

DuPage County Environmental, Safety, Health & Property Loss Control Program

DPC Confined Space Entry Policy for Non-Weatherization Staff

1.0 Purpose:

The purpose of this policy is to provide DuPage County Public Works, DOT, Facilities Management, employees and our responsibility to contractors with information concerning the hazards and requirements for the safe vertical entry into confined spaces that may be encountered during their work. When contractors are used for work within a Confined Space we are considered the *Host Employer*. Thus we are responsible to provide the contractor information we have regarding the Confined Space. (Also see Confined Space Excavation/Trenching policy).

2.0 Policy:

Note: All confined spaces shall be considered permit-required confined spaces until the pre-entry procedure in this policy demonstrates otherwise.

The Supervisor / Crew Leader responsible for the space must conduct a Risk Assessment completing the Entry Permit. That Risk Assessment shall require the assessor to personally inspect the confined space work area and verify that the necessary equipment, tests, and precautionary measures identified on the Entry Permit are in place before entry is allowed. If the entry Supervisor / Crew Leader conducting the Risk Assessment feels the conditions for entry are complex to the degree additional expertise is required, then the entry shall be delayed until appropriate expertise has been obtained to conduct a competent Risk Assessment of the space to be entered.

It is the policy of DuPage County to provide requirements for the evaluation and safe entry into Vertical confined spaces likely to be encountered during DuPage County operations by employees and contractors.

Horizontal Confined Spaces are not to be entered by County employees i.e. hot and cold water storage tanks etc.. As this type of entry is rare; the County does not have the appropriate safety equipment nor training for entry into Horizontal Confined Spaces such as drainage pipes. Work required in horizontal confined spaces will need to be performed by a vendor following IDOL/OSHA Confined Space requirements AA Subpart of CFR 1926. (

Any employee required to or permitted to pre-check or enter a confined space shall have successfully completed, as minimum classroom training on Confined Space offered by the County and is considered "an Authorized Entrant" and/or "Authorized Attendant".

A hard copy of this and any rescue procedures shall be at the work site and available to all employees for the duration of the project.

Confined Space Entry Permit shall be kept at the job site for the duration of the Project. If circumstances i.e. job continues to next day, dictate interruption in the confined space then the permit space must be re-evaluated and a new checklist must be completed.

All "Authorized Entrants and Attendants" shall re-certify every 12 months by completing a practice rescue.

DuPage County Environmental, Safety, Health & Property Loss Control Program

DPC Confined Space Entry Policy for Non-Weatherization Staff

DPC adheres to non-entry rescues by employees. Entry rescues will be performed by fully trained Confined Space Entry Fire service personnel.

Smoking is not permitted within or around a project containing a Confined Space.

The following procedure does not relieve a contractor of their responsibility for a safe entry of their staff. (See "Excavations with trenching and shoring exposures" Procedure).

3.0 General Requirements:

3.1 DPC shall endeavor to evaluate the work place to pre-determine what spaces are permit- required workspaces at the time of evaluation. But as every confined space is unique to their location and location configurations change, it is not practical to provide signage at every confined space such as highway manholes.

3.2 If the work is to be done in a Permit Required space(s), the County shall inform exposed employees by posting danger signs, and the dangers posed by the permit space(s)..

Example: Danger, Permit Required Confined Space, Do Not Enter.

3.3 When DPC arranges to have a vendor perform work that involves permit space entry, DPC shall:

3.3.1 Inform the *Controlling Contractor* that the work place contains permit spaces and that entry is allowed only through compliance with a DPC permit space program or similar program of the *Controlling Contractor per OSHA 29 CFR 1910.146. This exchange of information must be documented in writing.*

3.3.2 Apprise the contractor of the elements, identified hazards, and previous experience with the space that make it a permit space.

3.3.3 Inform the contractor of any implemented precautions and procedures used by DPC to protect DPC employees in or near the space where contractor employees will be working.

3.3.4 When both DPC and contractor personnel will be working in or near permit required spaces co-ordinate entry operations with the contractor.

3.3.5 Debrief the contractor at the conclusion of the entry operations regarding permit procedures followed, and hazards confronted, or created.

3.3.6 **Note:** At no time should DPC Supervise the contractors' employees. The contractor is ultimately responsible for the safety of their employees and or their sub-contractors.

3.3.7 **Note:** At no time shall the contractor be permitted to utilize DPC equipment or tools.

DuPage County Environmental, Safety, Health & Property Loss Control Program

DPC Confined Space Entry Policy for Non-Weatherization Staff

3.4 In addition to complying with the permit space requirements that apply to all working on a DPC project each contractor shall:

3.4.1 Train their supervisors to become competent persons, and to be equipped to institute this standard procedure requirement for confined space work by their employees.

3.4.2 Train their employees in the Confined Space Policy.

4.0 Definitions

4.1 **"Authorized Entrant/Attendant"** Any DPC employee required to or permitted to pre-check or enter an enclosed/confined space shall have successfully completed training on Confined Space offered by the County.

4.2 A **"Bump test"** verifies calibration by exposing the instrument to a known concentration of test gas. The instrument reading is compared to the actual quantity of gas present (as indicated on the cylinder).

4.3 **Calibration** refers to an instrument's measuring accuracy relative to a known concentration of gas.

4.4 **"Competent person"** means one who is capable of identifying existing and predictable hazards in the surroundings or work conditions, which are unsanitary, hazardous, or dangerous to employees and who has the authorization to take prompt corrective measures to eliminate them.

4.5 **Confined Space** means any space that has limited or restricted means of entry/exit; is large enough for a person to enter and perform work; is not designed for continuous occupancy.

4.6 **Controlling Contractor** is the firm DPC has contracted with. The Controlling contractor is responsible for assuring sub-contractors who may be working in the space follow the DPC or their own Confined Space program.

4.7 **Entry Supervisor / Crew Leader** means the employee responsible for evaluating and authorizing confined space entry operations and for signing permits for entries into permit-required confined spaces. This employee has the authority to terminate all confined space entries if conditions in the confined space change or present an increased hazard to the entrants. In most situations, the DuPage County Crew Leader assigned to the project will perform the duties as an Entry Supervisor / Crew Leader.

4.8 **Hazardous Atmosphere** means the atmosphere within a confined space that contains less than 19.5% or more than 23.5 % oxygen, presence of flammable gases or vapors in excess of 10% of the lower flammable limit of the flammable substance present, or the presence of toxic gases, vapors, dusts or mists in excess of the materials' permissible exposure limits.

DuPage County Environmental, Safety, Health & Property Loss Control Program

DPC Confined Space Entry Policy for Non-Weatherization Staff

Examples of toxins commonly found in confined spaces include vapors or gases that may be present in laboratories within buildings, carbon monoxide (CO) >35 ppm, Hydrogen Sulfide (H₂S) > 10 ppm etc.

- 4.9 **Hot Work** Any operations that create heat, sparks or hot slag having the potential to ignite flammable vapors or combustible material. Operations such as welding, brazing, torch cutting, grinding and soldering.
- 4.10 **Host Employer** When we contract work to be done in a Confined Space we become the Host Employer.
- 4.11 **Isolation/LOTO** means the process used to reduce or eliminate hazards within a confined space. Also referred to as Lock-Out & Tag-Out, hazards such as the flow of water can be eliminated by placement of plugs, closing of valves, blanking of piping, etc. Activation of pumps and other mechanical equipment that can contribute to or increase the hazards within a space, can be protected through the opening of an electrical switch or other isolating method such as removal of fuses or electrical leads to the motor. (See LOTO policy)
- 4.12 **Non-Permit Required Confined Space:** A space that is large enough and so configured that an employee can bodily enter and perform assigned work;
and is not intended for continuous occupancy;
and has limited or restricted means for entry or exit (for example tanks, electrical vaults);
and ~~does not contain nor has the potential to contain~~ an atmospheric hazard or any hazard capable of causing death or serious physical harm.
- 4.13 **Permit-Required Confined Space:** A space that has one or more of the following:
a space that has known potential to contain, a hazardous atmosphere;
and/or has the potential for engulfing or entrapping the entrant;
and/or has an internal configuration that could trap or asphyxiate the entrant;
and/or contains other recognized safety or health hazards.
- 4.14 **Personnel Protective Equipment (PPE)** refers to protective clothing, helmets, goggles, etc. designed to protect the wearer's body from injury by blunt impacts, electrical hazards, heat, chemicals, and infection, for job-related occupational safety and health purposes.
- 4.15 **Qualified** means one who, by possession of a recognized degree, certificate, or professional long standing, or by extensive knowledge, training and experience, has successfully demonstrated their ability to solve or resolve problems relating to the subject matter, the work, or the project.

5.0 Confined Space Entry Evaluation

DuPage County has attempted to identify all the types of confined spaces that can be encountered at permanent sites. Exhibit 2.

- 5.1 Confined spaces being entered are non-permit, and permit-required confined spaces. Including active storm system inlets and manholes, tanks on water tankers, HVAC units, boilers, pits, vaults, wells etc.

DuPage County Environmental, Safety, Health & Property Loss Control Program

DPC Confined Space Entry Policy for Non-Weatherization Staff

and some excavations.

- 5.2 These spaces typically have limited means of entry and exit, are large enough to enter, and are not designed for continuous employee occupancy. Therefore, these spaces described above meet the definition of a confined space.

6.0 Non-Permit Confined Spaces

Evaluation and subsequent determination of a non-permit confined space may be based on the knowledge of the space concerning the potential that exists for a hazardous atmosphere, or other hazards that may be present in the space.

- 6.1 A determination that a non-permit confined space exists *MUST* be based upon atmospheric testing conducted using a properly calibrated gas detector and the verification that no other hazards exist within the confined space.

- 6.2 It must be demonstrated that no potential for a hazardous atmosphere exists in the confined space. For example, entry into an HVAC unit to replace filters or entry into a Horizontal Boiler for inspection or repairs.

- 6.3 If a DuPage County Entry Supervisor / Crew Leader are unsure of the status, or potential status, of any space that needs to be entered, then atmospheric testing must be performed to verify that a space is truly a non-permit confined space.

7.0 Physical Protection of Work Area

The Entry Supervisor / Crew Leader will ensure that employees are protected from vehicular traffic and protected from confined space entry activities by properly barricading the area where confined space entry activities are conducted.

7.1 Safe Removal of Space Covers

Employees engaged in the removal of any covers to the confined space shall use caution removing the cover to avoid creating sparks which could cause an explosion of gases contained within the space; or removal of a cover from a confined space which is under pressure. Covers may be heavy and may require the assistance of another employee to avoid injuries caused as a result of lifting or carrying a cover. Gloves shall be worn and appropriate tools used to remove and carrying the cover.

- a. The Entry Supervisor / Crew Leader shall ensure that testing is performed at all manhole entrances by insertion of the gas detector hose thru the manhole cover hole (if provided) or under wedged up cover to determine if a flammable atmosphere exists prior to complete removal of the cover.
- b. If a hazardous atmosphere is encountered immediately contact the Entry Supervisor / Crew Leader. DO NOT remove the cover.
- c. If a non-hazardous atmosphere is found then safely remove the cover.

DuPage County Environmental, Safety, Health & Property Loss Control Program

DPC Confined Space Entry Policy for Non-Weatherization Staff

- d. Lower the meter probe into the manhole and continuously take readings while operations continue.

7.3 Guarding & Posting Signs at Entry to Confined Space

The Entry Supervisor / Crew Leader shall ensure that a railing, temporary cover, or other barrier is placed near or around the entrance or opening to protect employees/public from falling through the opening and to protect entrants from materials and debris that could fall into the opening.

7.3.1 Manhole Precautions

- 7.3.1.2 If in a sidewalk or roadway traffic shall be detoured around work site. i.e. lane closure per Illinois Department of Transportation (IDOT) Section. 701 Work Zone Traffic Control and Protection.
- 7.3.1.3 Remove all loose gravel/debris within 5 ft. of manhole to prevent such being kicked into manhole and injuring staff inside.
- 7.3.1.4 Manhole ring condition must be evaluated and any loose, corroded or damaged rings reported to the Supervisor/ Crew Leader immediately.

7.3.2 Placing Warning Devices on Roadway's:

- 7.3.2.1 Whenever work is to be performed in the roadway, employment of warning devices and worker clothing, according to Illinois Department of Transportation (IDOT) Section. 701 Work Zone Traffic Control and Protection shall be followed.
- 7.3.2.2 Place vehicles in a location that will provide maximum protection to the work party.
- 7.3.2.3 Insure all vehicle warning lights and flashers are operating properly.
- 7.3.2.4 Retro-reflective vests or other Retro-reflective garments with a manufacturer's tag indicating Conspicuity Class 2 must be worn by all outside a vehicle and within 25 feet of a Roadway during day light hours. For nighttime use then Retro-reflective vests/garments with Conspicuity Class 3 must be worn.

DuPage County Environmental, Safety, Health & Property Loss Control Program

DPC Confined Space Entry Policy for Non-Weatherization Staff

7.4 Atmospheric Testing

7.4.1 Only employees trained in the use of atmospheric testing instrumentation shall test the atmosphere of the confined space prior to entry to determine the presence of a hazardous atmosphere. Contaminants or potential hazards within the confined space shall be tested in the following order:

7.4.1.1 Oxygen not less than 19.5% nor more than 22 %

7.4.1.2 Flammable Gas or Vapor (methane) not more than 10% of the LEL

7.4.1.3 Toxic Materials (hydrogen sulfide) not more than 10 ppm

7.4.2 Instrumentation should be “Bump Tested” by a properly trained person prior to use each day, or according to the manufacturer's instructions. (Exhibit 3)

7.4.3 Readings on most meters vary and fluctuate slightly, but in no case should entry be permitted if instrumentation indicates that a hazardous atmosphere may be present.

7.4.4 If a hazardous atmosphere exists after testing the confined space, the entry supervisor shall classify the space as permit- required confined space.

7.4.5 The atmosphere within the space must be continuously monitored throughout the entry to ensure that the continuous forced air ventilation is preventing the accumulation of a hazardous atmosphere

7.4.6 All compartments where workers will be present must be tested, including the top, bottom and middle. Tests should be taken at 4 foot intervals.

7.4.7 Public Works Operations Manager is responsible for assigning a designated employee to be responsible for maintenance of the testing units including calibration per manufacturer's instructions. (Exhibit 3)

7.5 Isolation / Lock-out & Tag-out (LOTO)

7.5.1 Prior to any entry into either a permitted or non-permitted confined space, the Entry Supervisor / Crew Leader shall ensure that all sources of energy or material flow into the confined space have been identified.

7.5.2 The Entry Supervisor / Crew Leader will review drawings or discuss the confined space hazards to determine all possible sources of energy and material flow.

DuPage County Environmental, Safety, Health & Property Loss Control Program

DPC Confined Space Entry Policy for Non-Weatherization Staff

7.5.3 Once these sources of energy or material flow have been identified, the Entry Supervisor / Crew Leader shall take the necessary precautions to isolate, remove, or lock out such potentially hazardous sources from the confined space. Just isolating the equipment by blocking flow at both ends and bleeding off pressure or draining is not sufficient for confined space entry. It is also necessary to lock out and tag all associated pumps, motors or other energy source to ensure complete isolation of the confined space.

7.5.4 LOTO actions may involve:

7.5.4.1 Closing and locking of valves connected to the confined space.

7.5.4.2 Placement of plugs or blocks in piping.

7.5.4.3 Disconnection of piping and blanking of piping connected to the confined space.

7.5.4.4 Exposed electric circuits shall be de-energized and properly grounded if necessary, or covered with insulating material of the proper voltage class so employees will not be exposed to contact. Opening and locking of switches where electrically operated devices are located within a confined space or operate pumps that could flow materials into the confined space, etc. Work on energized conductors may only be done by qualified electricians following NFPA 70E.

7.5.4.5 All mechanical parts within the confined space shall be disconnected and locked out, or otherwise rendered inoperative, whenever hazards exist from exposure to moving parts in the space. This includes spring-loaded, hydraulic or suspended equipment.

7.6 Welding and Cutting “Hot Work”: (also see Hot Work Permit Program)

7.6.1 The following special precautions are needed to prevent a fire or explosion whenever “Hot Work” will be done in a Permitted or Non-permitted Confined Space.

7.6.2 No Hot Work is allowed in an oxygen enriched atmosphere (>21.5%).

7.6.3 All combustible materials in the area must be removed or protected with fire-retardant material.

7.6.4 Compressed gas cylinders shall not be allowed inside a confined space.

7.6.5 Before cutting into any pipe with a torch, the pipeline must be empty, clean and at 0 psi. If the pipe contained a flammable or combustible liquid or gas, it must be cleaned and flushed or enerted to ensure there is no residue that could cause a fire or explosion.

DuPage County Environmental, Safety, Health & Property Loss Control Program

DPC Confined Space Entry Policy for Non-Weatherization Staff

7.6.6 Whenever a welding torch is not being used it and the tank should be removed from the confined space.

7.6.7 No "Hot Work" is permitted on any tank that has stored any flammable, combustible or hazardous product until the tank has been cleaned and inert the atmosphere.

7.6.8 Before gas welding or burning is started all hose lines have been checked for leaks

7.7 Confined Space Re-Classification (Non-permitted to Permitted)

If conditions change within the space that increase the hazard to the entrants, the Entry Supervisor / Crew Leader shall terminate the entry and re-classify the space as full permit-required confined space. The Permitted Space Entry form must then be completed

8.0 Authorized Entrants Duties:

- a. Must be capable of self-rescue
- b. Know the hazards, including information on the means of exposure such as inhalation or dermal absorption, signs and symptoms and consequences of the exposure. Exhibit 1.
- c. Know how to use appropriate PPE
- d. Maintains communications with Attendant as necessary to enable them to monitor the entrants status

8.1 Exit from the space as soon as possible when:

- a) Ordered to by attendant
- b) He or she recognizes the warning signs or symptoms of exposure
- c) A prohibited condition exists
- d) An automatic alarm is activated

9.0 Ventilation

Continuous, forced ventilation must be provided for entry into confined spaces with hazardous atmospheres at a minimum rate of 1 air change every 2 minutes. In a non-hazardous atmosphere up to 6 air changes an hour is acceptable. Ventilation of the confined space should continue while the space is occupied to ensure a safe working environment.

9.1 Employees may not enter the space until the forced air ventilation has eliminated the hazardous Atmosphere and a minimum of 6-8 air changes of the space prior to entry has occurred.

9.2 Forced air ventilation must be designed to ventilate the immediate areas where employees are working within the space and must continue until all employees have left the space.

9.3 Position the fan four to six feet from entry point with the fan intake pointed into the wind. For eight feet from the fan intake, the area should be free from airborne contaminants and loose stones. fig1

DuPage County Environmental, Safety, Health & Property Loss Control Program
DPC Confined Space Entry Policy for Non-Weatherization Staff

- 9.4 For vertical spaces, position the hose in approximately 75 per cent of the distance to the bottom of the space, and no more than maximum 15 feet from the work area. Tie a rope approximately 2' from the end of the hose and lower the hose into the space. Raise the end of the hose with the rope to achieve a second bend (inside hose angle between 120 and 150 °) in the hose and secure the rope to keep the bend in place. For horizontal spaces, lay the hose on the floor with the end of the hose within 10 feet of the far wall.
- 9.5 Turn the ventilator on before placing the hose into the space and let the unit run for time enough for two complete air changes before performing any gas testing. When testing, ensure the detector is out of the direct ventilation airflow pattern.
- 9.6 Ensure there is no "short circuiting" of the air. If the space has a second opening, place the ventilator at the smaller opening to create better air circulation through the space. If the space has only one large opening, place the ventilator on the opposite side farthest from the area where the workers will enter the space.
- 9.7 If any liquids have been removed from the confined space, potentially hazardous vapors and gases must be removed prior to entry by providing adequate ventilation of the confined space.
- 9.8 If there is a potentially hazardous environment exhausting from the space near the ventilator, attach a four foot hose to the intake side of the fan to prevent recirculating the polluted air coming from the space. In addition, monitor the area around the entry point with the gas detector.
- 9.9 For both supply and exhaust operations involving atmospheres that present a LEL reading on the gas detector, always remove or retract the ventilation hose before the ventilator is turned off. With no velocity pressure in the hose to keep combustible gases out, the gases can come up the hose, across the hot motor and possibly ignite.
- 9.10 If combustion-type equipment must be in confined space to perform job then provisions must be made to ensure exhaust gases are vented outside of the space and away from the entry point

DuPage County Environmental, Safety, Health & Property Loss Control Program
DPC Confined Space Entry Policy for Non-Weatherization Staff

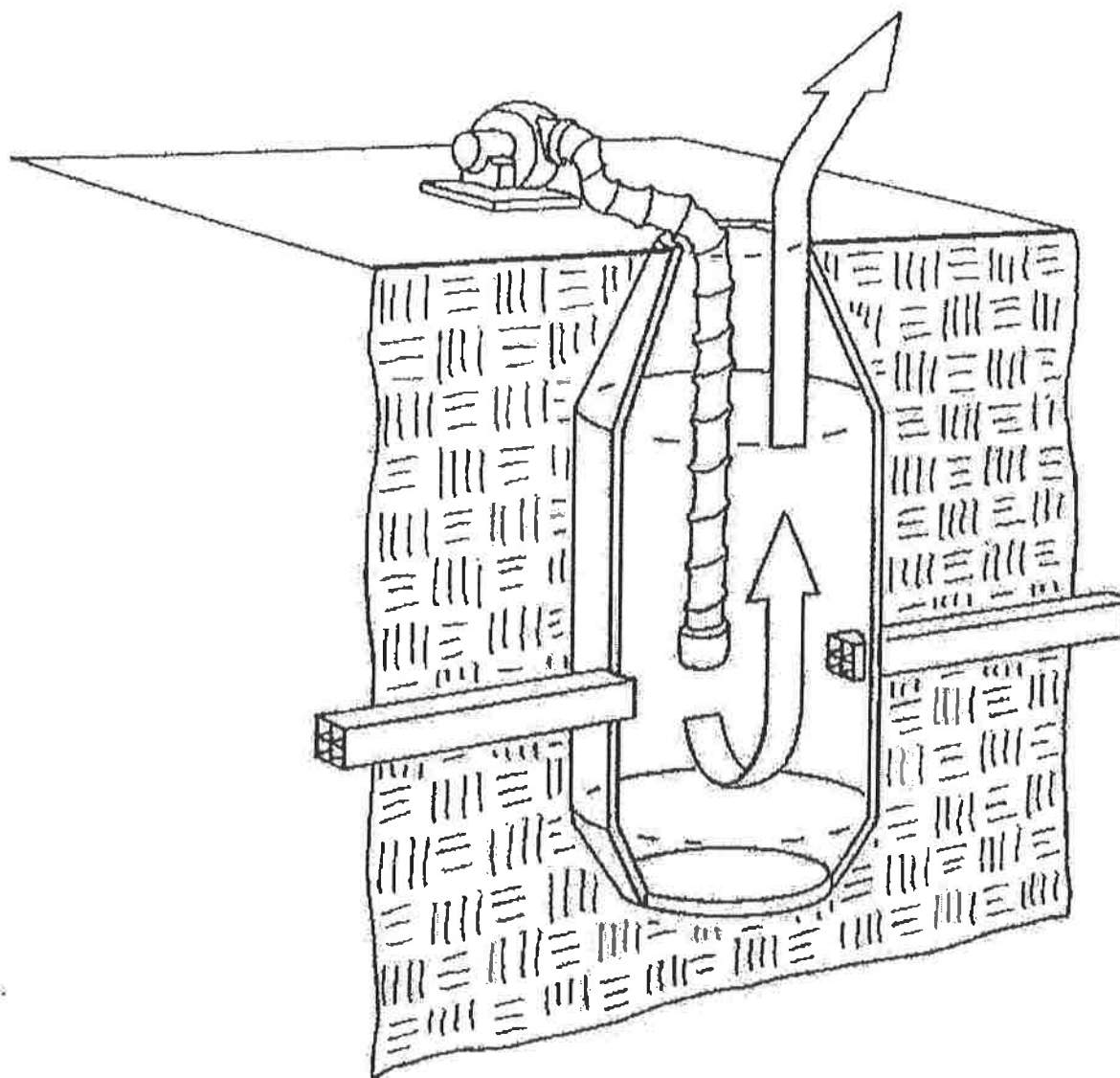


Fig 1

DuPage County Environmental, Safety, Health & Property Loss Control Program DPC Confined Space Entry Policy for Non-Weatherization Staff

9.9.1 Samples for determining needed ventilation:

Tanks or cylinder shaped spaces cubic feet per minute (cfm) calculations are:

$$\text{Volume (V)} = \pi r^2 h$$

π is pi @ 3.142, R^2 is the circular radius of an end of the cylinder squared, h is the height of the Cylinder.

So the cylinder has a 6 ft radius and is 10 ft deep.

$3.142 \times 10 \times 6\text{ft}^2 = 3.142 \times 10 (31.42) \times 6\text{ft}^2 (36) = 1131.12 \div 4 \text{ (cubic ft)} = 283 \text{ ft}^3$
divided by 2 minutes of needed air change = 142 cfm of fan speed required.

Cube:

A cube is a little like a square, but 3-dimensional. $L \times L \times L = V$, where L=the length of one edge of the cube, and V is the volume. $10\text{ft} \times 10\text{ft} \times 10\text{ft} = 1000\text{ft}^3$ divided by 4 (cubic ft) = 250 ft^3 divided by 2 minutes of required air changes = 125 cfm needed to keep air clear.

Rectangle:

$$L \times W \times H = \text{Volume}$$

L W and H refer to Length times Width times Height.

10.0 Attendant Duties:

The Entry Supervisor / Crew Leader shall ensure that attendants can effectively communicate with entrants of the confined spaces.

- 10.1** Attendants should maintain contact with entrants.
- 10.2** Radios may be required if the attendants cannot effectively communicate with entrants.
- 10.3** Remain outside the entry space during operations unless relieved by another authorized attendant.
- 10.4** Know existing and potential hazards, including information on the mode of exposure, signs or symptoms of distress including physiological effects.
- 10.5** Order evacuation of the space when:
 - A prohibited condition exists
 - A entrant shows signs of physiological effects of hazard exposure (Exhibit 1)
 - An emergency outside the space exists
 - The attendant cannot effectively and safely perform required duties.

DuPage County Environmental, Safety, Health & Property Loss Control Program

DPC Confined Space Entry Policy for Non-Weatherization Staff

- 10.6 Summon rescue personnel
- 10.7 Continuously monitor the air quality in the confined space for appropriate Readings per 7.4 Atmospheric Testing section of this procedure.
- 10.8 Ensure unauthorized staff stay away from entrance or exit immediately if they entered the Permitted space.
- 10.9 Inform authorized entrants and Supervisor whenever an unauthorized person enters the space.
- 10.10 Assure any tools are placed in a bucket and safely lowered or tied directly to a rope for lowering, never allow anyone to drop tools etc. into the confined space.
- 10.11 Performs no other duties that interfere with the attendant's primary confined space duties.

11.0 Emergency Equipment & Rescue

- 11.1 The Entry Supervisor / Crew Leader shall ensure that attendants are instructed to never enter a permitted confined space to affect a rescue, unless the attendants have been properly trained, equipped and drilled in confined space entry rescue. If an entrant cannot exit the space on their own the responding fire service (911) should be immediately contacted and informed a confined space rescue is needed telling them the types of confined space i.e. dry manhole, and the # of personnel to be rescued. This is to be done even if non-entry rescue is being initiated.
- 11.2 The Entry Supervisor / Crew Leader shall ensure that adequate emergency rescue equipment is available and set-up prior to entry into a Permitted confined space.
- 11.3 The Entry Supervisor / Crew Leader shall ensure that each entrant is equipped with a full body harness and a "D" ring located at the back near the shoulder level and that the end of the retrieval line is securely attached to an approved winch/tripod for rescue from vertical spaces greater than 5 feet deep.
- 11.4 Any full body harness or mechanical retrieval device that is used to arrest the fall of an employee being lowered into, or removed from a confined space, shall be removed from service immediately and tested and re-certified by the manufacturer.
- 11.5 The attendant shall rescue the entrant by assisting the entrant out of the space, if the entrant is conscious and capable of being assisted or through the use of a body harness, or other extrication equipment necessary to remove the entrant from the space.

DuPage County Environmental, Safety, Health & Property Loss Control Program

DPC Confined Space Entry Policy for Non-Weatherization Staff

12.0 Permit Completion for Permit Confined Spaces

The Entry Supervisor / Crew Leader shall prepare and sign a permit authorizing entry into a permit-required confined space.

- 12.1 This permit shall be posted at the portal to the confined space. The permit must be available to the authorized entrants by posting it at the entry portal, or by any other equally effective means, so that the entrants can confirm that pre-entry preparations have been completed.
- 12.2 The permit shall contain results of initial atmospheric testing, a description of the ventilation system used, isolation methods used to eliminate the hazard of mechanical or electrical equipment or flow of materials into the space.
- 12.3 The permit is valid only for the duration of the time it takes to complete the work or 1 shift, whichever is shorter?
- 12.4 The permit in the appendix to this procedure shall be used.
- 12.5 For multiple manholes to be entered in a single shift by the SAME CREW 1 permit is sufficient with an attached page listing the address's of all manholes to be entered. It is the Supervisor/Crew Leaders responsibility to assure the safety precautions including air monitor readings and use are used at each manhole.

13.0 Completion of Confined Space Entry Operations

Upon completion of all work within Permitted confined spaces, the Entry Supervisor / Crew Leader will ensure that the following actions have been completed:

- ✓ All entrants have safely evacuated the confined space
- ✓ Debriefing entrants and attendants related to conditions within the space
- ✓ All tools and equipment have been removed from the confined space
- ✓ The confined space has been properly closed or secured
- ✓ The permit form has been canceled and signed
- ✓ The canceled permit is returned to the DuPage County Division/Department's Office where the crew is out of for filing.

DuPage County Environmental, Safety, Health & Property Loss Control Program

DPC Confined Space Entry Policy for Non-Weatherization Staff

14.0 Personal Protective Equipment:

- ✓ At a minimum personnel who enter a confined space should wear coveralls or a long sleeve shirt with long pants.
- ✓ A hard hat must be worn when the entrant can be struck by falling objects.
- ✓ A bump hat or hard hat must be worn when the entrant is subjected to striking their head on hanging pipes/conduits etc.
- ✓ Fall protection equipment must be used to protect workers who could fall six feet or more to a lower level.
- ✓ U.S. Coast Guard approved personal floatation devices must be worn if workers could fall into water that is over 4 feet deep.
- ✓ Hearing protection must be worn if the noise level can exceed 85 decibels.
- ✓ Each entrant must wear a full-body harness (class III) with a lifeline attached to an approved retrieval device.(see Harness Policy)
- ✓ Additional personal protective equipment shall be specified based on the potential hazards that may be encountered.

DPC CONFINED SPACE ENTRY PERMIT

NOBODY WILL ENTER A CONFINED SPACE UNTIL PERMIT IS COMPLETED BY ENTRY SUPERVISOR <i>Post at entrance to confined space until work inside is complete</i>			
Jobsite Location & Description: _____			
Permit Begins: Date _____ Time: _____ AM PM Expires: Date _____ Time: _____ AM PM			
Circle Type: Manhole Lift Station Vault Tank Excavation Other _____			
Purpose of Entry: _____			
Print Names of Authorized Individuals			
Supervisor: _____		_____	
Attendants		Entrants	
_____		_____	
_____		_____	
_____		_____	
Circle Method of Communication: Hand Radio Cell Visual			
Designated Rescue FD & # _____			
Circle: ENTRY EQUIPMENT NEEDED		Circle: RESCUE EQUIPMENT NEEDED FOR ENTRY	
Hard Hat Y N Boots Y N		Harness / Lifeline	
Coveralls Y N Safety Glasses Y N		Tripod with Winch	
Safety Goggles Y N Face Shield Y N		First Aid Kit	
Ear Protection Y N Gloves Y N		Eye Wash Applicator and Solution	
Safety Lights Y N Encapsulated Suit Y N		Other: _____	
Lockout Devices Y N Warning Signs Y N		_____	
Fire Extinguisher Y N Non-spark tools Y N		_____	
Ventilator Y CFM _____ N		_____	
LOCKOUT REQUIREMENTS (please circle and initial)			
Electrical: locked out		NA Y N	Initials
Mechanical moving parts: Latched chained chocked blocked		NA Y N	_____
Pumps & Hydraulics: blanked bled disconnected		NA Y N	_____
Pipelines: blanked bled disconnected		NA Y N	_____
Valves: locked out disconnected		NA Y N	_____
Belt Drives: locked out disconnected		NA Y N	_____
Chain Drives: locked out disconnected chocked		NA Y N	_____
Shaft Drives: locked out chocked		NA Y N	_____
Space Purged: Inert gas		NA Y N	_____

NOBODY WILL ENTER A CONFINED SPACE UNTIL PERMIT IS COMPLETED BY ENTRY SUPERVISOR					
ACCEPTABLE ENTRY CONDITIONS					
Oxygen: > 19.5% < 23.5%		Flammable / Combustible: < 10% LEL			
Hydrogen Sulfide: < 10 PPM		Carbon Monoxide: < 35 PPM			
ATMOSPHERIC TESTING & MONITORING					
Make/Model/ID of Meter: _____					
Calibration Date: _____		Site Tested: Y N		Used for Continuous Monitoring of Site Y N	
Date of Site Test: _____		Test 1		Time: _____ AM PM	
Oxygen % _____					
LEL % _____					
CO: _____					
H2S % _____					
Methane % _____					
more tests on page 3					
Tested By: _____					
HOT WORK PERMIT: if yes attach to this permit					
Is a Hot Work Permit required: Y N					
SIGNATURE OF ATTENDANTS AND ENTRANTS					
The confined space job had it's safety aspects explained to us.					
We have read and understand this permit. We consider it safe to proceed with the entry into the confined space.					
(Please sign, date and Initial)					
ATTENDANTS	Date	Initials	ENTRANTS	Date	Initials
SIGNATURE OF ENTRY SUPERVISOR					
All actions and/or conditions necessary for safe entry have to the best of my knowledge been satisfactorily performed.					
I consider it safe for the attendants and entrants to proceed with the Confined Space Entry.					
Signed: _____		Date: _____		Time: _____ AM PM	
CANCELLATION OF PERMIT					
Date: _____		Time: _____ AM PM		Decided by: _____	
Reason: _____					
EVALUATION (within 24 hours of completion of the work)					
BY: _____		Date: _____		Time: _____	

DuPage County Confined Space Permit page 3

Test 2	Time:	AM	PM
Oxygen %			
LEL %			
CO:			
H2S %			
Methane %			
Tested By:			

Test 3	Time:	AM	PM
Oxygen %			
LEL %			
CO:			
H2S %			
Methane %			
Tested By:			

Test 4	Time:	AM	PM
Oxygen %			
LEL %			
CO:			
H2S %			
Methane %			
Tested By:			

Test 5	Time:	AM	PM
Oxygen %			
LEL %			
CO:			
H2S %			
Methane %			
Tested By:			

Test 6	Time:	AM	PM
Oxygen %			
LEL %			
CO:			
H2S %			
Methane %			
Tested By:			

Test 7	Time:	AM	PM
Oxygen %			
LEL %			
CO:			
H2S %			
Methane %			
Tested By:			

Test 8	Time:	AM	PM
Oxygen %			
LEL %			
CO:			
H2S %			
Methane %			
Tested By:			

Test 9	Time:	AM	PM
Oxygen %			
LEL %			
CO:			
H2S %			
Methane %			
Tested By:			

Test 10	Time:	AM	PM
Oxygen %			
LEL %			
CO:			
H2S %			
Methane %			
Tested By:			

Test 11	Time:	AM	PM
Oxygen %			
LEL %			
CO:			
H2S %			
Methane %			
Tested By:			

Manhole listing per shift by same Crew

[illegible]

DPC Confined Space Entry Policy

Exhibit 2

Evaluate the hazards of any entry into a permit space

Knowing when a permit is necessary can save a life

Posted November 6, 2010 from J.J. Keller & Assoc.

OSHA's standard on permit-required confined spaces (PRCS) says entry occurs as soon as any part of the entrant's body breaks the plane of the opening into the permit space. As clarified in an OSHA letter of interpretation dated Oct. 18, 1995, "When any part of the body of an entrant breaks the plane of the opening of a PRCS large enough to allow full entry, entry is considered to have occurred and a permit is required, regardless of whether there is an intent to fully enter the space."

This definition of "entry" might seem to be too strict, but OSHA's letter clarifies that there are situations where a partial entry would be hazardous: "Examples of situations where entry by only part of the body into a PRCS can expose an entrant to the possibility of injury or illness are as follows:

1. An entrant can possibly suffer a burn while reaching into a PRCS, which is so classified because it contains a thermal hazard.
2. An entrant can possibly fall into a below grade PRCS while standing on a vertical ladder in the opening of the space, which is so classified because it contains an oxygen deficient atmosphere.
3. An entrant can possibly become unconscious as result of his head accidentally entering a PRCS while they are reaching into a PRCS, which is so classified because it contains an oxygen deficient atmosphere.

As another example, if the space contains a flammable or oxygen enriched atmosphere, and if the activities during a partial entry could produce a spark or other ignition source, then a fire in the space could flash out of the opening and cause serious injuries to the employee.

This doesn't necessarily mean that you'd be fined if a permit wasn't followed when someone reached into a tank. OSHA's guidance continues: "However, if entry by only part of the body does not expose the entrant to the possibility of injury or illness, then the violation may be considered a 'de minimis' violation. (A 'de minimis' violation is one in which a standard is violated, but the violation has no direct or immediate relationship to employee safety or health. These violations are documented but no citations are issued.)" Examples of situations where entry by only part of the body into a PRCS would not expose an entrant to the possibility of injury or illness are as follows:

1. An entrant reaches through the opening of a horizontal PRCS, which is so classified only because it contains exposed live electrical parts ten feet from the opening.
2. An entrant put his head through the opening of an overhead PRCS, which is so classified only because it contains unguarded rotating parts ten feet from the opening.

Also consider a situation such as a worker reaching through a small grate to take a sample from a permit space. OSHA's letter states: "If a part of the body were placed in an opening through which the worker could not pass into the permit-required confined space, no PRCS entry will have occurred. Keep in mind, however, that the employee would still need protection from any hazards involved in the task, but a permit would not be needed."

Signs and Symptoms of Exposure to some Gases and lack of Oxygen

Carbon Monoxide (Colorless and Odorless)

- Loss of eye / hand coordination
- Fatigue / Weakness
- Headache
- Mental Confusion
- Nausea

Hydrogen Sulfide (Colorless and Rotten Egg Odor at low levels Odorless at high levels)

- Eye irritation
- Fatigue
- Headache
- Nausea
- Lung paralysis

Methane Gas (Colorless and Odorless)

- Breathing difficulty
- Blurred vision
- Dizziness
- Headaches
- Heart Palpitations
- Inattentive, Poor Judgment, Loss of Memory
- Lack of motor coordination (may drop tools frequently)
- Nausea
- Unconsciousness

Oxygen Depletion (Colorless and Odorless)

- Increased heart rate
- Tiredness
- Headaches
- Dizziness
- Agility of mind and body decreases significantly
- Unconsciousness

CONFINED SPACE HAZARD ASSESMENT

Site name / Campus Bldg. #: _____

Location of space: _____

Date Assessment Last Modified: _____

To be a Confined Space must meet ALL of the 3 criteria's:

1. Large enough for an employee to enter
2. And has limited or restricted means of entry
3. And is not designed for continuous occupancy

To be a Permit Required Confined Space it must **meet any one** of the below criteria:

Contains or has the potential to contain a Hazardous atmosphere

And / or contains a material that has the potential for engulfing entrant

And / or has a internal configuration such that an entrant could be trapped or asphyxiated by inwardly covering walls or by a floor that slopes downward and tapers to a small opening.

And / or contains any other recognized serious health or safety hazard

Circle Authorized Entry Points	SIDE	BOTTOM	TOP
--------------------------------	------	--------	-----

Circle Hazards	Source/Type	Abatement Method
----------------	-------------	------------------

Explosive Atmosphere

Toxic Atmosphere

Combustible Material

Electrical

Machinery/Rotating parts

Engulfment

Piping under pressure

Ventilation Requirements:

Space Volume in Cubic Feet is: _____ cf

Mechanical Ventilation Required in cubic feet a minute: _____ cfm

Natural (no atmospheric hazards usual in the space -additional ventilation may be needed for Hot Work or other operations producing dust, fumes, mist)

Ventilation Formulas:

Tank/cylinder shape: Volume = 3.142 x circular radius squared x height of the space

Cube shape: Length x length x length = volume divided by 4 = cubic feet
divided by # of air changes required = cfm needed.

Rectangle: Length x width x height +volume divided by 4 = cubic feet divided by # of air changes required = cfm needed to keep air clear.

Space marked with Permit Sign? Y N

Print Completed by: _____

Notes on back:

Gas Monitoring Introduction: Gas monitoring instruments are designed to protect personnel from unseen hazards that may exist in workplace environments, including confined spaces. It is vital to worker safety that these instruments are maintained and calibrated properly.

Instrument inaccuracy due to improper or irregular calibration can lead to serious accidents. Exposure to excessive levels of toxic gas or an oxygen-deficient environment can cause workers serious illness and even death. Combustible gas explosions are often catastrophic, injuring or killing personnel and destroying property.

The International Safety Equipment Association (ISEA), founded in 1933, is a trade association for manufacturers of protective equipment, including environmental monitoring instruments. The ISEA recommends, at a minimum, verification of sensor accuracy before each day's use.

The only way to guarantee that an instrument will detect gas accurately and reliably is to test it with a known concentration of gas. Exposing the instrument to a known concentration of test gas will show whether the sensors respond accurately and whether the instrument alarms function properly.

Calibration Gas Certificate of Analysis:

Whenever purchasing calibration gas be sure the gas cylinder is NIST (National Institute of Standards and Technology) traceable.

NIST traceability provides confidence that the proper cylinder concentration analysis was performed and that a **Certificate of Analysis** is provided with the cylinder.

Typically the manufacturer's private label will be NIST traceable but it never hurts to verify this critical element. As you know if you start with a flawed calibration gas source, you are going to get a flawed calibration and that can be deadly.

Calibration: The Key to Accurate Readings

Gas detection instruments are used to detect the presence of toxic and combustible gases, as well as oxygen deficiency or oxygen enrichment (a fire and explosion hazard). Workers cannot rely on their sense of smell to alert them to odorless hazards, necessitating the use of gas detectors whenever a worker enters an area with potential atmospheric hazards.

"Calibration" refers to an instrument's measuring accuracy relative to a known concentration of gas. Gas detectors measure the concentration of a gas in an air sample by comparing the sensor's response to the response generated by a calibration gas of a known concentration. The instrument's response to the calibration gas serves as the measurement scale or reference point.

The responsiveness of electrochemical sensors will vary with environmental conditions. Sensor response will be different (lower or higher) depending on the actual environmental conditions. Therefore, as much as possible, the monitors should be calibrated at environmental conditions that are the same as (or similar to) actual field conditions. Calibration at locations where the equipment is to be used is always preferable.

Most instruments are equipped with two levels of alarms – warning and danger. The warning alarm alerts the user that the environment has a detectable concentration of gas and is therefore potentially hazardous. The danger alarm indicates that the gas concentration exceeds the programmed "hazard" threshold, and the area is approaching a hazardous level. Whether an instrument warns and/or alarms at the proper time depends on its detection abilities and its ability to translate its findings into an accurate reading.

If the instrument's reference point has shifted, the reading will shift accordingly and be unreliable. This is called "calibration drift" and it happens to all detectors over time. An instrument that experiences calibration drift can still measure the quantity of gas present but it cannot convert this information into an accurate

numerical reading. Regular calibration with a certified standard gas concentration will update the instrument's reference point, ensuring that the instrument will produce continued, accurate readings.

Causes of Calibration Drift

Over time, the accuracy of gas detection instruments can diverge from their calibration settings in several ways:

- Gradual chemical degradation of sensors and drift in electronic components that occur naturally over time.
- Chronic exposures to, and use in, extreme environmental conditions, such as high/low temperature and humidity, and high levels of airborne particulates.
- Exposure to high (over-range) concentrations of the target gases and vapors.
- Chronic or acute exposure of catalytic hot-bead LEL sensors to poisons and inhibitors. These include: volatile silicones, hydride gases, halogenated hydrocarbons, and sulfide gases.
- Chronic or acute exposure of electrochemical toxic gas sensors to solvent vapors and highly corrosive gases.
- Harsh storage and operating conditions, such as when an instrument is dropped onto a hard surface or submerged in liquid. Normal handling/jostling of the equipment can create enough vibration or shock over time to affect electronic components & circuitry.

Often, after exposure to the more extreme conditions above, when calibration is attempted, the detector will either display a failure message or it will not allow the user to fully adjust the display reading. At this point, the severely damaged sensor must be replaced and/or the detector serviced by qualified personnel.

Worker Safety: The Number One Reason for Proper and Regular Calibration

The primary reason for proper, regular instrument calibration is to prevent inaccurate gas concentration readings that could lead to injury or to death. Correctly calibrating an instrument helps to ensure that the instrument will accurately respond to the gases that it is designed to detect, warning users of hazardous conditions before they reach dangerous levels. In addition to detecting and correcting for calibration drift, regular calibration assures the user that the instrument is functional. Gas detection instruments are often subjected to harsh operating and storage conditions where they can be damaged. Both of these factors can affect instrument performance, leading to inaccurate readings or even instrument failure. While a unit may appear to be sound during a visual inspection, it actually could be damaged internally. Regular calibration is the only way to be certain that a detector is fully functional. Moreover, a standing policy for regular calibration sets the tone for a safety-conscious work environment and indicates to workers that safety is a priority. As a result, workers may be more likely to keep safety principles in mind throughout the workday.

A written record of calibration should be kept for the life of each instrument. This record allows users to quickly identify an instrument that has a history of excessive maintenance/repair or is prone to erratic readings.

Bump Tests vs. Full Calibration

There are two methods of verifying instrument accuracy: a functional or bump test and a full calibration, each appropriate under certain conditions. A bump test verifies calibration by exposing the instrument to a known concentration of test gas. The instrument reading is compared to the actual quantity of gas present (as indicated on the cylinder). If the instrument's response is within an acceptable tolerance range of the actual concentration, then its calibration is verified. (Note: It is recommended that users check with the detection equipment manufacturer for the acceptable tolerance ranges.) Instruments should be "zeroed" before the bump test in order to give a more accurate picture of the bump test results. When performing a bump test, the test gas concentration should be high enough to trigger the instrument alarm.

If the bump test results are not within the acceptable range, a full calibration must be performed. A full calibration is the adjustment of the instrument's reading to coincide with a known concentration (generally a certified standard) of test gas. For verification of accuracy, calibration gas should always be certified by and traceable to the National Institute of Standards and Technology (NIST). In most cases, a full calibration is only necessary when an instrument fails a bump test or after it has been serviced. The full calibration and bump test should be conducted in a clean fresh air environment.

When to Bump Test and When to Calibrate

In the past, there often has been confusion regarding proper calibration procedures and frequency. To clarify this issue, the International Safety Equipment Association (ISEA) issued a position statement on instrument calibration that states, "A bump test or full calibration of direct-reading portable gas monitors should be made before each day's use in accordance with manufacturer's instructions, using an appropriate test gas." If the instrument fails a bump test, it must be adjusted through a full calibration before it is used.

ISEA recommends more frequent testing if environmental conditions that could affect instrument performance are suspected, such as sensor poisons. **The ISEA allows for less frequent calibration verification under certain conditions (see below), but the interval between testing should never exceed 30 days.**

According to the ISEA, less frequent verification may be appropriate if the following criteria are met:

- During a period of initial use of at least 10 days in the intended atmosphere, calibration is verified daily to ensure there is nothing in the atmosphere to poison the sensor(s). The period of initial use must be of sufficient duration to ensure that the sensors are exposed to all conditions that might adversely affect the sensors.
- If the tests demonstrate that no adjustments are necessary, the interval between checks may be lengthened, but it should not exceed 30 days.
- When calibrating an instrument, always follow the instrument user's manual for the manufacturer's recommended calibration frequency and procedure.

Calibration Rules

The following are a few basic instrument calibration rules to ensure a clear path to health and safety.

- Follow the manufacturer's guidelines for proper calibration. No job, including instrument calibration, can be performed properly or safely without the right tools. The type and concentration of calibration gas, sample tubing, flow regulators and calibration adapters are key links in the calibration chain. Using equipment provided by the original manufacturer should ensure a proper start to every calibration.

- Only use certified calibration gas before its expiration date. The most important tool used in calibration is the gas itself. The instrument can only be as accurate as the gas used to calibrate it. Be certain your supplier can provide a traceable certificate of analysis for every calibration gas cylinder. The concentration of calibration gas, particularly the concentration of reactive gases such as hydrogen sulfide or chlorine, will only remain stable for a finite period of time. Never use calibration gas after its expiration date.
- Train workers on the proper methods of calibration. Most instruments are designed to be field calibrated with instructions detailed in user manuals, training videos or computer-based training modules. Everyone responsible for performing instrument calibration should be trained and tested accordingly.

Conclusion

There is an inherent risk in many workplaces of injury or illness from respiratory hazards such as oxygen deficiency and the presence of toxic gases. Detection technology and products exist to minimize such risk. Properly verifying the accuracy of gas detection equipment before each day's use (Bump Test) will help to ensure that each worker finishes the job safely.