

University of Massachusetts/Amherst

Physical Plant

Confined Space Entry Program

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1.0 SCOPE

In accordance with the University Policy on Environmental Health and Safety, this program shall provide the minimum safety requirements to be followed by Physical Plant personnel and its contractors while entering and working in confined spaces at the University of Massachusetts at Amherst and other locations to which Physical Plant has responsibilities.

2.0 PURPOSE

OSHA estimates that in the United States, over two million confined space entries are made annually, resulting in over 5000 serious injuries and between 50 and 60 deaths, 72% of which are would-be rescuers. The purpose of this program is to ensure the safety and well-being of Physical Plant employees and contractors involved in confined space entry and to establish safety requirements pursuant to 29CFR 1910.146, permit-required confined spaces.

3.0 OBJECTIVE

The objective of this program is to prevent unauthorized entry into confined spaces and to minimize the risk to those who must enter confined spaces. This will be accomplished through the implementation of a program containing the following key elements:

- 3.1 Determination of confined spaces
- 3.2 Recognition, evaluation, and control or elimination of potential hazards
- 3.3 Establishment of a permit system
- 3.4 Development of a safety procedures for confined space operations
- 3.5 Designation of authorized entrants, attendants, and supervisors
- 3.6 Responsibility for contractor employees
- 3.7 Rescue and emergency services
- 3.8 Training
- 3.9 Annual review of the Confined Space Program

4.0 DEFINITIONS

- 4.1 *Attendant*— The person who is assigned and responsible for monitoring and overseeing a confined space process or operation. The attendant is also required to provide support services for the confined space activity, provided he/she does not leave the site. The attendant must be able to react to any situation, including an emergency, as required. An attendant is required for both permit and non-permit required confined spaces.
- 4.2 *Authorized Entrant*— An employee trained in confined space entry who is authorized by the employer to enter a permit space.
- 4.3 *Blinding/Blanking*— The insertion of a barrier (obstructing device) against the open end of a pipe which enters or exits a confined space, and securing such a barrier so as to prevent leakage of material into the confined space.
- 4.4 *Confined Space*— An area which has the following three characteristics:
- 4.4.1 its primary function is something other than human occupancy
 - 4.4.2 has restricted entry and exit
 - 4.4.3 may contain potential or known hazards including but not limited to:
 - 4.4.3.1 hazardous gases and materials, active electrical and steam supplies, oxygen deficiencies, flammable atmospheres or any other introduced hazards like welding operations that may adversely affect the occupants/workers health and safety.
- 4.5 *Non-Permit Required Confined Space (NPRCS)*— A space which by configuration, meets the definition of a confined space, but which after evaluation is found to have no potential for creation of a hazardous atmosphere or has had such hazardous conditions eliminated by engineering controls.
- 4.6 *Permit Required Confined Space (PRCS)*— A confined space which has been evaluated and found to have actual or potential hazards that pose a threat to the health and safety of the workers and requires a written authorization to enter. A PRCS is one that has one or more of the following characteristics:
- 4.6.1 Contains or has a known potential to contain a hazardous atmosphere including but not limited to:

- 4.6.1.1 gas
- 4.6.1.2 heat
- 4.6.1.3 toxic vapor
- 4.6.1.4 oxygen deficiency or enrichment
- 4.6.2 Contains a material with the potential for engulfment or drowning of an entrant for example:
 - 4.6.2.1 particulate matter
 - 4.6.2.2 liquid
- 4.6.3 Has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or a floor which slopes downward and tapers to a smaller cross section.
- 4.6.4 Contains any other recognized serious safety and health hazard, including but not limited to:
 - 4.6.4.1 high water level
 - 4.6.4.2 steam leak that cannot be isolated from another point
- 4.7 *Double Block and Bleed*— A means by which a line, duct or pipe is shut down by physically closing two in-line valves on a piping system, and then opening a vent between them to release excess pressure within the closed lines.
- 4.8 *Engulfment*— The capturing and/or drowning of a person in a particulate matter or liquid.
- 4.9 *Entry*— The action by which a person passes through an opening into a permit-required confined space and is considered to have occurred as soon as any part of the entrant's body breaks the plane of an opening into the space.
- 4.10 *Entry Permit*— A written or printed document that defines the conditions under which the permit space may be entered. The entry permit contains information relating to hazard identification and evaluation, isolation, monitoring requirements, personal protective equipment requirements, etc.

- 4.11 *Entry Supervisor*— The person responsible for determining if acceptable entry conditions are present at a permit space where entry is planned, for authorizing entry and overseeing entry operations, and for terminating entry.
- 4.12 *Hazard Evaluation*— The assessment of a confined space to determine the potential hazards within. These hazards can be real or potential, or a combination of both.
- 4.13 *Hazardous Atmosphere*— An atmosphere, outside or within the confined space that could pose the risk of injury or death to the occupants because of flammability, explosivity, toxicity or oxygen deficiency (<19.5%) or enrichment (>23.5%).
- 4.14 *Hot Work*— The performance of any work that could or will produce arcs, flames, heat, sparks or other sources of ignition (i.e. cutting, brazing, welding, soldering, etc.).
- 4.15 *Immediately Dangerous to Life or Health (IDLH)*— Any condition that poses an immediate or delayed threat to life or that would cause irreversible adverse health effects or that would interfere with an individual's ability to escape unaided from a permit space.
- 4.16 *Inerting*— The displacement of the atmosphere in a permit space by a noncombustible gas (such as nitrogen) to such an extent that the resulting atmosphere is non combustible. This procedure produces an IDLH oxygen-deficient atmosphere.
- 4.17 *Isolation*— Physically disconnecting or interrupting the flow of service through a confined space. This would include piping for steam, water and gas, lines for telephone, electricity and other energy sources.
- 4.18 *Line Breaking*— The intentional opening of a pipe, line, or duct that is or has been carrying flammable, corrosive, or toxic material, an inert gas, or any fluid at a volume, pressure, or temperature capable of causing injury.
- 4.19 *LFL or LEL*— The lower flammable/explosive limit is the minimum concentration of a flammable gas or vapor, expressed in percent volume, that will ignite given an ignition source of sufficient energy.
- 4.20 *Lock Out/Tag Out*— In accordance with requirements of the OSHA Lock Out/Tag Out Program and the University Policy, lock out/tag out shall mean the placement of a lock and tag on the energy isolating device. The energy isolating device shall not be operated, until all lock out/tag out devices have

been removed by installer of said locks or tags.

- 4.21 *Energy Isolating Device*— Any device that prevents the transmission or release of energy. For example: A circuit breaker, a disconnect switch, a slide gate, a manually operated switch, a line valve, blocks, and other similar devices with a visible indication of the position of the device. Push buttons, selector switches and other circuit controlling type devices are not energy isolating devices.
- 4.22 *Prohibited Condition*— Any condition in a permit space that is not allowed by the permit during the period when entry is authorized.
- 4.23 *Qualified Person*— A person who has appropriate education, training, and experience to work in and around confined spaces, and is experienced and knowledgeable in the various operations of confined space work. This includes the ability to properly evaluate the hazards that may or may not be involved, and the ability to rectify/control problems or hazards found.
- 4.24 *Retrieval System*— The equipment (including a retrieval line, chest or full-body harness, wristlets, if appropriate, and a lifting device or anchor) used for non-entry rescue of persons from permit spaces.
- 4.25 *Standard Railing*— A vertical barrier erected along exposed edges of a floor opening, wall opening, ramp, platform, or runway to prevent falls of persons.

5.0 DETERMINATION OF CONFINED SPACES

Note: Words italicized indicate terms that are defined in section 4.0, Definitions.

- 5.1 All campus locations which are considered to be *permit required confined spaces* (PRCS) shall be identified as specifically as possible, including area or room, the building and its specific address.
- 5.2 *Entry* into these spaces (this includes any portion of the body) shall be subject to the provisions of this program.
- 5.3 The Physical Plant shall post permanent signage near each *permit required confined space*, clearly identifying it as such. See Figure 1.

Fig. 1



- 5.4 *Permit Required Confined Spaces* that can not be labeled, because the area is subject to adverse conditions, shall be identified by this program.

5.4.1 *Permit required confined spaces* at the University of Massachusetts at Amherst shall include, but are not limited to:

- 5.4.1.1 Sewer(s), Storm and Sanitary
- 5.4.1.2 Certain underground tunnels and pits, as identified
- 5.4.1.3 Elevator hoistways and limited access pits and penthouses
- 5.4.1.4 Previously identified exhaust systems/HVAC equipment accessed for maintenance
- 5.4.1.5 All sump pump pits
- 5.4.1.6 The ten (10) pits in Lederle Graduate Research Center (high-rise and low-rise)
- 5.4.1.7 Campus Center Garage exhaust fans

5.4.1.8 Underground water stream from Visitor=s Center to Lot 25, by Mullins Center

5.4.1.9 Tanks that personnel can enter for cleaning and maintenance

5.5 If entrance into an identified PRCS will never be necessary, access to the space will be prohibited. Appropriate warning signage shall be posted, or some other means to prevent access shall be provided.

6.0 TRAINING

- 6.1 Any employee who is required to enter or supervise those entering or serve as an *attendant* for any *entry* into a *confined space* shall receive appropriate training. This training will assure that understanding, knowledge and skills necessary for safe performance of duties are acquired.
- 6.2 Initial training will be given to all affected employees before the employee is assigned duties and will be followed up with annual refresher training. Training will be conducted as necessary on any new procedures, before there is a change in assigned duties or when there is a change in *confined space* hazards for which an employee has not been previously trained.
- 6.3 Training will be provided whenever there is a reason to believe that there are deviations from the procedure or if there are inadequacies in the employee's knowledge or use of the procedure.
- 6.4 Training will include, but is not limited to:
 - 6.4.1 Review of the confined space entry program and procedures.
 - 6.4.2 Familiarization with all hazards associated with *confined space*, (i.e. toxic atmospheres, oxygen deficiency, flammable vapors).
 - 6.4.3 Field training on the use of monitoring, testing, ventilation, safety and rescue equipment. This training will also include: hazard recognition, communication, emergency procedures, harness and hoisting equipment.
 - 6.4.4 Other associated concerns, such as electrical safety, guarding and Personal Protective Equipment.
- 6.5 The Office of Environmental Health and Safety shall maintain certification records of all employees trained and tested in *confined space entry* and operations; including documentation of training subjects, signature(s) of the trainer(s), attendees and dates of training.
- 6.6 The Physical Plant Safety Officer shall keep records of employee training dates and reschedule retraining on an annual basis.

7.0 NOTIFICATIONS

7.1 When it has been determined that *entry* into a PRCS will be necessary, the following groups shall be notified:

Department Performing Work	Notify
Physical Plant	<p align="center"> <u>Physical Plant Service Desk*</u> and the <u>Physical Plant Safety Office</u> or <u>Environmental Health and Safety</u> </p>
Power Plants (both Tilson and old Power Plants)	<p align="center"> <u>Power Plant Office</u> and the <u>Physical Plant Service Desk*</u> and the <u>Physical Plant Safety Office</u> or <u>Environmental Health and Safety</u> </p>
Outside Contractor	<p align="center"> <u>Planning and Facilities Division</u> and the <u>Physical Plant Service Desk*</u> and the <u>Physical Plant Safety Office</u> or <u>Environmental Health and Safety</u> </p>

* The Physical Plant Service Desk shall be made aware of any *confined space* work, so they are prepared to specifically listen for emergency requests. If Physical Plant Service Desk is not available, the UMASS Police Department shall be notified of the work.

8.0 HAZARD EVALUATION

- 8.1 All areas meeting the definition of a *confined space* shall be considered as permit required until such time as it can be demonstrated that it can be reclassified as non-permit required.
- 8.2 *Hazard evaluations* and reclassification of *permit required confined spaces* to *non-permit confined spaces* shall be performed by a technically qualified person.
 - 8.2.1 All reclassified spaces shall remain marked as *confined spaces*.
 - 8.2.2 After reclassification, supervisors may allow *entry* without a *permit* provided the assigned work does not introduce hazards.
- 8.3 Hazards shall be identified for each *confined space* and listed in the hazard section of the *Confined Space Entry Permit* and shall include:
 - 8.3.1 Past or current uses of the *confined space* which may adversely effect the atmosphere of the *confined space*.
 - 8.3.2 Existing or potential hazards in the *confined space* including oxygen deficiency or enrichment, flammable, explosive or toxic atmospheres, mechanical, biological, chemical or radioactive hazards.
 - 8.3.3 Location within the *confined space* (exact)
 - 8.3.4 Physical characteristics of the hazards
 - 8.3.5 Other health or safety hazards
- 8.4 Each hazard, potential or known, shall be examined for the following:
 - 8.4.1 Hazard exposure - who and how many people would be affected?
 - 8.4.2 Hazard potential - how much energy could be released?
 - 8.4.3 Hazard consequences - what is the likelihood of injury, explosion or fire within the *confined space*?
 - 8.4.4 Hazard Conditions - what activities or conditions could change within the *confined space* which might make the *confined space* more or less hazardous? (e.g. steam, electricity, PCB's, flooding/weather changes)

- 8.4.5 Hazard control - strategies for controlling hazards
- 8.4.6 Emergency Response - Which agencies might be called for this *confined space* (e.g. Amherst Fire Dept., EH&S, Electric Shop, Plumbing Shop, Service Desk).
- 8.5 During the evaluation by a *qualified person*, the atmosphere of a *confined space* shall be considered within acceptable limits if the following criteria are met:
 - 8.5.1 Oxygen— levels are between 19.5-23.5%
 - 8.5.2 Flammability— is less than 10% of the Lower Explosive Limit
 - 8.5.3 Carbon Monoxide— is less than 35 ppm
 - 8.5.4 Hydrogen Sulfide— levels are less than 10 ppm
 - 8.5.5 Toxicity— is less than the recognized exposure limits
 - 8.5.6 Airborne Dusts— levels are less than 10% of the Lower Explosive Level¹
- 8.6 Whenever a hazardous atmosphere is encountered in any confined space, the Physical Plant Safety Officer or EH&S shall be notified immediately.
 - 8.6.1 When testing of the atmosphere indicates that levels of oxygen, flammability, or toxicity are not within acceptable limits, *entry* shall be prohibited until appropriate controls are implemented or appropriate personal protective equipment, (PPE) and training has been provided.
 - 8.6.2 If respiratory protection is needed for confined space entry, the Physical Plant Safety Officer or EH&S shall be notified prior to entry.
- 8.7 If hazardous gas (toxic/flammable) or oxygen deficiency/enrichment is discovered, the space can be purged or ventilated using intrinsically safe (explosion-resistant) equipment to eliminate or control atmospheric hazards. Then re-monitor the area.
 - 8.7.1 Whenever possible, ventilation shall be directed to ventilate the immediate areas where an employee is or will be present within the space and shall continue until the employees have left the space.

¹ NFPA Handbook, 14 Edition for particular dusts

- 8.7.2 Exhaust ventilation is recommended for a confined space when the hazard is created by the work, (i.e. welding, cutting, painting, cleaning, etc.).
- 8.7.3 Exceptions:
- 8.7.3.1 Negative air (already permanently installed) can be used in lieu of forced ventilation (i.e. east Experiment to CC. Parkway Garage) provided that it will not draw Acontaminated air≅ into the *confined space*
- 8.7.3.2 Fresh air intake plenums for buildings on campus
- 8.7.4 Air supply for the forced air and exhaust ventilation shall be from a clean source (e.g. not in close proximity to internal combustion engine exhaust), and shall not increase the hazards within the *confined space*.
- 8.7.5 When air quality (re-testing), shows that the atmosphere remains unsafe or unacceptable for *entry*, *the permit* shall be revoked and *entry* prohibited.
- 8.7.6 If hazardous gases or oxygen deficiency/enrichment is not indicated after re-testing, the *confined space* may be entered. This provides that continuous atmospheric testing is conducted and that ventilation is continuous throughout the work period.
- 8.8 If, during any *entry*, a *hazardous atmosphere* is detected, all employees shall leave the *confined space* IMMEDIATELY, and notify the Physical Plant Safety Officer or Environmental Health and Safety. The space shall then be evaluated by a *qualified person* to determine how the *hazardous atmosphere* developed. All necessary steps, including corrective action, continuous ventilation and atmospheric monitoring, shall be taken to protect employees prior to re-*entry*. All test results shall be documented to certify safe re-*entry*.
- 8.8.1 If the source of the contaminant can not be determined, precautions shall be adequate to deal with the worst possible condition within the *confined space*.
- 8.9 If there is a possibility that a Non Permit Confined space could become unacceptable for occupancy while personnel are working, then safety equipment including tripod, safety harness, telephone or portable radios shall be provided.

- 8.10 Any potential asbestos containing materials, (friable, mastic, transite etc.), shall be reported immediately to the Physical Plant Asbestos Shop. Precautions must be taken to reduce the risk of exposure to the *entrant(s)* and the University community.
- 8.11 Any biological hazards (i.e. holding tanks etc. for blood and body fluids), and/or radiological hazards shall be evaluated by Environmental Health and Safety, as well as the *qualified person*, before *entry*.
- 8.12 Any chemical hazards not previously taken into consideration shall be evaluated by Environmental Health and Safety, as well as the *qualified person*, before *entry*.
- 8.12.1 Any applicable Material Safety Data Sheets (MSDS) should be attached to the *entry permit* to provide information to *entrant(s)*, *attendant(s)*, *entry supervisor* and aid rescuers and /or medical personnel in the event the entrant(s) are exposed to the hazard.
- 8.13 All energy sources, (i.e. electric, hydraulic, mechanical and/or pneumatic), which are or could be hazardous to those entering a *confined space*, shall be isolated before personnel enter a *confined space*. *Isolation* of energy hazards must be incorporated at all times to ensure the health and safety of University personnel, and outside contractors. If complete *isolation* is not possible, provisions shall be made to reduce any hazard before work in a *confined space* is initiated.
- 8.13.1 After locking or tagging out energy sources, the individual locking/tagging out the energy source shall make sure that all potential stored energy has been relieved and that if necessary, blocked or otherwise secured for additional safety.
- 8.13.2 The Physical Plant Electrical Shop must be contacted for assistance prior to starting work in *confined spaces* with electrical hazards.
- 8.14 Open flames, welding, cutting, soldering, brazing, general purpose electrical equipment, light sources, smoking material, or other spark or flame producing agents or devices other than explosive-resistant equipment shall not be used in any *confined space*, until it has been demonstrated by approved test, that the atmosphere in the space is less 10% of the lower explosive limit. Appropriate and sufficient portable fire extinguishers shall be readily available, and in good working order at the site.
- 8.15 When *Hot Work* (i.e. welding, cutting, soldering or brazing, etc.) is required in a *confined space*, adequate ventilation shall be provided to prevent accumulation of toxic materials or possible oxygen deficiency. This applies

not only to the welder, but also to helpers and other personnel in the immediate vicinity. Such ventilation shall be at a minimum of 2000ft³ per minute, per welder, except where local exhaust hoods are used by the welder and the hood can maintain a minimum air flow velocity of 100 linear feet per minute at the point of welding.

- 8.16 A *hot work permit* must be acquired from the *Physical Plant Safety Office* or *Environmental Health and Safety*, before *hot work* in a *confined space* may begin.
- 8.17 All portable electrical devices including power tools, lighting, generators, etc. shall be properly grounded and protected by approved ground fault circuit interrupters (GFCI).
- 8.18 When covers of manholes, vaults or other vertical *confined space* accesses are opened, the opening shall be guarded by a *standard railing*. The railing must also protect the *entrants* working in the manhole or other *confined space* from falling objects that may enter the hole/opening. Appropriate cones with scotch lite and other warning devices must also be placed near the work area to warn of the work being done and/or the type of hazard involved. Signs, barriers or other necessary measures shall be taken to prevent unauthorized access to the *confined space* work area. As work is suspended each day, the opening shall be completely covered. The cover must be able to withstand the expected weight that may be applied to it.
- 8.19 Adequate lighting shall be used to safely accomplish work in *confined spaces*. Intrinsically safe equipment shall be used when necessary.
- 8.20 All necessary personal protective equipment (PPE), including but not limited to hard-hats, hand/foot protection and safety eyewear (including welder=s glasses for all personnel in *confined spaces*) shall be used. The *qualified person* or safety officer(s) shall identify the appropriate PPE needed for the intended work.
- 8.21 When work is required within roadways or when employees and/or outside contractors are exposed to vehicular traffic, the University Police Department (UMPD) shall be notified. Proper measures must be taken to divert traffic away from the work area/opening. High visibility and reflectorized warning vests and garments shall also be used.

9.0 ESTABLISHMENT OF A PERMIT SYSTEM

9.1 The *entry permit* shall identify the following:

- 9.1.1 *permit* space to be entered
- 9.1.2 purpose of the *entry*
- 9.1.3 date and time of issuance and completion
- 9.1.4 names of *authorized entrants, attendants* and *entry supervisor* with space for the supervisors signature authorizing *entry*
- 9.1.5 hazards of the *permit* space
- 9.1.6 measures used to isolate the *permit* space and to eliminate or control hazards before *entry*
- 9.1.7 acceptable *entry* conditions
- 9.1.8 results of initial and periodic tests performed accompanied by the names or initials of the testers and an indication of when the tests were performed
- 9.1.9 rescue and emergency services that can be summoned along with the means to be used in the event of an emergency (e.g. two-way radio - call AService Desk≅)
- 9.1.10 communications procedure used by *entrants* and *attendants* to maintain contact during *entry*
- 9.1.11 any other equipment and information necessary to ensure employee safety and compliance (e.g. personal protective equipment)
- 9.1.12 reference to additional *permits* issued to authorize work, such as Radiation Work Permits or *Hot Work* Permits

9.2 Operation of the *Permit* System

NOTE: The *permit* may be revoked by: the *attendant, supervisor, qualified personnel, Physical Plant Safety Officer* or any *qualified person* within the department of Environmental Health and Safety.

9.2.1 The *permit* must be authorized and signed by the *entry supervisor*.

- 9.2.2 The *permit* shall be posted at the entrance of the *confined space* throughout the duration of the *confined space* work.
- 9.2.3 A *permit* is only valid for one shift. If the work shall be performed on subsequent shifts or days, a new *permit* for each shift is required. For each subsequent *permit*, re-inspection of the space is required. Atmospheric testing shall be performed before each re-*entry* after breaks and lunch, as a minimum, and the results recorded.
- 9.2.4 *Permits* for elevator spaces (i.e. associated elevator pits, hoistways and penthouses) can be issued for periods up to three months provided that:
 - 9.2.4.1 the space is evaluated for all hazards by a *qualified person*, including atmospheric hazards, prior to each *entry*;
 - 9.2.4.2 when new hazards are encountered, other than those the *permit*, then the new hazard(s) shall be identified on *permit* along with the measures used to eliminate or them, prior to entry. And the Physical Plant Safety shall be informed of this *permit* change prior to the next use.
 - 9.2.4.3 an *authorized, attendant and entrant*, are at the scene to ensure their prescribed duties are performed as required by this program.
 - 9.2.4.4 all personal protective equipment and communication equipment necessary for the *entry* is available to the *entrants/attendants* prior to *entry*.
 - 9.2.4.5 the proper notifications are made, as per Section 7.1 of this program prior to entry and renotification that the work is completed.
- 9.2.5 Upon completion of work, the *permit* shall be returned to the Physical Plant Safety Officer for review.
- 9.2.6 Each *entry permit* should be retained by the Physical Plant Safety Officer for at least one year to facilitate the review of the *confined space* program. Any problems encountered during an *entry* must be noted on the pertinent *permit* so that appropriate revision to the *confined space* program can be made.

listed on
the
control
Officer
permits

9.2.7 If employees must enter a *confined space* where toxic substances are present, or where the atmosphere is oxygen deficient, then the atmospheric testing method(s) must be noted and the *permit* kept for at least thirty years as a record of employee exposure.

10.0 PROCEDURES FOR SAFE ENTRY OPERATIONS

10.1 Procedures shall be developed to outline safe methods of operation for the preparation of *confined space* work as well as the work itself. The procedures shall include, but are not limited to the following:

10.1.1 Specifying acceptable *entry* conditions

10.1.2 Isolating the *permit* space

10.1.3 Purging, *inerting*, flushing or ventilating the *permit* space as necessary to eliminate or control atmospheric hazards

10.1.4 Providing pedestrian, vehicle or other barriers as necessary to protect *entrants* from external hazards

10.1.5 Verifying that conditions in the *permit* space are acceptable for *entry* throughout the duration of an authorized *entry* and exit.

11.0 DUTIES OF AUTHORIZED ENTRANTS, ATTENDANTS, SUPERVISORS

11.1 *Authorized entrants* shall:

- 11.1.1 know the hazards that may be faced during *entry*, including information on the mode, signs or symptoms, and consequences of exposure to the hazards
- 11.1.2 know how to use equipment properly
- 11.1.3 communicate with the *attendant* as necessary to enable the *attendant* to monitor the *entrant(s)* status and enable the *attendant* to alert *entrant(s)* of the need to evacuate the space.
- 11.1.4 alert the *attendant* whenever:
 - 11.1.4.1 the *entrant* recognizes any warning sign or symptom of exposure to a dangerous situation;
 - 11.1.4.2 detects a *prohibited condition*.
- 11.1.5 exit the *permit* space as quickly as possible whenever:
 - 11.1.5.1 the order is given by the *attendant* or *entry supervisor*;
 - 11.1.5.2 the *entrant* recognizes any warning sign or symptom of exposure to a dangerous situation;
 - 11.1.5.3 the *entrant* detects a *prohibited condition*;
 - 11.1.5.4 an evacuation alarm is activated.
- 11.1.6 The *entrant* who will be entering the *confined space* shall make sure that the *qualified person* has evaluated/inspected the *confined space*, and that it was determined to be safe for *entry*.
- 11.1.7 The *entrant* shall make sure, before *entry* that all potential hazards have been identified and that serious hazards have been *isolated*.
- 11.1.8 The *entrant* shall also make sure, before *entry*, that all appropriate rescue equipment has been made available at the site. Whenever a worker is required to enter a PRCS:

He/she is required to don a full body harness and an attached retrieval line, secured outside the *confined space*, unless the retrieval equipment would increase the overall risk or would not contribute to the rescue of the victim. Retrieval lines must not be secured to any vehicle.

11.1.8.2 Mechanical hoisting equipment, i.e., tripod, retrieval line, and full body harness shall be set up to provide for emergenc

11.1.9 The *entrant/attendant/qualified person* shall make sure that the appropriate ventilation equipment and tubing has been positioned properly to provide continuous, clean air to the work area, if required.

11.1.10 The *entrant* shall make sure they have the necessary communication equipment for the type of work being performed.

11.1.11 The *entrant* should be familiar with the use and warnings of all monitoring equipment.

11.2 Authorized *attendants* shall:

11.2.1 Know the hazards that may be faced during *entry*, including information on the mode, signs or symptoms, and consequences of the exposure;

11.2.2 Be aware of the possible behavioral effects of hazard exposure in *authorized entrants*;

11.2.3 Assist the *entrants* entering the space, but shall not themselves, at any point, enter the *confined spaces*;

11.2.4 Remain outside the *permit=s* space during *entry* operation until relieved by another *attendant*;

11.2.5 Continuously maintain an accurate count of *authorized entrants* in the *permit* space and ensure that the *permit* accurately identifies who is in the *permit* space;

11.2.6 Communicate with *authorized entrant(s)* as necessary to monitor *entrant* status and to alert *entrant(s)* of the need to evacuate the space;

11.2.7 Verify that the means to summon rescue services is operable (e.g. radio check with Service Desk).

- 11.2.8 Monitor activities inside and outside the space to determine if it is safe for *entrants* to remain in the space and order the *authorized entrants* to evacuate the *permit* space immediately under the following conditions:
 - 11.2.8.1 If the *attendant* detects a prohibited condition;
 - 11.2.8.2 If the *attendant* detects the behavioral effects of hazard exposure in an *authorized entrant*;
 - 11.2.8.3 If the *attendant* detects a situation outside the space that could endanger the *authorized entrant*; and,
 - 11.2.8.4 If the *attendant* cannot effectively and safely perform all their duties.
- 11.2.9 Summon rescue and other emergency services as soon as the *attendant* determines that *authorized entrants* may need assistance to escape from the space.
- 11.2.10 Takes the following actions when unauthorized persons approach or enter a *permit* space while *entry* is underway:
 - 11.2.10.1 Warn the unauthorized persons that they must stay away from the *permit* space;
 - 11.2.10.2 Advise the unauthorized persons that they must exit immediately if they have entered the *permit* space; and,
 - 11.2.10.3 Inform the *authorized entrants* and the *entry supervisor* if unauthorized persons have entered the *permit* space.
- 11.2.11 Perform no duties that might interfere with the *attendant's* primary duty to monitor and protect the *authorized entrant(s)*:
- 11.3 *Entry Supervisor/Project Manager* shall:
 - 11.3.1 Ensure that all shops involved, or having responsibility for the *confined space*, have been notified at least 24 hours in advance to allow the specific shop(s) to identify any possible hazards that they may be aware of, (i.e. asbestos, leaks, etc.), before work is initiated.
 - 11.3.2 Ensure that the necessary equipment has been made available and placed on site before work has begun.
 - 11.3.3 Ensure that each *confined space* to be entered shall have been

properly assessed by a *qualified person* before *entry* is permitted. If the *qualified person* finds the *confined space* unacceptable, the *Entry Supervisor/ Project Manager* shall make sure that no one enters the *confined space* until corrective measures have been made, and the *qualified person* has then permitted *entry*.

- 11.3.4 Ensure that the *attendants* and *entrants* have monitoring equipment in the *confined space* at all times when necessary, and that the *attendants/entrants* know what to do in case of alarm(s).
- 11.3.5 Ensure that the appropriate two-way communication equipment is made available to the *attendants/entrants*. The *Attendant* shall be equipped with communication equipment, in case of emergency. The University Physical Plant Service Desk shall be made aware of any *confined space* work, so that they are prepared to specifically listen for emergency requests.
- 11.3.6 Ensure that the *entrant/attendant* shall have plenty of water and cups at the site, should heat and weather conditions warrant.
- 11.3.7 Ensure that a proper American Council of Governmental Industrial Hygienists (ACGIH) work/rest ratio has been implemented for working in a *confined space*. (This is done to avoid heat exhaustion or heat stroke, a life threatening illness). The ACGIH manual is available through EH&S.
- 11.3.8 Know the hazards that may be faced during *entry*, including information on the mode, signs or symptoms, and consequences of the exposure.
- 11.3.9 Verify, by checking that the appropriate entries have been conducted and that all procedures and equipment specified by the *permit* are in place before endorsing the *permit* and allowing *entry* to begin.
- 11.3.10 Verify that rescue services are available and that the means for summoning them are operable.
- 11.3.11 Remove unauthorized individuals who enter or who attempt to enter the *permit* space during *entry* operations.
- 11.3.12 Determine, whenever responsibility for a *permit* space *entry* operation is transferred, that *entry* operations remain consistent with terms of the *entry permit* and that acceptable *entry* conditions are maintained.

12.0 CONTRACTORS

- 12.1 Contractors performing work for Physical Plant shall be notified of the following:
- 12.1.1 The campus contains *permit-required confined spaces* and that *permit-required confined space entry* is allowable only through compliance with a program that, as a minimum, complies with 29CFR1910.146 Permit Required Confined Space;
 - 12.1.2 The elements, including the hazards identified and Physical Plant's experience with the space, that make the space in question a *permit-required confined space*;
 - 12.1.3 Any precautions or procedures that Physical Plant has implemented for the protection of employees in or near *permit-required confined spaces* where contractor personnel will be working;
 - 12.1.4 Physical Plant shall coordinate *entry* operations with the contractor, when both Physical Plant and contractor personnel will be working in or near *permit-required confined spaces*, as required by the standard;
 - 12.1.5 A Physical Plant or EH&S Safety Officer will debrief the contractor at the conclusion of the *entry* operations followed and regarding any hazards confronted or created in the *permit-required confined spaces* during *entry* operations;
- 12.2 Each contractor who performs *permit-required confined space entry* operations shall ensure they:
- 12.2.1 Obtain any available information regarding *permit-required confined space* hazards and *entry* operations from Physical Plant;
 - 12.2.2 Coordinate *entry* operations with Physical Plant, when both Physical Plant and contractor personnel will be working in or near *permit-required confined spaces*;
 - 12.2.3 Inform the Physical Plant of the *permit-required confined space* program that the contractor will follow and of any hazards confronted or created in *permit-required confined spaces*, either through a debriefing or during the *entry* operation.

13.0 RESCUE AND EMERGENCY SERVICES

- 13.1 The Confined Space Emergency Response Team (CSERT) shall be made up of the following organizations for fast and effective rescue:
- 13.1.1 Amherst Fire and Ambulance Service,
 - 13.1.2 UMASS Environmental Health and Safety,
 - 13.1.3 UMASS Physical Plant,
 - 13.1.4 UMASS Police Department.
- 13.2 In the event of a *confined space* emergency, CSERT shall be mobilized in the following manner:
- 13.2.1 The *authorized attendant* at the *confined space* shall notify the Physical Plant Service Desk by portable radio or cellular phone, identifying the site as accurately as possible. (In the event Physical Plant Service Desk is unavailable, or the *authorized attendant* is part of an outside contractor company, the initial call shall be made to the UMASS Police Department).
 - 13.2.2 Physical Plant Service Desk shall then notify the UMASS Police and the UMASS Physical Plant preventative maintenance (PM) staff, initiating the necessary response.
 - 13.2.3 UMASS Police Department shall notify the EH&S Fire and Safety Officer (radio designation AF-1≡) of the incident, requesting Environmental Health and Safety to respond.
 - 13.2.4 The EH&S Fire and Safety Officer shall respond with the necessary *confined space* rescue equipment to augment the Amherst Fire and Ambulance Service and any on-site personnel (University or outside contractor).
 - 13.2.5 Physical Plant PM Staff and EH&S Fire and Safety Officer shall assist the Amherst Fire and Ambulance Service in any way possible and shall make all rescue equipment immediately available, for fast and effective rescue of the victim(s).

- 13.2.6 Before entering a *confined space* with unknown hazards for rescue, all personnel shall don SCBA or AType C≅ Airline/SCBA breathing equipment combinations. However, if it is determined that a *hazardous atmosphere* is not the cause of the emergency, then rescue breathing equipment may not be necessary. Its use, in this situation, will be at the discretion of the highest ranking fire department command individual at the scene.
- 13.2.7 As a minimum, each rescuer that enters a *confined space* shall have received the training required of *authorized entrants* and also be trained to perform the assigned rescue duties².
- 13.3 Physical Plant and/or Environmental Health and Safety shall provide rescue organizations with:
- 13.3.1 Information on hazards they may confront when called on to perform a rescue;
- 13.3.2 Opportunity to access to all *permit* spaces from which rescue may be necessary so that the rescue service can develop appropriate rescue plans and practice rescue operations.
- 13.4 To facilitate non-*entry* rescue, *retrieval systems* or methods shall be used whenever an *authorized entrant* enters a *permit* space, unless the retrieval equipment would increase the overall risk of *entry* or would not contribute to the rescue of the *entrant*. *Retrieval systems* shall meet the following requirement:
- 13.4.1 Each *authorized entrant* shall use a full body harness, with a retrieval line attached at the center of the *entrant=s* back near shoulder level, or above the *entrant=s* head.
- 13.4.2 The other end of the retrieval line shall be attached to a mechanical device or fixed point outside the *permit* space in such a manner that the rescue can begin as soon as the rescuer becomes aware that rescue is necessary. A mechanical device shall be available to retrieve personnel from vertical type *permit* spaces more than 5 feet deep.
- 13.5 If an injured *entrant* is exposed to a substance for which a MSDS or other similar written information is required to be kept at the worksite, that MSDS shall be made available to the medical facility treating the exposed *entrant*.

²Training received for a *confined space* program other than the Physical Plant=s, may be acceptable for this requirement.

14.0 ANNUAL REVIEW OF THE CONFINED SPACE PROGRAM

14.1 An annual review shall be performed as follows:

14.1.1 Evaluate the Confined Space Program;

14.1.2 Evaluate and ensure the appropriateness of the *Confined Space Permit*;

14.1.3 Evaluate the *confined space* procedures to ensure they take into account any new information on hazards, improved methods or process changes within specific *confined spaces* that could alter their associated hazards;

14.1.4 Evaluate all Emergency Response activities, including practice rescue operations, for Alessons learned \cong and include necessary programmatic or procedural changes as a result.

15.0 REFERENCES

- 15.1 University of Massachusetts/Amherst Confined Space Program
- 15.2 Fundamentals of Industrial Hygiene, Second Edition, National Safety Council
- 15.3 29 CFR 1910.146 Permit Required Confined Spaces
- 15.4 29CFR1910.252 Welding, Cutting and Brazing
- 15.5 29 CFR 1926.416 General Requirements for Safety-Related Work Practices (Electrical)
- 15.6 Complete Confined Spaces Handbook, by John Rekus, National Safety Council
- 15.7 1995 Best=s Safety Directory