize the number of employees permitted to enter confined spaces, and list every involved employee on the Confined Space Entry Permit;
- Review the job duties and entry permit requirements for the permit-required confined space;
- Assure that all safety equipment and job tools necessary to safely complete the assigned work in the confined space are present and in good working condition;
- Ensure the functionality of the communication method between Entrants and Attendants, and the department's method to summon Fire Department Emergency Response Rescue personnel (e.g., department dispatcher or Department of Public Safety dispatcher);
- Assure that the entry conditions are acceptable;
 - Verify that the confined space has been decontaminated of hazardous materials to the extent feasible before entry;
 - Where potential exists for electrical shock, ensure that:
 - appropriate electrical equipment is used, including protections such as ground fault circuit interrupters, assured grounding systems, double insulated tools, and low voltage systems, and that
 - any electrical equipment used in hazardous locations meets appropriate requirements of Article 500 of the National Electrical Code (NFPA-70);
 - Specify, and include on the entry permit, any pre-entry procedures necessary to eliminate or isolate hazardous energy sources that could be expected to cause injury or illness to entrants if not isolated, including electrical, mechanical, hydraulic, pneumatic chemical, thermal, radioactive and gravitational sources;
 - isolation methods may include securing, relieving pressure, blinding, blanking, double block and bleed, lockout/tagout;
 - in confined spaces where complete isolation is not possible, specify as rigorous an isolation as

- practical, and assure that a hazard evaluation is conducted prior to entry;
- Specify on the Entry Permit the air monitoring necessary to ensure a continued safe work environment, and assure that the Attendant understands the monitoring requirements;
 - Assure that all entrants review the air monitoring results prior to entry, and if a respirator is required, that all entrants have appropriate respiratory equipment and current USC Certification to wear the respirator that they intend to use;
 - Complete and sign the entry permit prior to entry, but only after all entry requirements are fully understood and completed, including:
 - ventilation requirements as specified on the permit,
 - procedures to isolate all hazardous energy sources;
 - Assure that all employees entering the confined space know and understand their duties, the potential hazards that the space presents, the time required to do the work, the equipment and tools required, and the methods of communication with a standby employee;
 - Post a copy of the entry permit at the entry site, and fax a copy of the permit to EH&S at (213) 740-0820;
 - Terminate the entry permit after assuring that all entrants have safely exited the space, and the space is secured; and
 - Refer to EH&S any questions regarding confined space entry.

5.1.2. Responsibilities of the Attendant in a Permit-Required Confined Space Entry

The Attendant for each Permit-Required Confined Space Entry will:

- Conduct air monitoring and hazard assessment as specified on the Entry Permit by the Entry Supervisor;
- Prohibit entry whenever monitoring indicates that oxygen, flammability or toxicity are not within acceptable limits or until appropriate controls are implemented or appropriate personal protective equipment is provided. Acceptable limits are as follows (in order of testing):
 - Oxygen: 19.5% to 22.0%;
 - Flammability: less than 10% of the lower explosive limit (LEL);
 - Hydrogen sulfide: less than 5 ppm;
 - Carbon monoxide: less than 12 ppm;
 - Toxicity (substances listed on Entry Permit under “other”): less than the Permissible Exposure Limit (PEL).
- If the source of a contaminant cannot be determined, initiate precautions adequate to deal with the worst possible condition that the contaminant could present in the confined space.
- Require ventilation, when feasible, to remove atmospheric contaminants from the confined space until the atmosphere is within the acceptable range;
- Assure that ventilation is drawn from a clean source and will not increase the hazards in the space;
- When utilizing forced ventilation, periodically test the atmosphere to ensure that the ventilation is preventing the accumulation of a hazardous atmosphere;
- When ventilation is not feasible, establish alternate protective measures prior to authorizing entry; and
- Terminate the entry whenever a safety concern arises or an unauthorized person enters the area.

5.2. Department Supervisor Responsibilities

It is the responsibility of each department supervisor affected by this program to:

- Understand the requirements of this Confined Space Entry Program;
- Identify and maintain a list of work locations that are confined spaces, and determine whether they are Permit-Required (contact EH&S at (213) 740-6448 for assistance with identification or permit status of confined spaces);
- Ensure that openings to permit-required confined spaces are posted with danger signs, and, where possible, have secured doors to prevent unauthorized entry;
- Ensure that all persons who work in or are involved with confined space entry work are trained in confined space entry procedures and hazards;
- Ensure that the persons who will authorize and oversee entry operations for department personnel are trained to the Confined Space Entry Supervisor level;
- Establish and document a method for communication between Entrants and Attendants, and the department's method to summon Fire Department Emergency Response Rescue personnel;
- Provide all information, safety equipment, and job tools necessary to safely complete the assigned work in the confined space, and ensure that the equipment and tools are maintained in ready-to-use condition (contact EH&S at (213) 740-6448 for assistance with safety equipment requirements);
- For each Permit-Required Confined Space operation:
 - assign at least one Attendant who is trained in Confined Space Entrant and Attendant procedures, and who will be responsible for verifying safety entry conditions and standby procedures,
 - assign an Entry Supervisor who is trained as a Confined Space Entry Supervisor, and who will be responsible for determining if entry conditions are acceptable, for authorizing and overseeing entry operations, and for terminating the entry, and
 - design the work plan to minimize the number of people and the time spent in the confined space;
- Forward a copy of each completed Confined Space Entry Permit to EH&S at Mail Code 1143 or fax to (213) 740-0820;
- Store terminated Confined Space Entry Permits, Contractor Pre-Entry Information Sheets, and Contractor Debriefing Forms until EH&S review;
- Require all contractors hired by the department whose duties for USC may include entering confined spaces to submit a written Confined Space Entry Program for approval prior to commencement of any confined space work;
 - assign a person trained as a Confined Space Entry Supervisor to review and approve the contractor's Confined Space Entry Program prior to commencement of any entry into a confined space (EH&S is available at (213) 740-6448 for assistance in program review);
- Provide contractors hired by the department with a completed Contractor Pre-Entry Information Sheet prior to entry into a confined space; and
- Refer to EH&S any questions or problems regarding confined space entry he or she cannot resolve.

5.3. Environmental Health and Safety Office Responsibilities

It is the responsibility of the Environmental Health and Safety Department to:

- Provide confined space training for Entrants and Attendants, and for Entry Supervisors;
- Provide exposure assessment and/or monitoring of airborne hazards as needed to determine whether work areas are permit-required confined spaces;
- Upon request, assist supervisors with:

- identification of Permit-Required Confined Spaces;
- selection of safety equipment required for confined space work;
- review of contractors’ written Confined Space Entry Programs; and
- Oversee an annual review of departmental confined space entry permits.

6.0 CONFINED SPACE ENTRY PROCEDURES

Standard Operating Procedures for the various spaces follow; also see the Confined Space Entry Permit.

6.1. Entering A Permit-Required Confined Space

- A. The Entry Supervisor physically inspects the space to determine if the entry is at that time a “Permit-Required,” “Alternate Procedure,” or “Non-Permit” entry. Entry Supervisor then completes all items on the Confined Space Entry Permit.
- B. Entry Supervisor faxes a copy of the Permit to EH&S at (213) 740-0820, retains a copy until termination of the Permit, and **posts the Permit at the entry site.**
- C. At least one Attendant externally monitors the Permit Space being entered for the duration of the entry operation.
- D. Attendant and entrants maintain rescue equipment or an escape breathing device, and use any other safety equipment as specified on the permit.
- E. Attendant verifies acceptable entry conditions by identifying, and controlling or eliminating any hazards, by testing the atmosphere with an **oxygen / gas detector** at 4 ft. intervals, and with a **photoionization detector (PID)** if organic vapors are detected or expected, and with other appropriate testing equipment if any additional contaminants are known or expected, and by complying with all entry permit conditions.
- F. Attendant directs the Entrant(s) to enter and exit the space, and conducts periodic checks of hazard controls.
- G. Attendant orders immediate evacuation of the space if safety equipment fails or if the space becomes, or has the potential to become, immediately hazardous. If necessary, Attendant summons emergency responders, but **NEVER ENTERS** space.
- H. When the confined space operation is complete, Entry Supervisor accounts for all Entrants, assures that the space is secured, and terminates the entry by initialing in Section #11 on the permit.
- I. If the entry supervisor will not be available to terminate the entry, responsibility for the entry operation may be transferred to another entry supervisor. The new entry supervisor and the time of transfer must be documented on the original entry permit. The new entry supervisor must complete a new entry permit for the operation before responsibility is transferred.
- J. Submit terminated permit to department supervisor.

6.2. Entering A Permit-Required Confined Space Using “Alternate Procedure”

- A. This Alternate Entry Procedure may be used if the only hazard present in the confined space is (as determined by the Entry Supervisor):
 - 1) atmospheric in nature, and
 - 2) the atmospheric hazard can be controlled by mechanical ventilation alone, and if
 - 3) the Permit Space atmosphere will not become immediately dangerous to life and health (IDLH) if the mechanical ventilation fails.
- B. After evaluating the “Permit Required Confined Space” and establishing appropriate atmospheric

controls, the Entry Supervisor may classify the Permit Space as an Alternate Entry Space by checking the appropriate box in Section #1 of the Confined Space Entry Permit, and completing applicable parts of “Sections 2–5 and 8–13” of the Entry Permit.

- C. Entry Supervisor faxes a copy of the Permit to EH&S at (213) 740-0820, and posts the Permit at the entry site.
 - D. The Entrant (see note below) may enter the confined space without the assistance or use of an Attendant, following the procedure below.
 - E. When entering the Alternate Entry Confined Space, the Entrant will:
 - 1. Establish and ensure that the mechanical ventilation system is operational and providing clean, fresh air to the Entrants work location within the space during the entire entry;
 - 2. Test the atmosphere of the Permit Space prior to entry into the space;
 - 3. Use and continually operate a personal gas detector during the entire confined space operation;
 - 4. Immediately evacuate the space if ventilation fails, or if the portable air sampling equipment fails or enters alarm mode; and
 - 5. Immediately evacuate the space if you discover, or become aware of a previously unrecognized hazard. If this occurs, immediately notify the Entry Supervisor (or Entrant’s line supervisor, if Entrant is also Entry Supervisor). The Entry Supervisor re-evaluates the Permit Space and implements appropriate safety precautions prior to resuming the confined space operation.
- Note:** The Entry Supervisor may act as Entrant during Alternate Entry Confined Space operations. No Attendant is necessary for Alternate Procedure entries, unless assistance is needed to accomplish safe entry and exit by the Entrants (e.g., a tripod to enter a tank, etc.).
- F. All steps taken to reclassify the Permit Space to an Alternate Entry Space must be written on the entry permit. All confined spaces shall be considered Permit-Required until the pre-entry procedures demonstrate otherwise.

6.3. Entering a Non-Permit Confined Space

- A. If there is no inherent hazard associated with the space, or if all inherent hazards have been ELIMINATED (not just controlled, but eliminated), the space may be classified as a Non-Permit Confined space, and entered using the following guidelines.
 - B. When entering the Non-Permit Confined Space, the Entrant will:
 - 1. Survey the surrounding area before entry for potential hazards and sources of drifting vapors and gases;
 - 2. Always test the Non-Permit Confined Space with an oxygen/explosive gas detector before and during entry; document pre-entry tests;
 - 3. Follow USC safety rules and use generally acceptable safe work practices when entering and working in Non-Permit Confined Spaces;
 - 4. Never use paints, thinners, chemicals, or weld or create any other atmospheric hazard while working in a Non-Permit Confined Space;
 - 5. Never introduce any other atmospheric, mechanical, engulfing, or electrical hazard into the space.
- Note:** introduction of a hazard (e.g., paint thinner) into the confined space requires that the full permit process be followed.
- C. No attendant or arrangement for rescue service is necessary when workers enter Non-Permit Spaces.
 - D. All steps taken to reclassify a Permit-Required Space to a Non-Permit-Required Space must be written on the entry permit.

6.4. Emergency Rescue Procedures

In the event of any emergency situation requiring rescue from a confined space, University of Southern California employees **shall not** attempt to enter the space to perform a rescue. The attendant on duty shall immediately implement the predetermined emergency rescue system, and contact the pre-determined dispatch office, e.g., Department of Public Safety dispatch, X04321, or Facilities Management Services dispatch.

Rescue services that can be performed safely from outside the confined space (e.g. hoisting a harnessed entrant) shall be undertaken. Other entrants in the space shall immediately exit the space and only provide assistance which does not endanger themselves.

The Los Angeles Fire Department is the primary emergency rescue facility associated with both University Park and Health Sciences confined space entries.

6.5. Contractors

In the event that a contractor needs to enter a confined space, the contracting department shall inform the contractor of the following:

- Contractor system must meet or exceed USC's Confined Space Entry Program requirements;
- Contractor's written Confined Space Entry Program must be approved in writing by a USC Confined Space Entry Supervisor prior to commencement of any entry into a confined space;
- The contractor must conduct their own testing with their own equipment, and use their own entry permits; and
- The contractor must complete and submit the [Contractor Debriefing Form](#) to the contracting department within 48-hours of termination of entry.

Additionally, the contracting department shall provide the contractor with a completed [Contractor Pre-Entry Information Sheet](#) prior to confined space entry, which informs the contractor of the following:

- Identified hazards associated with the space, past experience with the space, and whether it is a Permit-Required Confined Space;
- Precautions and procedures that must be implemented for the protection of employees in or near the confined space area; and
- Available methods to activate the emergency notification system.

6.6. Inspection Requirements

- Inspection of a Permit-Required Confined Space will be conducted by the assigned Entry Supervisor prior to entry by any person, and during completion of the Entry Permit.
- Pre-assessments should be conducted prior to entry, and a list of potential hazards associated with the space kept in a database or on a list that is readily available to all Confined Space Entry Supervisors in the department.

7.0 EQUIPMENT AND SUPPLIES

The following equipment is required to perform permit-required confined space entry:

- Combustible Gas Indicator (CGI);
- A Volatile Organic Compound (VOC) detector, or Photoionization Detector (PID) if organic vapors

- are reasonable to expect;
- Any other device(s) necessary to monitor a hazardous environment, as appropriate for hazards identified on permit;
- Extraction harness, tripod and wench;
- Means of communication between attendant and entrant(s), e.g., handheld radio in areas without explosion hazard, rope and tug signal system, etc.; and
- Means of communication to immediately summon emergency rescue personnel.

8.0 TRAINING AND COMMUNICATION

Training is required at least annually for all confined space entrants, attendants and supervisors, and is provided free of cost by Career and Protective Services. The following components are included in Confined Space training classes.

- Confined Space Entrants, Attendants, and Entry Supervisors will be instructed in the nature of hazards involved in confined space entry, and informed of possible consequences that may occur if the procedures in this program are not followed;
- Each Confined Space Entry Supervisor will be instructed that he or she is responsible for a final assessment of the hazards associated with each entry for which they complete an Entry Permit, for assuring that hazards are controlled or eliminated, for assuring that Entrants and Attendants are trained and understand the nature of the hazards and the control methods used for the entry, and for completing and posting the Entry Permit;
- Instruction and training will cover proper entry procedures, hazard identification, control methods, monitoring, and proper use and adjustment of the equipment used in entry; emphasis will be placed on keeping equipment in a ready-to-use condition at all times;
- Confined Space Entrants and Attendants must pass both a written and a practical test to become certified for confined space entry;
- Confined Space Entry Supervisors must pass a written exam to be certified as a Confined Space Entry Supervisor;
- Records of training will be maintained by each department that conducts confined space entry, and made available for EH&S review.
 - Documentation of training provided by EH&S personnel will be forwarded to the department supervisor.
- Supervisors will maintain a current list of all departmental Confined Space Entrants and Attendants, and Confined Space Entry Supervisors.

9.0 RECORD KEEPING

A Confined Space Entry Permit must be completed by the Entry Supervisor and Attendant before each entry into a Confined Space, and posted at the entry site for the duration of the entry operation.

Each department that conducts confined space entries will keep every Confined Space Entry Permit generated until reviewed by the Environmental Health and Safety (EH&S) Confined Space Review Committee.

Each department that hires a contractor for any job in which a person will enter a confined space will

provide the contractor with a completed [Contractor Pre-Entry Information Sheet](#) prior to confined space entry, and will assure that the contractor's Entry Supervisor completes the [Contractor Debriefing Form](#) or equivalent within 48 hours of termination of the Entry Permit. Forward a copy of both forms to EH&S, and keep a copy of each in department files until reviewed by the EH&S Confined Space Review Committee.

9.1. Permit Implementation

Before each entry into a Confined Space, the Entry Permit must be completed by the Entry Supervisor and the assigned Attendant. Contents of the Entry Permit must be communicated to the entrants and the Permit posted near the entrance to the space.

9.2. Permit Duration

A permit may remain valid for the duration of the entry operation or a single work shift, not to exceed eight-hours. When the same entry team is used for overtime work, the permit may be extended for up to four-hours if conditions are reassessed by the Entry Supervisor and air monitoring continues. The Confined Space Entry Supervisor must pay special attention to fatigue when assessing the ability of an entry team to continue work on overtime.

9.3. Revoking Permits

When conditions or work activities change from those specified on the permit and could introduce a new hazard to the Confined Space, then the Permit shall be immediately revoked by the Attendant or Entry Supervisor. The entry team must be notified immediately that the permit is no longer valid and that Entrants must immediately leave the space. Reasons for revoking the permit must be recorded on the permit.

9.4. When Work Conditions Change

A new Entry Permit must be issued, or the original Permit revised and re-issued, whenever changes in work conditions or work activities introduce new hazards to the workspace.

10.0 PROGRAM APPROVAL AND REVIEW

This program will be periodically reviewed by a Safety Specialist in USC Environmental Health and Safety. Changes will be approved by the Director of Environmental Health and Safety prior to implementation.

Date Prepared: May 10, 2000

By: Jane Bartlett, Daniel Phillips

Date Reviewed: June 25, 2002

By: Jane Bartlett, Matthew Letany, John Hagthrop

Date Revised: June 26, 2002

By: Jane Bartlett

Date Revised: July 29, 2004

By: Jane Bartlett, Ed Becker