

Northwestern
Confined Spaces
Environmental Health and Safety

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I. Purpose

This program establishes the framework to protect individuals from the hazards associated with entering and performing work in confined spaces through evaluations, training, safe work practices, and permitting. Entering confined spaces must be avoided when feasible and should only be considered after reasonable efforts are made to avoid entry such as reconfiguring or relocating equipment, using cameras for inspections, utilizing extension tools to operate equipment, or changing the characteristics of the space so that it's no longer classified as a confined space. Reasonable efforts must be made to avoid creating new confined spaces through project design and configuration, modifying existing confined spaces so that they are no longer confined spaces, and installing or reconfiguring equipment to facilitate entries compliant with this program.

II. Scope

This program applies to those (e.g., Northwestern employees, contractors, 3rd party rescue services, utility companies) who enter confined spaces to perform service, maintenance, installations, inspections, and other activities on campus property or in spaces maintained by, operated by, or under the control of the University. This program does not apply utility tunnels not classified as confined spaces and to contractor-controlled worksites where the confined spaces are maintained by, operated by, or under the control of a contractor.

III. Definitions

- A. Confined spaces are defined as areas that:
 - i. Are large enough for an employee to enter and perform work,
 - ii. Have limited or restricted means for entry or exit, and
 - iii. Are not designed for continuous occupancy.
- B. Examples of confined spaces at Northwestern are sewers, manholes, tunnels, tanks, boilers, transformers, pipes, excavations, elevator pits, vaults, and ducts. For the purpose of this program, there are two classifications of confined spaces:
 - i. *Non-permit confined space*: A space that meets the definition of a confined space, but does not meet the requirements for a permit-required confined space.
 - ii. *Permit-required confined space*: A space that has one or more of the following characteristics:
 - a) Contains or has the potential to contain a hazardous atmosphere,
 - b) Contains a material that has the potential for engulfing an entrant,
 - c) Has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or a floor that slopes downward and tapers to a smaller cross-section, or
 - d) Contains any other recognized, serious safety or health hazard.

IV. Responsibilities

- A. **Environmental Health and Safety (EHS)**
 - i. Adhere to the requirements of this program.
 - ii. Review and revise this program, as necessary.
 - iii. Coordinate and/or administer training (see **Section XVI – Training**).

- iv. Provide consultation and guidance, as necessary and upon request, to identify, evaluate, and control hazards associated with confined spaces and to facilitate entries.
- v. Conduct documented confined space assessments (see **Section V – Assessments**) in collaboration with the applicable stakeholders (e.g., Facilities, Information Technology “NUIT”) to determine if they are confined spaces, utilities present, potential hazards, and entry requirements.
- vi. Collaborate with stakeholders (e.g., Facilities, NUIT, contractors, 3rd party rescue services) to develop and approve safe operating procedures (SOPs).
- vii. Maintain the database of confined space assessments and provide them to applicable units and contractors as necessary and prior to entries.
- viii. Review permits, SOPs, and other relevant documentation after each entry to ensure compliance with this program.
- ix. Review entry operations when there is reason to believe that the measures taken under this program may not protect employees and revise the program to correct deficiencies found to exist before subsequent entries are authorized. Examples of circumstances requiring the review of this program are:
 - a) Any unauthorized entry of a confined space,
 - b) The detection of a confined space hazard not covered by the permit or SOP,
 - c) The detection of a condition prohibited by the permit or SOP,
 - d) The occurrence of an injury or near-miss during entry,
 - e) A change in the use or configuration of a confined space, and
 - f) Employee complaints about the effectiveness of the program.
- x. Review the scope of construction and renovation projects that may involve confined spaces to ensure alignment with this program.
- xi. Inform the local fire department in advance of permit-required confined space operations.
- xii. Evaluate that 3rd party rescue service capabilities meet the requirements of this program.
- xiii. Review contractor confined space programs and procedures, as necessary, to ensure compliance with this program.
- xiv. Perform or facilitate the inspection and testing of rescue equipment (e.g., body harnesses, tripods, winches).
- xv. Provide air monitoring to facilitate Northwestern unit confined space entries, if necessary.

B. Northwestern Units

- i. Adhere to the requirements of this program.
- ii. Ensure employees complete all required training (see **Section XVI – Training**).
- iii. Prevent unauthorized entry into confined spaces within their area through training, signage, and security measures (e.g., locking).
- iv. Ensure employees and contractors do not enter confined spaces unless trained and authorized in accordance with this program.
- v. Designate an appropriate number of supervisors, or their designees, to approve entry into confined spaces, including for contractors entering on behalf of the unit (see **Appendix A – Guidelines for Contractors Entering Confined Spaces**).
- vi. Monitor employees’ need for additional or refresher training, based upon assigned duties, changes in confined spaces, or changes to this program.

- vii. Collaborate with EHS and other stakeholders to conduct documented confined space assessments to determine if they are confined spaces, utilities present, potential hazards, and entry requirements.
 - viii. Collaborate with stakeholders (e.g., EHS, Facilities, NUIT, contractors, 3rd party rescue services) to develop and approve SOPs.
 - ix. Collaborate with EHS to ensure that contractor confined spaces programs and permits comply with regulatory requirements and this program.
 - x. Identify, shut down, and isolate hazardous energy (e.g., utilities), as necessary, to facilitate confined space entries.
 - xi. Maintain all necessary equipment (e.g., air monitoring devices, rescue equipment) in accordance with manufacturer guidelines and regulatory requirements.
 - xii. Assign the appropriate number of qualified individuals to maintain air monitoring equipment (see **Section XI – Air Monitoring**).
 - xiii. Notify EHS of potential changes to existing confined spaces, the removal of confined spaces, or the planning of new confined spaces.
 - xiv. Provide employees with the required personal protective equipment (PPE).
- C. Project Managers (including those who oversee activities that involve confined spaces)**
- i. Adhere to the requirements of this program.
 - ii. Complete all required training (see **Section XVI – Training**).
 - iii. Inform EHS and the relevant stakeholders (e.g., Northwestern units, employees, or contractors) of work that involves confined spaces.
 - iv. Provide this program to contractors involved in confined space operations, including any specific procedures.
 - v. Collaborate with EHS to ensure that contractor confined spaces programs and permits are compliant with regulatory requirements and this program.
 - vi. For more guidelines regarding contractors working in confined spaces, see **Appendix A – Guidelines for Contractors Entering Confined Spaces**.
 - vii. Collaborate with EHS, Facilities, NUIT, 3rd party rescue services, and others to conduct documented confined space assessments to determine if they are confined spaces, utilities present, potential hazards, and entry requirements.
 - viii. Collaborate with stakeholders (e.g., EHS, Facilities, NUIT, contractors, 3rd party rescue services) to develop and approve SOPs.
 - ix. Collaborate with the appropriate units (e.g., NUIT, Facilities, EHS) and contractors to identify, shut down, and isolate hazardous energy (e.g., utilities), as necessary, to facilitate confined space entries.
 - x. Notify EHS of known potential changes to existing confined spaces, or the planned creation of new confined spaces.
 - xi. Submit completed permits, safe operating procedures, and any other relevant documents to EHS at the end of entry operations.
- D. Authorized Entrants**
- i. Adhere to the requirements of this program, including safe operating procedures.
 - ii. Complete all required training (see **Section XVI – Training**).
 - iii. Know the potential hazards faced during entry, including information on the mode, signs or symptoms, and consequences of exposure.
 - iv. Conduct assigned tasks in a safe manner at all times.
 - v. Wear appropriate and assigned PPE correctly.

- vi. Maintain communication with the attendant to alert them regarding the need to evacuate the space and other relevant information such as air monitoring results.
- vii. Exit the space as quickly as possible whenever:
 - a) An order to evacuate is given by the attendant or entry supervisor,
 - b) An entrant recognizes any warning signs or symptoms of exposure to a dangerous situation,
 - c) An entrant detects a prohibited condition,
 - d) There is any doubt as to whether procedures are effective in keeping entrants protected from hazards, or
 - e) An evacuation alarm is activated.
- viii. Report any injuries, illnesses, questions, or unsafe working conditions to the entry supervisor.

E. Authorized Attendants

- i. Adhere to the requirements of this program, including safe operating procedures.
- ii. Complete all required training (see **Section XVI – Training**).
- iii. Know the potential hazards that may be faced by an entrant during entry, including information on the mode, signs or symptoms, and consequences of exposure.
- iv. Conduct assigned tasks in a safe manner at all times.
- v. Wear appropriate and assigned PPE correctly.
- vi. Be aware of possible behavioral effects of hazard exposure of entrants.
- vii. Continuously maintain an accurate count of entrants in the space.
- viii. Maintain a constant presence at the access point (e.g., hatch) while entrants are in the space.
- ix. Maintain communication with the entrants to assess their status and alert them of the need to evacuate immediately if the attendant:
 - a) Detects a prohibited condition,
 - b) Detects the behavioral effects of hazard exposure in an entrant,
 - c) Detects a situation outside the space that could endanger the entrants,
 - d) There is any doubt as to whether procedures are effective in keeping the entrant protected from hazards, or
 - e) Cannot effectively and safely perform the duties in this section.
- x. Utilize non-entry rescue equipment (e.g., tripod and winch), where applicable and as indicated in the permit and SOP.
- xi. Summon rescue or other emergency services if entrants need assistance to escape from the space or require medical attention
- xii. Ensure unauthorized individuals do not enter the confined space.
- xiii. Report any injuries, illnesses, questions, or unsafe working conditions to the entry supervisor.

F. Authorized Entry Supervisor

- i. Adhere to the requirements of this program, including safe operating procedures.
- ii. Complete all required training (see **Section XVI – Training**).
- iii. Know the potential hazards that may be faced by the entrant during entry, including information on the mode, signs or symptoms, and consequences of exposure.

- iv. Conduct assigned tasks in a safe manner at all times.
- v. Wear appropriate and assigned PPE correctly.
- vi. Verify all tests (e.g., air monitoring) and procedures specified by the confined space entry permit and SOP have been conducted, including hazardous energy isolations, and equipment specified on the permit and SOP are operable and in place prior to endorsing the permit and allowing entry to begin.
- vii. Verify rescue services are available and a means to summon them is operable.
- viii. Ensure an authorized person (e.g., attendant) is assigned responsibility for accurately recording data on the permit (e.g., names of individuals, date, time of entry, atmospheric data) and posting the permit.
- ix. Terminate the entry permit, when required (e.g., work complete, conditions that violate the permit or SOP).
- xii. Submit completed permits, and associated SOPs, hot work permits, and any other relevant documents to EHS at the end of the work.
- x. Report any injuries, illnesses, questions, or unsafe working conditions to EHS.

G. Contractors (including municipalities and utility companies)

- i. Adhere to the requirements of this program, including safe operating procedures.
- ii. Ensure subcontractors adhere to the requirements of this program.
- iii. Ensure employees complete all applicable training, as required (see **Section XVI – Training**).
- iv. Provide a copy of their confined spaces program to EHS, units, or project managers, upon request, which must meet or exceed the Occupational Safety and Health Administration (OSHA) regulations, as applicable.
- v. Inform employees, subcontractors, and Northwestern project managers of the location of known or suspected confined spaces where individuals may need to enter.
- vi. Prohibited from entering confined spaces without explicit approval from the Northwestern project manager and EHS.
- vii. Obtain the confined space assessment from EHS for each space to be entered and coordinate all confined space entries with Northwestern project managers, EHS, Facilities, NUIT, subcontractors, 3rd party rescue services, and other stakeholders, as necessary, including when employees from multiple employers (e.g., Northwestern and contractors) personnel will be conducting activities in or near confined spaces.
- viii. Collaborate with stakeholders (e.g., EHS, Facilities, NUIT, contractors, rescue services) to develop and approve SOPs.
- ix. Provide the necessary equipment (e.g., air monitoring instruments, rescue equipment, body harnesses, PPE), adequate personnel, and resources necessary for entry into confined spaces in compliance with this program.
- x. Develop rescue procedures specific to the space(s) entered (see **Section XII – Rescue**).
- xi. Maintain all necessary equipment in accordance with manufacturer guidelines and regulatory requirements.
- xii. Conduct assigned tasks in a safe manner at all times.
- xiii. Provide employees with the required PPE.

- xiv. Must use their own confined space permit system, including reclassification and alternate entry procedures, and are not permitted to use the Northwestern permit system unless authorized by EHS.
- xv. Submit completed permits, and associated safe operating procedures, hot work permits, and any other relevant documents to project managers at the end of entry operations.
- xvi. Inform Northwestern project managers or EHS of any hazards confronted, suspected, or created in confined spaces.
- xvii. Provide a scope of work to Northwestern project managers and EHS prior to entry into confined spaces on Northwestern property that are not maintained, operated, or under the control of Northwestern (e.g., city sewers, ComEd electrical vaults, contractor-controlled construction or renovation sites). In the event of shared responsibilities (e.g., Northwestern-controlled utilities feeding the space), the appropriate hazardous energy isolations must be followed, including group lockout/tagout, pursuant to the [Northwestern Control of Hazardous \(Lockout/Tagout\) Program](#).

H. 3rd Party Standby Rescue Service Providers

- i. Adhere to the requirements of this program, including safe operating procedures.
- ii. Ensure employees complete all applicable training, as required (see **Section XVI – Training**).
- iii. Equipped for, and proficient in, performing rescue services pursuant to the SOP.
- iv. Proficient with rescue-related tasks and equipment to function appropriately while rescuing entrants from the particular permit-required confined space or types of permit-required confined spaces identified.
- v. Capable of reaching the entrants within a time frame that is appropriate for the permit-required confined space hazard(s) identified.
- vi. Collaborate with EHS and other stakeholders to develop and approve confined space entry SOPs, including the methods of rescue, communication, determination of the maximum number of entrants, and abilities to cover simultaneous entries into separate spaces.
- vii. Communicate rescue plans to entry teams and other stakeholders, as necessary.
- viii. Must utilize their own entry permit system.
- ix. See **Section XII – Rescue** for additional information

V. Assessments

- A. No confined space may be entered until EHS, or a qualified firm or individual under the supervision of EHS, conducts a baseline assessment to identify the characteristics of the space, utilities present, potential hazards, ventilation, entry requirements, and classification (e.g., permit-required).
- B. Assessments must be documented using the [Confined Space Assessment Form](#) or equally effective means.
- C. Confined space assessments and photos are available by contacting EHS at ehs@northwestern.edu and on the EHS SharePoint [website](#) for authorized Northwestern units.
- D. In addition to the requirements of **Section V.A-C.**, confined spaces must be evaluated prior to any entry, utilizing information from the baseline assessment, scope of work,

nearby activities or conditions, safety data sheets (SDSs), weather, and any other information that may be relevant to ensure entries are compliant with this program. This evaluation will typically be performed during the development of SOPs (see **Section IX – Permit-Required Confined Space Entry**).

- E. During entries, reasonable efforts must be made and included in the SOPs to inspect, assess, and document the conditions (e.g., piping, valves, structural integrity) inside confined spaces, and identify and report issues (e.g., suspected or observed leaks or damage) to EHS. In such instances where issues are discovered that are not addressed by the permit or SOP, or where potential hazards exist to the entrant, the space must be evacuated immediately.
- F. Documented reassessments are required when there are changes to existing confined spaces (e.g., new utilities, new hazards, configuration changes), including when non-confined spaces may be reclassified as confined spaces.

VI. Identification and Access

- A. Confined spaces must have appropriate danger signage posted at the entry portal, hatch, cover, or equally effective location, when feasible.
 - i. Permit-required confined spaces must have signage indicating: ‘Danger: Permit-Required Confined Space, Do Not Enter’ or similarly effective language (see **Appendix B** for an example).
 - ii. Non-permit-required confined spaces must have signage indicating: ‘Danger: Confined Space, Authorized Personnel Only’ or similarly effective language (see **Appendix C** for an example).
- B. When posting permanent danger signage is infeasible at confined space entry points (e.g., outdoor steam vaults, hot water vaults, chill water vaults), post temporary appropriate danger signage at the access point(s) when the access points are open.
- C. When feasible, provide locks on confined space access points. When locks are not feasible (e.g., sewer manhole covers), space access must require the use of special tools.
- D. Steam, chilled water, and hot water vault access points must be marked (e.g., with paint, tags, or any other effective means) with the vault number, in a conspicuous manner, which corresponds to the system drawings and confined space assessments.

VII. General Safety Requirements

- A. Adhere to the posted signage requirements in **Section VI – Identification and Access**.
- B. Smoking is prohibited in confined spaces and near the access point.
- C. Outdoor confined space entry operations are prohibited in inclement weather.
- D. Standing water must be pumped out of confined spaces prior to entry; if standing water is present and in contact, or presumed to have come in contact, with any electrical equipment (e.g., conduit, receptacles), the space cannot be entered until the appropriate hazardous energy isolations are performed.
- E. Gasoline or diesel-powered vehicles or equipment are prohibited in confined spaces and must not be operated near confined space access points and ventilation equipment.
- F. Safe and compliant access to the entry point and work area must be established prior to confined space entry operations (e.g., scaffolding).
- G. No one may enter a confined space until all identified hazards are eliminated or controlled and acceptable entry conditions have been established pursuant to this program (i.e., entry permit, SOP, and hazardous energy isolations).

- H. Only trained and authorized individuals may enter (i.e., the entrant) a confined space or serve as an attendant or supervisor.
- I. Confined spaces such as steam vaults may be hot. The Northwestern [Heat Illness Prevention Program](#) must be followed when the heat index is 80° Fahrenheit (F) or higher.
- J. Entrants, attendants, and supervisors must wear all appropriate and assigned PPE (e.g., hard hat, long pants and sleeves, gloves, safety footwear, eye protection, hearing protection).

VIII. Non-Permit-Required Confined Space Entry

- A. Only trained and authorized individuals may enter and perform work inside non-permit-required confined spaces.
- B. Before entry into non-permit-required confined spaces, entry supervisors must evaluate the scope of work, worksite conditions, and the confined space assessment to determine whether conditions might make the space a permit-required confined space. Examples include use or configuration changes, welding, working with hazardous chemicals, and known or assumed structural failure. If such conditions are expected, suspected, or develop, the space must be evacuated and is assumed to be a permit-required confined space. Supervisors must contact EHS to assist with a hazard assessment to determine the entry requirements. If necessary, the space will be reclassified as a permit-required confined space.
- C. If non-permit confined spaces have no hazards, entry can be done without using the permit system (e.g., ventilation system spaces with no atmospheric hazards and other hazards such as exposed moving parts).

IX. Permit-Required Confined Space Entry

- A. Planning (Safe Operating Procedure Development)
 - i. Notify EHS at ehs@northwestern.edu if an entry into a permit-required confined space is needed or anticipated, with as much information and advanced notice as possible.
 - ii. SOPs are required for all entries and may be used to consolidate multiple entries, days, and spaces, at the discretion of EHS.
 - iii. SOPs are developed in advance, typically at least a few days before the work commences.
 - iv. SOPs are developed based on information from the confined space assessment, utilities present, worksite conditions, scope of work, parties involved, impacted buildings or equipment, weather, and any other relevant information to determine the entry and permit requirements, including if there is a possibility of a release of hazardous energy, in which case appropriate lockout/tagout procedures must be utilized (see **Section XIII – Hazardous Energy Isolation**).
 - a) [Safe Operating Procedure \(SOP\) Guide](#)
 - b) [Safe Operating Procedure \(SOP\) Template](#)
 - v. SOPs must include assigned responsibilities, all parties involved (e.g., contractors, subcontractors, Facilities), rescue procedures, emergency procedures, methods of communication, utilities present, hazardous energy isolation procedures, other permits (e.g., hot work), notifications to

stakeholders, and required safety measures such as training, PPE, and preventing unauthorized access.

- vi. Northwestern unit supervisors and their directors, the EHS director, and the contractor and subcontractor supervisors (if applicable), or their designees, must review and sign the SOP prior to the commencement of work.
- vii. Approved SOPs must be communicated to all stakeholders and the local fire department, with as much advanced notice as possible, to:
 - a) Evanston Fire Department at mrsmith@cityofevanston.org, ppolep@cityofevanston.org, and wmuno@cityofevanston.org, or
 - b) Chicago Fire Department at andrew.mcgill@cityofchicago.org

B. Pre-Entry

- i. A [confined space entry permit](#) is required for entry into each space, may not be consolidated to cover multiple spaces, and is valid for no more than 1 shift (i.e., 8 hours) and may not be extended.
- ii. All parties involved must review, acknowledge, and agree to comply with all the procedures and safety requirements in the SOP by signing it prior to the commencement of work during a pre-work briefing.
- iii. Inspect all equipment, tools, and PPE for proper function before use.
- iv. Test air monitoring equipment in accordance with **Section XI – Air Monitoring**.
- v. Verify worksite conditions to ensure the work can proceed as planned.
- vi. Protect all openings to confined spaces with barriers (e.g., guardrails) when hatches, covers, or lids are removed to protect individuals from hazards such as dropped objects and falls.
- vii. Implement measures to prevent unauthorized entries or access to the work area, such as barricades.
- viii. Continuous forced air ventilation must be used during all entry operations to eliminate the potential for any hazardous atmosphere:
 - a) Air must be taken from a clean source (e.g., away from running vehicles or exhaust vents) and continue until all workers have left the space.
 - b) If the atmospheric conditions cannot meet the requirements of **Section XI – Air Monitoring**, entry is prohibited and EHS must be consulted.
 - c) When continuous forced air ventilation may impede or interfere with rescue procedures, operations, or communications, continuous air monitoring is required in accordance with **Section XI.E.iii.d**.
- ix. Complete the necessary steps in the SOP to verify safe atmospheric conditions, hazardous energy isolations, communication, rescue procedures, and equipment, and record them in the applicable sections of the confined space entry permit.
- x. Notify University Police prior to entry into a permit-required confined space; this information must be noted on the entry permit.
 - a) Evanston Campus: (847) 491-3254
 - b) Chicago Campus: (312) 503-3456
- xi. Submit the completed and authorized entry permit to EHS for review and approval in person or by such means as emailing or texting a photo of the permit. EHS will evaluate the permit to ensure all requirements are met prior to entry.
- xii. Post the authorized confined space entry permit at the entry portal, or by any other equally effective, conspicuous manner, prior to beginning work.

C. Entry

- i. Adhere to the requirements of the SOP, entry permit, and all other requirements (e.g., hot work permit) and this program during entry operations.
- ii. Upon entry, entrants must evaluate the conditions of the space; if any observed or suspected hazards or conditions are present that violate the SOP or permit, the entrant must evacuate the space immediately and EHS must be notified to evaluate the situation and ensure measures are implemented to control or eliminate the hazard(s) before any subsequent entries take place. This may result in the need for a new SOP and/or permit at the discretion of EHS.
- iii. An attendant must be present at all times at the access point (e.g., hatch); the attendant cannot perform any other tasks that could potentially interfere with their abilities to provide any/all support necessary to the entrant(s).
- iv. An entry supervisor must be present at the worksite at all times (note that the entry supervisor may serve as the attendant or entrant).
- v. Entrants and attendants must maintain communication pursuant to **Section X – Communication**).
- vi. In the event a hazardous atmosphere or condition is observed or suspected, or if anyone involved in the operation is in doubt as to the effectiveness of the procedures that may compromise the safety and health of anyone involved, the space must be immediately evacuated and EHS must be notified to evaluate the situation and ensure measures are implemented to control or eliminate the hazard(s) before any subsequent entries take place. This may result in the need for a new SOP and/or permit at the discretion of EHS.
- vii. In the event of an emergency such as an injury where the entrant is unable to evacuate the space and a rescue becomes necessary, the entry supervisor, attendant, or a designee must call 911 immediately to report the incident as a “confined space rescue” and provide information, guidance, and assistance as necessary, and must adhere to emergency procedures in the SOP and permit (see **Section XII – Rescue**). Any other confined space entries are immediately suspended and all attendants must evaluate the spaces until EHS determines entries can resume.

D. Post-Entry

- i. When all work is complete and the confined space is vacated, the entry supervisor must ensure that:
 - a) The worksite is returned to safe conditions (e.g., access point closed and secured),
 - b) The entry permit is closed,
 - c) University Police and EHS are notified that the entry has been completed, and
 - d) Any issues encountered during the entry are documented and communicated to EHS.
- ii. Fully signed SOPs and closed/canceled permits must be submitted to EHS for post-entry review to ensure that those participating in entry operations are protected from confined space hazards and compliance with this program, which includes but is not limited to:
 - a) Ensuring forms, SOPs, and permits were completed properly,
 - b) Ensuring all personnel involved signed the SOP, and

- c) Providing immediate feedback and guidance to entry teams for any deficiencies, efficiencies, or opportunities for improvement identified.

X. Communication

- A. Effective two-way communication must be established, verified, and maintained during all permit-required confined space entries, including permit-required confined spaces that are temporarily reclassified to non-permit-required confined spaces:
 - i. Between those inside the confined space (entrants),
 - ii. Between those inside the confined space (entrants) and those outside (attendants), and
 - iii. To summon emergency responders (e.g., 3rd party rescue service, fire department) in the event of an emergency.
- B. Examples of acceptable forms of communication are:
 - i. UHF portable radio,
 - ii. Cellular phone,
 - iii. Verbal,
 - iv. Fixed telephone, if available,
 - v. Visual (e.g., hand signals), and
 - vi. Tugs on a lifeline.
- C. Careful consideration must be given to the selection of communication methods as cellular service and UHF radio coverage may be limited in certain confined spaces at Northwestern.

XI. Air Monitoring

- A. Air monitoring is required for all permit-required confined space entries.
- B. Air monitoring equipment must be maintained, calibrated, and operated air according to the manufacturer's instructions and this program by trained and authorized personnel. Consult EHS when necessary.
- C. Documented monthly calibration of air monitoring equipment must be performed.
- D. Prior to performing air monitoring for a confined space entry:
 - i. A bump test or full calibration must be performed in accordance with the manufacturer's instructions using the appropriate test gas.
 - ii. If a bump test fails, a full calibration is required before further use. If the calibration fails, or the equipment is, or is suspected to be, not operating properly, the equipment must not be used.
- E. Air monitoring
 - i. Measurement must be made for at least the minimum response time of the test instrument specified by the manufacturer.
 - ii. When monitoring for entries involving a c into atmospheres that may be stratified, the atmospheric envelope must be tested a distance of approximately 4 feet in the direction of travel and to each side. If a sampling probe is used, the entrant's rate of progress should be slowed to accommodate the sampling speed and detector response.
 - iii. Frequency
 - a) Measurements must be performed within 15 minutes before the initial entry,
 - b) At least every 2 hours, and

- c) More frequently as necessary based on the hazards present, and at any times deemed necessary by EHS or any member of the confined space entry team.
 - d) Entry teams are encouraged to utilize continuous monitoring for the duration of the entry to provide early detection of changing atmospheric conditions. In such instances, atmospheric monitoring results must still be recorded on the permit at least every 2 hours.
- F. Atmospheric conditions must remain within the following limits at all times while entrants are in the space:
- i. **Oxygen:** between 19.5% and 23.5%
 - ii. **Lower Explosive Limit (LEL):** less than 10%
 - iii. **Carbon Monoxide (CO):** less than 35 ppm (parts per million)
 - iv. **Hydrogen Sulfide (H₂S):** less than 10 ppm (parts per million)
- G. Atmospheric test results, including any air monitoring equipment bump test or calibration results, must be documented on entry permits.
- H. Communicate all air monitoring results to all entrants or their authorized representatives.

XII. Rescue

- A. Rescue procedures are required for all permit-required confined space entries. There are two types of rescue methods: entry and non-entry.
- i. Non-entry rescue:
 - a) Trained and authorized attendants and entry supervisors may perform non-entry rescues with the use of a retrieval system (e.g., tripod, winch, lifeline, body harness).
 - b) Rescue equipment must be inspected and verified functional prior to use and in accordance with the manufacturer's guidelines.
 - c) Retrieval equipment must be inspected and tested annually by a competent person and in accordance with the manufacturer's guidelines, the Northwestern [Fall Protection Program](#), and any other applicable standards.
 - d) Certain situations, such as unobstructed horizontal entries into boilers or crawl spaces, may allow the use of a body harness or wristlets, lifeline, and multiple attendants to effectively pull the entrant out of the space in an emergency. EHS, or a qualified firm or individual under the supervision of EHS, will determine the feasibility of such procedures on a case-by-case basis.
 - e) When a lifeline is in use, it must be attached to each entrant individually and must not be disconnected at any time while the entrant is in the space.
 - f) If non-entry retrieval equipment increases the overall risk of entry, does not contribute to the rescue of the entrant, or will otherwise be ineffective (e.g., piping or equipment obstructions, space configuration limitations, multiple entrants), non-entry rescue procedures are prohibited and entry rescue procedures are required.
 - g) Entrants are prohibited from being in positions within the space or conducting activities in the space that present a reasonable probability

- of rescue being ineffective (e.g., obstructions such as piping or cabling between the entrant and the extraction point).
- ii. Entry rescue (i.e., 3rd party standby rescue team):
 - a) Entry rescue procedures are required when non-entry rescue procedures have a reasonable probability of being ineffective, are infeasible or impractical, when determined by EHS, or are required by this program.
 - b) An on-site 3rd party rescue team is required to provide standby rescue service when flowable materials are not isolated in permit-required confined spaces pursuant to **Section XIII – Hazardous Energy Isolation**, if the volume and flow of material are suspected or determined to present a potential engulfment or other serious safety or health hazard should a leak or rupture occur. Examples include entries into steam vaults that also contain chilled water piping when the work does not involve chilled water system components.
 - c) 3rd party standby rescue teams:
 - 1. Must be provided with confined space assessments, SOPs, hazardous energy isolations, and any other relevant information so they are informed of the hazards they may confront when called on to perform rescue, should one be necessary.
 - 2. Must have access to all confined spaces from which rescue may be necessary so that appropriate rescue plans and practice rescue operations can be developed.
 - 3. Must be involved in the development and approval of confined space SOPs.
 - d) Local fire department
 - 1. While the local fire department is capable of performing confined space rescues, it is not a primary rescue service, and as such is considered a backup rescue service.
 - 2. Must be notified prior to any permit-required confined space entry pursuant to **Section IX.A.vii**.
 - 3. Must be notified immediately (e.g., 911) in the event of an emergency to provide additional support.
 - e) Northwestern employees are not trained to perform entry rescues and are prohibited from entering a permit-required confined space to perform a rescue under any circumstances.
 - B. If a vertical space is over 5 feet deep (e.g., steam vault or sewer), a retrieval system is required (entry and non-entry methods) and must include a chest or full-body harness, retrieval line, and a mechanical retrieval device.

XIII. Hazardous Energy Isolation

- A. Hazardous energy (e.g., steam, water, gases, sewage, electricity, moving parts) must be isolated prior to entry into a confined space if there is a reasonable probability for a potential for a serious safety or health hazard to the entrant, including but not limited to engulfment, burns, entrapment, shock, electrocution, or other serious safety or health hazard. Examples of activities in confined spaces where hazardous energy must be isolated include, but are not limited to:

- i. Line breaking
- ii. Installation, repair, or demolition of system components (e.g., piping, flanges, valves)
- iii. Adjusting or tightening compression seals, such as flanges
- iv. Activities conducted in close proximity to, adjacent to, or that may contact piping, piping components, or systems where a potential exists for a rupture, leak, or release of hazardous energy (e.g., within reach or when tools or equipment may make contact)
- v. Whether the activities will involve the piping, valves, flanges, or other connections or system components
- vi. Manipulation of valves
- vii. Inspections or surveys
- viii. Draining or releasing hot water from steam traps or condensate lines
- ix. Any work in normally flooded spaces, such as boilers and water tanks
- B. When hazardous energy must be isolated, the procedures outlined in the [Northwestern Control of Hazardous Energy \(Lockout/Tagout\) Program](#) must be followed, including documented lockout/tagout procedures and group lockout/tagout.
- C. Only trained and authorized individuals may isolate hazardous energy.
- D. Isolation of all hazardous energy is required to temporarily reclassify a permit-required confined space to a non-permit-required confined space (see **Section XIV – Reclassification Procedures**).
- E. Steam and condensate
 - i. Steam and condensate isolation is required when there exists a potential for the piping inside the space to rupture or leak into the space and potentially result in engulfment, burns, or other serious safety or health hazards to an entrant due to:
 - a) The piping terminates in the space (e.g., tank),
 - b) The presence of steam or condensate system components (e.g., valves, flanges), and not contained in mechanically and structurally sound continuous runs of piping,
 - c) The age and condition of the system piping, valves, flanges, or other components,
 - d) Visible or suspected leaks, corrosion, damage, or otherwise compromised piping or piping components,
 - e) The frequency of inspection and maintenance of piping and piping components,
 - f) History of failures of piping or piping components,
 - g) Manipulation and/or work performed related to the system components (e.g., valves, flanges, traps)
 - h) Work done adjacent to, or in close proximity to (e.g., within reach or when tools or equipment may make contact), the piping, valves, flanges, or other system components, or
 - i) For any other reason there exists a potential for the piping inside the space to rupture or leak into the space and potentially result in engulfment, burns, or other serious safety or health hazard to an entrant.
 - ii. When isolation is required:
 - a) Single-valve isolation is not permitted.

- b) Isolation must be performed using one of the following techniques:
 1. Blanking or blinding,
 2. Misaligning or removing sections of lines or pipes, or,
 3. Use of a double block and bleed system.
 - iii. If the piping does not terminate in the space, is contained in mechanically and structurally sound continuous runs of piping without connections such as valves and flanges, and no potential exists for rupture or leakage of materials into the space, then isolation of the piping is not required.
- F. Flowable materials other than steam and condensate (e.g., water, sewage, gases)
 - i. Flowable material isolation is required when there exists a potential for the piping inside the space to rupture or leak into the space where the volume or flow of the material could potentially result in engulfment, burns, or other serious safety or health hazard to an entrant due to:
 - a) The piping terminates in the space (e.g., tank),
 - b) The age and condition of the system piping, valves, flanges, or other components,
 - c) Visible or suspected leaks, corrosion, damage, or otherwise compromised piping or piping components,
 - d) The frequency of inspection and maintenance of piping and piping components,
 - e) History of failures of piping or piping components,
 - f) Manipulation and/or work performed related to the system components (e.g., valves, flanges, traps),
 - g) Work done adjacent to, or in close proximity to (e.g., within reach or when tools or equipment may make contact), the piping, valves, flanges, or other system components,
 - h) For any other reason there exists a potential for the piping inside the space to rupture or leak into the space and potentially result in engulfment, burns, or other serious safety or health hazard to an entrant.
 - ii. When isolation is required:
 - a) Single-valve isolation is not permitted.
 - b) Isolation must be performed using one of the following techniques:
 1. Blanking or blinding,
 2. Misaligning or removing sections of lines, pipes, or duct, or,
 3. Use of a double block and bleed system.
 - iii. If the piping does not terminate in the space and no potential exists for rupture or leakage of materials into the space where the volume or flow of the material could potentially result in engulfment, burns, or other serious safety or health hazards to an entrant, then isolation of the piping is not required.
- G. Electrical Circuits
 - i. Mechanical equipment isolation is required when there exists a potential for the release of hazardous energy that could potentially result in entrapment or other serious safety or health hazards to an entrant due to:
 - a) Unguarded mechanical equipment (e.g., fans, belts, rotating parts),
 - b) The age and condition of the mechanical equipment or associated components,

- c) Visible or suspected corrosion, damage, or otherwise compromised mechanical equipment or associated components,
 - d) The frequency of inspection and maintenance of mechanical equipment or associated components,
 - e) History of failures of mechanical equipment or associated components,
 - f) Manipulation and/or work performed related to the mechanical equipment or associated components,
 - g) Work done adjacent to, or in close proximity to (e.g., within reach or when tools or equipment may make contact), the mechanical equipment or associated components,
 - h) For any other reason there exists a potential for the mechanical equipment or associated components to release hazardous energy into the space and potentially result in entrapment or other serious safety or health hazards to an entrant.
- ii. Mechanical equipment isolation is not required when adequately guarded and no potential exists for the release of hazardous energy into the space and potentially result in entrapment or other serious safety or health hazards to an entrant.
- H. Notwithstanding the requirements of this section, confined spaces must be immediately evacuated and re-evaluated at any time a potential safety or health hazard is suspected, develops, or is discovered to ensure the appropriate isolations are executed pursuant to this program.
 - I. Notwithstanding the requirements of this section, when feasible and practical to do so, all utilities and moving parts should be isolated.

XIV. Reclassification Procedures

- A. Only trained and authorized individuals may utilize reclassification procedures.
- B. A permit-required confined space may be temporarily reclassified as a non-permit confined space if:
 - a. The space poses no actual or potential atmospheric hazards,
 - b. The space poses no entrapment hazards,
 - c. All hazards (e.g., biological, chemical, electrical, engulfment, mechanical, thermal, or any other serious hazards) within the space are eliminated without entry into the space, and
 - d. The work being done inside or near the space does not introduce new hazards (e.g., painting, chemicals, welding, dust).
- C. Permit-required confined spaces such as steam and chilled water vaults are not eligible for reclassification.
- D. An SOP is required to reclassify a permit-required confined space to a non-permit-required confined space, pursuant to the applicable requirements of **Section IX.A**.
- E. If it is necessary to enter the permit space to eliminate hazards, such entry must be performed using a confined space entry permit pursuant to **Section IX – Permit-Required Confined Space Entry**. If testing and inspection during that entry demonstrate that the hazards within the permit-required confined space have been eliminated, the permit-required confined space may be reclassified as a non-permit-required confined space for as long as the hazards remain eliminated.

- F. Control of atmospheric hazards through forced air ventilation does not constitute elimination of atmospheric hazards.
- G. In the event a hazardous atmosphere or condition is observed or suspected, or if anyone involved in the operation is in doubt as to the effectiveness of the procedures that may compromise the safety and health of anyone involved, the space must be immediately evacuated and EHS must be notified to evaluate the situation and ensure measures are implemented to control or eliminate the hazard(s) before any subsequent entries take place. This may result in the need for a new SOP and/or permit at the discretion of EHS.
- H. Entry operations are immediately canceled when the work is completed or when conditions are observed or suspected that would violate the SOP. Re-entry into the space may result in the need for a new SOP and/or permit at the discretion of EHS.

XV. Alternate Entry Procedures

- A. Only trained and authorized individuals may utilize alternate entry procedures.
- B. Alternate entry procedures may be utilized to enter a permit-required confined space if the only hazard posed by the permit-required confined space is an actual or potential hazardous atmosphere and continuous forced-air ventilation alone is sufficient to maintain that permit-required confined space safe for entry.
- C. Permit-required confined spaces such as steam and chilled water vaults are not eligible for alternate entry procedures.
- D. An [alternate entry form](#) must be utilized to certify that the space is safe for entry and that all required pre-entry measures have been taken to authorize entry into the space and to monitor and document the atmosphere within the space.
- E. An SOP is required to utilize alternate entry procedures, pursuant to the applicable requirements of **Section IX.A**.
- F. If an initial entry of the permit-required confined space is necessary to verify that the only hazard posed by the permit-required confined space is an actual or potential hazardous atmosphere and continuous forced-air ventilation alone is sufficient to maintain that permit-required confined space safe for entry, the entry must be performed using a confined space entry permit.
- G. Any conditions making it unsafe to remove an entrance cover (e.g., pressurized tank) must be eliminated before the cover is removed.
- H. When entrance covers are removed, the opening must be promptly guarded by a railing, temporary cover, or other temporary barrier that will prevent an accidental fall through the opening and protect entrants in the space from falling objects entering the space.
- I. Before an entrant enters the space, the internal atmosphere must be tested pursuant to **Section XI – Air Monitoring**. There may be no hazardous atmosphere within the space whenever an entrant is inside the space.
- J. An entrant may not enter the space until the forced air ventilation has eliminated any hazardous atmosphere.
- K. The forced-air ventilation must be so directed as to ventilate the immediate areas where an entrant is or will be present within the space and must continue until all entrants have left the space.
- L. The air supply for the forced-air ventilation must be from a clean source and may not increase the hazards in the space.

- M. The atmosphere within the space must be periodically tested as necessary pursuant to **Section XI – Air Monitoring** to ensure that the continuous forced-air ventilation is preventing the accumulation of a hazardous atmosphere.
- N. Any entrant who enters the space, or that entrant’s authorized representative, must be provided with an opportunity to observe the required periodic testing.
- O. In the event a hazardous atmosphere or condition is observed or suspected, or if anyone involved in the operation is in doubt as to the effectiveness of the procedures that may compromise the safety and health of anyone involved, the space must be immediately evacuated and EHS must be notified to evaluate the situation and ensure measures are implemented to control or eliminate the hazard(s) before any subsequent entries take place. This may result in the need for a new SOP and/or permit at the discretion of EHS.
- P. Entry operations are immediately canceled when the work is completed, a condition that is not allowed under the alternate entry procedures arises, or after 8 hours. Re-entry into the space requires a permit or a new alternate entry form.

XVI. Training

- A. Northwestern employees must complete training, as follows:
 - i. Those whose tasks may involve confined spaces must complete online [Confined Space Awareness](#) training upon hire and every 2 years.
 - ii. Those involved in confined space operations as an entrant, attendant, or supervisor must complete 4-hour [Confined Space Theory](#) training upon hire and every 3 years.
 - iii. Those involved in confined space non-entry rescue operations must complete 2-hour [Confined Space Rescue Equipment](#) training upon hire and every 3 years.
 - iv. Additional training may be required, including but not limited to:
 - a) When there is a change in a confined space that presents hazards(s) to which the employee has not been previously trained,
 - b) Changes to procedures,
 - c) New hazards, or
 - d) Observed inadequacies in an employee’s knowledge or execution of confined space procedures.
- B. Contractors, subcontractors, and 3rd party rescue service providers must ensure employees are adequately and appropriately trained for the tasks performed in accordance with this program and applicable regulatory requirements. Records must be made available to Northwestern upon request.
- C. Fire Department
 - i. EHS will collaborate with the local fire department to provide opportunities, when practical and feasible, to utilize confined spaces and tunnels at Northwestern for training exercises.
 - ii. The fire department will be provided with opportunities, when practical and feasible, to attend University-led confined spaces training.

XVII. Recordkeeping

- A. EHS
 - i. Maintain the database of confined space assessments and ensure accessibility to stakeholders.

- ii. Document changes to existing confined spaces, including when classifications or hazards change.
 - iii. Maintain all closed/completed entry permits and associated documentation including but not limited to, SOPs and hazardous energy isolation procedures, for at least 5 years.
 - iv. Maintain training records in myHR Learn for the duration of employment, plus 1 year.
- B. Northwestern Units
- i. Maintain air monitoring instrument records (i.e., bump tests, calibrations, and service repairs) for at least 5 years. Electronic means, such as instrument software, may be used to record this information in lieu of paper logs, if available.
 - ii. Maintain relevant system drawings, schematics, and other information to support confined space entries.
- C. Contractors (including 3rd party standby rescue services)
- i. Submit entry permits and associated documentation including but not limited to, SOPs and hazardous energy isolation procedures, to Northwestern at the completion of work.
 - ii. Maintain records (e.g., permits, training records, confined space entry programs) as required by regulations. Records must be made available to Northwestern upon request.

XVIII. Documents

[Confined Space Assessments](#) (SharePoint)
[Confined Space Assessment Form](#)
[Confined Space Entry Permit](#)
[Confined Space Alternate Entry Form](#)
[Air Monitoring Equipment Bump Test and Calibration Log](#)
[Evanston Fire Department Confined Space Rescue Capabilities](#)

XIX. Regulatory Authority and Related Information

Northwestern and contractors will comply with the Occupational Safety and Health Administration's (OSHA) standards and any other applicable codes and standards, including:

[NFPA 101 – Life Safety Code](#)
[Northwestern Contractor Safety Program](#)
[Northwestern Control of Hazardous Energy \(Lockout/Tagout\) Program](#)
[Northwestern Fall Protection Program](#)
[Northwestern Heat Illness Prevention](#)
[Northwestern Personal Protective Equipment \(PPE\) Program](#)
[Northwestern Safe Operating Procedure Guide](#)
[Northwestern Safe Operating Procedure Template](#)
[Northwestern Welding, Cutting, and Brazing \(Hot Work\) Program](#)
[OSHA 29 CFR 1910.146 – Permit-Required Confined Spaces](#)
[OSHA 29 CFR 1926 Subpart AA – Confined Spaces in Construction](#)

XX. Contact

For questions, contact Environmental Health and Safety at ehs@northwestern.edu.

Appendix A – Guidelines for Contractors Working in Confined Spaces

Northwestern project managers and others responsible for projects that require contractors to enter confined spaces covered in this program should use these guidelines to ensure all requirements are met prior to any entries.

A. Northwestern Requirements

- i. Inform EHS at ehs@northwestern.edu if contractor activities may involve confined spaces.
- ii. Inform the contractor that the workplace contains confined spaces and that entry is allowed only through compliance with the Northwestern [Confined Spaces Program](#).
- iii. Provide a Statement of Work (SOW) that indicates the contractor will provide the necessary confined space equipment, rescue procedures, and an adequate number of trained employees.
- iv. Provide the contractor with the Northwestern [Confined Spaces Program](#) and applicable confined space assessment and identify any hazards inside or associated with the confined space(s).
- v. Collaborate with stakeholders (e.g., EHS, Facilities, NUIT, contractors, 3rd party rescue services) to develop and approve SOPs, ensuring that the contractor is:
 - a) Apprised of the elements, including the hazards identified and Northwestern's experience with the space, that make the space in question a permit-required confined space.
 - b) Apprised of any precautions or procedures that Northwestern has implemented for the protection of employees in or near permit-required confined spaces where contractor personnel will be working.
- vi. Coordinate entry operations with the contractor when both Northwestern personnel and contractor personnel will be working in or near permit-required confined spaces.
- vii. Isolate or de-energize all sources of hazardous energy, and communicate isolations to the contractor to ensure group lockout/tagout.
- viii. Review the contractor's confined space entry permit and authorize the entry.
- ix. Debrief the contractor at the conclusion of the entry operations regarding the permit-required confined space program followed and any hazards confronted or created in permit-required confined spaces during entry operations.

B. Contractor Requirements

- i. Obtain any available information regarding permit-required confined space hazards and entry operations from Northwestern.
- ii. Coordinate entry operations with Northwestern when both Northwestern and contractor personnel will be working in or near permit-required confined spaces.
- iii. Inform Northwestern of the permit-required confined space program that the contractor will follow, and any hazards confronted or created in permit-required confined spaces, either through a debriefing or during the entry operation.
- iv. Provide written procedures for work to be performed inside the permit-required confined space, including entry and rescue methods and procedures.
- v. Attach lockout/tagout device(s) to all hazardous energy source isolations.
- vi. Utilize their own confined space entry permits and submit all permits to Northwestern for entry authorization.

Appendix B – Permit-Required Confined Space Sign Example



Appendix C – Non-Permit-Required Confined Space Sign Example



**CONFINED SPACE
AUTHORIZED
PERSONNEL ONLY**