

University of Colorado at Boulder

Environmental Health and Safety Campus Policy and Procedure

Topic: **CONFINED SPACE ENTRY (CSE)**
(<http://ehs.colorado.edu/publication.html>)

Approved by: _____
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Reference: Gandalf Associates – *CSE Program* prepared for UCB Facilities Management 10/9/98
The Chasen Group – CSE Hazard Surveys, Assessments, and Summary Tables
OSHA 29 CFR 1910.146 – Permit Required Confined Spaces
URM CSE Best Practices Standard

UCB Distribution: Chancellor
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University Risk Management, Facilities Management, Research Properties Services,
Housing, UCB Student Union (UCSU) facilities, Information Technology Services (ITS),
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Definition

A confined space (CS) is an enclosed area that can be entered to perform assigned work, has limited or restricted entry and egress, and is not designed for continuous occupancy. Confined spaces have the potential to be immediately dangerous to life and health (IDLH) due to hazardous atmospheres, the possibility of engulfment or entrapment, or other safety hazards. Examples of confined spaces at UCB include, but are not limited to: steam tunnels, electrical vaults, manholes, sumps, crawl spaces, attics, tanks, air plenums, and certain mechanical rooms.

Policy Statement

University Risk Management, in their 2005 Confined Space Entry (CSE) Best Practices Standard, recommends that each University of Colorado Campus develops and implements confined space entry procedures to protect the health and safety of employees and contractors. It is the policy of the University of Colorado at Boulder (UCB or CU-Boulder) that any person who enters a Campus permit-required confined space must be authorized, properly trained and equipped, and follow the access and operational procedures detailed below. Failure to abide by this Policy may result in serious injuries or fatalities, subjecting the violator to administrative consequences.

Background and Purpose

Due to limited resources and the complexity of the Campus, not all confined spaces have been identified; identification is an on-going process. Those that have been evaluated are posted with confined space precaution designations as shown in Appendix 1: P1 = permit required (see Appendix 3), and NP3 = no permit required. It is important to note that although UCB's confined space designations use OSHA's standard "permit required" language, the Boulder Campus does not implement a formal *permit* system. Rather, Appendices 3 and 4 use a checklist format and do not require signature approvals.

In order to protect the health and safety of University and contract workers, confined space entry (CSE) at the University of Colorado at Boulder must be performed in accordance with these Campus-wide procedures, which are designed using OSHA 29 CFR 1910.146, the standard for work in confined spaces, as general guidelines.

These procedures initially focus on Campus subterranean steam tunnels, which have already been inventoried and their hazards identified as generally described in Appendix 2. As more confined space surveys and assessments are performed, procedures will be expanded to cover access into those additional areas. Should a question arise as to whether or not an area is considered to be a confined space, the Environmental Health and Safety Division (EH&S) of the University will be contacted prior to entry. Identified with precautionary signage or not, **all confined spaces shall be considered hazardous until proven otherwise.**

Procedural Overview

These policy and procedures are NOT intended to be all-inclusive or to replace the detailed procedures presented during confined space (CS) training. The process and responsibilities for entry into confined spaces are as follows:

RESPONSIBLE PARTY

Department Heads

REQUIRED ACTIONS AND RESPONSIBILITIES

Department Heads of Facilities Management, Housing, Information Technology Services, UCB Student Union (UCSU Facilities), Research Property Services, Athletics, Environmental Health and Safety, the College of Engineering, and any other Department that has employees, students or contractors who need to enter a Campus confined space, are responsible for designating Confined Space Entry Coordinators whose duties are outlined below.

Individual Departments are responsible for funding: a) acquisition of any equipment and supplies necessary for approved CS entry for their employees, b) medical evaluations / approvals for any employees who are required to wear respiratory protection as part of their work assignments, c) consultant fees associated with the evaluation of new (non-General Fund) confined spaces or the re-evaluation of existing confined spaces in their facilities or work areas, and d) any necessary signage, locking hardware and other physical modifications to non-General Fund confined spaces.

Facilities Management (FM)

Survey Campus General Fund areas, identify potential confined spaces and maintain an inventory of CSE locations, designations and hazards.

Label CSE access points in Campus General Fund areas and utility tunnels with Campus-standard signs, stickers, emblems or other devices that indicate CSE classifications.

Install hardware and locks at CSE General Fund locations and tunnels, and implement a card and/or key issuance system consistent with the CSE permit process which will physically restrict and control access to permit spaces.

Maintain a "sole source" Campus-wide standing purchase order (SPO) for a CSE Consultant who can perform CS hazard assessments, assign CS designations and update the CS inventory accordingly.

FM is also subject to other responsibilities denoted below for Departmental CSE Coordinators, Supervisors, Project Managers, Contract Workers, CS Entrants and CS Attendants.

Departmental CSE Coordinators

Designate at least one "back-up" CSE Coordinator for their Department. Become familiar with CSE locations in their respective building(s) and work areas, using the Campus CSE Inventory, available from EH&S. Identify additional potential (non-General Fund) confined spaces at their facilities and use the Campus CSE Consultant (see FM above) to perform hazard assessments and provide CSE designations.

Make sure that CSE access points in their areas are labeled with Campus-standard signs, stickers, emblems or other devices that indicate CSE classifications. Also assure that hardware and locks are installed to physically restrict and control access to permit spaces. Individual departments are responsible for installing signs, locks, etc. for non-general fund CSE locations at their facilities.

Confer with supervisors to identify staff who need to enter confined spaces, serve as entry attendants, or be in proximity to identified Campus confined spaces. Determine who needs comprehensive or awareness level CSE training from EH&S. The Departmental CSE Coordinators and back-up Coordinators also need to obtain CSE training. If respiratory protection is required, employees also need medical approvals from Wardenburg Health Center and respiratory protection training and fit testing from EH&S. Obtain and keep copies of employee CSE certifications showing the dates they were trained and the names of their trainers.

Departmental CSE Coordinators (cont.)

Arrange annual refresher training (comprehensive or awareness) for Department employees. Additional re-training may be necessary if there are changes in confined spaces or work operations that present new or previously unrecognized hazards, or if it is believed that there are inadequacies in employees' knowledge of proper CSE procedures or the use of CSE equipment.

Based upon information learned at CSE training, obtain whatever operational equipment, personal protective equipment (PPE), and supplies necessary for Department staff to perform authorized CSEs. Consult with EH&S for assistance in maintaining and calibrating atmospheric monitors (e.g., 4-gas meters), maintaining respirators, etc. Contractors must provide their own equipment and PPE.

Authorize all CS Entries for Department staff and contractors. Obtain access keys or cards and issue them through a trackable system. Manage the CS entrant and tracking process, all the way through post-entry checkout.

Consult with EH&S regarding the need for clarifications to the UCB CSE Policy and Procedures, or when deviations from the specified protocols are necessary. Alert EH&S if any new potential confined spaces are discovered. Also alert EH&S whenever there appear to be discrepancies in the CS Inventory, or when work occurring in CS locations results in additional or altered hazards compared to those listed in the CS Inventory.

Departmental Supervisors

Confer with the Department CSE Coordinator to identify staff that needs to enter confined spaces, serve as entry attendants, or be in proximity to identified Campus confined spaces. Determine who needs comprehensive or awareness level CSE training from EH&S.

Allow schedule accommodations for employees to obtain CSE training (comprehensive, awareness, refresher) as well as other safety training if required (Asbestos, Hot Work, Hazardous Materials, Ladder Safety, Trenching and Shoring, Hazcom, Lockout-Tagout, etc.). Re-assess employee training needs whenever new employees are hired or when work assignments change. Make sure employees receive CSE training before they perform any confined space duties or enter a confined space.

Additional re-training may be necessary if there are changes in confined spaces or work operations that present new or previously unrecognized hazards, or if it is believed that there are inadequacies in employees' knowledge of proper CSE procedures or the use of CSE equipment.

Departmental Supervisors (cont.)

If respiratory protection is required, medical approval must be received from Wardenburg Health Center (send documentation to EH&S and URM). Procure suitable respiratory protective equipment and arrange for annual respirator training and fit testing from EH&S (see *EH&S Policy and Procedure for Respiratory Protective Equipment* <<http://ehs.colorado.edu/Download/resp062700.pdf>>).

Discuss CSE issues, questions or concerns with the Departmental CSE Coordinator, especially if employees need to deviate from the specified safety protocols or if any new potential confined spaces are discovered.

Departmental Project Managers

All renovation and construction projects are required to have an Environmental Site Assessment (ESA) performed by EH&S prior to design and construction. The ESA reveals safety and environmental compliance issues that need to be addressed as part of the project.

Project Managers (PMs) are responsible for alerting EH&S of any changes to confined spaces, including additional or deleted hazards. PMs must also alert EH&S if potential new confined spaces are found.

Assure that new construction properly identifies all confined spaces; otherwise UCB will NOT accept a project's Certificate of Occupancy.

Assure that contract workers are informed about the existence of applicable confined spaces related to the project, along with the known hazards associated with those spaces. Also make them aware of UCB's CSE requirements, permits, policies and procedures.

Obtain assurance that contractors who will be entering Campus confined spaces have received certified CSE training from their employers. Obtain assurance that contractors are compliant with all OSHA-applicable programs, including but not limited to: Asbestos, Lockout-Tagout, Hot Work, Respiratory Protection, Trenching and Shoring, Hazcom, etc.

Contract Workers

Receive CSE training through their employers and be compliant with other applicable OSHA programs, including but not limited to: Asbestos, Lockout-Tagout, Hot Work, Respiratory Protection, Trenching and Shoring, Hazcom, etc. Provide all safety and operational equipment necessary to comply with OSHA and UCB rules and regulations.

Review the hazards identified in the CSE Inventory for each UCB CSE location that needs to be accessed, complete necessary written employer-provided permits, and receive UCB authorization for entry into specific CSE locations from the Departmental CSE Coordinator. Obtain access keys or cards from the UCB Project Manager or designated CSE Coordinator and comply with all precautions and procedures noted for each CSE location, including post-entry checkout.

Contract Workers (cont.)

In addition to UCB CSE requirements, implement any additional procedures mandated by the contractor's employer or OSHA. If required, retrieval, air monitoring, ventilation, communication, and other CSE or safety equipment must be supplied by the contractor.

All renovation and construction projects are required to have an Environmental Site Assessment (ESA) performed by EH&S prior to design and construction. The ESA will note safety and environmental compliance issues that need to be addressed as part of the project.

UCB Employee CS Entrants

Receive initial comprehensive CSE training (and annual refresher training) from EH&S before entering any confined space. Additional re-training may be necessary if there are changes in confined spaces or work operations that present new or previously unrecognized hazards, or if recollection of proper CSE procedures or the use of CSE equipment becomes inadequate.

If required, obtain other necessary safety training as mandated or determined by supervisors: Asbestos, Hazardous Materials, Lockout-Tagout, Hot Work, Respiratory Protection, Trenching and Shoring, Hazcom, Ladder Safety, etc.

If respiratory protection is required, medical approval must be received from Wardenburg Health Center (send documentation to EH&S and URM). Procure suitable respiratory protective equipment and arrange annual respirator training and fit testing from EH&S. See *EH&S Policy and Procedure for Respiratory Protective Equipment* <<http://ehs.colorado.edu/Download/resp062700.pdf>>.

Review the hazards identified in the CSE Inventory for each CSE location to be entered, receive authorization for entry from the Departmental CSE Coordinator and obtain CS access keys or cards.

If retrieval, air monitoring, communication, ventilation or other CSE equipment is required, its acquisition can be facilitated through the Department's CSE Coordinator.

Comply with the P1, P2 or NP3 hazard controls and actions noted for each CSE location (atmospheric monitoring, ventilating, buddy system, communications, etc.). Also adhere to other relevant applicable occupational health and safety requirements such as Lock-out Tag-out, Hot Work, MSDS availability, Ladder Safety, etc.

Follow CS requirements throughout the entry, including post-entry checkout. Immediately exit the confined space if a life or health threatening condition is discovered or if the CSE Attendant calls for evacuation.

Report problems or concerns with CSE procedures or changes in identified CS hazards, to the Departmental CSE Coordinator, especially if the need arises to deviate from specified safety protocols. Also report any newly discovered potential confined spaces.

Receive initial comprehensive CSE training (and annual refresher training) from EH&S. Additional re-training may be necessary if recollection of proper CSE procedures or attendant responsibilities becomes inadequate.

If respiratory protection is required, medical approval must be received from Wardenburg Health Center (send documentation to EH&S and URM). Procure suitable respiratory protective equipment and arrange annual respirator training and fit testing from EH&S. See *EH&S Policy and Procedure for Respiratory Protective Equipment* <<http://ehs.colorado.edu/Download/resp062700.pdf>>.

If required, obtain other necessary safety training as determined by supervisors: Asbestos, Hazardous Materials, Lockout-Tagout, Hot Work, Respiratory Protection, Trenching and Shoring, Hazcom, Ladder Safety, etc.

Review hazards identified in the CSE Inventory for each CSE location to be entered and verify that entrants are following all applicable CS requirements.

Attendants must be supplied with proper equipment to effectively communicate with entrants and rescue personnel, and familiarize themselves with its operation. Remain stationed outside the confined space, tracking authorized CS entrant access. If an emergency situation arises where an attendant on duty must be replaced, the new attendant must be fully briefed regarding the nature and details of the entry and must review the permit in its entirety.

Monitor activities inside and outside of the space while communicating with entrants as necessary to determine their status. Be ready to alert entrants of the need to evacuate if a prohibited hazardous condition in the space is detected, if a situation outside the space develops that could endanger the entrants, or if the attendant believes that the entrant's behavior suggests they are being affected by a hazardous exposure.

During life or health threatening emergencies or if it is determined that entrants may need assistance escaping from CS hazards, attendants will not enter the space but must call 911 for rescue and retrieval, as detailed in CSE training. Attendants will then standby to prevent unauthorized CS entry and to direct and assist rescue personnel.

Report problems or concerns with CSE procedures or changes in identified CS hazards, to the Departmental CSE Coordinator, especially if the need arises to deviate from specified safety protocols. Also report any newly discovered potential confined spaces.

University Risk Management (URM)

Issue a URM Confined Space Entry Standard, recommending that each University of Colorado Campus develop and implement confined space entry procedures to protect the health and safety of employees and contractors.

Environmental Health & Safety (EH&S)

Issue Campus Confined Space Policy and Procedures; update and re-distribute the Procedures as appropriate.

Provide respirator training and fit testing to Campus employees for whom it is determined that respiratory protective equipment is required. Provide expertise to assist Departments in maintaining and calibrating their CSE atmospheric monitors, i.e. 4-gas meters.

Provide asbestos initial assessments, consultation and compliance assistance for tunnels, crawl spaces, mechanical rooms, air plenums and other Campus general fund locations (non-general fund areas and contractor-projects may be charged or required to pay for a certified consultant assessment).

Perform Environmental Site Assessments (ESAs) before all renovation and construction projects.

Give BFD and CUPD an on-site overview of permit confined space locations and provide them with copies of the UCB CSE Inventory. Formalize expectations for emergency rescue from confined spaces, and incorporate that information into the UCB CSE Training Program.

Present CSE training to UCB employees as requested, and provide documentation of training indicating the course name, names of trainers and training dates.

Oversee administration of the UCB CSE Program. Receive updates to the CSE Inventory from Campus CSE Coordinators, Project Managers, and CSE Consultant(s), and periodically distribute updated CSE Inventory information to Campus CSE Coordinators, BFD and CUPD.

Arrange periodic meetings of the Campus Confined Space Program Committee and Departmental CSE Coordinators to discuss the UCB CSE Program and consider process improvements.

CSE APPENDIX 1

UCB Confined Space Designations and General Requirements

The Appendix 1 table below is a summary of general considerations for confined space entry. It is not intended to be all-inclusive or to replace the detailed procedures presented during confined space training.

ENTRY PRECAUTION LEVELS	CONFINED SPACE ENTRY PROGRAM REQUIREMENTS
<p>LEVEL P1</p> <p><i>Classic OSHA "Permit" Confined Space</i> (See Appendix 3)</p> <p>- hazardous atmosphere or potential asphyxiation or - potential engulfment or entrapment or - other serious safety/health hazard</p> <p>*Do not direct forced air onto asbestos containing materials (ACM), or use forced air in areas with uncontrolled asbestos without EH&S approval and protocols.</p>	<p>MUST DO:</p> <ul style="list-style-type: none">● Initial & continuous atmospheric monitoring● Forced air ventilation or adequate natural ventilation*● 2 workers; attendant remaining out of space and in constant contact with entrants● Effective communication including reliable means of summoning rescue services● Retrieval for vertical entries if effective● CSE training● Complete written checklist, post at entry site, identifying hazards and entrant information
<p>LEVEL NP3</p> <p><i>No Permit Required</i></p> <p>- Conducting hot work, live steam line activities, or the use of chemicals can change space to P2.</p>	<p>MUST DO:</p> <ul style="list-style-type: none">● Workers in communication with a means to summon rescue personnel● All entrances opened during entry to allow for natural ventilation, provided the opened entrance does not present a security concern or safety hazard● CSE training required <p>* Notify Powerhouse operator with time in, expected duration, and time out.</p>

CSE APPENDIX 2A – Steam Tunnel Utilities Abbreviations

ABBREVIATIONS	UTILITIES
STM	Steam
LPS	Low Pressure Steam (< 10 psi)
MPS	Medium Pressure Steam (10-120 psi)
HPS	High Pressure Steam (>120 psi)
VPR	Vacuum Pump Return
PD	Pump Condensate
CPD	Condensate Pump Discharge
CA	Compressed Air
OIL	Oil
TEL	Telephone
CW	Cold Water
HW	Hot Water
HWC	Hot Water Circulate
CWR	Chilled Water Return
CWS	Chilled Water Supply
OHT	Overhead Telephone
OHE	Overhead Electrical

CSE APPENDIX 2B – Steam Tunnel Potential Hazards

RECOGNIZED POTENTIAL HAZARDS
Entry Egress Complications
Restrictive Work Space
Lighting
Dangerous surfaces
Falling Objects
Mechanical Equipment
Engulfment
Noise
Communication difficulties
Pests
Extreme Temperatures
Oxygen deficiency/Displacement
Toxic Atmosphere
Flammable Gases
Live (Hot) Work - Follow appropriate hot work procedures.
Asbestos Contamination - Uncontrolled asbestos is a danger to life and health and triggers mandated response actions. The presence of asbestos when it is encapsulated, labeled and not disturbed is a precautionary (potential) hazard. Do not direct forced air onto asbestos containing materials (ACM) or use forced air in areas with uncontrolled asbestos without EH&S approval and protocols. Report suspected damaged asbestos. Assessment of asbestos conditions must be made by EH&S or a certified consultant.

ENTRY DATE _____ TIME OF ENTRY _____ EXPECTED DURATION OF ENTRY _____ TIME FINISHED _____

P1 ENTRY LOCATIONS _____

PURPOSE OF ENTRY _____

KEYS / CARDS ISSUED _____ KEYS / CARDS RETURNED _____

WO# / PROJECT# _____ CSE COORDINATOR _____

AUTHORIZED & TRAINED ENTRANTS _____

TRAINED ENTRY ATTENDANT(S) _____

RESCUE AND EMERGENCY SERVICES WILL BE PROVIDED BY _____ TELEPHONE _____

COMMUNICATION METHODS (including summoning rescue personnel) _____

POTENTIAL HAZARDS OF THE P1 PERMIT SPACE TO BE ENTERED (circle)

low oxygen	combustible gases	combustible vapors	combustible materials	flammable materials
chemicals	toxic gases/vapors	electrical hazards	severe weather	mechanical equipment
engulfment	entrapment	extreme temperatures	uncontrolled asbestos*	corrosive materials
noise	pests or vectors	steam	vertical entry	other _____

*Assessment of asbestos conditions must be approved by EH&S or certified consultant. Where asbestos is found to be damaged, stop work, notify CSE Coordinator and EH&S Asbestos group – proper response action required prior to work or re-entry. Do not direct forced air onto asbestos containing materials (ACM) or use forced air in areas with uncontrolled asbestos without EH&S approval and protocols.

CONTROL MEASURES USED TO ISOLATE THE SPACE AND ELIMINATE HAZARDS OR CONTROL EXPOSURES (explain)

Purge, Test and Vent _____

Ventilation* _____

Lockout/Tagout _____

Hot Work (permit?) _____

Blocking, Bleeding Lines _____

Barricades, Other Controls _____

ENVIRONMENTAL AND ATMOSPHERIC MONITORING

TEST	PERMISSIBLE ENTRY LEVEL	INITIAL READING	READINGS DURING ENTRY
A. Percent Oxygen	19.5 – 23.5%		
B. Percent LEL	<10%		
C. CO	<25 ppm		
D. H ₂ S	<10 ppm		
E. Noise	<85 dB (adequate communication must be maintained)		
Name or Initials of Tester & Time of Measurements			

EQUIPMENT SUPPLIED TO EMPLOYEE (note type, quantity, condition, charged, calibrated, returned, etc.)

Air Testing _____	PPE Respiratory _____
Ventilating _____	PPE Hearing _____
Communications _____	PPE Hands/Feet _____
Lighting _____	PPE Body / Clothing _____
Barriers/Barricades (pedestrian, vehicle...) _____	PPE Head / Face _____
Access In & Out (ladders, tools...) _____	Other PPE _____
Rescue & Emergency (lifeline, hoist, first aid...) _____	Other Equipment _____

APPENDIX 4 UCB **P2 CONFINED SPACE ALTERNATE ENTRY CHECKLIST**

ENTRY DATE _____ TIME OF ENTRY _____ EXPECTED DURATION OF ENTRY _____ TIME FINISHED _____

P2 ENTRY LOCATIONS _____

PURPOSE OF ENTRY _____

KEYS / CARDS ISSUED _____ KEYS / CARDS RETURNED _____

WO# / PROJECT# _____ CSE COORDINATOR _____

AUTHORIZED & TRAINED ENTRANTS _____

RESCUE AND EMERGENCY SERVICES WILL BE PROVIDED BY _____ TELEPHONE _____

COMMUNICATION METHODS (including summoning rescue personnel) _____

ADDITIONAL SAFETY PROCEDURES IMPLEMENTED

Lockout/Tagout _____

Hot Work (permit?) _____

Blocking, Bleeding Lines _____

Barricades, Other Controls _____

NOTE: Conducting hot work, live steam line activities, or the use of chemicals can change space to P1.

ENVIRONMENTAL AND ATMOSPHERIC MONITORING

TEST	PERMISSIBLE ENTRY LEVEL	INITIAL READING	READINGS DURING ENTRY
A. Percent Oxygen	19.5 – 23.5%		
B. Percent LEL	<10%		
C. CO	<25 ppm		
D. H₂S	<10 ppm		
E. Noise	<85 dB (adequate communication must be maintained)		
Name or Initials of Tester & Time of Measurements			

IF ANY ALLOWABLE LEVEL IS EXCEEDED DESCRIBE VENTILATION CONTROLS USED: _____

EQUIPMENT SUPPLIED TO EMPLOYEE (note type, quantity, condition, charged, calibrated, returned, etc.)

Air Testing _____	PPE Respiratory _____
Ventilating _____	PPE Hearing _____
Communications _____	PPE Hands/Feet _____
Lighting _____	PPE Body / Clothing _____
Barriers/Barricades (pedestrian, vehicle...) _____	PPE Head / Face _____
Other Equipment _____	Other PPE _____

CONTRACTORS: In addition to abiding by all UCB requirements, I acknowledge that our company has approved OSHA programs in place, including employee training, and that we comply with OSHA rules for confined space entry, lockout-tagout, personal protective equipment, asbestos awareness, and other applicable regulations.

Name _____ Company _____ Date _____