

CONFINED
SPACES
PLAN

Revised April 2000

Department/Location _____

Review and Approval Authority

Prepared and Edited by:

Industrial Hygienist

Date

Reviewed and Approved by:

Director - Department of Environmental Safety

Date

Vice President for Administrative Affairs

Date

Provost

Date

Approved as UM Policy:

President

Date

Confined Space Entry Plan Completed for the Department by:

Name

Title

Date

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Emergency and Assistance Telephone Numbers

FIRE - POLICE - RESCUE - EMERGENCY MEDICAL SERVICE - 24 hour #

9-1-1

CALL IMMEDIATELY FOR ANY EMERGENCY INCLUDING CONFINED SPACE INCIDENT, CHEMICAL SPILL, FIRE, INJURED OR SICK PERSON

Environmental Safety (Main Office) (301) 405-3960
3115 Chesapeake Building 338 , College Park, MD 20742-3113
(Industrial Hygiene, Occupational Safety, Hazardous Waste Management,
Fire Safety, Radiation Safety, Insurance Services,
Hazard Communication, Accident Investigation, Air Monitoring
and Safety Education)

University Health Center - Occupational Health (301) 314-8172
(Medical Consultation and Evaluation)

Facilities Management Work Control Center (301) 405-2222
(Repair of Facility Equipment Deficiencies, e.g., steam
line leaks, electrical failures, ventilation, etc.)

Departmental Confined Space

Entry Coordinator:

Business-hours #

After-hours #

Departmental Authorized Permit Issuers:

Business-hours #

After-hours #

POLICY STATEMENT

Approved by the President March 13, 1996

Revised April 2000

A. PURPOSE

This is a statement of official University policy to establish the process for compliance with the Occupational Safety and Health Administration (OSHA) regulation "Permit-Required Confined Spaces", 29 CFR 1910.146. The revision of this policy adopts additional measures required as a result of an amendment to the regulation that became effective February 1, 1999. OSHA requirements regarding underground lines for Telecommunications, 29 CFR 1910.268, have also been incorporated into this policy.

B. SCOPE

The Confined Spaces Plan shall be implemented for all facilities at University of Maryland located in College Park, Maryland (UM) and its satellite locations where there is need to perform any activity within a confined space as defined by Confined Spaces standards and this plan. Employees and students who are authorized to enter a Permit-Required Confined Space must complete Confined Spaces entry training. Authorized employees and students shall not enter any Confined Space until satisfactory air monitoring is completed and appropriate action taken as described in this plan to protect entrants. An attendant must be present and in constant communication with entrants for the duration of any entry. The Confined Space Entry Supervisor must inform the Department of Facilities Management Work Control Center at (301) 405-2222 of the entry date, time, location and purpose of entry prior to entering any Permit-Required Confined Space on UM campus. Required rescue services for all Confined Space entries made on UM campus shall be provided by Prince George's County Fire Department (PGFD). At other locations, the Confined Space Entry Supervisor shall coordinate with local fire and rescue services prior to entry to assure local rescue services are equipped and prepared to provide Confined Space rescue services. Appropriate communication equipment and the local emergency rescue service telephone number shall be supplied to the attendant on duty prior to entry. Where rescue services are not immediately available, no Confined Space entry may be made.

Satellite locations may adopt their own policies for confined space entry when and where it better suits their operational needs. Copies of these policies will be sent to the Department of Environmental Safety, 3115 Chesapeake Building 338, College Park, MD 20742-3113 or electronically to safety@umd.edu for evaluation.

Contractors operating on UM property are required to comply with all applicable provisions of OSHA/MOSH Confined Spaces regulations. Contractors must notify the Facilities Management Work Control Center at (301) 405-2222 of the entry date, time, location and purpose of entry prior to making any entry into a permit-required confined space on the UM campus. Contractors must also provide the name and contact information for the individual acting as supervisor for the entry.

C. POLICY

The University is dedicated to providing safe and healthful facilities for all employees and students, in compliance with federal and state occupational health and safety standards. Administrators, faculty, staff and students all share the responsibility to reduce potential exposures to physical and health risks encountered in the performance of duties requiring entry into a Confined Space.

The Confined Spaces Plan will be reviewed and evaluated for its effectiveness at least annually, and updated as necessary. In order to facilitate review, original copies of permits utilized for completed or aborted Confined Space entries shall be forwarded to the UM Department of Environmental Safety at 3115 Chesapeake Building 338. College Park, MD 20742-3133.

D. DUTIES AND RESPONSIBILITIES

1. Department of Environmental Safety (DES) shall:

- (a) Provide assistance to departments in identifying Permit-Required Confined Spaces and Non-Permit-Required Confined Spaces;
- (b) Prepare the Confined Spaces Plan (CSP) with annual review and revisions as needed;
- (c) Distribute CSP to each affected department for re-distribution to all individuals who are authorized by the department to make entry into any Confined Space;
- (d) Provide consultation, advisory assistance and information concerning use of hazardous materials, entry procedures or physical hazard assessment;
- (e) Provide assistance in locating direct reading monitoring equipment for hazards anticipated during Confined Space entry and consultation for monitoring of hazards for which direct reading equipment is not available;
- (f) Maintain the Confined Spaces Inventory on the DES web site with information provided by Confined Space Coordinators;
- (g) Investigate and document all accidents or near misses reported as a result of a Confined Space entry or an aborted entry attempt;
- (h) Direct periodic safety audits of Confined Space entry procedures as needed by employees to determine regulatory compliance, and recommend action to correct conditions of non-compliance; and
- (i) Specify and coordinate training for all Confined Space entrants through Departmental Confined Space Coordinators;
- (j) Issue alerts to Departmental Confined Space Coordinators of special hazards that have been identified that may impact the safety of entries; and
- (k) Coordinate any Confined Space rescue drills with Prince George's County Fire Department.

2. Department of Facilities Management shall:

- (a) Oversee contracts requiring Confined Space entry;
- (b) Identify requirements for compliance with applicable Confined Space entry regulations and applicable portions of this plan in contract specifications;
- (c) Notify the contractor of the locations of Permit-Required Confined Spaces (as identified by the UM,CP Confined Space inventory) where contractors will require access to inventoried Confined Spaces in order to complete work under the scope of a contract;
- (d) Provide DES with the information necessary to update the confined space inventory when Confined Spaces are created or modified during campus constructions and renovation projects;
- (e) Interface with contractors where enforcement of Confined Space contract provisions is required; and
- (f) Maintain the master log of Confined Space entries at the Work Control Center.

3. Department Heads shall:

- (a) Evaluate or have evaluated, the need for Confined Space entry by employees or students under their control, and if applicable:
 - (1) Designate a Departmental Confined Space Coordinator(s);
 - (2) Distribute the CSP to Coordinators; and
 - (3) Assure that the CSP is received and implemented within the work areas under their review;
- (b) Assure that necessary resources are made available to the Departmental Confined Space Coordinator to allow for compliance with this plan; and
- (c) Assure that new or updated Confined Space inventory information is transmitted to DES for inclusion in the campus inventory.

4. Departmental Confined Space Coordinators shall:

- (a) Implement all provisions of the CSP for work or research areas under their control;
- (b) Inventory and identify all potential Confined Space work areas or facilities under their control;
- (c) Prepare and train personnel to use supplemental Confined Space entry procedures for circumstances not adequately addressed by the campus CSP;
- (d) Identify authorized Confined Space entrants and assure that each entrant attends an approved Confined Space entry training course;
- (e) Identify individuals that are authorized to sign the UM permit for Permit-Required Confined Space entry;
- (f) Provide site-specific training to authorized Confined Space entrants regarding the specific equipment and practices used during entry for the spaces each entrant is authorized to enter;
- (g) Update the departmental Confined Space inventory and forward new information to DES for inclusion in the UM master Confined Space inventory when a new

- Confined Space is created or an existing Confined Space changes in configuration, use or hazard potential;
- (h) Assure that warning signs are posted immediately outside of entrances to Confined Spaces, and that such signs are secured. (Underground utility access vaults will not be posted. Employees will be informed of the Confined Space classification of these spaces during Confined Space training.);
 - (i) Interface with Confined Space Supervisors where enforcement of this program is required; and
 - (j) Disseminate information such as hazard alerts and changes in the program to all participants in the Confined Spaces Program.

5. Confined Space Entry Supervisor shall:

- (a) Adhere to all requirements of the CSP and supplemental entry procedures;
- (b) Complete all safety training requirements, request further instruction if unclear on any part of the training and comply with documentation procedures;
- © Complete the Permit-Required Confined Space entry permit and verify that all precautions and pre-entry procedures have been fulfilled prior to entry;
- (d) Terminate entry and cancel permits in the event conditions within the space change, entrants show signs of over-exposure or conditions can not be verified;
- (e) Verify the availability of a local rescue team prior to entry (if off-site from UM,CP);
- (f) Assure that unauthorized people do not enter the Confined Space during the time that authorized entry is in progress. If an unauthorized person is located in a Confined Space, UM Campus Police or other appropriate security force shall be called to enforce trespass prohibitions;
- (g) Assure that appropriate personal protective equipment is available and used by entrants;
- (h) Coordinate the requirements of a contractor's Confined Space Program with those of this plan when University employees make an entry into a permit space with a contractor; and
- (i) Assure that original entry permits are forwarded to DES upon completion or termination of a Permit-Required Confined Space entry.

6. Confined Space Entrants shall:

- (a) Adhere to the requirements of the CSP and supplemental entry procedures;
- (b) Fulfill all entry team functions as defined by this plan and any procedures created to supplement this plan for specific Confined Space entry;

- © Communicate with the attendant regularly while inside of the Confined Space, report any unusual circumstances to the attendant and leave the space immediately when instructed to do so by the attendant;
- (d) Complete all safety training requirements, request further instruction if unclear on any part the training and comply with documentation procedures;
- (e) Report all work place injuries, over-exposure incidents or unsafe conditions to their Confined Space Entry Supervisor as soon as possible; and
- (f) Use appropriate safety and personal protective equipment as provided for entry.

7. Confined Space Entry Attendants shall:

- (a) Adhere to the requirements of the CSP and supplemental entry procedures;
- (b) Remain outside of the Confined Space in constant two-way communication with the entrants until relieved by an alternate attendant or all entrants have exited the space;
- © Continuously communicate with the Confined Space entrants and monitor the space to assure that conditions remain within acceptable parameters as defined in the Permit-Required Confined Space Entry section of this plan and instruct entrants to leave a space if any parameter varies from acceptable as defined in the this document;
- (d) Summon rescue personnel in the event of an emergency; and police in the event that an unauthorized person enters the space;
- (e) Complete all safety training requirements, request further instruction if unclear on any of part of the training, and comply with documentation procedures;
- (f) Report all workplace injuries, exposure incidents or unsafe conditions to the Departmental Confined Space Entry Coordinator as soon as possible;
- (g) Perform non-entry rescue procedures if able to do so safely;
- (h) Perform no duty that may interfere with attendant duties while serving in the capacity of attendant; and
- (i) Secure the Confined Space after completion of the work to prevent dangerous conditions.

8. University Health Center shall:

- (a) Coordinate and direct all required or recommended medical surveillance programs, including respiratory protection physicals;
- (b) Provide medical consultations and examinations for workers who have been overexposed to hazardous chemical substances or who have sustained an injury related to a Confined Space entry; and
- © Maintain medical records relating to consultations, examinations and medical surveillance as required by law.

9. University Police shall:

- (a) Respond to reported unauthorized Confined Space entries and enforce appropriate trespassing prohibitions. **Officers shall not enter any Confined Space to retrieve or rescue individuals;**
- (b) Provide crowd control in the event of a Confined Space related emergency; and
- (c) Participate in any Confined Space rescue drills.

INFORMATION

Assistance will be provided by DES to any department or individual requesting guidance or training to satisfy implementation of this policy. DES can be reached at (301)405-3960.

GLOSSARY OF TERMS

Attendant: an individual stationed outside of one or more Confined Spaces to monitor the authorized entrants and perform specified duties as described under the Duties and Responsibilities section of this program.

Authorized entrants: an employee who is authorized by the Departmental Confined Space Coordinator to enter a permit-required-confined space.

Confined Space: a space that:

- (a) is large enough and so configured that an employee can enter and perform assigned work; **and**
- (b) has limited or restricted means for entry or exit; **and**
- © is not designed for continuous employee occupancy.

(See also, Permit-Required Confined Space and Non-Permit-Required Confined Space.)

Entry: the action by which any part of a person's body passes through an opening into a permit-required Confined Space. Entry includes ensuing work activities in that space.

Entry Permit: the written/printed document that is signed by the entry supervisor to allow and control entry into a regulated Confined Space. The permit contains the information required by regulation. (See the Confined Space Entry Permit in Appendix II of this plan.)

Entry Supervisor: the individual responsible for determining if acceptable entry conditions are present at a permit space where entry is planned.

Hazardous Atmosphere: an atmosphere that may expose employees to the risk of death, injury, impairment of ability to escape unaided, or acute illness from one or more of the following causes:

- (a) Flammable gas, vapor or mist in excess of 10% of its lower flammability limit (LAL);
- (b) Airborne combustible dust at a concentration that meets or exceeds its LAL; (NOTE: This concentration may be approximated as a condition in which the dust obscures vision at a distance of 5 feet or less);
- © Atmospheric oxygen concentration below 19.5% or above 23.5%;
- (d) Atmospheric concentrations of any substance for which a dose, permissible exposure limit (PEL) or threshold limit value (TLV) exists and which could result in employee exposure in excess of its limit; and
- (e) Any other atmospheric condition that is immediately dangerous to life or health.

Hot Work: work within a Confined Space that produces arcs, sparks, flames, heat or other source of ignition. (Contact DES, Fire Safety at (301)405-3970 or <http://des.umd.edu/hotworks> for information about obtaining a hot works permit.)

Isolation: a process of physically interrupting and/or disconnecting, pipes, lines and energy sources from the Confined Space.

Lockout/Tagout: the placement of a lock and/or tag on an energy-isolating device, indicating that the device shall not be operated until removal of the lock and/or tag in accordance with established procedure.

Non-Permit Required Confined Space (as defined by OSHA standard): a Confined Space that does not contain or have the potential to contain any atmospheric hazard capable of causing death or serious physical harm.

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

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

Permit-Required Confined Space (as defined by OSHA standard): a Confined Space that has one or more of the following characteristics:

- (a) Contains or has the potential to contain a hazardous atmosphere; **OR**
- (b) Contains a material that has the potential for entrapping, engulfing or suffocating an entrant; **OR**
- © Has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor which slopes downward and tapers to a smaller cross-section; **OR**
- (d) Contains any other recognized serious safety or health hazard.

Identification and Classification of Confined Spaces

An initial inventory of Confined Spaces located on UM,CP-owned property has been prepared by DES with the cooperation of individual user departments. The inventory shall identify all spaces that meet the definition of a Confined Space and shall further classify each space as Permit-Required Confined Spaces or Non-Permit-Required Confined Spaces. Definitions for these are located in the Glossary of Terms section of this plan.

It shall be the responsibility of Departmental Confined Space Coordinators to update the Confined Space inventory if the use, configuration or condition of a space under their control changes or if new Confined Spaces are identified.

The Departmental Confined Space Coordinator may reclassify a permit-required confined space as a non-permit confined space if the space poses no actual or potential atmospheric hazards and if all hazards within the space are eliminated without entry into the space. The permit space may be reclassified as non-permit space as long as the hazards remain eliminated. The Confined Space Coordinator must document the basis for determining that all hazards in a permit space have been eliminated with a certification that contains the date, the location of the space and the signature of the person making the determination.

All information concerning changes to the Confined Spaces Inventory shall be sent to DES via email to safety@umd.edu or by campus mail to Environmental Safety 3115 Chesapeake Building.

The UM,CP Confined Spaces Inventory database is maintained by DES. The inventory may be viewed online at <http://www.des.umd.edu/os/csp>.

Posting Requirements and Signage

Permit-Required Confined Spaces listed on the UM,CP Confined Spaces Inventory are required to be posted with a sign reading "DANGER - PERMIT REQUIRED CONFINED SPACE - DO NOT ENTER .

Each Departmental Confined Space Entry Coordinator are responsible for assuring that the Permit-Required Confined Spaces accessed by individuals in their department remain posted with appropriate signs. Signs are to be printed and maintained in stock by the Facilities Management Operations & Maintenance Sign Shop.

Where it is not practical to post signs at the entrance to a space (e.g., underground utility access vault covers), employees will be informed of the classification of these spaces during Confined Space training and will receive instructions for access to the UM,CP Confined Space Inventory.

Information and Training

All UM,CP personnel who enter Permit-Required Confined Spaces must assume an active role in maintaining a safe working environment by reporting any problems or noncompliance with policies to their Departmental Confined Space Coordinator. All authorized personnel are expected to assist their peers, and should fully utilize any information provided during formal and informal training sessions. Any person who does not understand a policy or procedure should consult their Departmental Confined Space Coordinator, supervisor or DES for clarification.

All personnel entering or attending Confined Spaces shall be provided with information and training regarding the hazards associated with Confined Space entry and the workings of the CSP before being required to enter any Permit-Required Confined Space. Additional training will be provided by the Departmental Confined Space Coordinators when personnel are assigned to a new task for which they have not been trained, or when a new hazard is recognized in the work space.

Training of Confined Space attendants, entrants, supervisors and coordinators in the methods and procedures for standard Permit and Non-Permit-Required Confined Space entry and the provisions of the OSHA Confined Spaces Standard's requirements shall be conducted by a DES-approved training source such as the Maryland Fire and Rescue Institute (MFRI). The Departmental Confined Space Coordinator shall be responsible for training of all authorized entrants in the specific operations, safety equipment, monitoring equipment, emergency procedures, etc. used by the individual department. Contact Environmental Safety at (301)405-3969 to coordinate training for employees at College Park locations. Satellite locations may contact the Special Programs Section of MFRI directly at (301)220-7250 or visit their web site at www.mfri.org.

Documentation of CSP training shall be forwarded to DES for recordkeeping. Individual departments may also keep records.

Information regarding the Confined Spaces Program can be found on the Environmental Safety web site <http://www.des.umd.edu/os/csp>. This information includes the University of Maryland Confined Spaces Plan, the inventory of permit-required confined spaces, copies of the Confined Space Entry Permit with instructions, and a link to the OSHA Permit-Required Confined Spaces Standard.

Material Safety Data Sheets (MSDS's) can be obtained by the manufacturer or distributor of the product. Environmental Safety maintains links to MSDS databases at its web site www.des.umd.edu in the Occupational Safety Section under Right-To-Know.

Permit-Required Confined Space Entry

PRE-ENTRY DETERMINATIONS

Prior to scheduling an entry into a Permit-Required Confined Space the Departmental Confined Space Entry Supervisor shall;

- a) Assure that the required task can not be accomplished from outside of the space using alternate technology or alternate locations for work on a system;
- b) Identify all products or processes that may be present in the space prior to entry;
- c) Obtain access to Material Safety Data Sheets (MSDS) for all products or materials expected to be in the space or taken into the space with the entry team;
- d) Assure that equipment necessary for Permit-Required Confined Space entry is available, calibrated (if applicable) and in proper working order; and
- e) Identify isolation points for piping, electrical systems, etc., to allow for complete Lockout/Tagout (LOTO) of hazardous energy sources.

PERMIT USE

Permit Implementation

Before each entry into a Confined Space the permit must be completed by the Confined Space Entry Supervisor or Attendant as designated by the Departmental Confined Space Entry Coordinator. The contents of the permit must be communicated to the entrants and the permit posted near the entrance to the space.

Duration of the Permit

A permit may remain valid for the duration of the entry task or a single work shift not to exceed 8 hours. When the same work crew is used for overtime work, the permit may be extended for up to 4 hours by repeating the air monitoring requirements. (See the atmospheric testing section for more information.) The Departmental Confined Space Entry Supervisor must pay special attention to fatigue when assessing the ability of a entry team to continue work on overtime.

Additionally, permissible exposure limits for toxic contaminants are based on an 8 hour per day, 40 hour per week exposure. Additional work time lowers the permissible exposure limit. DES can assist the supervisor in calculating the altered permissible exposure limit for a 12 hour shift where applicable. If the supervisor is aware

that the task will require overtime, these calculations shall be performed prior to entry and the adjusted permissible exposure limits used during initial space testing.

Revoking Permits

When conditions or work activities are different from those specified on the permit and could introduce a new hazard to the Confined Space, then the permit shall be immediately revoked by the Confined Space Entry Supervisor or Attendant. The Confined Space Entry Supervisor or Attendant shall immediately notify the entry team that the permit is no longer valid. Authorized entrants must immediately leave the space. Reasons for revoking the permit must be recorded on the permit form and returned to DES for use in annual program review.

Changing Work Conditions

A new permit shall be issued or the original permit re-issued whenever changing work conditions or work activities introduce new hazards to the workplace.

Permit Disposition

Expired permits, including permits where entry is aborted, must be retained and forwarded to Environmental Safety. Permits will be retained for a period of one year and will be used in annual program review. It is necessary that a clear explanation of the cause of any permit cancellation be included on the permits prior to submitting them to DES in order to facilitate a complete review of the plan and related entry procedures.

Individual departments may photocopy and retain copies of expired permits if so desired, but are not required to do so.

Attendant

An attendant must be stationed outside any Permit-Required Confined Space prior to posting of the entry permit. The Confined Space Entry Supervisor may assign more than one attendant to an entry if the task poses exceptional risk or if several entrants will be in the space at one time. See the responsibilities section for a description of the attendants duties. (NOTE: Absence of an attendant for any reason shall invalidate the entry permit and entrants must exit the space immediately.)

ATMOSPHERIC TESTING

a) Before entering a Permit-Required Confined Space, atmospheric testing shall be conducted by a trained person designated by the Confined Space Entry Supervisor. Authorized entrants and/or their authorized representative shall be provided with the opportunity to observe the pre-entry and subsequent testing or monitoring of the space. Testing equipment used in hazardous atmospheres shall be listed or approved for use in such areas by a nationally-recognized testing laboratory such as Underwriters Laboratories or Factory Mutual Systems. DES can assist individual departments in the selection of appropriate testing equipment.

b) Instruments must be available to measure oxygen content, combustible/flammable limits and anticipated toxic contaminants. Testing equipment shall be accurate to the lowest concentration at which the contaminant

becomes hazardous. Where technically feasible, direct reading instruments shall be used for all measurements to assure that results represent the conditions in the space at the time of entry.

c) All instruments shall be calibrated and performance-tested in accordance with the manufacturer's instructions prior to use. Testing must continue for each parameter for at least the minimum response time of the instrument used, accounting for travel distance if remote sampling techniques are used (e.g., a drop probe). The manufacturer's instructions will provide calibration instructions, performance testing guidelines and instrument response time. DES can assist in instrument use training.

Sampling strategies shall be developed for each space based upon the configuration of the space and the potential hazards present. Sampling points should be selected to characterize the entire space where work will be performed. Sample sites should be no more than 4 ft in the direction of travel from the previous point and 4 ft to each side of the entry space to assure comprehensive test results. **Continuous monitors should be worn by employees entering a space where concentrations of contaminants are capable of elevating during the entry or where communication systems are subject to error** (e.g., radio communication in a tunnel). Contact your Departmental Confined Space Coordinator or DES for assistance in creating a sampling strategy.

d) Initial testing of atmospheric conditions and subsequent tests after the job has been stopped for a significant period of time shall be done with ventilation systems shut down where possible. Some spaces will require ventilation to allow monitoring equipment to function properly (e.g., high heat in steam tunnels will render sampling equipment inoperable). The space must be ventilated to reduce ambient heat loads before accurate measurements of air quality may be made or any entry attempted.

e) Initial testing of the air shall be performed from outside of the space. No part of the employee may enter the space while air testing is being performed. Interior air testing of a vertical Permit-Required Confined Space may be done by drop tests (using a tube dropped into the space to extract the sample) or insertion of sample probes. Where entrants must move farther into a Permit-Required Confined Space than allowed by the length of the air monitoring probe, air samples shall be taken progressively in front of the entry team. The entrants shall continuously monitor the space. If questions arise concerning the specific use of monitors, the employee may consult their supervisor, the product manufacturer's representative or DES.

f) Further testing shall be conducted prior to entry with ventilation systems intended for use during entry turned on to ensure that contaminants are removed and that the ventilation systems are not themselves causing a hazardous condition.

g) Testing of Confined Spaces shall be conducted throughout all occupied areas of the space.

Hazardous Concentrations Present

If initial tests indicate the presence of hazardous concentrations of flammable vapors, workers shall **not** be allowed to enter the space until the space has been ventilated to eliminate the hazard. Where toxic substances or oxygen deficiencies exist, the space should be ventilated and/or sources of the hazard removed or controlled prior to entry.

Ventilation units must be carefully placed outside of a Confined Space to avoid drawing contaminated outside air into the space (e.g., engine exhaust is a ready source of carbon monoxide, a simple asphyxiant that is heavier than air and able to replace oxygen in a Confined Space.)

Where it is not possible to eliminate a toxicity or oxygen deprivation hazard, entrants must be equipped with air-supplied respiratory equipment and other applicable personal protective equipment. (Note: entrants must be trained in the proper use of personal protective equipment prior to its use. Entrants must also be included in the *University of Maryland Respiratory Protection Program*. Most entrants at UM,CP will not be allowed to enter Confined Spaces that require Self-Contained Breathing Apparatus (SCBA) or Supplied Air Respirators (SAR) use. If SCBA or SAR is required and provided for use, a separate respiratory protection training class will be provided.)

If ventilation is used to control a toxic or oxygen-deprivation hazard for the purpose of entry, entrants may be equipped with personal protective equipment to allow escape in the event of ventilation failure, such as an SCBA 5-minute escape respirator. (Note: SCBA training will be required for escape SCBA use.)

No Hazardous Concentrations Present

When tests do not indicate the existence of oxygen deficiencies, hazardous concentrations of flammable vapor, or toxic substances, the space may be entered and tests performed progressively throughout the space. If tests indicate the existence of hazardous atmospheres within the space, the tester must exit the space and proceed as described above.

Re-entry into a Permit-Required Confined Space

An entry team may exit and re-enter the Confined Space on the existing permit only if the following are completed prior to re-entry:

- a) Atmospheric testing shall be repeated and found within acceptable limits. If atmospheric tests are not within acceptable limits, precautions to protect entrants against the hazards shall be appended to the existing permit;
- b) The Confined Space Entry Supervisor shall verify that all safety precautions and other measures called for on the permit are still in effect;
- c) Only operations or work originally approved on the permit shall be conducted in the work place; and
- d) Only the original entrants may be admitted to the space specified on the original permit.

Acceptable Air Quality

Oxygen levels - not less than 19.5% nor more than 23.5% oxygen in ambient air.

Flammability/Combustibility - Less than 10% of the Lower Flammability Limit (LAL) or Lower Explosive Limit (LEL). These terms are used interchangeably on MSDSs and in product literature.

No source of ignition shall be permitted into or in contact with Confined Spaces (including adjacent spaces having common walls, floors, or ceilings with the Confined Space) until proper tests have ensured that the percentage of combustible/flammable gas or vapor is not greater than 10% of the lower flammability limit (LFL). Only intrinsically safe electrical and mechanical equipment may be used in or near a Confined Space where the potential for a LAL exists, regardless of current test results.

Note: Flammable concentrations of dusts cannot be measured by a combustible gas meter. You should consider dust that obscures vision 5 feet away to be potentially flammable.

Toxicity - less than any recognized exposure limits including OSHA Permissible Exposure Limits, ACGIH Threshold Limit Values and industry standards. Exposure limits for chemical substances are usually indicated on product MSDSs which can be obtained from DES. Potential contaminants produced as a by-product of activity in the Confined Space must also be evaluated. Exposure limits for many process by-products may be obtained from the Confined Space Entry Supervisor or DES.

Exposure limits are usually identified as:

- Eight-hour time weighted average (TWA)
The average concentration to which an employee may be exposed to a particular chemical for up to eight hours per day, five days per week.
- Short Term Exposure Limit (STEL)
The average concentration to which an employee may be exposed to a particular chemical for up to fifteen minutes.
- Ceiling (C)
The maximum concentration to which an employee may be exposed to a particular chemical at any time.
- Skin
Often, a notation of "Skin" is printed with an exposure limit. This indicates that skin absorption of that chemical occurs readily and could contribute to an employee's overall exposure. Employee exposure to dermal absorption of chemical substances can often be monitored through the use of biological testing.

Temperature stress - Heat stress must be considered when evaluating the potential hazards associated with a Confined Space. Large scale communication equipment, computer equipment, steam lines or other equipment located in Confined Spaces may increase the ambient heat load of a Confined Space. Personal protective equipment worn by entrants to protect against another hazard may also increase the likelihood of heat stress by trapping body heat. The level of activity required by entrants, worker acclimatization to heat and individual physical condition will also affect potential for development of heat-related disorders.

Symptoms of heat stress include reddening of the skin, profuse sweating, fatigue and sometimes nausea. Entrants should exit the Confined Space, remove personal protective clothing and take cool liquids if symptoms of heat stress are experienced.

If not treated, heat stress can progress to heat exhaustion. Symptoms of heat exhaustion include moist and clammy skin, accompanied by a feeling of giddiness, fatigue, nausea, headache and a pale or mottled/flushed look. The next stage of heat stress is heat stroke in which the entrant's skin becomes hot and dry, with a mottled or bluish color. Mental confusion and a quickly-rising core body temperature will be noted. Heat stroke can be fatal without rapid medical attention. **If symptoms of heat exhaustion or heat stroke are experienced by a member of the entry team, 9-1-1 must be contacted for assistance.**

Personnel who must work in hot environments should exit the Confined Space at regular intervals for short rest breaks including water or an electrolyte replacement drink. Liquids should be cool but not cold. DES can assist entry teams in assessing the heat stress potential of a Confined Space prior to entry upon request.

COMMUNICATION

Confined Space entrants must be in constant communication with the attendant on duty. The attendant must be able to immediately contact 9-1-1. The attendant may communicate with 9-1-1 via radio as long as radio communication is monitored during the entire duration of the entry and immediate access to 9-1-1 is available.

If a Confined Space entry is made on UM,CP property, the Confined Space Entry Supervisor must notify the Department of Facilities Management Work Control of the time, date, location and purpose of the entry prior to entry. Work Control will identify other work being performed in the same location if applicable. Work Control may be reached by calling (301)405-2222.

MSDS Access

The *University of Maryland Right-To-Know Program* requires Material Safety Data Sheets (MSDSs) to be developed or obtained for hazardous chemicals used or stored on UM,CP property. Employees who are not familiar with MSDSs or the *University of Maryland Right-To-Know Program* should be registered for Right-To-Know training by calling DES at (301)405-3960. Training is required for all UM,CP personnel who do not work in a laboratory but do work with a hazardous material as part of their normal job duties. MSDSs for all hazardous materials used in a Confined Space shall be made accessible to entrants prior to entry.

MSDSs are maintained for UM at DES and may also be found through the DES web site at <http://www.des.umd.edu/>. Call DES at (301)405-3960 to receive information by phone, have a MSDS faxed or have a MSDS mailed to your campus address. MSDS's can also be obtained free of charge from the product manufacturer, importer or distributor.

PROTECTION OF PERSONNEL

Personal Protective Equipment

All individuals working in and around Permit-Required Confined Spaces must be instructed as to the hazards of their respective jobs. Each supervisor is responsible for providing such information to the employees. Personal protective equipment (PPE) required for entry shall be supplied by the entrant's department and used by employees according to the *University of Maryland Personal Protective Equipment Program*. A Hazard Assessment that has been certified by a foreman or supervisor shall be conducted for each employee or position and employees shall be trained in the use, limitations and maintenance of PPE. PPE may include protective clothing, goggles, hard hats, gloves, respirators, ear plugs and safety shoes. DES is available to assist departments with personal protective equipment selection, the development of Hazard Assessments and training.

Non-entry Rescue Equipment

Entrants shall be supplied with and required to wear a full body harness attached to an extraction device **except** when such equipment increases the risk of entry or would not contribute to rescue of the entrant. A full body harness that provides leg straps as well as waist and shoulder straps is necessary to prevent injury when used for removing an entrant from a Confined Space. **A full body harness shall be used by all entrants regardless of life line use.** For descents of five feet or more into a permit space, entrants must be attached to a tripod and winch or hoist designed for lifting personnel.

Site Safety

Barriers must be used to direct pedestrian or vehicular traffic away from the entrance to a Confined Space when the entrance can not be secured by other means. Reflective traffic vests, flags and signs must also be used to protect both workers and passers by.

When covers of manholes or vaults are removed, the opening shall be promptly guarded by a railing, temporary cover, or other suitable temporary barrier which is appropriate to prevent an accidental fall through the opening.

All lighting and electrical equipment used inside of a Confined Space shall be properly insulated, grounded, approved for the use and in good repair.

Lockout/Tagout (LOTO)

Locking devices and tags shall be used when employees are performing maintenance or service on any machine or system where unexpected or unintentional release of energy or unexpected motion could cause harm or release a toxic material into a Confined Space. Sources of stored energy include electrically, chemically, pneumatically, thermally and/or hydraulically powered equipment or systems.

Locking devices and tags shall also be used when guards or other safety devices must be removed during service or when moving or energized parts put any part of the employee's body at risk of injury.

Examples of conditions where locking and tagging should be used may include but are not limited to:

- Clearing blocked or jammed mechanical equipment
- Maintenance or repair work on equipment with moving parts
- Repairing tanks with pipe feeds
- Steam line repair
- Repairs or installation of electrical equipment

More information about how to safely control hazardous energy can be found in the *University of Maryland Lockout/Tagout Plan*.

VENTILATION

Ventilation shall be maintained during Confined Space occupancy if there is potential for atmospheric conditions in the Confined Space to move out of acceptable ranges as defined in this program. (See "Acceptable Air Quality" under Atmospheric Testing.)

Ventilation shall not be used to control atmospheric contaminants in a Confined Space when the hazard can be eliminated by another means (e.g., through blanking or purging a system).

If ventilation is used to control a toxicity or oxygen deprivation hazard for the purpose of entry, entrants may be equipped with personal protective equipment to allow escape in the event of ventilation failure (e.g., an SCBA 5-minute escape respirator).

Exhaust ventilation equipment used in Confined Spaces shall be approved for use in potentially explosive atmospheres. Supply ventilation equipment (excluding ductwork) used in Confined Spaces shall be approved for use in potentially-explosive atmospheres if the mechanical components (fan, motor, etc.) are to be placed within the Confined Space. The source of air supplied to Confined Spaces must be derived from a location that is free from contaminants. A blower that has the capability to provide 600 cubic feet per minute of fresh air should be used. The hose should be 6 to 10 inches wide and long enough to reach the bottom of the confined space.

When an air compressor is used to supply breathing air, it must be oil-free, located away from potential sources of contamination (e.g., mechanical equipment exhaust) and equipped with appropriate alarms to indicate compressor failure, compressor overheating and elevated carbon monoxide content in the supplied air.

Where ventilation is not possible or feasible, alternative protective measures shall be used to protect entrants as determined by the Confined Space Entry Supervisor prior to authorizing entry. If respiratory protection is required for entry, personnel must be respirator-qualified and enrolled in the *University of Maryland Respiratory Protection Program* prior to respirator use.

WORK IN CONTAMINATED ATMOSPHERES

Confined Spaces that cannot be confirmed as free of dangerous air contamination or oxygen deprivation should not be entered by UM employees. If an entry must be made, additional precautions must be taken as listed below:

- (a) Evaluate the entry task to identify creative means of completing the task without entering the space (e.g., Can a valve be extended to operate from outside of the space? Can a gauge be moved to read remotely? Can tools on extension rods be used to complete the task?).
- (b) Ventilate the space to relieve any atmosphere that exceeds 10 % of the LAL for a flammable or combustible contaminant. Exhaust ventilation equipment used shall be listed or approved for use in flammable or combustible atmospheres by a nationally-recognized testing laboratory such as Underwriters Laboratories or Factory Mutual Systems.
- (c) Where a toxic atmosphere exists, entrants must be supplied with a self-contained breathing apparatus or supplied-air respirator with escape bottle of sufficient size to assure employee egress in the event of air supply failure. All entrants must be included in the *University of Maryland Respiratory Protection Program* and have current respirator training, fit-test and medical clearance.
- (d) Where a contaminant may cause irritation or burning to exposed skin, or may be absorbed through the skin, entrants must be supplied with personal protective clothing capable of preventing skin exposure to the contaminant. One type of protective clothing will not protect against all types of contaminants. Check with DES, the equipment supplier or manufacturer for specific information about a product's ability to protect against the expected contaminant.

Non-Permit Confined Space Entry

If a space does not require that a permit process be used, appropriate safety precautions to be determined by the Confined Space Coordinator must still be followed. Manholes and unvented utility vaults that contain telecommunications equipment shall be tested for combustible gas and, except when continuous forced ventilation is provided, the atmosphere shall also be tested for oxygen deficiency. When unsafe conditions are detected by testing or other means, the work area shall be ventilated and otherwise made safe before entry. Entry into these spaces with monitoring and/or ventilation does not require a permit procedure. However, if a hazard such as a chemical hazard, physical hazard or mechanical hazard cannot be eliminated, the Confined Space Permit process will be used.

Other spaces that have been reclassified from Permit-Required Spaces may also require ventilation and/or monitoring for safe entry, but may not require an attendant and full-body harness and life line. Communications equipment such as radios or cell phones are recommended for entry into non-permit spaces, especially when an attendant is not present.

Follow the instructions for “Atmospheric Testing” and “Ventilation” in the section on *Permit-Required Confined Space Entry* when monitoring or ventilating any confined space. The requirements for “Personal Protective Equipment”, “Site Safety” and “Lockout/Tagout” must also be followed.

Contractors Working In UM,CP Permit-Required Confined Spaces

Contractors who are hired by any agent of the University to perform work on UM,CP property must inform the Department of Facilities Management Work Control Center of the date, time, location and purpose of any Permit-Required Confined Space entry made on UM,CP property. Work Control may be reached 24 hours a day at (301)405-2222. Contractors must also provide the name and contact information for the individual acting as supervisor for the entry.

Contractors must have a complete written Confined Space entry plan in compliance with federal and state Confined Space regulations and use appropriate Permit-Required Confined Space entry procedures. **A copy of the permit used for entry must be provided to DES upon completion of the entry** for use in annual program review. Permits may be mailed or delivered to University of Maryland, Department of Environmental Safety, 3115 Chesapeake Building 338, College Park, MD 20742-3133. The fax number is (301)314-9294 and the telephone number is (301)405-3960.

When UM,CP employees work along side contractors in a Permit-Required Confined Space, both permit procedures will be used at the same time . The entry supervisor will coordinate the requirements of both programs before the entry is made.

Specialized Work

Welding (29 CFR 1910.252): Minimum ventilation for welding requires: (1) a minimum of 2000 cubic feet per minute per welder as general ventilation, or (2) local exhaust ventilation (at the point of contaminant generation) of 100 feet per minute. Welding machines and compressed gas cylinders must be kept outside of the space. Electrodes must be removed from the holder when welders exit the space; welding gas and related fuel gases must be turned off from outside of the space. Where practical, torches, cables and hoses should be removed from the space when welding is not in progress. A hot work permit must be secured before any welding is done in any Permit-Required Confined Space. Hot work permits are available through DES web site at <http://des.umd.edu/hotworks>.

Emergency Rescue

An entrant's evacuation from a Confined Space, or self-rescue, shall take place when any of the following conditions occur:

- ' An attendant observes a potential problem that can affect the entrants, such as failure of a ventilation blower;
- ' Activation of an alarm that signal a hazardous change in atmospheric conditions;
- ' Entrants believe they are in danger because they experience signs and symptoms of a hazard in the space.

In the event that an entrant becomes unconscious, attendants **shall not** attempt to enter the space to perform rescue. Rescue services that can be performed safely from outside of the Confined Space (e.g. hoisting a harnessed entrant) shall be undertaken. Other entrants in the space shall immediately exit the space and only provide such assistance as will not endanger themselves. The attendant shall immediately contact the Prince George's County Fire Department (PGFD) by calling 9-1-1 or radio for help directly to work control. At off-campus locations, the attendant must call local fire and rescue services directly. The telephone number must be in the attendant's possession prior to any entry. **In no case shall the attendant be required to relay emergency information through a third party unless the third party location is fully staffed during the entire entry.**

Emergency rescue services will be provided for all Confined Space emergencies by the PGFD at UM, or local fire and rescue services at off-campus locations. Local fire and rescue services will provide their own equipment and training in accordance with federal and state regulations. The University of Maryland Department of Environmental Safety will invite the fire department rescue service to its facilities for confined space rescue drills on a regular basis and will evaluate its ability to respond to confined space emergencies.

Appendix I

UM CONFINED SPACE ENTRY PERMIT

Approvals

Entry Supervisor (Print) _____ (Sign) _____

I assumed the responsibility of Entry Supervisor on (date) _____ at (time) _____

Entry Supervisor (Print) _____ (Sign) _____

This Confined Space Entry Permit has been revoked because: _____

Entry Supervisor (Print) _____ (Sign) _____

Comments: _____

INSTRUCTIONS - Confined Space Entry Permit

University of Maryland

The Confined Space Entry Permit process shall be completed before any University of Maryland employee enters a space designated as a “Permit Required Confined Space.”

1. Check the UM Confined Space Inventory at www.des.umd.edu/os/csp to verify that the space that will be entered is listed in the inventory. If it is, use the information found in the inventory listing for identifying the location, type of space, and hazards on the permit. If the information in the inventory is NOT correct or the space is NOT listed, send an email to safety@umd.edu with the necessary information so that the inventory can be updated.
2. Evaluate the known hazards and prepare control measures.
3. Enter the names of the authorized entrants and attendants with the name of their department, shop, or company. All entrants and attendants must have completed Confined Space Awareness and Entry training. Contractors are required to follow their own permit system.
4. Notify the Department of Facilities Management Work Control Center at (301)405-2222 before entry. Give the date, time, location and reason for entry. Also give the name of the Entry Supervisor and a means of contacting that person during the entry.
5. At the site, ensure the following items have been implemented:
 - ' All barricades are in place and caution signs are posted.
 - ' Hazardous energy has been locked and tagged.
 - ' An emergency escape plan has been developed. All phones and radios are operational.
 - ' Retrieval systems (tripod, winch, harness, life line) are in place.
 - ' Space has been properly ventilated.
 - ' Personal Protective Equipment is available and in use.
 - ' Hot Works Permits has been obtained for all welding and cutting. A permit can be obtained online from <http://des.umd.edu/hotworks>.
6. Perform atmospheric testing and enter readings on permit. Entrants may not enter space until acceptable entry conditions are verified. Entrants have the right to witness the testing.

7. The Entry Supervisor must sign the permit only after all precautions have been implemented and the atmospheric readings have been taken and found to be acceptable.
8. POST THE PERMIT at the entrance of the space.
9. Enter additional atmospheric readings on permit. For continuous monitoring, enter readings at regular intervals.
10. After the work has been completed and the entrants have left the space, notify the Work Control Center at (301)405-2222.
11. FORWARD THE EXPIRED PERMIT to Environmental Safety, 3115 Chesapeake Bldg. 338 College Park, MD 20742-3133. Expired permits are needed for the OSHA required program evaluation.