

ALVERNIA UNIVERSITY				
OSHA REGULATION: 29 CFR 1910.146 PERMIT-REQUIRED CONFINED SPACE				
SECTION: 600	NUMBER: 1	REVISION: 4	EFFECTIVE DATE: 4/16/2008	REVISION DATE: 12/2/2008

A. POLICY

1. This procedure follows requirements set forth in 29 CFR 1910.146.
2. It is the policy of Alvernia University that any individual entering into a confined space will do so in accordance with the procedures outlined in this document.
3. A Confined Space Entry Permit must be completed for **all** permit-required confined space entries by the supervisor on site trained to Confined Space Supervisor Level.
4. Alvernia University confined space trained personnel are responsible for air monitoring **all** confined spaces and the opening and closing of a Confined Space Entry Permit.
5. Alvernia University will provide personal protective equipment, operating equipment, and supervision necessary for protection of the individual health and safety.

B. PURPOSE

To ensure that all individuals entering a confined space adhere to established safety practices and utilize required confined space entry procedures and equipment.

C. DEFINITIONS

"Acceptable entry conditions" means the conditions that must exist in a permit space to allow entry and to ensure that employees involved with a permit-required confined space entry can safely enter into and work within the space.

"Attendant" means an individual stationed outside one or more permit spaces who monitors the authorized entrants and who performs all attendant's duties assigned in the employer's permit space program.

"Authorized entrant" means an employee who is authorized by the employer to enter a permit space.

"Blanking or blinding" means the absolute closure of a pipe, line, or duct by the fastening of a solid plate (such as a spectacle blind or a skillet blind) that completely covers the bore and that is capable of withstanding the maximum pressure of the pipe, line, or duct with no leakage beyond the plate.

"Confined space" means a space that:

- (1) Is large enough and so configured that an employee can bodily enter and perform assigned work; and
 - (2) Has limited or restricted means for entry or exit (for example, tanks, vessels, silos, storage bins, hoppers, vaults, and pits are spaces that may have limited means of entry); Even if a work area has more than one way of escape, it can still be considered a confined space; and
 - (3) Is not designed for continuous employee occupancy. A space designed without lighting, heating, and ventilation is not intended for human occupancy. It was designed to hold something other than people.
- Examples of confined spaces: manholes, boilers, tanks, vats, sewer pipelines, vaults. Trenches may also be considered as confined spaces depending on local regulations.

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"Dangerous Air Contamination" means an atmosphere capable of causing death, injury, acute illness, or disablement due to the presence of flammable, explosive, toxic, or incapacitating substances.

"Double block and bleed" means the closure of a line, duct, or pipe by closing and locking or tagging two in-line valves and by opening and locking or tagging a drain or vent valve in the line between the two closed valves.

"Emergency" means any occurrence (including any failure of hazard control or monitoring equipment) or event internal or external to the permit space that could endanger entrants.

"Enclosed space" means any space that does not meet the definition of a confined space but may require precautionary measures upon entering. Examples of enclosed spaces are: crawl spaces and service tunnels with existing general ventilation.

"Engulfment" means the surrounding and effective capture of a person by a liquid or finely divided (flowable) solid substance that can be aspirated to cause death by filling or plugging the respiratory system or that can exert enough force on the body to cause death by strangulation, constriction, or crushing.

"Entry" means the action by which a person passes through an opening into a permit required confined space. Entry includes ensuing work activities in that 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.

"Entry permit (permit)" means the written or printed document that is provided by the employer to allow and control entry into a confined space.

"Entry supervisor" means the person (such as the employer, foreman, or crew chief) 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 as required by this section. NOTE: An entry supervisor also may serve as an attendant or as an authorized entrant, as long as that person is trained and equipped as required by this regulation for each role he or she fills. Also, the duties of entry supervisor may be passed from one individual to another during the course of an entry operation.

"Hazardous atmosphere" means an atmosphere that may expose employees to the risk of death, incapacitation, impairment of ability to self-rescue (that is, escape unaided from a permit space), injury, or acute illness from one or more of the following causes:

- (1) Flammable gas, vapor, or mist in excess of 10 percent of its lower flammable limit (LFL);
- (2) Airborne combustible dust at a concentration that meets or exceeds its LFL;
NOTE: This concentration may be approximated as a condition in which the dust obscures vision at a distance of 5 feet (1.52 m) or less.
- (3) Atmospheric oxygen concentration below 19.5 percent or above 23.5 percent;
- (4) Atmospheric concentration of any substance for which a dose or a permissible exposure limit is published in 29 CFR 1910 Subpart G, Occupational Health and Environmental Control, or in 29 CFR 1910 Subpart Z, Toxic and Hazardous Substances

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and which could result in employee exposure in excess of its dose or permissible exposure limit; NOTE: An atmospheric concentration of any substance that is not capable of causing death, incapacitation, impairment of ability to self-rescue, injury, or acute illness due to its health effects is not covered by this provision.

(5) Any other atmospheric condition that is immediately dangerous to life or health. NOTE: For air contaminants for which OSHA has not determined a dose or permissible exposure limit, other sources of information, such as Material Safety Data Sheets that comply with the Hazard Communication Standard, 29 CFR 1910.1200, published information, and internal documents can provide guidance in establishing acceptable atmospheric conditions.

"Hot work permit" means the employer's written authorization to perform operations (for example, riveting, welding, cutting, burning, and heating) capable of providing a source of ignition.

"Immediately dangerous to life or health (IDLH)" means 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. NOTE: Some materials -- hydrogen fluoride gas and cadmium vapor, for example -- may produce immediate transient effects that, even if severe, may pass without medical attention, but are followed by sudden, possibly fatal collapse 12-72 hours after exposure. The victim "feels normal" from recovery from transient effects until collapse. Such materials in hazardous quantities are considered to be "immediately" dangerous to life or health.

"Inerting" means 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 noncombustible. NOTE: This procedure produces an IDLH oxygen-deficient atmosphere.

"Isolation" means the process by which a permit space is removed from service and completely protected against the release of energy and material into the space by such means as: blanking or blinding; misaligning or removing sections of lines, pipes, or ducts; a double block and bleed system; lockout or tagout of all sources of energy; or blocking or disconnecting all mechanical linkages.

"Line breaking" means 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.

"Lower Explosive Limit (LEL)" means the lowest concentration of a substance in air that will produce a flash of fire when an ignition source (heat, arc, or flame) is present. At concentrations lower than the LEL, the mixture is too "lean" to burn.

"Non-permit confined space" means a confined space that does not contain or, with respect to atmospheric hazards, have the potential to contain any hazard capable of causing death or serious physical harm.

"Oxygen deficient atmosphere" means an atmosphere containing less than 19.5 percent oxygen by volume.

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"Oxygen enriched atmosphere" means an atmosphere containing more than 23.5 percent oxygen by volume.

"Permissible Exposure Level (PEL) means the permissible amount of exposure to a toxic substance that an employee is allowed to receive in any given time period. This may be a Time Weighted Average (TWA) or a Threshold Limit Value (TLV).

"Permit-required confined space (permit space)" means a confined space that has one or more of the following characteristics:

- (1) Contains or has a potential to contain a hazardous atmosphere;
- (2) Contains a material that has the potential for engulfing an entrant;
- (3) 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
- (4) Contains any other recognized serious safety or health hazard, for example, exposed live wires or moving equipment.

"Permit-required confined space program (permit space program)" means the employer's overall program for controlling, and, where appropriate, for protecting employees from, permit space hazards and for regulating employee entry into permit spaces.

"Permit system" means the employer's written procedure for preparing and issuing permits for entry and for returning the permit space to service following termination of entry.

"Prohibited condition" means any condition in a permit space that is not allowed by the permit during the period when entry is authorized.

"Rescue service" means the personnel designated to rescue employees from permit spaces.

"Retrieval system" means 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.

"Testing" means the process by which the hazards that may confront entrants of a permit space are identified and evaluated. Testing includes specifying the tests that are to be performed in the permit space. NOTE: Testing enables employers both to devise and implement adequate control measures for the protection of authorized entrants and to determine if acceptable entry conditions are present immediately prior to, and during, entry.

"Time Weighted Average (TWA)" means the average exposure calculated over a set period of time. The National Institute of Occupational Safety and Health (NIOSH) establishes these standards as recommended exposure limits (for most industrial / workplace chemicals) to which nearly all persons can be exposed to for up to a 10 hour work day during a 40 hour work week without any adverse health effects.

"Threshold Limit Value-Time Weighted Average (TLV-TWA)" means the time weighted average concentration for a normal eight hour work day and a forty hour work week, to which all workers may be repeatedly exposed, day after day, without adverse effect. The TLV is established by the American Conference of Government Industrial Hygienists.

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“Threshold Limit Value-Short Term Exposure Limit (TLV-STEL)” means the concentration to which workers can be exposed continuously for 15 minutes without suffering from irritation, chronic or irreversible tissue damage, narcosis of sufficient degree to increase the likelihood of accidental injury, impair self-rescue, or materially reduce work efficiency, provided that the daily TLV-TWA is not exceeded.

“Threshold Limit Value-Ceiling Value (TLV-C)” means the concentration that should not be exceeded during any part of the working exposure.

“Upper Explosive Limit (UEL)” means the highest concentration of a substance in air that will produce a flash of fire when an ignition source (heat, arc, or flame) is present. At concentrations higher than the UEL, the mixture is too “rich” to burn.

D. RESPONSIBILITIES

1. The Alvernia University Safety Technician will
 - a. Evaluate the workplace to determine if any spaces are permit-required confined spaces.
 - b. If the workplace contains permit spaces, the Safety Technician and the Maintenance Supervisor shall inform exposed employees by posting danger signs of the existence and location of and the danger posed by the permit spaces.
 - c. Develop, implement and maintain the Confined Space procedure in accordance with 29 CFR 1910.146.
 - d. Comply with all additional OSHA requirements (ie. Lockout-Tagout) that may overlap the work being performed in the confined space.
 - e. Utilize the Alvernia University Confined Space Entry Permit.
 - f. Maintain monitoring records for the confined space which are to be placed in the job folder after the entry is completed for the permanent record.
 - g. Maintain all confined space entry equipment and calibrate gas detectors as necessary.
 - h. Review procedures with contractors for any work involving confined space entry. Specific contract language is required to ensure that contractors provide an adequate level of protection to their employees while working for Alvernia University.
2. Supervisors
 - a. Ensure that Alvernia University employees under their direct supervision understand and adhere to adopted procedures during confined space entry operations.
 - b. Assure that necessary education and training will take place prior to the employee being assigned to work in a confined space.
 - c. Maintain copies of all confined space entry permits, including all air testing results.
 - d. Provide necessary operations equipment and resources including confined space attendants.
 - e. Identify locations and potential hazards of each confined space that may require entry by employees.
3. Entry Supervisors
 - a. Open and close permits as required, documenting all on-site readings and tasks.
 - b. Determine if acceptable entry conditions are present at a permit space where entry is planned.

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- c. Oversee entry operations for the duration of assigned work and terminate entry when conditions are determined to be unsafe.
- d. Perform air monitoring as required.
- e. Obtain and maintain training at confined space attendant and supervisor levels.
- f. Notify the Alvernia University Safety Technician prior to confined space entry.
- 4. Authorized Entrants
 - a. Because of the number of potential hazards that may exist or develop in the work environment, confined space entrants are required to use extreme caution at all times.
 - b. Disregard for established safety practices will be brought to the attention of appropriate management supervisors.
 - c. Confined space entrants are responsible for reading and complying with procedures and guidelines.
 - d. Ensure that their confined space entry training is up to date.
- 5. Attendants
 - a. Position can be covered by the entry supervisor as needed.
 - b. Attendants are to maintain direct contact with authorized entrant and can not leave the entry point. **If the attendant needs to leave the entry site, the entry person must exit the confined space.**
 - c. Keep unauthorized persons from entering the permit space and notify the Entry Supervisor if an unauthorized person has entered or is interfering with the Attendant's duties.

E. SPECIFIC PROCEDURES

1. Minimum number of employees - A minimum of two employees will be immediately available during all permit-required confined space entries. It is recommended that a typical confined space team consist of an Entry Supervisor, an Attendant, and entry personnel. The Attendant position may be performed by the Entry Supervisor. Complicated confined spaces may require additional personnel and a rescue team (the Reading Fire Department) and equipment may also be required. This will be determined by the Maintenance Supervisor and the Safety Technician prior to scheduling a job.
2. Ventilation
 - a. Adequate ventilation will be provided to protect employees from dangerous working conditions resulting from accumulations of hazardous concentrations of flammable vapors, toxic gases, or an oxygen deficient or enriched environment in all buildings, pits, rooms, or other enclosed areas. Prior to the job start, a determination of what mechanical ventilation is available must be made.
 - b. Monitoring of confined space will be performed during the entire operation and all personnel will be notified of any changes that occur.
3. Pre-Entry Procedures
 - a. Lines which may convey flammable, injurious, or incapacitating substances into the space should, if possible, be disconnected, blinded, or blocked off by other positive means to prevent the development of dangerous air contamination and/or oxygen deficiency within the space. Consult the Alvernia University Lockout/Tagout policy guideline for specific information. The method used should prevent inadvertent re-connection or disabling of the line.

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- b. The confined space shall be emptied, flushed, or otherwise purged of flammable, injurious, or incapacitating substances to the extent feasible.
- c. If air contamination exists, spaces shall be ventilated for at least 30 minutes prior to entry using the most effective method (ie. blowing air into or drawing air from the space).
- d. Where interconnected spaces are blinded off as a unit, each space shall be tested and the results recorded, and the most hazardous condition so found shall govern the procedures to be followed.
- e. A Confined Space Entry Permit will be completed, signed, and dated by qualified and trained Alvernia University personnel and placed in the job file as part of the permanent record. No permit shall be valid for more than eight (8) hours after the time of issue by the supervisor.
- f. An attendant shall be continually present while workers are inside an enclosed or confined space. The attendant may operate the air monitoring equipment.
- g. To the feasible extent, all exits and entries shall be readily accessible.
- h. All tanks, vessels, or other confined spaces will be entered from the side whenever possible. Top entry spaces will use a tripod or other retrieval system for entry.
- i. Prior to entry, the attendant shall notify the City of Reading Fire & Rescue Services at (610) 655-6080 to inform them that Alvernia will be making a Permit-Required Confined Space entry. After the entry is complete and the permit revoked, the attendant shall notify the City of Reading Fire & Rescue Services to inform them that the Permit-Required Confined Space entry is complete.

F. PRE-ENTRY TESTING REQUIREMENTS

- 1. The air shall be tested with an appropriate device or method to determine whether dangerous air contamination and/or oxygen deficiency exists and a written record of such testing results shall be made and kept at the work site for the duration of the work.
- 2. Testing should be performed without disturbing the space, if possible.
- 3. Monitoring of confined space will be continuous while entry is being performed.
- 4. Employees shall refrain from leaning over entry point or breaking the plane of the confined space.

G. SPECIAL PRECAUTIONS

- 1. Work involving the use of flame, arc, spark, or other source of ignition is prohibited within a confined space)or any adjacent space having common walls, floor, or ceiling with the confined space) which contains, or is likely to develop, dangerous air contaminants due to flammable and/or explosive substances.
- 2. Whenever gases such as Nitrogen are used to provide an inert atmosphere for preventing the ignition of flammable gases or vapors, no flame, arc, spark, or other source of ignition shall be permitted unless the oxygen concentration is maintained at less than 20% of the concentration which will support combustion.
- 3. If the existence of dangerous air contamination and/or oxygen deficiency is determined by the tests performed, existing ventilation shall be supplemented by the appropriate means.
- 4. Whenever oxygen-consuming equipment is used, arrangements will be made to ensure sufficient venting for all combustion air and exhaust gases.

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5. Automatic fire suppression systems employing toxic or oxygen displacing gases or total foam flooding shall be deactivated. If it is not feasible to deactivate these systems, then the use of respiratory protective equipment shall be used during entry into and work within such spaces (SCBA or supplied air respirator with egress bottle only).

6. Only approved lighting and electrical equipment shall be used in confined spaces where dangerous air contamination due to flammable and/or explosive substances exists. For example, approved hand lights versus drop lights).

7. Where live electrical work will be performed, the tripod unit will be properly grounded (ie. welding cable and clamp).

8. If high noise activities are being performed (ie.lawn mowing), personnel will be required to wear appropriate hearing protection. Alternative communication will be set up with entry personnel (direct line of site with hand signals or use of a rope signal as form of communication. ie. 1 = stop/exit the space; 2 = backup; 3 = resume work).

H. OPERATING PROCEDURES

1. Permit Required Confined Spaces

a. Employees working in non-permit and permit-required confined spaces shall wear appropriate personal protective equipment appropriate for the hazards expected in the space.

b. Air testing shall be conducted continuously to monitor the pre-existing atmospheric environment and to detect any atmospheric changes that might occur. All testing data obtained shall be recorded on the confined space entry permit.

c. Monitoring equipment will be operated from the outside of the space and monitored by the attendant. If high noise area is present, an additional attendant may be assigned this task since the alarm may not be heard.

d. If air sampling instruments indicate a developing adverse atmospheric change (ie. steadily rising hydrogen sulfide or carbon monoxide levels, or steadily increasing or decreasing oxygen concentration), the supervisor will immediately pull or entrants from the confined space and reassess the area for its new hazard. Any time a limit is exceeded, no matter what the reason, all personnel shall immediately exit the space and no others shall enter until atmospheric conditions return to safe levels.

e. The Confined Space Entry Permit will be completed and signed prior to entry into the confined space and the Permit will be posted at the entrance to the permit space. The Entry Permit shall be valid for no more than eight (8) hours. Once the Entry Permit has expired, no one will be allowed into the permit space until another Confined Space Entry Permit is completed.

f. An approved safety harness with an attached line shall be used. The free end of the line will be monitored outside the entry opening. The line shall be at least a 900 kg test (2000 pound) and 11 mm in diameter. If two personnel are in the space, both workers shall wear approved safety harnesses and shall remain attached to the anchor point at all times.

g. Where air contaminants persist or begin to appear after ventilating a confined space, continuous air monitoring will be performed. Data will be entered on the Confined Space Entry Permit every 15 minutes by the Confined Space Supervisor.

h. Top opening – When entry must be made through a top opening, then the following requirement will apply:

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Each authorized entrant shall use a chest or full body harness, with a retrieval line attached at the center of the entrants back near shoulder level, above the entrants head or at a place which presents a small enough profile for the successful removal of the entrant. A space that has at least a five-foot vertical entrance must have a tripod / hoist and winch retrieval setup.

2. Non Permit Confined Spaces

- Employees working in non-permit and permit-required confined spaces shall wear appropriate personal protective equipment appropriate for the hazards expected in the space.
- Before entering a non-permit confined space, the employee should check to ensure that no hazards (ie. water, toxic air contaminants) are present in the confined space that could jeopardize the health and safety of the employee entering the space. If hazards that could jeopardize the health and safety of the employee are present, the employee should not enter the space and should follow the procedures for Permit-Required Confined Spaces as outlined in this section. The space will be considered a Permit-Required Confined Space for as long as the hazard exists.
- Prior to entering the tunnel under Francis Hall, it is recommended that the air testing be performed before entry to ensure that no toxic air contaminants or adverse atmospheric conditions exist. All testing data obtained shall be recorded and maintained by the Alvernia University Safety Technician. It is also recommended that the tunnel be ventilated with forced ventilation at least 30 minutes prior to entry. Because a harness and safety line would impede an entrant in the tunnel, the harness and safety line are not required to be worn during entry. However, all of the above precautions and procedures for Confined Spaces should be followed.

I. AFTER HOURS AND PRIORITY ENTRIES

- Under no circumstances is an employee to enter a permit required confined space without following the procedures outlined in this section.
- In the event that a permit required confined space must be entered after regular working hours, proper personnel will be contacted in a timely fashion. A confined space entry outside of normal operating hours may proceed if at least three trained confined space personnel are present and all of the procedures outlined in this document are followed.

J. EMERGENCY AND RESCUE PROCEDURES

- Should an employee become disabled while in a confined or enclosed space, the attendant shall immediately call the emergency number (911) to summon emergency personnel. It is important to communicate to the 911 dispatchers that a "confined space rescue" is necessary.
- Rescue attempts shall be made only by individuals who are trained in confined space rescue procedures and that have the necessary equipment to perform the rescue without endangering the safety of the would-be rescuer.

Under no circumstances is the Attendant to enter the confined space.

K. RESCUE RESPONDER TRAINING

The Reading Fire Department will act as confined space rescue if needed. The Reading Fire Department will be invited to perform confined space rescue training on campus at least once per year.

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L. EQUIPMENT AND MATERIALS

The following equipment and materials will be made available to employees and used when appropriate:

1. Air monitor for gas with or without PID (Gases are Oxygen, Hydrogen Sulfide, Carbon Monoxide, and Combustible Gas).
2. Eye and/or face protection
3. Head and/or foot protection
4. Hearing protection
5. Respiratory protection (ie. dust mask, respirator)
6. Harness and life lines
7. Forced air device (ie. fan) or other mechanical ventilation
8. Appropriate fire extinguishers
9. 2-way communication device (ie. a walkie-talkie that is intrinsically safe)
10. Chemical resistant protective clothing (full or partial body)
11. Lockout/Tagout devices

M. EMPLOYEE TRAINING

Unless otherwise specified, employees entering confined spaces (Authorized Entrants), Confined Space Entry Supervisors, and Attendants must have received all of the training outlined below at the specified time interval. Training as per 29 CFR 1910.146(g) shall be provided to each affected employee prior to assigned duties involving confined space operations.

1. First Aid / CPR certification. One attendant, on-site supervisor, or other facility individual must be present and trained in CPR whenever the use of respiratory protective equipment is required or when live electrical work is being performed.
Individuals certified in First Aid / CPR / AED:
 - a. Kevin Burns (Director of Science Laboratory Services & Safety) 610-796-2865
 - b. Kera Wierzbicki (Safety Technician) 610-796-8231
2. Confined Space Operating and Rescue Procedures
 - a. Duties of entrants, attendants, and entry supervisors
 - b. Physical and chemical hazards
 - c. Air monitoring
 - d. Operation of communication equipment
 - e. Initial training then annual refresher training

Retraining will be conducted for employees entering confined spaces (Authorized Entrants, Confined Space Entry Supervisors, and Attendants) whenever

1. There is a change in Confined Space permit operations
2. Employees appear to be deviating from required procedures.

N. RECORDKEEPING AND LABELING

1. A Confined Space Entry Permit will be completed, signed, and dated by qualified Alvernia University personnel. A copy of the Confined Space Entry Permit will be placed in the job folder and kept on file for a minimum of three years.
2. Prior to entry, each confined space shall be identified by location and potential known hazards that may be associated with the space. Permit Required Confined Spaces, when

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identified, shall be appropriately labeled “Danger – Confined Space – Keep Out – Authorized Personnel Only” and be assigned a unique identification number.

3. The Alvernia University Safety Technician will maintain records of all confined spaces. Additional information shall include location, description of area, anticipated hazards, and identification number.

O. OUTSIDE CONTRACTORS

Outside contractors who will conduct confined space entry activities at Alvernia University will receive contractor hazard communication training. As part of this training, Alvernia University shall:

1. Inform the contractor that the University contains permit spaces and entry is only allowed through compliance with OSHA regulations.
2. Inform the contractor of the specific hazards and any experience Alvernia University personnel have had with the confined space they are entering.
3. Inform the contractor of any precautions or procedures that Alvernia University has implemented for the protection of employees in or near permit-required spaces where the contractors are working.
4. Coordinate entry operations with the contractor when both the contractor and Alvernia University personnel will be working in or near permit spaces.
5. Retain a photocopy of the contractor’s completed permit for program review.
6. It is recommended, but not required, that Alvernia University authorized personnel who have Confined Space training should complete an Alvernia University Confined Space Entry permit even if Alvernia University personnel are not entering the permit space.

The contractor shall comply with OSHA Confined Space regulations 29 CFR 1910.146 and Alvernia University procedures and

1. Obtain information regarding permit space hazards and entry operations from the Alvernia University Maintenance Supervisor or Safety Technician.
2. Coordinate entry operations with both the Alvernia University Maintenance Supervisor when both Alvernia University personnel and contractor personnel will be working in or near permit spaces.
3. Provide both the Alvernia University Maintenance Supervisor and Safety Technician with a copy of the contractor’s Permit-Required Confined Space Procedures and Confined Space Entry Permit prior to entry. Their program must be approved by Alvernia University safety and supervisor personnel prior to entry.
4. Must advise both the Alvernia University Maintenance Supervisor and Safety Technician of all hazards that may be introduced into a permit-required space (ie. patching and cleaning chemicals, welding and burning, thermal).
5. Will provide a copy of the Material Safety Data Sheet (MSDS) for any hazardous material that the contractor brings into a confined space. The MSDS must be included with the completed Confined Space Entry Permit.

P. ALVERNIA UNIVERSITY CONFINED SPACES

1. Non-Permit Confined Spaces

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- * These spaces would be considered Non-Permit Required Spaces as long as the employee's feet remain on the ground outside of the unit to perform work. Proper safety precautions (ie. Lockout-Tagout, Personal Protective Equipment) must still be taken before any work is performed.
- If the employee must physically enter the unit to perform work (the employee's feet leave the surface of the roof or will be inside the unit), the space will be considered a Permit-Required Confined Space and all of the above procedures as set forth in this plan shall be followed with the exception of the harness, life line, and tripod requirement. Due to the configuration of the air handlers, a harness and life line would be a hindrance and could possibly cause greater harm to the employee.
- The "penthouse" unit on the roof of the [REDACTED] would be considered a Non-Permit Required Confined Space. However, because communication via Nextel phone is poor/sporadic and emergency egress may be hindered due to the access ladder and roof hatch, two employees will be required whenever work is to be performed in this area. Permit-Required Confined Space procedures do not apply; however, all proper personal protective equipment shall be worn and all other proper safety procedures (ie. Lockout-Tagout) shall be followed. The feasibility of installing a telephone land line in order to improve communication in case of emergency will be researched.

2. Permit-Required Confined Spaces

This space intentionally left blank. See Alvernia University Safety Technician.

Potential hazards: Oxygen deficiency; Water Engulfment

ALVERNIA UNIVERSITY				
OSHA REGULATION: 29 CFR 1910.146 PERMIT-REQUIRED CONFINED SPACE				
SECTION: 600	NUMBER: 1	REVISION: 4	EFFECTIVE DATE: 4/16/2008	REVISION DATE: 12/2/2008

This space intentionally left blank. See Alvernia University Safety Technician.

Potential hazards: Electrical; Frostbite (contact with chiller coils); Asphyxiation (Freon exposure if coils or tubing leak)
A campus map showing the locations of the Permit-Required Confined Spaces is attached (See Section 600 Number 4).

Q. ALVERNIA UNIVERSITY PERMIT-REQUIRED CONFINED SPACE ENTRY PERMIT

See attached Section 600 Number 2.

R. REFERENCES

Code of Federal Regulations, Title 29, Part 1910.146 Permit-Required Confined Spaces.

ALVERNIA UNIVERSITY				
OSHA REGULATION: 29 CFR 1910.146 PERMIT-REQUIRED CONFINED SPACE				
SECTION: 600	NUMBER: 2	REVISION: 5	EFFECTIVE DATE: 4/16/2008	REVISION DATE: 3/27/2009

A. ALVERNIA UNIVERSITY CONFINED SPACES

1. Non-Permit Confined Spaces

This space intentionally left blank. See Alvernia University Safety Technician.

- * These spaces would be considered Non-Permit Required Spaces as long as the employee's feet remain on the ground outside of the unit to perform work. Proper safety precautions (ie. Lockout-Tagout, Personal Protective Equipment) must still be taken before any work is performed.
- If the employee must physically enter the unit to perform work (the employee's feet leave the surface of the roof or will be inside the unit), the space will be considered a Permit-Required Confined Space and all of the above procedures as set forth in this plan shall be followed with the exception of the harness, life line, and tripod requirement. Due to the configuration of the air handlers, a harness and life line would be a hindrance and could possibly cause greater harm to the employee.
- The "penthouse" unit on the roof of the [REDACTED] would be considered a Non-Permit Required Confined Space. However, because communication via Nextel phone is poor/sporadic and emergency egress may be hindered due to the access ladder and roof hatch, two employees will be required whenever work is to be performed in this area. Permit-Required Confined Space procedures do not apply; however, all proper personal protective equipment shall be worn and all other proper safety procedures (ie. Lockout-Tagout) shall be followed. The feasibility of installing a telephone land line in order to improve communication in case of emergency will be researched.

2. Permit-Required Confined Spaces

This space intentionally left blank. See Alvernia University Safety Technician.

ALVERNIA COLLEGE				
OSHA REGULATION: 29 CFR 1910.146 PERMIT-REQUIRED CONFINED SPACE				
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** This pit is not owned by Alvernia University. However, if Alvernia University employees should need to enter this pit for any reason, all of the procedures specified in this Plan must be followed.

Potential hazards: Oxygen deficiency; Water Engulfment

This space intentionally left blank. See Alvernia University Safety Technician.

Potential hazards: Electrical; Frostbite (contact with chiller coils); Asphyxiation (Freon exposure if coils or tubing leak)

A campus map showing the locations of the Permit-Required Confined Spaces is attached.

This page removed. See the Alvernia University Safety Technician.

ALVERNIA UNIVERSITY				
OSHA REGULATION: 29 CFR 1910.146 PERMIT-REQUIRED CONFINED SPACE				
SECTION: 600	NUMBER: 3	REVISION: 3	EFFECTIVE DATE: 4/16/2008	REVISION DATE: 12/3/2008

A. ALVERNIA UNIVERSITY PERMIT-REQUIRED CONFINED SPACE ENTRY PERMIT

See attached.

Alvernia University

Confined Space Entry Permit

This form is to be completed by the Confined Space Entry Supervisor on site prior to starting work.

This form is to remain at the Point of Entry for the duration of entry being performed.

This permit is valid for one entry team during a single entry. Maximum duration of the permit will be eight (8) hours. All copies of this permit will remain at the job site until work has been completed. The report will then be filed with the job file and become part of the permanent record for the project.

All personnel on site are required to attend briefing and sign completed form prior to entry.

Identification / Tracking Information

Job Number / Work Order Number					
Date / Time					
Location of work (be specific)					
Specific location of confined space					
Type of confined space					
Contaminants involved					
Reason for entry					
Initial atmospheric check (before ventilation)	O ₂ ____	LEL ____	CO ____	H ₂ S ____	PID ____

Personnel Assignments

Position	Training Level	Printed Name	Signature
Incident Commander			
Entry Supervisor			
Safety			
Authorized Entrant 1			
Authorized Entrant 2			
Backup Entrant 1			
Backup Entrant 2			
Attendant			
Support 1			
Support 2			
Support 3			

Complete all information (Required)

What type of communication equipment will be utilized to maintain contact with entrants?

___ Radio ___ Phone ___ Visual contact ___ Signal system ___ Other

If Other, describe: _____

What type of communication equipment is available to contact outside emergency services?

___ Radio ___ Phone ___ Cell phone

Is respiratory protection required for the job? ___ Yes ___ No

Determining factors: _____

Supervisor / Safety signature: _____

Type of Respiratory Protection used by Authorized Entrant:

___ APR ___ Line Mask ___ SCBA ___ Other _____

Type of Respiratory Protection used by Backup / Standby crew:

___ Line Mask ___ SCBA ___ Other _____

What are the rescue procedures (if needed): _____

Personal Protective Equipment required for this job

Coveralls	Work gloves	Goggles
Tyvek	Chemical glove	Face shield
QC	Type:	Hard hat
Chemical suit	Steel toe boots	Hearing protection
Chemical overboots	Boots	Other:

Potential hazards present:

___ Electrical ___ Pneumatic ___ Thermal ___ Hydraulic ___ Chemical ___ Mechanical

Meter readings:

Initial ___ LEL ___ H₂S ___ O₂ Low ___ O₂ High ___ CO ___ Other _____

Ventilated ___ LEL ___ H₂S ___ O₂ Low ___ O₂ High ___ CO ___ Other _____

Lockout / Tagout controlled by: _____ (printed name)

_____ (signature)

How are these hazards controlled or eliminated: _____

Chemical Hazards if present

Chemical Name	MSDS	PEL	Other Information

Chemical hazards reviewed by: _____ (Initials)

☐ Area is secured (barrier tape, caution signs, etc)	☐ Initials
☐ Atmosphere monitoring in place	☐ Initials
☐ Lockout / Tagout completed	☐ Initials
☐ Tripod and winch	☐ Initials
☐ Full body harness / lifelines	☐ Initials
☐ Health & Safety Plan / Emergency Action Plan established	☐ Initials
☐ Safety equipment in place and operational	☐ Initials
☐ Confined space is ventilated	☐ Initials
☐ Required PPE available and in use	☐ Initials
☐ Safety briefing conducted	☐ Initials
☐ Checklist completed	☐ Initials

I have reviewed the work authorized by this permit and the information contained herein. Written instructions and safety procedures have been received and are understood. Entry cannot be approved if any required information is not present or has a negative response. This permit is not valid unless all appropriate items are completed.

Permit prepared by: _____

Safety reviewed by: _____

Atmospheric Testing Record

Meter: _____

Last calibrated: _____

Bump checked: _____

Monitoring Attendant: _____

If meter is equipped with a data log, initial documentation and periodic recordings need to be recorded on paperwork; if no data log, then recordings every 30 seconds to 1 minute need to be documented.

Oxygen between 19.5% and 23.5 %

LEL less than 10%

Time	Oxygen	LEL	H ₂ S	CO	SO ₂	PID	Initials

Additional forms may be attached for additional readings

Permit revoked by: _____

Reason: _____

Date / Time: _____

Atmmospheric Testing Record continued

[illegible]

This image shows a full page of blank white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page, typical of notebook or legal stationery. There are no margins, text, or other markings present.

ALVERNIA UNIVERSITY

OSHA REGULATION: 29 CFR 1910.146 PERMIT-REQUIRED CONFINED SPACE

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PROCEDURE FOR USING THE DURAHOIST AND WINCH SYSTEM

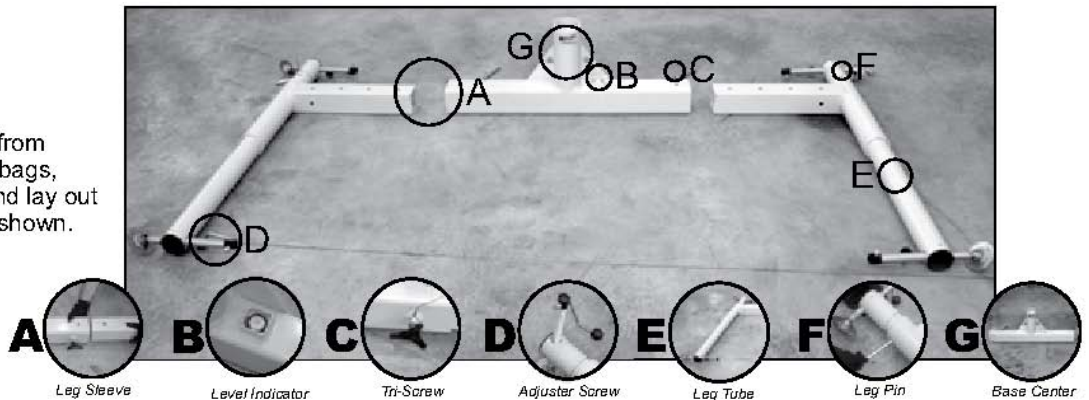
Before each use, make sure to inspect all structural parts for damage: dents, cracks, weld bends, or crushed tubes. Minor cosmetic damage such as chipped paint will not affect the structural integrity of the system but any seriously damaged parts must be repaired or replaced before use. Check all hardware: pins, tri-screws, adjusters screws, nuts, bolts, pulleys, rollers, and winch brackets for damaged threads, bends, damaged or missing fasteners, or loose fasteners. Check all pulleys and rollers for chips, grooves, and excessive wear. Ensure that all pulleys and rollers turn freely. Inspect the winch and cable.

A. ASSEMBLY OF THE BASE, HOIST AND WINCH



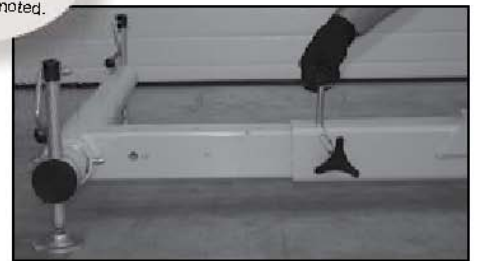
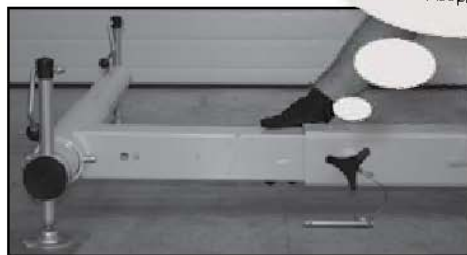
Assembling the DH-4 Base (Also applies with DH-1 and DH-2 systems)

- 1** Remove all parts from storage/transport bags, containers, etc. and lay out on the ground as shown.



- 2** Insert leg sleeve into base center section. Overall width of base may be adjusted by selecting different hole sets in the leg sleeve and installing the pins.

WARNING
Leg assemblies must be in operating position at all times when using the system. Except as noted.



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dimensions.

- Remove leg pins and rotate leg tubes in leg sleeve from transport position to operating position.



WARNING

Base must be pinned into position through hole sets in both the center section and the leg sleeve at all times when using the hoist. Except as noted.

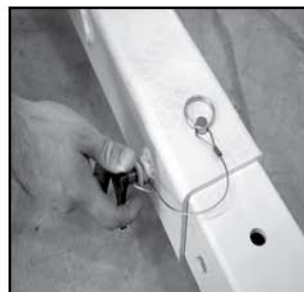


HINT:

Base sections must be assembled with Miller logo right side up to ensure proper fit.

(Can also be used in transport position for certain applications where clearance of manhole ring does not allow for normal operating position. Mounting surface must be flat enough for all (4) adjuster screws to contact ground while level - see step 5.)

- Tighten tri-screws after width adjustment to remove play from base.



- Move base into position over opening. Adjust height and level using adjuster screws and level indicator.

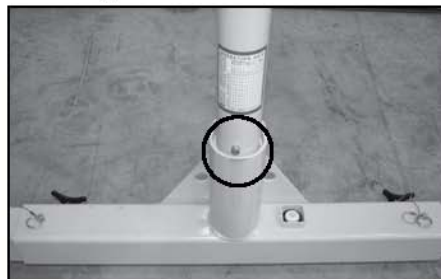


WARNING
Base must be level at all times.

- Insert mast into base sleeve, as shown.



- Make sure the stop dog faces the front of the sleeve and that the mast rotates freely throughout its range of rotation.



- The mast may be secured into position by tightening the tri-screw located at the back of the sleeve.



WARNING
Do not over tighten as this may interfere with mast rotation in a rescue situation.

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Assembling The DH-3 Mast (Also applies with DH-1 and DH-2 systems)

Before using the mast, make sure your mast offset is compatible with base/mounting option you intend to use. See the notes below for details.

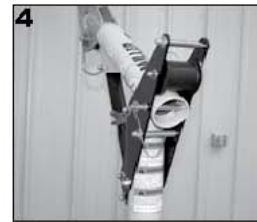
1 Start by applying mast to assembled base.



2 Move mast arm in an upward fashion towards open section above post.



3 Secure by inserting pin through hole sets.



Note: depending on the type and position of the confined space opening being entered, the mast offset (the angle and length of the mast) can be adjusted. To avoid tipping the base when swinging the mast from side to side (when raising or lowering a worker into a confined space), the base must also be adjusted per the instructions below. **The mast offset must match the base offset.**

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Mast Adjustment

The circumstances in which you are working will establish what offset you need to use. Once you determine what offset you will apply to your mast, refer to the next page and match the mast offset to your base to ensure a safe and steadily working system.



You may attain the maximum offset by fully collapsing (no visible threads) the adjustable gusset.

To reach the minimum offset, you must fully extend the adjustable gusset.



Pin Position 1

Top Pulley Offset
Maximum 19.00" (482mm)
Minimum 13.25" (337mm)

Bottom Pulley Offset
Maximum 16.50" (419mm)
Minimum 12.00" (305mm)

U-Bracket Maximum Anchor Load 5000lbs (22.2kN)

Pin Position 2

Top Pulley Offset
Maximum 21.50" (546mm)
Minimum 15.25" (387mm)

Bottom Pulley Offset
Maximum 18.75" (476mm)
Minimum 14.50" (368mm)

U-Bracket Maximum Anchor Load 5000lbs (22.2kN)



The pulley offset is the space between the hanging cable and the mast.

Pin Position 3

Top Pulley Offset
Maximum 25.00" (635mm)
Minimum 18.00" (457mm)

Bottom Pulley Offset
Maximum 22.50" (571mm)
Minimum 17.50" (445mm)

U-Bracket Maximum Anchor Load 3600lbs (16kN)

Pin Position 4

Top Pulley Offset
Maximum 29.00" (737mm)
Minimum 21.00" (533mm)

Bottom Pulley Offset
Maximum 26.00" (660mm)
Minimum 20.00" (508mm)

U-Bracket Maximum Anchor Load 3000lbs (13.3kN)

(All pictures are shown with a maximum offset)

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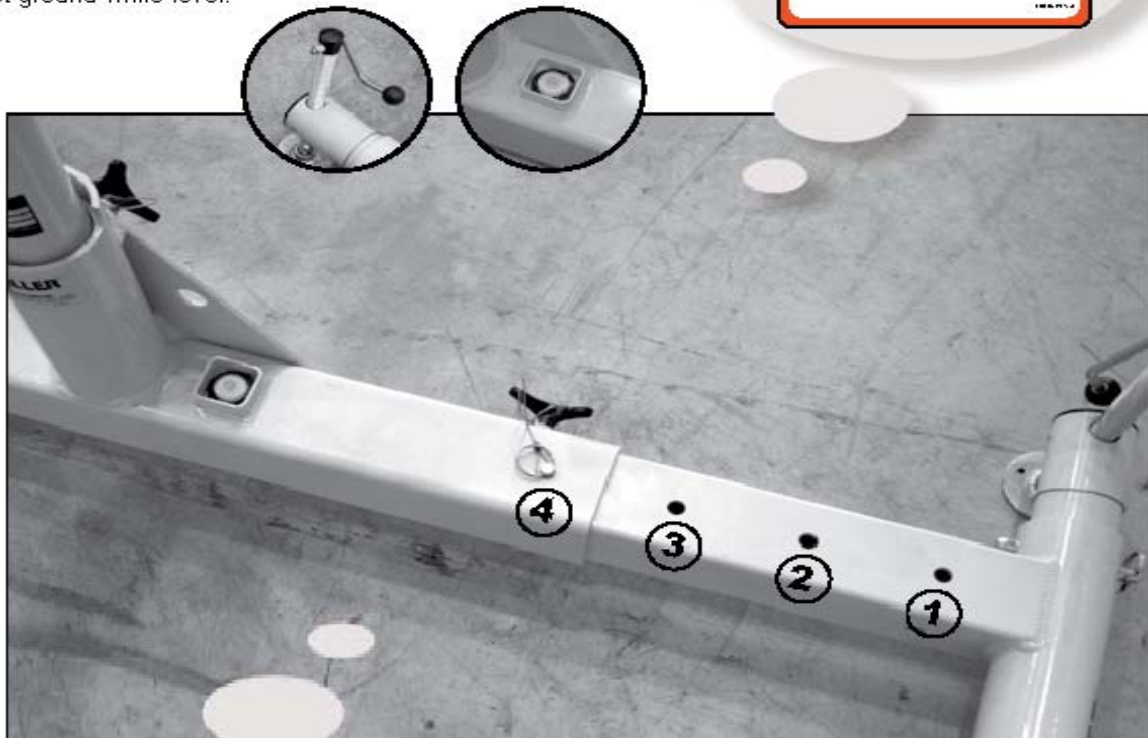
EFFECTIVE DATE: 7/18/2008

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Base Adjustment

- 1** Determine the maximum desired operating offset of the mast using the previous page.
- 2** Adjust the base offset and match it to that of the mast. (i.e. Pin Position 1 on your base must use pin position 1 on your mast. Refer to chart below for further details.)
- 3** Level the base using the adjuster screws and by centering the bubble in the level indicator.

Note: Mounting surface must be flat enough for all (4) adjuster screws to contact ground while level.



! WARNING

To avoid tipping the base when swinging the mast from side to side, follow these instructions carefully!

Base Pin Position	Allowable Mast Offset Pin Position
1	1
2	2 & 1
3	3, 2 & 1
4	4, 3, 2 & 1

(Base offset currently shown with pin in position 4)



When not sure of your offset, use base position 4 on base setup.

8.1 Assembly Of Winch Brackets

8.1.1 Assembly of DH-19 & DH-AB-Miller (DH-19-Miller)



1 Assemble both bolts through DH-19 spacer.

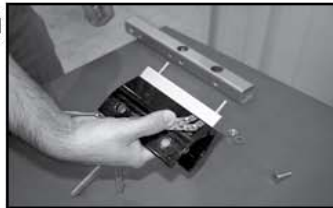
2 Assemble long portion of adapter bracket on top of spacer.

3 Assemble washer and nuts to both bolts.

4 Tighten nuts using a 9/16" socket and 7/32" hex wrench to a snug fit (approx. 20 ft-lbs.).

5 To ensure proper fit of bracket to winch/SRL, attach winch/SRL to bracket prior to use for verification of fit and make sure adaptor bracket and DH-19 are aligned parallel.

1



2



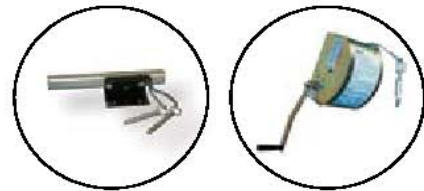
3



4



8.2.2 Mounting the DH-19-MILLER to the ManHandler



1 Align the DH-19-MILLER (illustrated hole set) with ManHandler.

Note: The illustrated hole set on the DH-19-MILLER is the only set that will fit the ManHandler.

2 Insert pins into both hole sets, as shown.

2a



2b

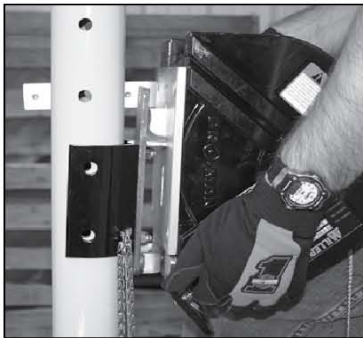


8.3 Mounting Winches/SRL's with Retrieval to DH-1, DH-2 and DH-3 Mast

8.3.1 Mounting Locations

8.3.1.1 Single Applications

- 1** Align the DH-19 with any allowable hole set of your choice (see chart).



- 2** Secure winch/SRL with retrieval by inserting pins through both hole sets.



Winch/Mounting
Bracket

ManHandler
&
DH-19-MILLER

Mounting
Location

Back 1-7 Front 2-7

Note: Manhandler = winch
DH-19 = mounting bracket

Position 1
Position 2
Position 3
Position 4
Position 5
Position 6
Position 7

SRL with retrieval = Self-retracting lifeline with rescue

Note: the ManHandler is not a SRL

Front Side — — Back Side

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Since the winch can be mounted either on the front or the back sides, below are instructions for running the winch cable from both the front and the back sides.

8.3.2 Cable Routing

8.3.2.1 Front Mounted Units

1 Insert cable through the bottom of the mast head.

①



2 Pull cable through to the top of the mast head.

②



3 Insert cable into opening above bottom pulley.

③



4 Pull cable over bottom pulley.

④

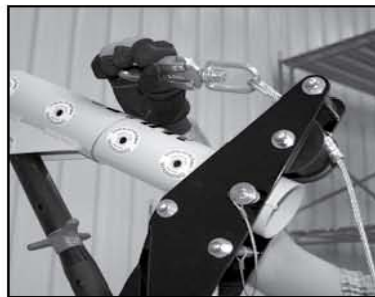
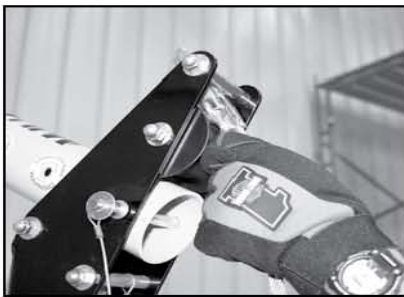


8.3.2.2 Back Mounted Units

1 Insert cable through opening; over pulley and under metal bar, at the back end of the mast.

2 Pull cable through opening, stringing along mast arm.

3 Remove pin on mast head.



4 Pull cable over pulley.

5 Reinsert pin.



⚠ WARNING
After cable routing is complete, ensure proper operation of all equipment.

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B. WARNINGS AND PRECAUTIONS

1. The maximum load limit for the Manhandler winch is 350 pounds. The maximum load limit for the hoist (base and mast) components is 450 pounds.
2. Do not use the hoist or winch units if any part appears to be damaged.
3. Do not lubricate any part of the winch.
4. Do not allow the cable to become slack or to pass under or entwine around the user's arms, legs or any other obstacle.
5. The maximum cable length on the Manhandler winch system is 50 feet.
6. Do not try to service the Manhandler winch system. If the unit is damaged and requires repair, please contact the Safety Technician to arrange servicing of the unit.
7. Avoid electrical hazards due to the possibility of current flowing through the wire rope cable.
8. The hoist, mast and winch system is designed for worker fall protection and confined space entry. Do not use the system to tow, lift, carry or move equipment or objects.
9. Always use proper Personal Protective Equipment (PPE) when entering a Permit-Required Confined Space. This includes a fall-protection harness and/or lanyard, safety glasses, safety shoes, gloves, and respiratory protection (if required). Air monitoring using the Multi-gas detector must be performed prior to entry.
10. Refer to the Alvernia College Permit-Required Confined Space program before entering any Permit-Required Confined Space.

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PROCEDURE FOR USING THE MSA SOLARIS MULTIGAS DETECTOR

A. GENERAL INFORMATION

The Solaris Multigas Detector is designed to detect gases and vapors in air only. Do not immerse it in water or other liquids.

It will only detect gases for which there is a sensor installed. The sensors currently installed on the model that Alvernia is using are: Flammable Gases, Oxygen, Hydrogen Sulfide, and Carbon Monoxide.

Perform a calibration check before each day's use.

Allow sufficient time for the unit to display the reading. It usually takes about 10-20 seconds for the monitor to display most recent reading.

The detector is kept in the Safety Technician's office. Please return it when finished.

If the detector needs repair or maintenance, please inform the Safety Technician.

B. USING THE SOLARIS MULTIGAS DETECTOR

Turning ON the Solaris Multigas Detector

Press the Power ON button; the instrument displays:

1. A self-test:
 - All segments display
 - Audible alarm sounds
 - Alarm light illuminate
 - Vibrator activates
 - Software version displays
 - Internal diagnostics
 - **"VISUAL OFF"** displays if red LEDs disabled
 - **"BACKLITE OFF"** displays if backlight disabled
 - **"AUDIBLE OFF"** displays if buzzer disabled
 - **"VIBRATE OFF"** displays if vibrator disabled.
2. Alarm setpoints:
 - Low
 - High
 - STEL (if activated)
 - TWA (if activated)
3. Calibration gas (expected calibration gas values)
4. Time and date (if data logging option installed)
5. Last CAL date (if data logging option installed)
6. CAL due date (if activated and if data logging option installed)
7. Instrument warm-up period
8. Fresh Air Setup option.

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Fresh Air Set Up Option

(for automatic zero adjustment of the Solaris Multigas Detector sensors)

NOTE: The Fresh Air Setup (FAS) has limits. If a hazardous level of gas is present, the Solaris Multigas Detector ignores the FAS command and goes into alarm.

WARNING

Do not activate the Fresh Air Setup unless you are certain you are in fresh, uncontaminated air; otherwise, inaccurate readings can occur which can falsely indicate that a hazardous atmosphere is safe. If you have any doubts as to the quality of the surrounding air, do not use the Fresh Air Setup feature. Do not use the Fresh Air Setup as a substitute for daily calibration checks. The calibration check is required to verify span accuracy. Failure to follow this warning can result in serious personal injury or death.

Persons responsible for the use of the Solaris Multigas Detector must determine whether or not the Fresh Air Setup option should be used. The user's abilities, training and normal work practices must be considered when making this decision.

1. Turn ON the Solaris Multigas Detector.
 - Once the instrument self check is complete, **ZERO?** flashes for 10 seconds.
2. To perform a Fresh Air Setup, push the ON/OFF button while **ZERO?** is flashing.
3. To immediately skip the FAS, push the  RESET button.
 - If no buttons are pushed, the **ZERO?** automatically stops flashing after the 10 seconds have expired and the FAS is not performed

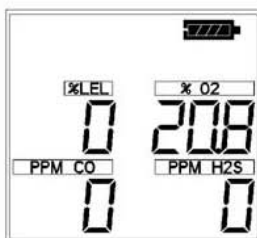


Figure 2-1. Battery Indicator

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Calibration Check

The calibration check is simple and should only take about one minute. Perform this calibration check before each day's use.

1. Turn ON the Solaris Multigas Detector in clean, fresh air.
2. Verify that readings indicate no gas is present.
3. Attach calibration cap to the Solaris Multigas Detector.
4. Ensure that "TOP" and "□" on the calibration cap are oriented so that "TOP" is positioned at the top of the instrument.
5. Attach regulator (supplied with calibration kit) to the cylinder.
6. Connect tubing (supplied with calibration kit) to the regulator.
7. Attach other end of tubing to the calibration cap.
8. Open the valve on the regulator.
 - The regulator flow rate is 0.25 lpm.
 - The reading on the Solaris Multigas Detector display should be within the limits stated on the calibration cylinder or limits determined by your company.
 - If necessary, change cylinder to introduce other calibration gases.
 - If readings are not within these limits, the Solaris Multigas Detector requires recalibration. See Chapter 4, "Calibration."

Measuring Gas Concentrations

Combustible Gases (% LEL) (FIGURE 2-2)

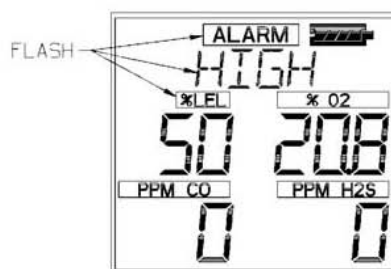


Figure 2-2. Instrument in LEL Alarm

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The Solaris Multigas Detector can be equipped to detect combustible gases in the atmosphere.

- Alarms sound when concentrations reach:
 - Alarm Setpoint or
 - 100% LEL (Lower Explosive Limit), 5% CH₄.
- When the combustible gas indication reaches the Alarm Setpoint:
 - Alarm sounds
 - Alarm lights flash
 - % LEL or CH₄ flag above the concentration flashes.
- To silence the alarm, press the RESET button.

NOTE: The alarm will stay silent if the alarm condition has cleared.

- When the combustible gas indication reaches 100% LEL or 5% CH₄, the LockAlarm™ circuit locks the combustible gas reading and alarm and:
 - Alarm sounds
 - Alarm lights flash
 - 100 or 5.00 appears on the display and flashes.
- This alarm cannot be reset with the RESET button.

⚠ WARNING

If the 100% LEL or 5.00% CH₄ alarm condition is reached, you may be in a life-threatening situation; there is enough gas in the atmosphere for an explosion to occur. In addition, any rapid up-scale reading followed by a declining or erratic reading can also be an indication that there is enough gas for an explosion. If either of these indications occur, leave and move away from the contaminated area immediately. Failure to follow this warning can result in serious personal injury or death.

- After moving to a safe, fresh-air environment, reset the alarm by turning OFF the instrument and turning it ON again.

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Oxygen Measurements (% O₂) (FIGURE 2-3)

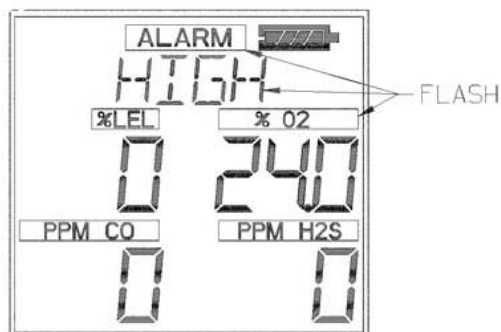


Figure 2-3. Instrument in Oxygen Alarm

The Solaris Multigas Detector can be equipped to detect the amount of oxygen in the atmosphere.

- Two conditions trigger the alarm:
 - Too little oxygen (deficient)
 - Too much oxygen (enriched).
- When the alarm setpoint is reached for either of the above:
 - Alarm sounds
 - Alarm lights flash
 - % O₂ flag above the concentration flashes.

⚠ WARNING

If the Oxygen alarm condition is reached while using the instrument as a personal or area monitor, leave the area immediately; the ambient condition has reached a preset alarm level. If using the instrument as an inspection device, do not enter the area without proper protection. Failure to follow this warning will cause exposure to a hazardous environment which can result in serious personal injury or death.

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Toxic Gas Measurements (FIGURE 2-4)

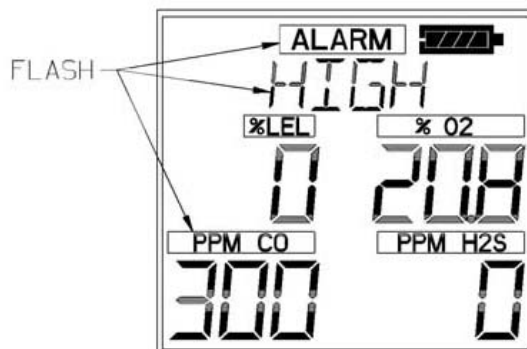


Figure 2-4. Instrument in Toxic Gas Alarm

- The Solaris Multigas Detector can be equipped to detect:
 - Carbon Monoxide (CO) and/or
 - Hydrogen Sulfide (H₂S) in the atmosphere.
- When the alarm setpoint is reached for Carbon Monoxide (CO) and/or Hydrogen Sulfide (H₂S):
 - Alarm Sounds
 - Alarm Lights flash
 - PPM CO or PPM H₂S flag above the concentration flashes.

⚠ WARNING

If the Toxic Gas alarm condition is reached while using the instrument as a personal or area monitor, leave the area immediately; the ambient condition has reached a preset alarm level. If using the instrument as an inspection device, do not enter the area without proper protection. Failure to follow this warning will cause over-exposure to toxic gases, which can result in serious personal injury or death.

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Safe LED

The Solaris Multigas Detector is equipped with a green "SAFE LED". This green SAFE LED will flash every 15 seconds under the following conditions:

- The green SAFE LED is enabled
- Instrument is on the normal Measure Gases page
- Combustible reading is 0% LEL or 0%CH₄
- Oxygen (O₂) reading is 20.8%
- Carbon Monoxide (CO) reading is 0 ppm
- Hydrogen Sulfide (H₂S) reading is 0 ppm
- No gas alarms are present (low or high)
- Instrument is not in Low Battery warning or alarm
- CO, H₂S, STEL and TWA readings are 0 ppm.

Operating Beep

The Solaris Multigas Detector is equipped with an operating beep. This operating beep activates every 30 seconds by momentarily beeping the horn and flashing the alarm LEDs under the following conditions:

- Operating beep is enabled
- Instrument is on normal Measure Gases page
- Instrument is not in Battery warning
- Instrument is not in Gas alarm
- Audible and visual options enabled.

Turning OFF the Solaris Multigas Detector

Push and Hold the ON-OFF button for three seconds.

NOTE: Releasing the ON-OFF button before the three seconds elapse returns the instrument to the Measure page.

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B. CHARGING THE BATTERY

Battery Charging (Lithium Ion Battery version only)

Charge the battery by using the Charger supplied with the instrument.

⚠ CAUTION

Use of any charger, other than the Charger supplied with the instrument, may damage or improperly charge the batteries.

- The charger is capable of charging a completely depleted pack in less than four hours in normal, room-temperature environments.

NOTE: Allow very hot or cold instruments to stabilize for one hour at room temperature before attempting to charge.

- Minimum and maximum ambient temperature to charge the instrument is 10°C, 50°F and 35°C, 95°F, respectively.
- For best results, charge the instrument at room temperature (23°C)

To Charge the Instrument

- Carefully place instrument into the charge stand.
- Charger status is indicated by the LED.
 - **Green:** Charging complete
 - **Red:** Charging in process
 - **Yellow:** Failure Mode; remove from charger.
- "CHARGE" flashes on the Solaris display when the unit is installed on the charge stand
 - This is not an indication that the charge is complete

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C. CALIBRATING THE SOLARIS MULTIGAS DETECTOR

Calibrating the Solaris Multigas Detector

Each Solaris Multigas Detector is equipped with an Autocalibration feature to make unit calibration as easy as possible.

The Autocalibration sequence resets instrument zeroes and adjusts sensor calibration for known concentrations of calibration gases.

Table 4-1. Autocalibration and Required Calibration Cylinders

SENSORS	EXPECTED GAS* CONCENTRATION	FOUR-GAS CYLINDER (P/N 10045035)
Combustible	58% LEL	●
Oxygen	15%	●
Carbon Monoxide	60 ppm	●
Hydrogen Sulfide	20 ppm	●

To Calibrate the Solaris Multigas Detector (FIGURE 4-1):

1. Turn ON the instrument and verify that battery is sufficiently charged.
2. Wait until the Measure Gases page appears.
3. Push and hold the RESET button until **CAL ZERO?** flashes on the display (FIGURE 4-2).
4. Push the ON-OFF button to zero the instrument.
 - Instrument must be in fresh air to perform the zero.
 - **CAL ZERO** flashes.

NOTE: To skip the Zero procedure and move directly to the calibration span procedure, push the RESET button. If no button is pushed for 30 seconds, the instrument returns to the Measure mode.

- Once the zeros are set, **CAL SPAN?** flashes (FIGURE 4-3).

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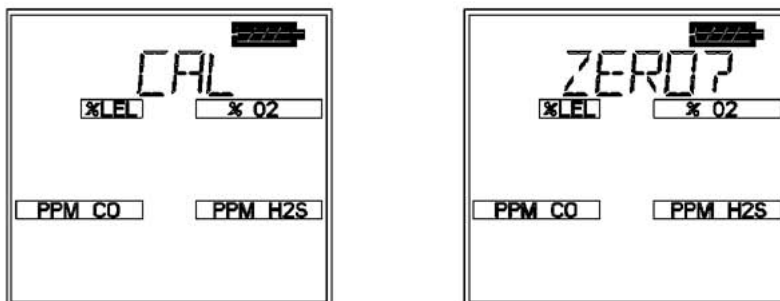


Figure 4-2. Zero Flag

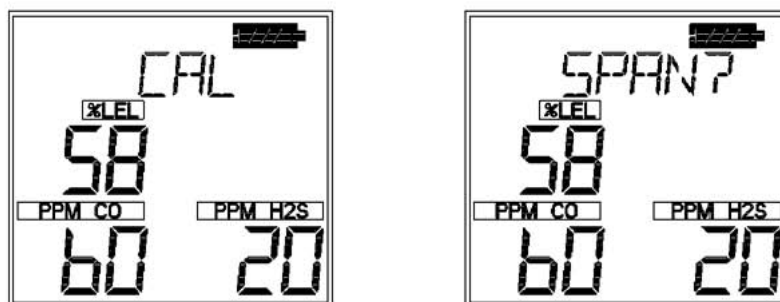


Figure 4-3. CAL Flag

4. Connect the appropriate calibration gas to the instrument.
5. Attach the calibration cap to the instrument.
 - a. Connect one end of the tubing to the calibration cap.
 - b. Connect other end of tubing to the cylinder regulator (supplied in the calibration kit).
 - c. Ensure that "TOP" and "☐" on the calibration cap are oriented so that "TOP" is positioned at the top of the instrument.
6. Open the valve on the regulator.
7. Push the ON-OFF button to calibrate (span) the instrument.
 - **CAL SPAN** flashes for approximately 90 seconds.
 - If autocalibration sequence passes, the instrument beeps three times and returns to the Measure mode.

NOTE: To skip calibration and return to the Measure mode,

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push the RESET button. If no button is pushed for 30 seconds, the instrument returns to the Measure mode.

8. Remove the calibration cap.
9. Close the valve on the regulator.

NOTE: The autocalibration procedure adjusts the span value for any sensor that passes the test; sensors that fail autocalibration are left unchanged.

Since residual gas may be present, the instrument may briefly go into an exposure alarm after the calibration sequence is completed.

Autocalibration Failure

If the Solaris Multigas Detector cannot calibrate one or more sensor(s), the instrument goes into the Autocalibration Failure Page and remains in alarm until the RESET button is pushed. Sensors that could not be calibrated are indicated by dashed lines on the concentration display.

D. SOLARIS MULTIGAS DETECTOR QUICK START GUIDE

MSA SOLARIS™ Quick Reference Card

Turn On

- Press the ON/OFF button

Warm-up

- Low, High, STEL, TWA Alarm Setpoints & Calibration Gas Values are each displayed for 5 seconds
- Current Time, Date, & Last Calibration Date are each displayed for 5 seconds (If Installed)
- "PLEASE", "WAIT" Countdown Timer is displayed and instrument counts down to zero.

Fresh Air Setup (FAS)

- To Perform a Fresh Air Setup Press the ON/OFF button while "ZERO?" is flashing on display.
- Press the RESET button or wait 10 seconds to skip FAS

Pages (Repeatedly press the PAGE button to scroll through the available pages)

- Measurement (default)
- Peak
- 02 MIN
- STEL (If Enabled)
- TWA (If Enabled)
- Current Time (If Installed)
- Current Date (If Installed)

To Return to the Measure Gases Page

- Wait 30 Seconds or
- Momentarily press the ON/OFF button or
- Continue to press the PAGE button

Reset Alarms

- Press the RESET button **NOTE:** Values can only be reset while on the page showing the alarm condition

Turn Off

- Press the ON/OFF Button for 3 seconds, Solaris will beep each second then display "OFF"

Calibration Check

- Perform a calibration check before each day use or more frequently if poisoning contaminants may be present.

Calibration

- Ensure fresh air is available to zero the instrument.
- While on Measure Gases Page, press the RESET button for 3 seconds.
- Press the ON/OFF button while "CAL", "ZERO?" is flashing on display.
- Upon a successful calibration zero the instrument will beep 3x and user to perform a "CAL SPAN?"
- Apply the correct calibration gas.
- Press the ON/OFF button while "CAL", "SPAN?" is flashing on display.

⚠ WARNING

This instruction card provides only a brief description of the operating instructions for the SOLARIS Multigas Detector Alarm. The user of this instrument must be fully aware of the limitations and instructions supplied in the operating instruction manual. Failure to follow the instructions may lead to serious personal injury or death.