Confined Space Entry Program

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PURPOSE: This program will address the hazards connected with the entry of a confined space by an employee of this University, the work requirements aimed at eliminating or reducing that hazard, the definition of a confined space and rescue procedures from a confined space.

SCOPE: This program covers the entry into any permit required confined space , on University property, by employees of this University for work related purposes. The term permit required confined space includes all those listed in the Confined Space Evaluation Book and those not listed, but meeting the definition of a confined space as found in 29CFR 1910.146 Permit Required Confined Spaces for General Industry.

RESPONSIBILITIES: It is the responsibility of the University to attempt to identify all areas meeting the definition of a Permit Entry Confined Space. Furthermore, it is this Universities' responsibility to provide training to any employee required to enter a permit entry confined space as part of their employment, provide the necessary equipment and man power to enhance safe entry and exit from a confined space, conduct an annual review of the Universities' program, and have a functional rescue plan, should the need arise.

It is the responsibility of the employees of this University to refrain from entering any confined space without prior hazard evaluation. Any employee that must enter a permit entry confined space will do so only with the knowledge of their supervisor and in adherence with the Confined Space Entry Program of this University.

DEFINITION OF A CONFINED SPACE - A space with limited or restricted means of entry or exit, large enough for an employee to enter and perform assigned work, and is not designed for continuous occupancy by employees. These spaces may include, but are not limited to, underground vaults, tanks, storage bins, pits, diked areas, vessels and silos.

DEFINITION FOR A PERMIT REQUIRED ENTRY -

A space that meets the above definition and has one or more of the following characteristics:

1. contains or has the potential to contain a hazardous atmosphere.
2. contains a material that has the potential to engulf an entrant.

3. has an internal configuration that may cause an entrant to be trapped or asphyxiated by inwardly converging walls or by a floor that slopes downward and tapers to a smaller section.

4. contains any other serious safety or health hazard.

SECTION 1. Determine if the confined space requires a permit for entry.

a. Check for a sign stating "Danger - Permit Required for Entry"

b. If no sign is in place and you are unfamiliar with the space, then check with your supervisor. The supervisor will determine if the space should be labeled (i.e., the sign is missing) or if the space is a non-permit space.

c. If the space requires a permit for entry, then proceed to Step 2.

SECTION 2. Contact your supervisor and discuss the need to enter the permit required confined space.

Do not enter the space at this time. Entry can begin only after your supervisor has completed the Confined Space Entry Permit. The Confined Space Entry Permit can be found under the FORMS Link on the EH&S Main web page. Click on FORMS and go to General Safety Forms - Confined Space Entry Permit.

Remember - Entry means to break the plane of the opening of the space with any body part. (i.e. sticking a hand into the space is considered an entry).

SECTION 3. The Entry Supervisor's Role

A. The supervisor deciding that entry into a permit required confined space assumes the position of Entry Supervisor. The Entry Supervisor is responsible for the following

a. Know the hazards in the space. Utilize the hazard evaluations, talk with other supervisors who have knowledge of the space, and review the last permit issued for that space.

b. Verify conditions within the space by completing the Confined Space Entry Permit. Make sure the Permit is completely filled out and air samples are current. Regardless of
the air sampling meter used, make sure that the meter has been calibrated recently in accordance with manufacturer's recommendations and is good working order. Air samples should be taken at space. The samples should be taken in the following sequence: Oxygen, Lower Explosive Limit, Toxic Gases. If any of these readings are unacceptable for entry (refer to permit for acceptable levels) Entry into the confined space is **NOT** to take place.

c. **Select entrant(s) and attendant(s) that have been trained** in their specific duties and are knowledgeable about the work to be performed. Review all safe entry procedures with the confined space entry team. Should more than one shop need to enter the space, confer with the supervisors of the other shops and coordinate entry so that hazards can be controlled.

d. **Obtain equipment needed for a safe entry.** This equipment may include, but is not limited to, barricades to protect the opening, air monitoring equipment, tripod and body harness, PPE, lockout tags and locks, air blower, flexible duct, saddle vent, radios, ladders, non-sparking tools, and lighting (is explosion proof needed?).

e. **Verify emergency plans.** Notify Power Plant Base of the confined space entry, the date(s) and time(s). Give the exact location, including building, floor, and nearest entrance.

f. **Terminate the confined space entry when:**

i. work is complete. The Entry Supervisor is responsible for space closure. All equipment should be removed, all entrants accounted for, all changes to the hazards within the space noted on the permit. The confined space should be secured to prevent unauthorized entry. The job termination time and date should be noted on the Permit and the Permit should be sent to the EH&S Office (Chemistry B73). The Permit will be maintained on file for no less that one year. Equipment should be cleaned and returned in good condition to its respective caretaker.

ii. when conditions within the space change. Should the entrant, attendant or entry supervisor know of, or suspect, that conditions may change/have changed in the confined space, and these changes are determined to be potentially hazardous, the entry supervisor is to halt the entry and order the exiting of the entrant(s) to exit the confined space.

iii. when conditions outside the space present a hazard to the entrant(s) or may prevent the attendant(s) from performing the job.
g. Take appropriate actions to remove unauthorized entrants. Upon notification, or through direct encounter, the Entry Supervisor will ask an unauthorized entrant to leave the area. Should this individual fail to comply promptly with the request, the Entry Supervisor is to contact the University Police Department (UPD) and request their immediate assistance in the removal of the unauthorized individual.

h. Ensure entry operations remain consistent with University policy and safe operating procedures.

SECTION 4. The Attendant’s Role

The attendant(s) is selected by the Entry Supervisor. This individual must be trained specifically as a confined space entry attendant. This person is expected to perform the following duties:

a. Remain outside the permit space during the entry operations. Under no circumstances should the attendant leave her/his post. Should the attendant need to leave the space, then the entry operation is to be halted and the entrant must exit the permit space. Re-entry can take place when all conditions for safe entry are again met by the team. The attendant can perform NO OTHER DUTIES while the confined space entry takes place.

b. Know existing and potential hazards within the space. The attendant must review the permit and decide if all hazards have been rendered harmless for entry. If conditions for safe entry have not been met, then the attendant must confer with the entry supervisor and prohibit entry until conditions are safe. The attendant must also be aware of hazards that could surface due to the nature of the work to be done in the space and the signs warning of the presence of those hazards. This information is covered in the attendant's training and should be noted on the Permit for entry.

c. Maintain communication with the entrant(s) to assess the entrant's condition. Communication must be verbal. In those spaces where distance between the attendant and entrant makes normal conversation impossible, radios are to be used. Should the attendant notice the entrant slurring, speaking in an illogical fashion or not answering, then the attendant must order the immediate evacuation of the confined space.

d. Perform non-entry rescues. Under no circumstances can an attendant enter a confined space to rescue an entrant. The attendant can perform a non-entry rescue, if the entrant is wearing a body harness and hooked to the retrieval set up. Prior to beginning non-entry rescue, the attendant must call Power Plant Base and state that a rescue is in progress. Albany Fire Department (AFD) will be summoned, with Paramedic and rescue units
responding whether a non-entry or entry rescue is needed. Power Plant base will notify AFD.

e. **Order an evacuation of the confined space when an emergency situation occurs.** The emergency warranting evacuation of the space can occur inside or outside the space. After ordering an evacuation of the space, the entry supervisor should be notified. Once the emergency has passed, the entry supervisor and/or the attendant will decide if re-entry is possible.

f. **Keep unauthorized people away from the space,** during entry. The attendant should contact the entry supervisor if unauthorized persons attempt to enter the space. In the event the unauthorized persons present a threat to the safety of the entrant(s), the attendant should then call Power Plant Base and request UPD intervention. Should an unauthorized person enter the space before help arrives, the attendant is to order the immediate evacuation of the entrant(s).

**SECTION 5. The Entrants Role**

The entrant is selected by the Entry Supervisor. This individual is trained specifically as a confined space entrant. This person is expected to perform the following duties:

a. **Know existing and potential hazards within the space.** It is imperative the entrant be aware of all actual and possible conditions that could jeopardize His/her safety during confined space entry. The entrant must review the completed permit and decide if hazards have been controlled prior to entry. If conditions for safe entry have not been met, then the entrant must confer with the entry supervisor and attendant before proceeding into the space. Actual hazards must be rendered harmless and potential hazards planned for before entry can begin. The entrant must also be aware of warning signs indicating a potential hazard is becoming actual. This information is covered in the entrants training and should be noted on the permit for entry.

b. **Use appropriate Personnel Protective Equipment (PPE).** The appropriate protective equipment will be designated by the entry supervisor, on the permit for entry. Should the entrant feel a need for additional PPE, the entry supervisor is to notified and entry delayed until the matter is concluded. The entrant is expected to utilize the PPE required on the permit. Failure to utilize the PPE will result in a delay of entry and the attendant will notify the entry supervisor of the problem.

c. **Maintain Communication.** The entrant will maintain verbal communication with the attendant at all times. When normal verbal communication is not possible, the radios are to be used. Failure to respond to a query by the attendant will result in an order for immediate evacuation. Should the entrant fail to respond to the order to evacuate, then
the attendant will call for a confined space rescue and begin non-entry rescue procedures. Should the entrant notice a change in conditions within the space, he/she should immediately communicate the change to the attendant.

d. Exit from space when ordered by the attendant. If the attendant orders an evacuation of the space, the entrant must immediately evacuate. The entrant is not to question the order to evacuate or delay evacuation. Failure, by the entrant, to evacuate when ordered will result in the initiation of rescue procedures.

e. Remove all tools and note any change in conditions of the space at the conclusion of the job. Prior to leaving the confined space, at the end of the work performed, the entrant should take one last look to ensure all tools have been removed and make note of any new hazards created by the job. If any existing hazards were eradicated by the job, this too should be noted. Upon leaving the space for the final time, the entrant is expected to assist the attendant in securing the space. The entrant should also note any changes in space hazards on the permit for entry. The permit for entry must then be returned to the entry supervisor (who will forward the document to EH&S).

SECTION 6. SITE PREPARATION

Prior to commencement of the confined space entry, the external site needs to be prepared to prevent accidental mishaps involving the entrant, attendant and the public. Traffic should be rerouted, barriers should be erected that prevent public access to the space and, in the case of a manhole, eliminate the possibility of someone falling into the hole. Just prior to entry, the external site should be cleaned up so that all trip and fall hazards are removed and there is clear access to the confined space opening. Clear access must be maintained at all times during the entry, in the event a rescue is needed. One of the first steps to be taken in preparing a site for confined space entry is the posting of the Permit for Entry. Actual entry cannot take place until this permit is complete and posted.

SECTION 7. ASSESSING ATMOSPHERIC HAZARDS

An assessment of possible atmospheric hazards is made by the entry supervisor during the permit process. If there is a potential for an atmospheric hazard, then more monitoring will be required before and during entry. (Not all spaces designated Permit Entry Confined Spaces have actual or potential atmospheric hazards, therefore monitoring during entry is not necessary). If a space is determined to have a potential for an inhospitable atmosphere, then these steps should be followed:

a. Prior to entry, obtain an air monitor from the Power Plant. Make sure it is good working condition. Note the date of calibration (calibration should be recent and be done
in accordance with the manufacturer's recommendations) and make of the meter, make sure this information is on the permit.

b. Once on site, again check to make sure the meter is in good working order. Begin sampling the air in the space by dropping the tubing to the bottom of the space. PLEASE!! DO NOT DROP THE TUBING INTO ANY LIQUID. Next take a sample half way and a final sample near the top. Follow this procedure for all air testing.

c. Begin sampling taking the Oxygen reading first, in the percent mode. Safe entry levels will be between 19.5 and 23%. Readings higher or lower than this means safe entry cannot be accomplished and ventilation of the space may be necessary.

d. If the Oxygen level is acceptable, next sample for combustible gas, lower explosive level (LEL). The acceptable level will be below 10% of the LEL. If the level is higher than 10% LEL, then the meter will sound an alarm. Again, entry is forbidden. In this case, notify the entry supervisor immediately.

e. If the two previous readings were acceptable, the readings for toxic gases should be taken. The meters will sample for Carbon Monoxide and Hydrogen Sulfide. Carbon Monoxide levels should read between 0 and 25 ppm (parts per million). The Hydrogen Sulfide level should read between 0 and 10 ppm (parts per million). Again, the meters are set to sound an alarm if levels are not safe. Regardless of whether the alarm sounds or not, if the levels exceed 25ppm for CO2 or 10 ppm for H2S. before or during entry, the space should be left uninhabited.

f. In the event unacceptable readings are obtained during pre-entry testing or operational monitoring, a decision will have to be made as to the hazard presented and the type of control needed to make entry safe. The options of purging, ventilating, flushing or inerting the space need to be addressed.

g. If the confined space contains the possibility of developing a hazardous atmosphere, then air monitoring must be conducted continuously during the entry operation. This is to be done regardless of the levels obtained during pre-entry atmospheric testing.

**SECTION 8. RESCUE PROCEDURES**

Where possible, entrants are to wear a full body harness and be attached to a retrieval system. This will allow non-entry rescues to take place. Understandably, there are some confined spaces on site that make use of the full body harness non-entry rescue system infeasible, even hazardous. If the entry supervisor has determined that this type of non-entry rescue system is not feasible, EH&S must be contacted for an alternative. No entry is to be made without the use of a non-entry retrieval system or a viable alternative.
1). If an emergency should arise requiring a confined space rescue (non-entry or otherwise), the attendant is to radio Power Plant Base, KYM511, on channel 1, immediately. The attendant will notify the Base operator that a confined space rescue is needed, briefly state the problem and confirm the number of entrants in trouble.

2). The Power Plant Base operator will then promptly notify the Albany Fire Department (AFD) and request a confined space entry rescue. AFD has been made aware of the confined spaces on the University property and equipment that will be available on site. AFD will be responding with Paramedics, automatically.

3). The attendant will not enter the confined space and prevent any unauthorized persons from entering the space. He/She will continue to communicate with the entrants, if possible. If non-entry rescue can be performed by the attendant, it should be done.

4). Upon arrival, the attendant will brief AFD as to the hazards within the space, suspected problem and any other pertinent information.

5). The entry supervisor will report to the site and stand by to assist the AFD, where needed.

6). Once the incident is remedied, the entry supervisor and attendant will secure the confined space, clean up the exterior site and fill out a detailed accident report.

SECTON 9. PROCEDURES FOR CANCELLATION OF A PERMIT

A permit for entry into a confined space can be canceled and the entry operation shut down, at any time, for the following reasons:

a. Changes in O2, LEL, CO or H2S to unacceptable levels

b. Uncontrolled hazards develop within the space.

c. Hazards develop outside the space that effect the attendant's function.

d. Person(s) attempting unauthorized entry.

e. Job completion.

f. Any condition that effects the safety of the entry team, other employees, or the public, not covered in this program.
The steps for cancellation are as follows:

1. Entrant leaves the confined space.
2. The space is secured as outlined in SEC. 3(f) and SEC. 5(e)
3. Power Plant Base is notified of the permit cancellation
4. Any changes to the confined space are noted on the permit.
5. The permit is sent to EH&S

**SECTION 10. ACCEPTABLE ENTRY CONDITIONS**

**Air Quality**

Whenever possible, alternative methods should be used in lieu of air purifying respirators. If this is not feasible, entrants must be current participants of the Respiratory Protection Program. In the cases where air supplied respirators are needed, EH&S must be notified.

Air testing must be done prior to entry for each permit entry confined space and throughout the entry as dictated by the potential hazards. Levels must be within acceptable range for entry and during entry. Entry is prohibited when levels are not within acceptable range.

- Oxygen (O2) - 19.5 to 23% total volume
- Lower Explosive Limit (LEL) - <10% of the LEL
- Carbon Monoxide (CO) - 0 to 25 ppm
- Hydrogen Sulfide (H2S) - 0 to 10 ppm

**Physical Hazards**

Physical hazards present a serious danger to confined space entrants. These hazards must be identified and neutralized prior to entry. Some of these neutralization techniques include, but are not limited to:

- **Lockout/Tagout** - All electrical equipment is to be locked out and all mechanical hazards are to be brought to ZES, prior to entry. (refer to the University’s LOTO Program).
Fall hazards - when the space has serious fall hazards, or requires a ladder for entry/exit, fall protection measures will be taken. All ladders are to tied be off, and suitable for the job requirements. Composition of the ladder should be suitable for the hazards.

Isolation Procedures - should be used for chemical or gas lines to eliminate potential hazards. These methods include blanking & blinding, double block and bleed, and line breaking or misalignment. One or more of these methods will need to be utilized for safe entry into a tank.

Paperwork

Prior to entry, the permit for entry must be completed by the entry supervisor. This permit must be reviewed by the attendant and the entrant, then posted at the job site. In the event more than one shop will be entering the space, shop supervisors must coordinate the entry of their personnel. It is recommended that one of the supervisors take on the role of entry supervisor. This will eliminate the possible confusion of who fills out the permit and cancels the permit if needed. All permits must be sent to the Office of Environmental Health and Safety in Chemistry B73 when jobs are complete or cancelled. These permits will remain on file for no less than one year and be reviewed annually.

When selecting entrant and attendant, the entry supervisor must confirm that the individuals selected have received training in their respective roles. If an entry supervisor is unsure of an individuals qualifications, call EH&S Office at 442-3495 for verification of training.

SECTION 11. ENTRY INTO A PERMIT REQUIRED CONFINED SPACE IS FORBIDDEN WHEN:

1. Oxygen level are less than 19.5%
2. Oxygen levels are greater than 23.5%
3. The combustible gas level has reached 10% of the Lower Explosive Limit (LEL).
4. Gases/mists or vapors are present in levels that exceed the PEL.
5. Liquids or solids pose an engulfment hazard.
6. Moving machine parts within the space are not locked out and at ZES.
7. Electrical hazards within the space are not locked out.
8. High temperatures that could cause burns or heat stress, are present in the space and uncontrolled.

9. The worker entering the space has not been trained as an entrant member of the confined space entry team.

10. The worker acting as attendant has not been trained as an attendant member of the confined space entry team.

11. Non-entry rescue equipment is not on site or easily accessible.

12. Hazards within the confined space are unstable, allowing for the possibility that unsafe conditions could arise while the space is occupied.

13. Conditions within the space cannot be stabilized to allow safe entry and job completion.

14. The attendant is not able to perform his/her confined space team member function.

15. Unauthorized personnel are attempting to gain entry into the space.

16. Conditions outside the space could endanger the entrant.

DEFINITION OF TERMS

**Attendant** - a person who is assigned to monitor conditions outside and inside a confined space while occupied by a co-worker, for the purpose of support and to react as required in the event of an emergency.

**Blinding/Blanking** - Inserting a solid barrier across the open end of a pipe leading into (of out of) the confined space to be entered. This barrier should be secured in such away so as to prevent leakage of material into the confined space.

**Double Block and Bleed** - a method used to isolate a confined space from a line, duct, or pipe by physically closing two inline valves on a piping system, and opening a vented to the atmosphere valve between them.
Engulfment - The surrounding, capturing (or both) of a person by divided particulate matter or liquid.

Entry - Ingress by a person(s) into a confined space, which occurs by the individual(s) breaking through the portal of the confined space with his/her body part.

Hazard Evaluation - a process by which known, potential and/or actual hazards are assessed according to the severity of injury they may inflict.

Hazardous Atmosphere - An atmosphere that may be (or is) injurious to occupants by reason of Oxygen deficiency or enrichment; flammability or explosivity; or toxicity.

LEL - lower explosion limit.

Oxygen Deficient Atmosphere - an atmosphere containing less than 19.5% oxygen total volume.

Oxygen Enriched Atmosphere - an atmosphere containing more than 23.5% oxygen total volume.

PEL - permissible exposure limit, an acronym for allowable level of air contaminants as established by the U.S. Dept. of Labor, Occupational Safety And Health Administration.

Permit Required Entry Confined Space - a confined space, which after evaluation has actual or potential hazards that could cause injury or death to an entrant, thereby necessitating a written evaluation of that hazard(s) and controls in place. This evaluation takes the form of an entry permit.

Qualified Person - A person by reason of training, education and experience is knowledgeable in the operation to be performed and is competent to judge the hazards involved.

Toxic Atmosphere - An atmosphere containing a concentration of a substance above the published or otherwise known safe.