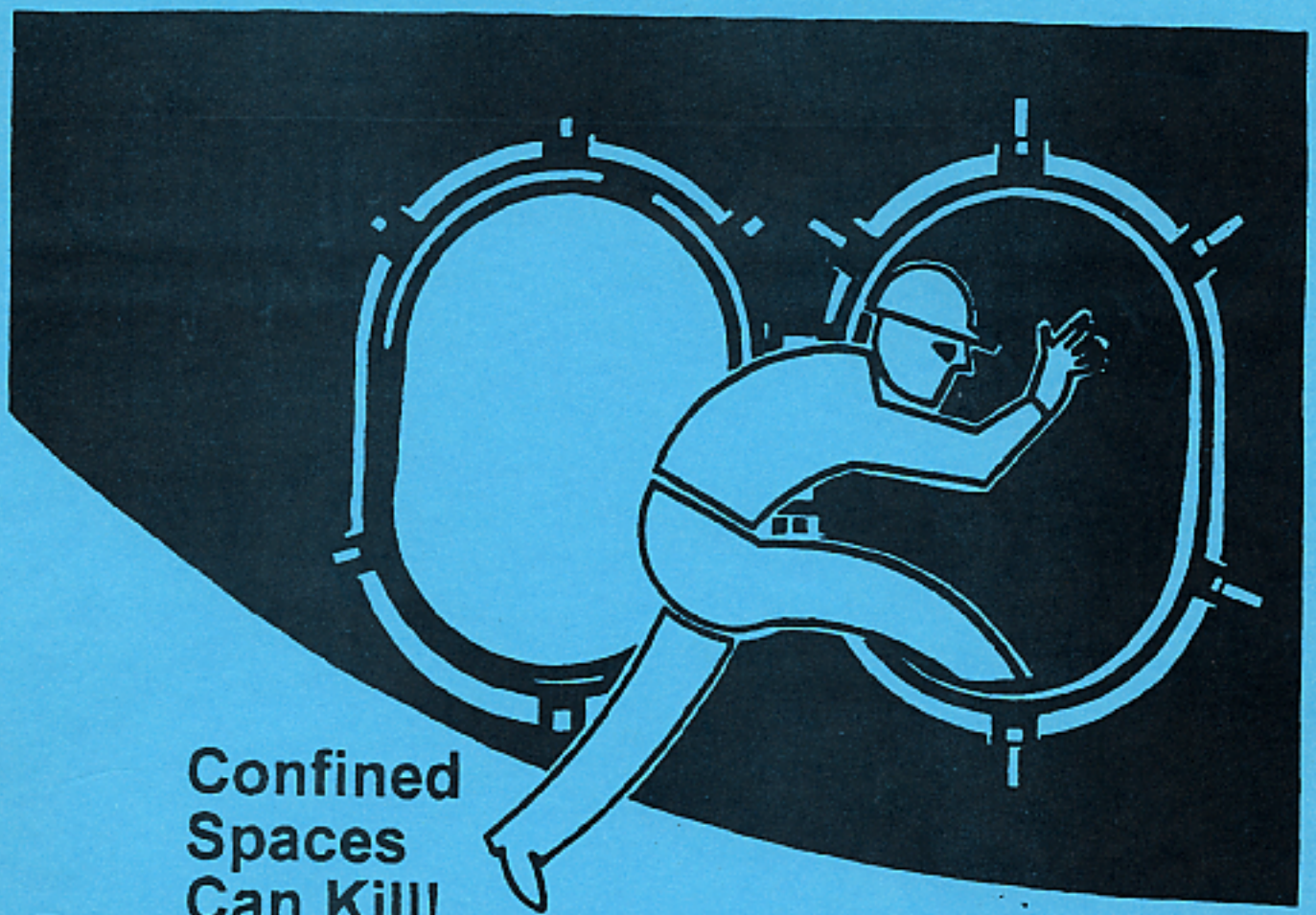

CONFINED SPACE TRAINING

Health and Safety Department
International Union, UAW

ACKNOWLEDGEMENTS

This manual was developed by the Health and Safety Department of the International Union, United Automobile, Aerospace, and Agricultural Implement Workers under federal funding from the National Institute for Environmental Health Sciences and the Occupational Safety and Health Administration.

Parts of this manual were adapted from following materials. We are very appreciative of these contributions.

- Confined Space Entrant and Attendant Training Manual, UAW-Ford National Joint Committee on Health and Safety (NJCHS)
- Confined Space Entry Manual, UAW-Chrysler National Training Center (NTC)
- Confined Space Training Manual, Service Employees International Union (SEIU)
- Permit-Required Confined Space Entry, Highlights from the OSHA Standard, OSHA Training Institute

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SECTION I

RECOGNITION OF CONFINED SPACES

SECTION I

EXERCISE 1: WHAT IS A CONFINED SPACE?

Objective: To identify features that make a work area a confined space.

How can you tell there is danger in a confined space or the chance for danger to develop? What do you look for to identify a confined space?

We would like you to write your own definition of a confined space. This will be a set of rules for deciding whether a work area is a confined space or not. Another way to think about this is what do all spaces have in common?

Think about your own experience and read the attached articles to give you some ideas. In your small group come up with a set of rules to answer the question "Is this a confined space?"

A work area is a confined space if: (We have listed OSHA's first rule to get you started)

1. It is hard to get into or out of in an emergency

2.

3.

4.

REMEMBER — CONFINED SPACES SHOULD BE MARKED TO WARN WORKERS

CONFINED SPACE - OSHA'S DEFINITION

OSHA defines a confined space as an enclosed space that is: 1) large enough for a person to enter (get his/her body into) and perform work; 2) has limited or restricted means for entry and exit; and 3) is not designed for continuous employee occupancy. As long as the area is big enough for you to fit your body into, "entry" could be just putting your head inside the space. For instance putting your head or upper body into the entry hole for a chemical storage tank is considered confined space entry.

Permit-Required Confined Spaces

According to the OSHA Standard, not all confined spaces have to be covered by a permit system. The employer has to evaluate all confined spaces in the workplace to determine the potential hazards that the space might contain. A confined space must be covered by a permit system if it has one or more of the following:

1. Contains, or has a known potential to contain, hazardous air;
2. Contains a material which could engulf an entrant
3. Has a shape that makes it possible for a person to be trapped or asphyxiated by inwardly converging walls or because the floor slopes downward and tapers to a smaller cross-section
4. Contains any other recognized, or potentially serious, safety or health hazards.

EXERCISE 2: WHAT DANGERS COULD YOU FIND IN A CONFINED SPACE?

Objective: To recognize the potential hazards of work in confined spaces.

We would like you to list the dangerous conditions that a worker might face in a confined space. The attached articles might give you some ideas. We have listed one of the hazards to get you started.

What dangerous conditions could you find in a confined space?

1. Too much oxygen — creates danger of explosion or fire.

2.

3.

4.

5.

6.

UAW CONFINED SPACE FATALITIES 1980 - 1991

12/23/80	Westmoreland, PA. (Volkswagen). Six overcome. Solvent exposure in a tank trailer.
9/4/81	Dearborn, MI. (Ford Motor Company). One dead. Carbon Monoxide in restroom near blast furnace.
7/20/82	Houston, TX. (GM Parts Depot). Three exposed to butylamine vapors in truck trailer.
8/2/82	Lansing, MI (GM Fisher Body). Three dead, two overcome. Solvent vapors/sludge pit.
8/22/82	Warren MI. (General Dynamics Corp.). One overcome. Solvent vapors/conveyor pit.
1/23/83	Windsor, ONT. (Windsor Bumper Co.). One overcome. Hydraulic vapors in pit.
3/29/83	Warren, MI (General Dynamics). One overcome. Solvent vapors in military tank.
9/21/83	Warren, MI (General Dynamics). One overcome. Solvent vapors in military tank.
11/183	Warren, MI (General Dynamics). One overcome. Solvent vapors in military tank (fuel department).
11/15/83	Centerline, MI (General Dynamics). One dead. Freon vapors in military tank.
8/10/84	New Orleans, LA (Martin Marietta Aerospace). One dead. Freon Vapors in pit.
8/23/84	Hudson, MI (Metalloy Corp.). One dead. Suffocation by sand in shakeout sand hopper.
1/4/86	Toledo, OH (GM Hydramatic). Three overcome. RX gas exposures in a heat treat oven furnace area.
10/7/86	Livonia, MI (GM Delco Products). Two burned. Iron dust explosion in a dust collector for a shot blast machine.
7/18/87	Muskegon, MI (Teledyne Continental Motors). One dead. Solvent vapors in degreaser tank.
10/5/87	Detroit, MI (BASF). One dead, one burned. Fire /explosion in a paint storage vessel-tank.
4/7/88	Moline, IL (Frank Foundries). One dead. Carbon monoxide in foundry cupola dust collector.
2/20/89	Dearborn, MI (Rouge Steel Co.). One dead suffocation by iron ore pellets in a bin.
8/15/89	Pontiac, MI (GM Truck and Bus). One dead. Solvent vapors in a hose washer solvent tank.
1/17/91	Rockford, IL (Gunite Corp.). One dead. Suffocation by limestone pellets in a cupola feed hopper.
12/13/91	Hurst, TX (Bell Helicopter). One dead, one overcome. Acid vapors in plating process sump pit.

OCCUPATIONAL HEALTH & SAFETY
YOURS, OURS, MINE

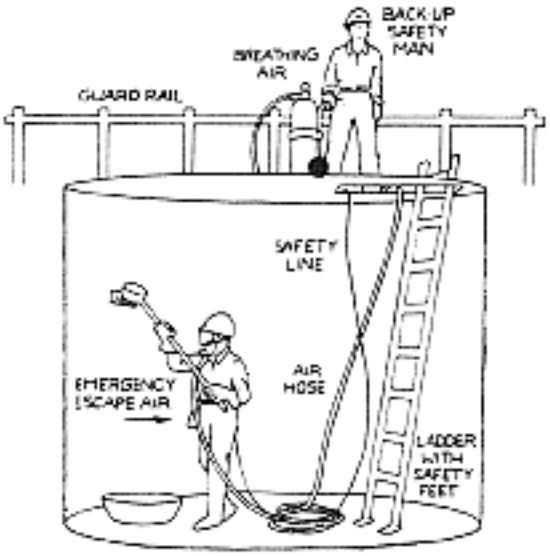
International Union, UAW 1982 #4

Three Killed In Confined Space

Two UAW members and a supervisor were killed and other workers hospitalized as a result of exposure to a high concentration of solvent vapors and/or oxygen deficient atmosphere in a confined area.

The accident took place August 2, 1982 in an automotive paint spray booth at GM's Fisher Body plant in Lansing, Michigan. Three workers were assigned to clean out the sludge tank which was approximately 14 feet below the floor deck grating. Two workers entered the pit area while the third worker held an extension cord light to provide illumination in the pit area. Shortly after entering the tank, the workers called for help. Their supervisor, who was nearby, radioed to obtain help and then went into the pit to assist the two workers. He was also overcome by the dangerous atmosphere.

In a very short time, there were many other plant personnel who arrived at the accident scene. Two of these workers were hospitalized and several other workers were treated at the plant medical department and released.



Check for:

cupolas	tunnels	pits
storage tanks	pipelines	bins
ventilation ducts	degreasers	vats
utility vaults	boilers	sewers

The investigation of this accident revealed that the workers entered the pit without any prior testing of the atmosphere in the pit, without any ventilation in the space, and without any training and without protective respiratory equipment, harnesses or lifelines.

Willful Violation

Michigan OSHA cited the company for a willful violation of the state's confined space standard, and levied a fine of $8,000. The Michigan standard requires pre-testing of a confined space atmosphere, fresh air ventilation, proper respirators if needed, back-up personnel, and training for the workers involved. Copies of the standard are available from Division of Occupational Health, P.O. Box 30035, Lansing, Mich. 48909.

Federal OSHA has no equivalent standard.

Local Union Action

In all locations, steps should be taken to prevent further fatalities. Each plant should:

1. Survey the plant and list all confined spaces where an entry procedure must be used.
2. Establish a confined space entry procedure.
   a) Test the air prior to entry for oxygen deficiency, toxic vapors and explosive gases. Various measuring devices are available, depending upon hazards likely to be encountered.
   b) Provide mechanical ventilation, when necessary.
   Provide a supplied-air respirator, when necessary.
   d) Provide a life-line and/or a "buddy system."
   e) Provide training for the workers involved.

Additional information can be obtained by writing the Health and Safety Department or can be found in past articles of the **UAW Health and Safety Newsletter** — "How to Prevent Confined Space Accidents" (Vol. VII, #2 May-June, 1978) and "Controlling Deadly Vapors" (Vol. VI, #5, Sept.-Oct., 1977).

Would-be rescuer loses life in sewer filled with fumes

BY JIM SCHAEFER 6/2-1/92
Free Press Staff Writer

A worker for a Detroit pollution control company died Thursday while trying to rescue another man who was overcome by fumes in a sewer, police said.

The would-be rescuer, William Yike, 27, of Detroit, also was overcome and he fell from a ladder and landed in about 18 inches of muck. He could not be revived.

Yike and Dennis Gorecki, 22, were trying to clean a sewer at Edwards Oil Service near Dix and Schaefer in southwest Detroit. Around 4:50 p.m., Gorecki descended the ladder and was felled by fumes.

Yike was trying to climb down after him when he fell, police said.

Gorecki's father, Rich Gorecki, who also works for Edwards Oil, tried to enter the sewer but could not stay in long enough to get to Yike. Father and son were recovering at Detroit Receiving Hospital.

Police did not say how Dennis Gorecki got out.

Yike was dead on arrival at Detroit Receiving Hospital. Police said he could have drowned or died from the fumes, but the official cause of death was not known.

Fire fighters said they did not know what type of fumes were in the sewer.

Yike worked for Inland Waters Pollution Control in Detroit. The owner could not be reached and a man who answered the telephone at Inland would say only that Yike was "an outstanding person."

SUSAN WATSON IS ON ASSIGNMENT

The Republic, Columbus, Ind., Friday, December 31, 1993

Worker dies in coal silo

UAW LOCAL #9212
UAW REGION 3

By Michael Martoccia
City Editor, The Republic

BUTLERVILLE — Two Muscatatuck State Developmental Center employees responding to an emergency situation at the center's coal silo on Thursday were dragged into an air pocket and buried by coal, killing one man and injuring the other.

More than 30 rescue personnel and volunteers feverishly worked nearly three hours before uncovering the body of Edward Larison. He was pronounced dead at the scene of traumatic asphyxiation, according to Jennings County Coroner Harold Pickett.

The 60-year-old Larison was the center's first recipient of Employee of the Year award in 1993.

Co-worker Terry Mitchell accompanied Larison to the silo and was dragged into knee-high coal before freeing himself and scrambling to safety before summoning assistance.

He was not seriously injured, according to emergency workers, noting that Mitchell later assisted them in recovering Larison.

Representatives of the Indiana Occupational Safety and Health Administration were examining the site and incident late Thursday and were expected to return early next week, noted Jennings County Sheriff's Department deputy Danny DeShong.

During a shift change at approximately 6:30 a.m. Thursday, Larison and Mitchell were notified by other employees that coal was not flowing normally through a chute to the 50-foot-high silo, which provides heat to the rural center off U.S. 50 near Butlerville, authorities said.

Less than three hours later, Larison and Mitchell climbed into the chute approximately 30 feet

(Continued From Page 1)

above the ground and were using a bar to break up the coal.

After unclogging the coal, the men were preparing to exit when they were dragged down with the collapsing coal, burying Larison and temporarily pinning Mitchell.

Moments after escaping, Mitchell requested assistance from the center's emergency personnel.

The emergency plea was initially taken by Larison's wife — an employee at the center — according to a developmental center office worker.

Within five minutes, scores of firefighters and rescue personnel from the center, Campbell Township Volunteer Fire Department, Rescue 20 and Jennings County Sheriff's Department began digging into the coal and chute.

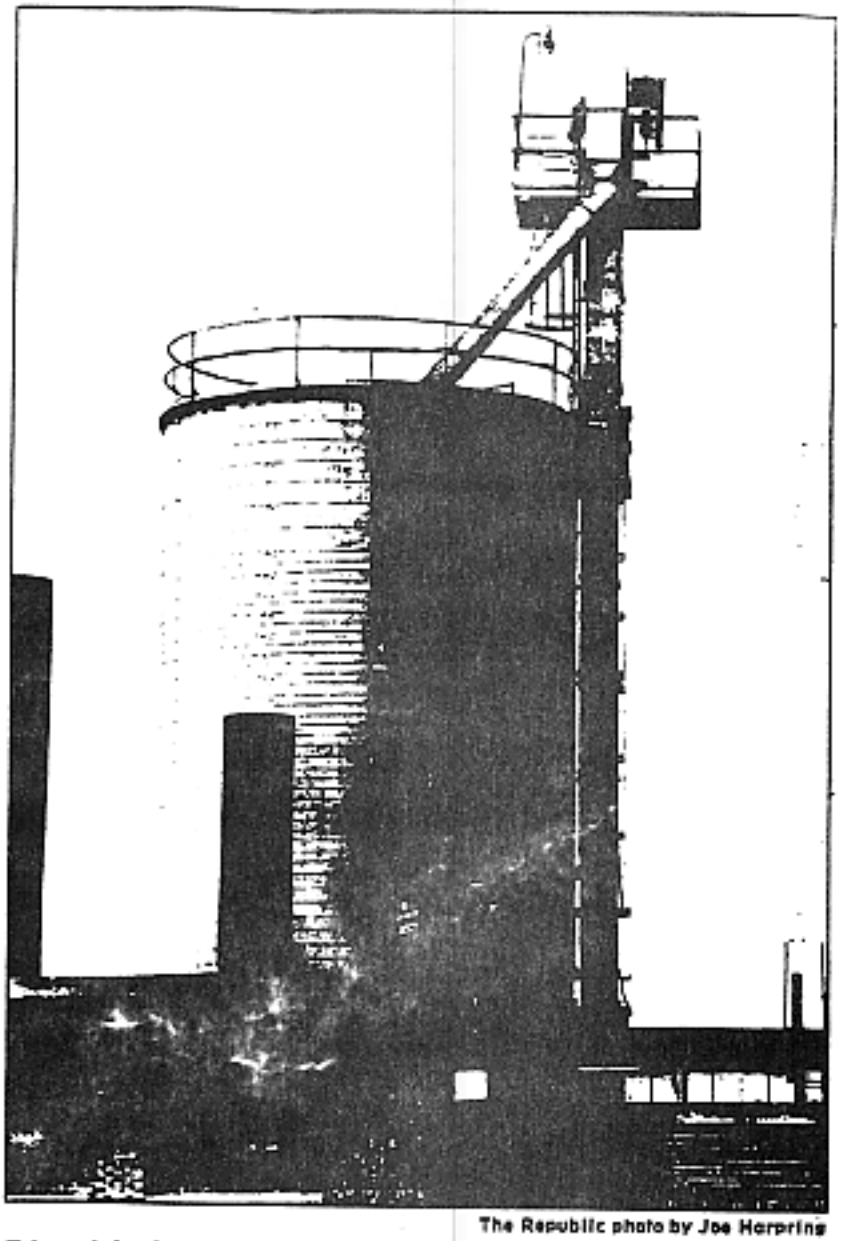
Initially, two large North Vernon wreckers were used to detach the chute from the silo. Those efforts failed.

Officials then used a masonry saw and spent nearly 45 minutes cutting through the stainless steel coal chute. They reached Larison shortly after 1 p.m.

"Just amazing work by everyone ... we used our hands and all kinds of tools to get to him... but it was too late," replied DeShong.

Center administrators were unavailable for comment late this morning.

DeShong believed it was the first accident involving death or serious injury at the silo.



The Republic photo by Joe Herpring

Edward Larison, an employee of Muscatatuck Developmental Center, died after a fall in this coal storage silo Thursday.

THE CONFINED SPACE PROGRAM

The Occupational Safety and Health Administration (OSHA) has published federal safety requirements for confined space entry programs. The standard is called "Permit Required Confined Spaces" and is found in 29 CFR 1910.146. OSHA standards say that a confined space entry training program must contain:

A written plan (completed and updated by the facility safety engineer)

- Confined space locations and descriptions
- Identification of associated hazards
- Entry procedures
- Special equipment
- Rescue plans
- Procedures for obtaining/completing a confined space entry permit

Hazard identification and control

- Identify existing and potential hazards and how they will be controlled, for example through ventilation, blocking and bleeding pipes, and effectively locking out.

Entry permit system

- Authorizes the entry and acceptable entry conditions
- Documents hazards of space to be entered, monitoring information and control measures
- Documents entry and attendent personnel and entry supervisor

- Must be filled out before **anyone** can enter a confined space with date and duration of work to be done
- Documents the completion of confined space work

Posting of confined spaces

- All identified confined spaces must be clearly labeled with warning signs or workers must be informed of location and danger by a means that is "equally as effective" as signs.

Prevention of unauthorized entry into confined spaces

- Only **trained** persons listed on the entry permit (including outside contractors) can enter confined spaces

Employee training

- All employees assigned to confined spaces must be trained. This includes entrants, attendents, employees responsible for monitoring confined spaces or authorizing entry permits, and rescers.

Confined space testing and rescue equipment

- Special equipment to test the air (atmosphere)
- Equipment for rescues and emergencies

Rescue procedures

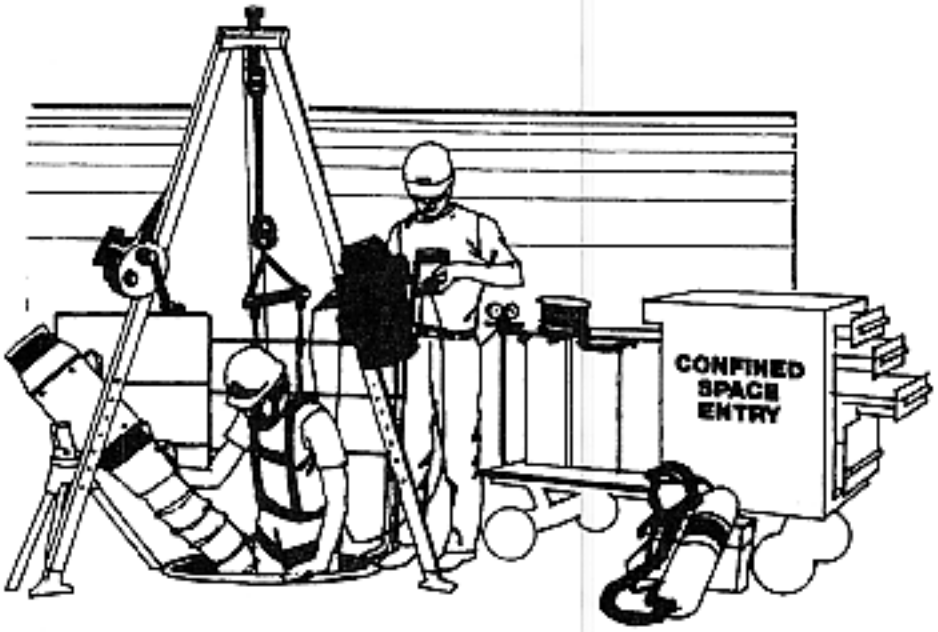
- A written rescue plan
- Trained rescue personnel
- Equipment for non-entry rescue as well as rescue requiring entry

Hazard protection

- Protective equipment and procedures for controlling environmental and physical hazards

Contractor information and policies

- Contractors must follow OSHA requirements and conform to the company's policy while on company property.



THE TEAM

Successful confined space operations require a well trained team. Difficult work tasks can best be done with cooperation and coordination. The following well-trained personnel will be involved in most confined space entries (occasionally an attendant will not be required and some of those duties will be assumed by a designated entrant).

MANUFACTURING ENGINEERING/PLANT ENGINEERING

- Notify the safety engineer, the UAW Health and Safety Representative, and outside contractors of any new or planned confined spaces because of plant changes

SAFETY ENGINEERS

(with the UAW Health and Safety Representative and manufacturing engineering and plant engineering activity)

- Identify each space that meets the confined space definition
- See that signs reading "Danger, Confined Space, Enter By Permit Only" are posted near each confined space
- Evaluate each confined space for real or potential hazards

SUPERVISORS

- Assign only fully trained employees
- Make sure that the entry permit is issued
- Make sure that proper confined space procedures are followed
- Know the confined spaces in your area and make sure the signs are posted and maintained

PERMIT ISSUERS

- Recognize, evaluate, and recommend methods for controlling hazardous materials and conditions in confined spaces
- Test and monitor the air in confined spaces
- Determine measures and protective actions necessary for safe confined space entries
- Prepare the entry permit
- Conduct pre-entry briefings with supervisors, entrants, and attendants (and rescue personnel if required) before any employee enters a confined space
- Return the entry permit to the employee responsible for the confined space program when all work is completed

ENTRANTS

- Enter and work in confined spaces only after being fully trained
- Verify that entry permit is issued and posted near the entrance of the confined space
- Recognize hazards, their signs and symptoms, and understand the consequences of exposure to hazards
- Follow communication requirements and evacuate the confined space when physical distress symptoms are noticed, when ordered by the attendant, or when an automatic alarm sounds
- Notify the attendant when entrant(s) evacuate the confined space for any reason

- Follow the Energy Control and Power Lockout Program
- Use personal protective equipment and other safety equipment specified on the entry permit

ATTENDANTS

- Remain outside the confined space to respond if there is an emergency
- Stay alert and aware of the entrant(s)
- Provide the primary means of communication outside the confined space for the entrant(s)
- Make other workers in the area aware that work is in progress in the confined space
- Return the entry permit to the permit issuer

RESCUE TEAMS

- Perform rescues in confined spaces
- Perform CPR and first aid as needed
- Use proper equipment which reaches all areas of a confined space, including self-contained breathing apparatus or air-supplied respirators
- Stand by during the entry if required by the permit issuer

SECTION II

HAZARDS OF CONFINED SPACES

HAZARDS YOU MAY FACE IN CONFINED SPACES

OSHA has identified four types of hazards that may be faced in confined spaces

Atmospheric — the quality of air in the space

Engulfment — being trapped or buried by particles like sand

Mechanical and Electrical — hazards created when equipment is not isolated from power sources.

Other hazards — temperature (too hot, too cold), noise, insecure footing, stagnant air, poor lighting, presence of animals (snakes, rats, etc.)

WARNING SIGNS THAT SOMETHING IS WRONG

There are many ways the air in a confined space can become poisonous. Entrants and attendants must be constantly alert for signs in the entrants' behavior that something may be wrong.

The following (or other) suspicious signs indicate that the entrant must exit or be removed from the space- immediately and that emergency help must be summoned.

Physical Distress Symptoms Checklist

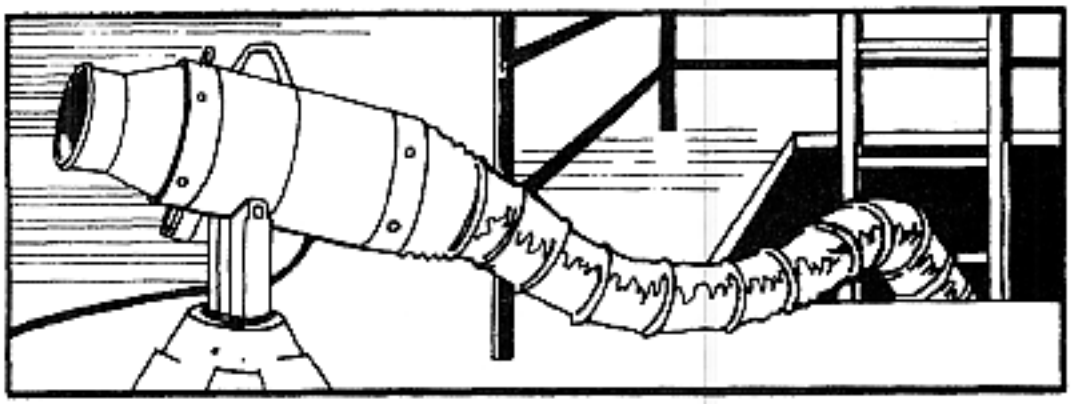
- ___ **dizziness**
- ___ **disorientation**
- ___ **weakness in the knees**
- ___ **shallow, rapid breathing**
- ___ **blurred vision**
- ___ **exaggerated sense of feeling good**
- ___ **profuse sweating**
- ___ **chest pains**
- ___ **inability to work as skillfully as normal with hands and arms (loss of manual dexterity)**
- ___ **loss of coordination**
- ___ **change in heartbeat**
- ___ **ringing in the ears**
- ___ **skin irritation**
- ___ **nausea**

IDLH: IMMEDIATELY DANGEROUS TO LIFE OR HEALTH

Any atmosphere which is immediately dangerous to life or health (IDLH) must be recognized and eliminated. Our objective is to remove all threatening atmospheres whenever possible. This is usually accomplished by purging the air with forced ventilation . Purging prevents accidents and makes it unnecessary for workers to wear complicated breathing devices while working in confined spaces. In a few cases it may be necessary to enter confined spaces which cannot first be purged. When this happens, entrants must wear the breathing device specified on the entry permit. They must be fitted for the device and trained in its use.

An IDLH atmosphere:

- Poses an immediate threat of loss of life
- Results in irreversible or immediate/severe health effects
- Results in eye damage
- Results in possible skin irritation
- Contains conditions which can make escape from the confined space more difficult



Purging a confined space

THE AIR IN CONFINED SPACES

There are several conditions that can cause the air in a confined space to be hazardous to employees who work there. **The air in a confined space must always be tested by the permit issuer and ventilated if test results require it. (See Appendix for a list of common substances found in confined spaces.)**

OXYGEN IN THE AIR

If there is not enough oxygen in the air in a confined space (less than 19.5%) workers can lose consciousness and die (asphyxiation).

The oxygen level in a confined space can be decreased in several ways:

- Work being done like welding, cutting or brazing
- Chemical reactions to bacteria or other chemicals
- Other gases (carbon dioxide or nitrogen, etc.) replacing the oxygen

Employees will become unconscious and possibly die when the oxygen in a confined space is replaced by another gas such as carbon dioxide.

If the entry permit shows there is not enough oxygen:

- If possible, the confined space must be ventilated (purged) until the air inside the confined space is safe.
- The air must be corrected so the employee can enter without using a supplied-air respirator (SAR) whenever possible.

When there is too much oxygen (more than 23.5%) in the air in a confined space, there is danger of explosion and fire. In this oxygen-rich atmosphere, clothing, hair, and other combustible materials will burn violently when ignited. When this condition exists, the cause will be investigated and the space will be ventilated and then retested.

Caution: Never use pure oxygen to ventilate a confined space. This will create a fire hazard.

What happens to your body when it does not get enough oxygen:

Amount of oxygen	Symptoms
22%	Too much oxygen — fire danger
21%	Normal air.
20%	Safe to breathe.
19.5%	Lowest safe level. Alarm on air monitor should be set to this point.
18%	Other gases have taken the place of oxygen in the air
16%	Breathe faster, feel giddy (happy and excited), make bad decisions, trouble concentrating.
14%	Poorjudgement, fim quickly, feel like you can't catch your breath, fast pulse, uncoordinated.
12 %	Uneven breathing, lips blue, may faint without warning.
10%	Mental failure, headache, weakness, fainting, feel sick to stomach, throw up, grey face.
8%	Survival possible if exposed less than 4 minutes.
6%	Breathing stops, death within minutes.

Low oxygen may make you dizzy or faint, which can cause accidents.

If you feel any of these symptoms, or if you notice any of them in a worker inside a confined space, get everyone out right away.

FLAMMABLE ATMOSPHERES

Remember: The OSHA standard does not allow entry into a confined space when the air measures more than 10% of the LEL.

When flammable gases, vapors or dusts are present in the air of a confined space there is the possibility of fire or explosion. There are two things that influence whether the air is flammable or explosive.

Flash point is the temperature at which a flammable or explosive liquid will give off enough vapors to form an ignitable mixture. Different liquids have different flash points. Gasoline, for example, can be ignitable at minus 45°F.

Ignition temperature is the temperature required to ignite gases or vapors. Gasoline has an ignition temperature of 536° F, which sounds high. Yet, when you consider that a common cigarette can burn at anywhere from 760°F to 1440°F, it is obvious that many things can ignite gases or vapors. If a cigarette won't ignite some gases or vapors, the flame used to light it (match or lighter) will. **Any open flame, arc from an electrical source or a spark from a dropped tool can ignite flammable gases or vapors.**

Flammable limits are the lowest and highest percentages of gas to air that will burn. The difference between the two limits is called the flammable range.

- When the amount of fuel present is too little to burn, the mixture is "too lean." It is below the lower explosive limit (LEL).

- When the fuel is too plentiful, conditions required for fire do not exist and the mixture is "too rich." That means it is above the upper explosive limit (UEL).

FLAMMABLE AND COMBUSTIBLE LIQUIDS

There are two classes of liquids which may catch fire. The basic difference between the two is their flash point.

Flammable liquids have a flash point below 100°F

Combustible liquids have a flash point at or above 100°F.

Remember! Different materials have different flammable ranges. If a source of ignition exists in a space containing a flammable atmosphere, an explosion may result. It is easier to change the air than to control the ignition sources.

TOXIC (POISONOUS) ATMOSPHERES

Toxic atmospheres are those where the air contains gases, vapors, fumes, dusts or mists that are poisonous to the human body. Air with an oxygen concentration greater than 20% can still be toxic if it contains poisonous substances. Carbon monoxide and hydrogen sulfide are the most common toxic gases found in confined spaces.

Toxic substances can come from several sources:

- Products stored in the space can be absorbed into the walls and give off toxic gases when removed. For example, removal of rotted materials or sludge from a tank can give off a deadly gas called hydrogen sulfide.

- Work in the confined space may produce toxic substances or atmospheres. Welding, cutting, brazing, painting, scraping, sanding, degreasing — all may release toxic fumes or substances. Solvents used for cleaning or degreasing may create toxic vapors.

- Gases, fumes, vapors and dusts from work in areas close by may enter and accumulate in the confined space.

All dusts, fumes, gases, liquids, mists, vapors and some solid materials in confined spaces should be considered potentially hazardous.

The effect on the body from toxic substances is called "toxicity." Small doses of a toxic material over a prolonged period (chronic exposure) can result in delayed health effects,

A large dose of toxic material over a short period (acute exposure) usually results in an immediate reaction, but sometimes there may be a delay of as much as 72 hours. For instance, hydrogen fluoride gas or cadmium vapor may cause a worker to feel sick for a short while, but then the symptoms usually pass. However, a high exposure to either of these substances may result in a fatal collapse 12 - 72 hours later.

There are several ways that toxic substances can enter the body: inhaling, swallowing, skin punctures, absorption through the skin, and ingestion.

Never take food, drink, gum, cigarettes or chewing tobacco into a confined space. They may absorb hazardous chemicals which will be present when you eat, drink or smoke them later. And, since toxic materials can enter your body through cuts, sores, burns or scratches, cover all such skin areas before entering a confined space.

PHYSICAL OR SPECIAL HAZARDS

HEAT

Excessive heat in a confined space combined with a lack of natural ventilation may cause serious problems. Those problems can progress from heat cramps to heat stroke.

- Heat cramps are marked by muscle cramps, overall weakness, moist and warm skin, and heavy perspiration; but seldom is there a loss of consciousness.

- Heat exhaustion includes symptoms of rapid and shallow breathing, weak pulse, overall weakness, cold and clammy skin, heavy perspiration, and loss of consciousness in some cases.

- Heat stroke includes deep and then shallow breathing, rapid pulse, overall weakness, dry and hot skin, little or no perspiration, and loss of consciousness in most cases.

COLD

Extreme cold can cause people to become clumsy, tire easily, make mistakes, and generally be at greater risk of injury. If not treated, this condition can cause body temperature to become abnormally low (hypothermia). Numbness in the arms and legs is a common symptom.

Frostbite causes injury to specific areas of the body and results from exposure to extremely low temperatures.

When any of the symptoms for heat or cold stress exist, remove the entrant from the confined space and summon emergency help.

NOISE

Many areas in plants are noisy and the work you do in confined spaces can increase noise levels. Excessive noise can cause ear damage and interfere with communication. Wear proper hearing protection where noise levels exceed 90 dBA.

If there is a chance that a shouted warning from a worker inside a confined space may go unheard, other kinds of communication must be used. Hand signals, tugging on a rope or lifeline, or throat microphones are examples of alternatives.

INSECURE FOOTING

Irregular surfaces and oily or slippery floors can be hazardous. Workers in confined spaces should wear footwear with non-slip soles.

STAGNANT AIR

Air in confined spaces may not be toxic but may be foul-smelling, musty, and unpleasant to breathe. Ventilation equipment should be used to remove stale air and pump fresh air into the space.

POOR LIGHTING

Since confined spaces are not primarily designed for humans to occupy, lighting may be poor. Portable lighting should be used and should be shielded and explosion-proof, if required.

PRESENCE OF ANIMALS

Snakes or rats may exist in some confined spaces and may be dangerous. When needed, exterminators should treat confined spaces before entry.

While some hazards are potentially less dangerous than others, they all can cause unsafe conditions for a worker inside a confined space. That's why confined space procedures are so important. Careful testing and monitoring, use of appropriate safety and personal protective equipment, and planning for good communication can prevent injuries from these hazards.

EXERCISE : IDENTIFYING CONFINED SPACES

List the areas at your workplace that are or might be confined spaces. Is this space marked as a confined space? Describe why you would go into each of these confined spaces. What kind(s) of hazards could you find in each?

Area	Is space marked?	Why would you go in? (to clean, do routine maintenance, etc.)	What dangers could be present or created by work?
1.			
2.			
3.			
4.			
5.			
6.			

SUMMARY

REMEMBER — You cannot recognize a confined space just by looking at it. You have to think about it. Would it be hard to get out in an emergency? Is it possible that the air could be unsafe? Is it on the list of confined spaces? Will the work to be done in the confined space create a dangerous condition?

If the answer to any of these questions is "Yes," or "I'm not sure," you need to protect yourself.

- **Never** go into a confined space unless you are trained and have a written permit.
- **Never** work alone in a confined space — use the buddy system.
- **Never** go into a confined space if someone is in trouble. You will probably be the next victim. Whatever has hurt the worker inside will probably get you, too. Do NOT go in. Employers must train workers about who to call for help. This may be an in-plant rescue squad (the best option) or someone from outside the plant. The on-site rescue team must be told whenever anyone goes into a confined space.

SECTION III

SAFETY EQUIPMENT FOR CONFINED SPACES

SAFETY EQUIPMENT FOR CONFINED SPACES

Workers in confined spaces must be aware of hazardous atmospheres which can cause asphyxiation. They also must prevent and avoid injuries from chemical burns, cuts and abrasions, broken bones, burns, head injuries, eye injuries and hearing loss. Now that you have an understanding of the potential hazards in a confined space, it is important to know and use appropriate safety equipment that will protect you.

There are three types of safety equipment that must be available and used in confined spaces:

- ✓ Precautionary equipment
- ✓ Equipment for making work safe
- ✓ Rescue equipment

PRECAUTIONARY EQUIPMENT

This is equipment that warns other employees that the work area is hazardous and that work is underway.

Warning Signs and Tapes

Clearly visible warning signs will be posted for all confined spaces. They warn workers that only authorized entrants may enter the permit space.

Warning tapes "rope-off " the area around confined spaces. They are especially effective in alerting workers to the presence of hazards.

Barricades, Pylons and Shields

Barricades and pylons physically block access to the work area and their bright colors add additional warning. Signs alone may not provide enough warning in poorly lit areas. If there is any doubt about their effectiveness, use barricades, pylons, or both. Shields should also be

used to prevent any tools or equipment from falling into the confined space and striking the entrant.

All barricading equipment should be removed and returned to storage after completion of the confined space operation.

EQUIPMENT FOR MAKING WORK SAFE

There are many types of equipment available to make work in confined spaces less hazardous.

These include personal protective equipment, hazard control equipment and air monitors.

Personal Alert Safety System (PASS)

These devices sense body movements when worn by workers. An alarm sounds to alert others if for any reason the worker's body movement stops,

Ventilating Equipment

Fans that move air are called ventilators. They bring fresh air into confined spaces to replace hazardous breathing conditions or explosive atmospheres. Ventilators are of two types:

- ✓ Electric blowers (portable and explosion-proof)
- ✓ Non-electric air movers (also called air horns or Venturi-type) which connect to in-plant compressed air lines

Ventilating equipment must be assembled and tested before use. After use, thoroughly clean and store ventilators to protect them from moisture and dirt.

Do not place an air mover so it blows contaminated air into the confined space.

Portable Lighting (explosion-proof)

Confined spaces may have little or no light. All power sources to the confined space may be locked out so the only light will be provided from portable lighting. All lighting devices must be shielded and, in some cases, explosion-proof.

Ground Fault Circuit Interrupters (GFCI)

Ground fault circuit interrupters are used when wet conditions are present that may cause electrical shock. GFCIs sense when current — even a little — passes to the ground through any path other than the conductor. They shut off instantly when input power is interrupted in any way. GFCIs also prevent accidental start up after a power interruption.

Non-sparking Tools

Non-sparking tools are used in confined spaces with potentially explosive conditions. The plant safety engineer can recommend the proper tools and their use should be discussed during the pre-entry briefing.

RESPIRATORY EQUIPMENT

A policy of purging and ventilating confined spaces whenever possible means workers will seldom wear respirators with supplied or self-contained air supplies. Respirators which filter or remove gases, fumes and particles will often be used and will be listed on the entry permit.

Air Purifying Respirators

Another type of respirator is the air purifying respirator. These devices do not supply air, but purify it as it passes through the respirator.

There are two types of air purifying respirators:

✓ **Particulate filter respirators** remove dusts, mists, and fumes with a filter.

✓ **Chemical cartridge respirators** remove gases and vapors through a cartridge or canister designed for specific gases.

Entrants should check the respirator to see that it is the same as specified on the entry permit.

Supplied-Air Respirators

Supplied-air respirators (SARs) supply breathable air for work in potentially hazardous confined spaces. SARs are of two types:

✓ Airline respirators with emergency escape air supply

✓ Self-contained breathing apparatus (SCBA)

SARs used for rescue have a mask and an air source. The air source must be under positive pressure — that means a greater pressure exists inside the mask than outside of it. This

prevents dangerous air from entering the mask from outside.

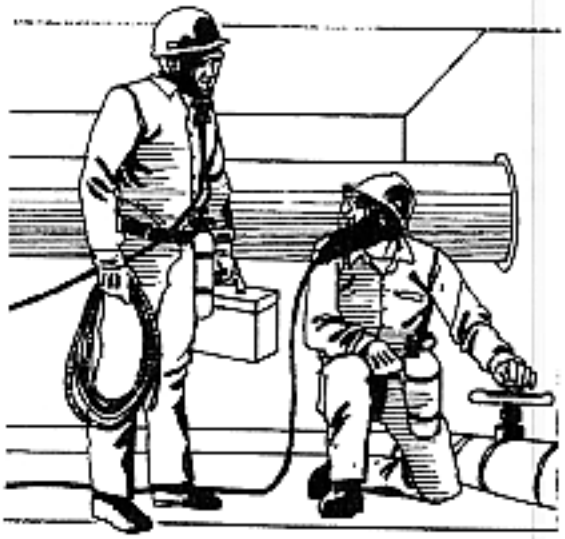
When plant air is used, the system must have a special airline respirator panel which filters the air. This panel must be checked often for oil, carbon monoxide, and water vapor.

Airline Respirators

Airline respirators are light weight and have an unlimited and constant pressure air supply. They consist of a mask connected to a hose that supplies breathable air to the mask through a filter.

Airline respirators to be used in confined spaces must meet these requirements:

- ✓ Hose no longer than 300 feet
- ✓ Air supply located outside the confined space and free of contaminants
- ✓ Compressor supplied air is monitored for carbon monoxide
- ✓ Equipped with emergency escape air supply when used inside a confined space



Self-Contained Breathing Apparatus (SCBA)

The self-contained breathing apparatus has a mask, a pressurized tank that supplies breathable air, valves, and a regulator to control the flow of air to the mask. The SCBA has its own air supply that provides breathable air under enough pressure to keep the dangerous air in unsafe atmospheres out of the mask.

The SCBA is usually used for rescue work when someone must enter a confined space where the air will not support human life. Entrants will seldom wear SCBAs since all dangerous atmospheres should be identified and purged before entry whenever possible, Attendants will **not** use SCBAs since they are not to enter confined spaces and attempt rescues.

SCBAs have some disadvantages:

- ✔ The air tank is heavy and awkward
- ✔ It is too large to permit entry into some spaces
- ✔ The amount of available air is limited to the air in the tank

Warning!

Anyone required to wear a respirator must be medically qualified, fit-tested, and properly trained in its use. For more information about proper use of an air purifying respirator, see your safety engineer or UAW Health and Safety Representative.

PERSONAL PROTECTIVE EQUIPMENT

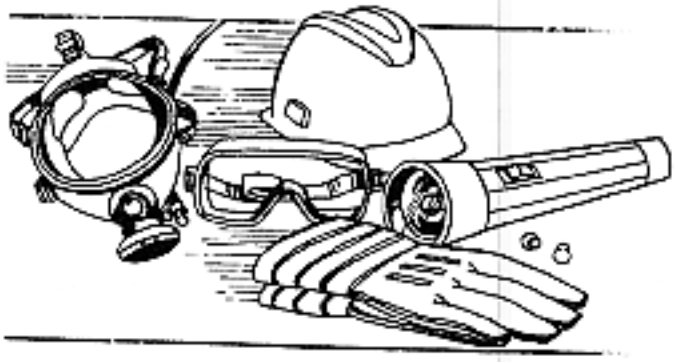
Personal protective equipment used throughout the plant is also important in confined spaces. Check all labels to make sure the materials used in the equipment are rated for the conditions listed on the entry permit.

Hard Hats

Hard hats (protective helmets) protect the head from falling objects or falls. Hard hats may also have hearing protection or face shields attached.

Eye and Face Protection

Face and eye protection are important in confined spaces. Chemicals that contact the face or eyes are often absorbed, cause burns, or cause blindness. Face masks also protect teeth and jaws.



Safety glasses, goggles (standard or chemical), face shields and full-face respirators can prevent serious injury while working in a confined space. Be aware that protective eye and face equipment can reduce peripheral vision and fog-up, and some chemicals can penetrate the shields. **Select the right equipment for the job you are doing.**

Hearing Protection

Loud and/or continuous noise can cause hearing loss. If there is excessive noise, you must wear hearing protection.

Two-way radio headsets provide voice communication between workers who cannot see one another, are working in noisy areas, or are wearing respiratory equipment. If you cannot talk by voice within 3 feet of the other person, use another form of communication — hand signals, ropes or microphones.

Hand, Foot, and Full-Body Protection

Entrants may be required to wear hand, foot, or full-body protection depending on the hazards in the confined space. All special protective requirements should be included in the written plan and entered on the entry permit.

The protective clothing selected should be designed to protect you from any chemicals that will be encountered. **Be aware that clothing that provides chemical protection may not also protect against heat and cold.** Follow manufacturers' recommendations when selecting personal protective equipment.

PERSONAL MONITORING AND TESTING EQUIPMENT

There are personal testing instruments designed to be worn by entrants in a confined space. They may be the same instruments used to test the air before entering the confined space. When worn by entrants on a belt around the waist, they sound an alarm if unsafe limits of gases or vapors are reached. The alarms sound at levels that allow enough time to exit the confined space.

The alarms on personal monitors should have standard settings as follows:

Oxygen — alarm sounds when level drops to 19.5%.

Flammable Gases/Vapors — alarm sounds at 10% of the lower flammable limit (LFL).

Toxic Gases/Vapors — alarm sounds at 50% of the permissible exposure limit.

The permit issuer must be aware of the substances that may exist and recommend the correct personal testing equipment. Asbestos removal requires special training, testing, and equipment.

RESCUE EQUIPMENT

There is equipment that is essential for confined space rescues. For example, conditions in the confined space may require that the entrant wear a body harness or a lifeline.

Important!

The entry permit will list the required rescue equipment and whether or not that equipment must be at the point of entry <u>before</u> workers enter the confined space.

Before each use, rescue equipment should be inspected and determined to be in good condition. It must be checked to make sure straps are not worn or frayed and that threads are not broken. After each use, rescue equipment should be cleaned, inspected, and properly stored.

BODY HARNESS

Body harnesses have adjustable straps and buckles and can be worn over the clothing. They are used to lift a worker out of a confined space. Again, the entry permit will specify if the entrant must wear a body harness in the confined space.

WRISTLETS

Wristlets have loops of strong strapping material that connect to a lifeline or lanyard, Rescue operations may require their use, especially where a worker must be withdrawn through narrow openings. According to OSHA, wristlets may only be used where it is NOT possible to use a body harness.

RETRIEVAL LINES

A retrieval line connects at one end to a lifting device or a fixed point outside the confined space and the other end attaches to the entrant. It can be used to pull the entrant from the confined space during an emergency. Rescues will be faster when retrieval lines are used with a power winch.

LIFELINES

Lifelines stop falls. They must be made of corrosion-resistant fiber and have a quick-latch on one end. Lifelines must be long enough for use in the confined space involved.

LANYARDS

Lanyards are simply short lifelines used for fall arrest. They are six feet long with double-locking snap links to protect against accidental slipping.

Lanyards must be taken out of service after receiving fall impact.

IMPORTANT! Use of manila rope or other ropes made of natural fibers is not recommended for confined space operations because they deteriorate with age. Approved synthetic ropes are generally better for confined space use.

MECHANICAL LIFTING DEVICES

Mechanical lifting devices include hoists, winches, and other lifting systems used to remove a person from a confined space in an emergency. These devices are not standard and may not be used in every facility.

Mechanical lifting devices should be carefully checked **before** placing a load on them.

TESTING THE AIR

Confined spaces may have hazardous oxygen levels, flammable gases or vapors, or poisonous (toxic) gases or vapors. Many of these cannot be seen or smelled. The permit issuer will use specialized air monitoring instruments to test the air in confined spaces. **Testing the air is the most important part of the confined space entry procedure.**

Tests are done for oxygen levels, toxic gases and vapors, and combustibles. **Personnel conducting these tests must have been trained in the use and reading of the test instruments. Air monitoring instruments must be calibrated periodically to make sure they are accurate.**

Testing is first done by the permit issuer from outside the confined space by probing with test instruments near the entry. After opening the space, the air must be tested from top to bottom by the permit issuer.

Some gases are lighter than air and others are heavier than air. For these reasons, gases may settle at the top or bottom of the confined space. It is imperative that all areas of a confined space are tested — top, bottom, middle, in corners, behind pipes and ducts —anywhere gases might accumulate.

When testing shows a lack of oxygen or any toxic gas or vapor, the confined space must be thoroughly ventilated. Then, the confined space must be tested again before anyone enters.

Important points to remember:

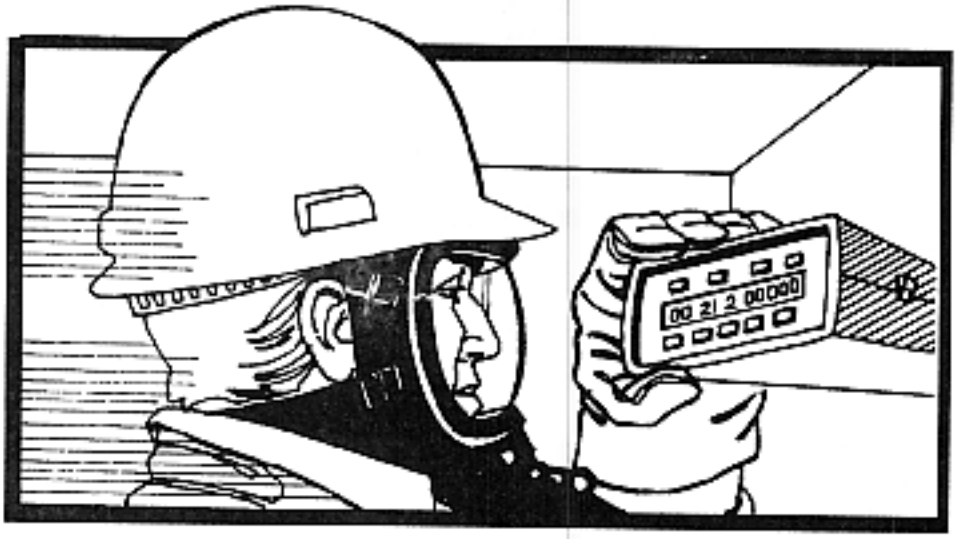
- ✓ If ventilation is not possible and entry is necessary, all entrants must have appropriate respiratory protection,
- ✓ If there is any chance that the atmosphere inside a confined space could change because of work in progress, frequent monitoring must continue for the duration of the entire confined space operation.
- ✓ If the space is not occupied for any period of time, it is required that the atmosphere is retested by the permit issuer before entry.

Exposure Limits

There are two lists of limits for employee exposure to contaminants. The idea behind these limits is that there are concentrations of substances that will cause no harmful health effects even with repeated, day-after-day exposure.

Permissible Exposure Limits (PEL) are OSHA's limits. Threshold Limit Values (TLV) are the designation of the American Conference of Governmental Industrial Hygienists (ACGIH). Some workers still suffer health effects even below these exposure limits. It is best if employee exposures are kept as **low** as possible.

No limits have been established by OSHA or ACGIH for gasoline and oil smoke, but companies can establish their own. Some have also established lower exposure limits for other substances. See your safety engineer or UAW Health and Safety Representative who can provide information regarding your company's policy.



SECTION IV

PREPARING TO ENTER CONFINED SPACES

PREPARING TO ENTER CONFINED SPACES

Good preparation **before** entering a confined space is crucial. Following these steps will help ensure the safety of confined space operations.

1. Permit issuer reviews the written plan and notes specific requirements on the entry permit.

2. Permit issuer tests the air in the confined space (measured hazard level of the atmosphere shows whether there is a need for purging and ventilation).

3. Air is ventilated (purged) if necessary, then retested.

4. Safety and rescue equipment (listed on entry permit) is assembled, inspected and set up.

5. Power sources are locked out when necessary.

6. Any lines feeding the confined space are blocked and bled.

7. Permit issuer holds a pre-entry briefing with the supervisor, attendant (when specified), entrant(s), and rescue personnel (if needed).

8. Permit issuer signs the entry permit.

9. Entry permit is posted, entry is made and work begins.

THE ENTRY PERMIT

The entry permit is a written authorization to enter a confined space. It includes:

- The location of the confined space and type of work to be done
- The names of workers trained and approved for entry
- Hazards in the confined space and required safety precautions
- Type of test equipment used
- Results of air testing and safe entry conditions
- Personal protective and rescue equipment required
- Provisions for communication between team members
- Signatures of entry supervisors and permit issuers
- Names of rescue personnel and how they can be summonded
- Date and how long permit is good

The entry permit is mandatory. It requires a review of each confined space operation so unsafe conditions can be recognized and corrected before entry. The entry permit certifies the evaluation of the confined space by a trained permit issuer and the identification of all protective measures. If a rescue is necessary, the entry permit is an important tool for rescuers.

The entry permit specifies the place, time, purpose, and the personnel assigned to the entry. In some cases, an attendant and/or rescue personnel may not be required — if so, that fact will be entered on the permit and they will not attend the pre-entry briefing.

An entry permit is good for the time specified or for a maximum of one shift only. If it is to be extended beyond one shift, it must be signed by the safety engineer. When workers must enter a confined space to do work not covered in the first permit issued for that space, a new permit must be issued and a new pre-entry briefing held, Also, the atmosphere must be re-tested if the space is evacuated for any reason.

All test, safety and work procedures specified on the entry permit are reviewed in the pre-entry briefing. **They must be followed during the confined space operation.**

TESTING

The permit issuer will test the atmosphere in the confined space before entry. Those tests will decide if the air is contaminated by hazardous materials. The tests also identify contaminants exceeding permissible exposure limits, and explosive materials containing 10% or more of the lower explosive limit.

Remember, the oxygen concentration must not be less than 19.5% or greater than 23.5%.

Frequent testing may be needed if the confined space operation can generate hazardous gases, vapors, or fumes.

In certain situations the entrant must:

- Wear personal monitoring equipment
- Wear respiratory protection designed for air that is immediately dangerous to life and health
- Wear an approved rescue harness
- Have rescue personnel standing by

SAFETY EQUIPMENT

The permit issuer determines the type of work assigned and rescue equipment needed to enter a confined space. That information is entered on the entry permit. **As an entrant, you must wear and use all safety equipment specified on the entry permit.** You should have received training in the use of this equioment in the pre-entry briefing if you are not familiar with rescue equipment or procedures.

An employee using a required respirator or SAR must go through proper medical monitoring, testing and training.

Retrieval lines may be specified on the entry permit. This line is used for rescues. It prevents the need for rescue personnel to enter the confined space to remove a worker if an emergency occurs.

PRE-ENTRY BRIEFING

THE PRE-ENTRY BRIEFING

The pre-entry briefing must occur **before** entering a confined space:

- Permit issuer, supervisor, entrant and attendent are always involved in the briefing
- Rescue team may be involved if required by the permit issuer

Before the pre-entry briefing, the permit issuer will review the written plan for details and restrictions. The entry permit will be reviewed in the briefing which should include:

- An analysis of the conditions that exist that make this site a confined space
- The type of work to be done in the confined space
- Materials to be used on the job
- The potential hazards of the job
- The work conditions in this confined space
- Potential hazards from the work in the confined space
- Any obstacles that would hinder the rescue during an emergency
- Equipment and procedures necessary to make an emergency rescue from this confined space
- A discussion of the physical distress symptoms

POWER LOCKOUT

Anyone entering a confined space where lockout is required must have completed the Energy Control and Power Lockout Training Program.

Each exposed employee entering the confined space must identify and lock out the appropriate energy sources.

Isolate the confined space from all other systems. Where necessary, all associated machinery must be isolated from the electrical or power supply. Electrical, steam, pneumatic, hydraulic, or other mechanical equipment can cause injury — they will be entered on the entry permit and must be locked out,

PURGE AND VENTILATE

Confined spaces should be purged or ventilated if there is dust, vapor, or gases that exceed safe levels. Purge if possible and if you can't, only then should you enter with a supplied air respirator. Ventilation must be done well before entry and continue until safe levels exist. Early and continuous ventilation is especially important if the confined space contains pockets of hazardous air — as the air is circulated, the dangerous pockets are mixed in the entire atmosphere.

The permit issuer informs the plant safety engineer/fire protection offices if the air in the confined space is explosive or flammable (exceeding 10% LEL). Proper ventilation procedures and equipment are then identified and entered on the entry permit.

Portable blowers can be used to ventilate enclosed spaces before and during a confined space operation. Ventilation outlets must be placed where no fumes and vapors can recirculate back into the confined space.

IS THE CONFINED SPACE PERMIT GOOD ENOUGH?

Permit Checklist

Does your permit meet OSHA requirements? Use this checklist to find out. Does your permit answer all of these questions?

	YES	NO
1. Does the permit say where the confined space is?	____	____
2. Does the permit say what kind of work will be done?	____	____
3. Does the permit say how long it is good for?	____	____
4. Does the permit say what the dangers are in the space?	____	____
5. Does the permit say how fresh air will be blown into the space?	____	____
6. Does the permit say what safety equipment will be used?	____	____
7. Does the permit say how the air will be tested? (air monitoring)	____	____
8. Does the permit say who will work inside and outside of the space? (entrant and attendant)	____	____
9. Does the permit say when the space is safe to enter? (percent oxygen, percent of LEL, other gases)	____	____
10. Does the permit say how electrical power and pipes will be shut off and locked? (lockout)	____	____
11. Does the permit say how the pit worker and the standby worker will communicate?	____	____
12. Does the permit say who will rescue workers in an emergency and how the workers will contact them?	____	____
13. Does the permit say what special procedures will be used to do work inside the space?	____	____

From SEIU confined space training material

SAMPLE #1 CONFINED SPACE ENTRY PERMIT

CONFINED SPACE ENTRY PERMIT

DATE_____

THIS PEMIT SHALL BE ISSUED BY THE SAFETY ENGINEER OR A QUALIFIED PERMIT ISSUER AND SHALL BE DISPLAYED AT EACH POINT OF ENTRY TO THE CONFINED SPACE. ADDITIONS/DELETIONS TO THIS ENTRY PERMIT SHALL BE APPROVED BY THE PLANT ENGINEER OR PERMIT ISSUER.

PLEASE PRINT

Name, location, and department of confined space area and **PURPOSE OF WORK**: _____

Names of employees approved for entry. No other person(s) may enter the confined space except in an emergency. **UNAUTHORIZED ENTRY IS FORBIDDEN.**

ENTRANTS

Name	Soc. Sec. No.	Name	Soc. Sec. No.

Expiration Date: Time: Shift:

The permit issuer must inspect and complete this section before first entry of work shift. After each absence, the atmosphere must be retested by a trained individual. The safety engineer's signature is required for extension of the permit beyond one shift

SAFETY PRECAUTIONS

	Item	Yes	No	Not Required	Comment (If you checked no or not required)
1.	Are all lines disconnected or blanked off (electrical, steam, hydraulic, pneumatic)?				
2.	Is power locked out?				
3.	Has confined space been properly vented? Circle ventilation method: mechanical natural				
4.	Is oxygen concentration range 19.5-23.5%?				
5.	Are toxic agents, heat stress potential, and explosive gases at safe levels?				
6.	Are ventilators in proper place?				
7.	Is appropriate fire extinguishing and rescue equipment available?				
8.	Have safety procedures been outlined and involved employees informed?				
9.	Are employees wearing required personal protective equipment. Have they been medically evaluated to wear them?				
10.	Is welding permit required? Is welding permit issued?				
11.	Is access adequate and clear?				
12.	Is an attendant available and properly equipped?				
13.	Is the confined space clean?				

TEST EQUIPMENT

ATMOSPHERIC MONITORING EQUIPMENT UTILIZED

Model	Serial Number	Date of Field Testing

Adapted from UAW-Ford Training Materials

TESTING

ATMOSPHERIC TESTING RESULTS

Time	Oxygen, %	Combustibles, % LEL	Carbon Monoxide, ppm	Other

PERSONAL/PROTECTIVE EQUIPMENT

CIRCLE PERSONAL PROTECTIVE EQUIPMENT REQUIRED:

- Supplied - Air Respirator
- Safety Alert System
- Hardhats
- Aprons
- Full Face Shield
- Air Purifying Respirator
- Powered Air Purifying PAP)
- Self-contained Breathing Apparatus (SCBA)
- Safety Glasses/Goggles
- Impervious Boots/Pants/Jacket/Gloves
- Other_____

CIRCLE RESCUE/EMERGENCY EQUIPMENT REQUIRED (Must have equipment available and in working condition at confined space entry area when required by the written plan or permit issuer.)

Tripod Harness Winch/chain or cable Communication device(s) (specify method)

Other_____

COMMENTS OR SPECIAL INSTRUCTIONS_____

COMMUNICATION

HAS COMMUNICATION BEEN ESTABLISHED BETWEEN ENTRANTS AND ATTENDENT?

YES____ NO____ If no or not required, please explain:_____

HAS COMMUNICATION BEEN ESTABLISHED BETWEEN ATTENDENT AND SECURITY?

YES____ NO____ If no or not required, please eXplain:_____

LOCATION OF NEAREST PHONE: PHONE:

HAS COMMUNICATION BEEN ESTABLISHED BETWEEN SECURITY AND RESCUE TEAM?

YES____ NO____ If no or not required, please explain:_____

TEST APPROVAL

PERMIT ISSUANCE/APPROVAL

Date	Time	Shift	Supervisor's Signature	Permit Issuer's Signature

Safety Engineer's Signature

_____

(If permit is extended beyond one shift)

SAMPLE #2 CONFINED SPACE PERMIT

cc 1102

MANUFACTURING TECHNICAL INSTRUCTION

SUBJECT: SAFETY AND HEALTH REQUIREMENTS FOR WORK IN CONFINED SPACES

ISSUE DATE	EFFECTIVE DATE	SERIES & NO.	SUPERSEDES	SHEET
2-15-88	2-15-88	SMI-110	S-B.P.E.-26.1 (1-1-83)	8 of 9

SAFETY

Confined Space Entry Permit

Effective Date _____ Shift _____ Time _____

Location and Identification of Confined Space _____

Identification of hazardous materials contained within, piped or fed to the confined space _____

This permit is valid for only one shift on date indicated above and must be displayed at each point of entry into the confined space.

(1) Confined space contents removed? _____Yes _____No

(2) Process lines or material feed openings disconnected, purged, and/or blanked off? _____Yes _____No

(3) Has power lockout been applied as required? _____Yes _____No

(4) Mechanical ventilation supplied? _____Yes _____No

(5) Confined space atmosphere tested periodically for flammable gases and vapors? _____Yes _____No

Reading _____% of LEL
Reading _____% of LEL
Reading _____% of LEL

(6) Confined space atmosphere tested periodically for oxygen deficiency and readings of at least 19.5% obtained: _____Yes _____No

Reading _____% of Oxygen
Reading _____% of Oxygen
Reading _____% of Oxygen

(7) Confined space atmosphere tested periodically for toxic gas, vapor, dust mists, or fumes? _____Yes _____No

Reading _____ppm or mg/m^3
Reading _____ppm or mg/m^3
Reading _____ppm or mg/m^3

cc: 1102

MANUFACTURING TECHNICAL INSTRUCTION

SUBJECT: SAFETY AND HEALTH REQUIREMENTS FOR WORK IN CONFINED SPACES

ISSUE DATE	EFFECTIVE DATE	SERIES & NO.	SUPERSEDES	SHEET
2-15-88	2-15-88	SMI-110	S-B.P.E.-26.1 (1-1-83)	9 of 9

(8) Safety harness lifeline and rescue equipment provided and worn? _____Yes _____No

(9) Self-contained breathing apparatus or air line respirator on hand? _____Yes _____No

(10) Has a trained confined space entry attendant been stationed outside the confined space? If more than one, fill in both names. _____Yes _____No

Name_____Clock No._____

(11) Can attendant communicate with all personnel in the confined space? _____Yes _____No

(12) Have confined space workers been provided with sufficient approved lighting and grounded portable electrical equipment? _____Yes _____No

(13) Is a Welding and Burning Permit required? _____Yes _____No
Issued? _____Yes _____No

(14) Are non-sparking type tools required? _____Yes _____No
Issued? _____Yes _____No

(15) Is special exhaust ventilation required? _____Yes _____No
In Use? _____Yes _____No

(16) Have confined space workers been issued proper personal protective equipment? _____Yes _____No

Precautionary Remarks:

_____

_____

_____

_____

A. This permit is to be retained at the work site while the job is in progress.

B. Each permit is to be forwarded to the Safety Department at the conclusion of each shift.

Signed_____
Maintenance Supervisor

Signed_____
Safety Department Representative

SAFETY

Adapted from UAW-Chrysler Training Materials

SECTION V

AFTER THE WORK STARTS IN CONFINED SPACES

WORKING IN CONFINED SPACES

After the atmosphere in a confined space has been tested, the entry permit completed, and the pre-entry briefing held, work can begin.

The following actions should be taken and maintained during the entire confined space operation:

1. Permit issuer posts the entry permit near the entrance of the confined space and leaves it there until all work is completed.

2. Permit issuer determines the need for continuously sampling the air and designates the person who will monitor it.

3. Permit issuer determines if notices warning of the potential for fire or explosion should be posted until the completion of all work.

4. Permit issuer is available for consultation or assistance.

5. Attendant (if assigned) remains outside the space and at the entrance to maintain constant communication with the entrants.

6. Attendant keeps a count and constant track of all entrants.

7. Rescue team with equipment is on standby if required by the written plan and entry permit.

8. Entrants put on appropriate personal protective and rescue equipment as the attendant sets up the specified rescue equipment for the rescue team.

9. Entrants and attendant verify that ventilation is continued until completion of all work.

10. Entrants take precautions not to create hazardous breathing, toxic or explosive atmo spheres.

11. Entrants use appropriate tools and work procedures. A Cutting, Welding and Hot Work Permit is completed if hot work (welding, cutting, brazing, riveting, etc.) is to be done.

12. Firefighting personnel, if specified on the entry permit, remain on site with required firefighting equipment.

RECOGNITION AND PREVENTION OF HAZARDOUS ATMOSPHERES

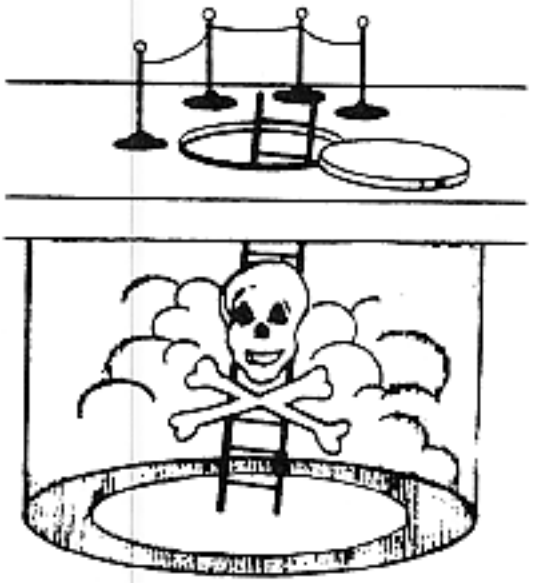
Although the confined space was tested before entry, the quality of the air must be constantly maintained. All of the work that goes on must be done in a way that will prevent the creation of new hazards or unsafe conditions.

Before entering a confined space, oxygen levels may have been reduced to dangerous levels when oxygen was absorbed by materials such as activated charcoal, through chemical reactions such as the rusting of a container, or by oxygen being replaced by gases or vapors that lowered the oxygen level below breathable levels. And, some chemicals can inhibit the body's ability to use oxygen. **Without adequate oxygen, your pulse will stop and you will suffocate (asphyxiation).**

Once work begins, potentially dangerous atmospheres may be created by using chemicals when painting, cleaning with solvents, or doing maintenance work (there are many chemicals that can create toxic vapors or gases). Also, hot work (welding, brazing, cutting, riveting, burning, heating) can create dangerous fumes.

AIR SAMPLING DURING WORK

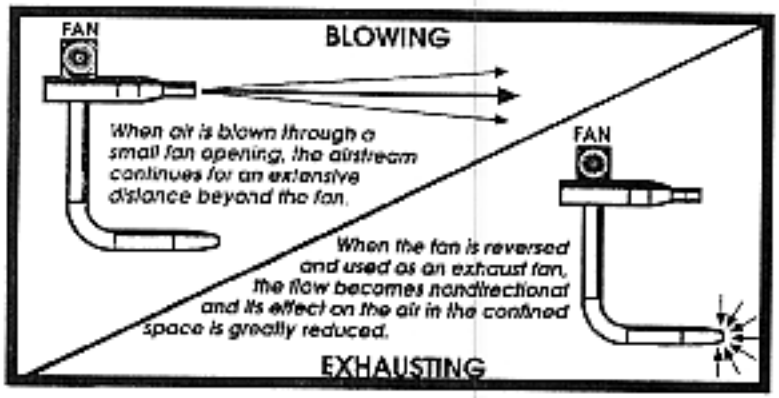
Continuous air monitoring may be required to en-sure that the air does not change and become hazardous.



VENTILATION DURING WORK

Ventilation should continue all during the work session to maintain the air quality. **Continue ventilating and testing until the air is acceptable, and retest periodically to make sure it remains that way.**

When ventilating confined spaces, it is more efficient to blow air into the space than to exhaust it out.



HOT WORK

Hot work hazards include fire/explosion, welding fume exposure, burning or asphyxiation. Heating or burning paint or plastic will break them down into fumes and create an extremely toxic atmosphere.

Workers also must consider potentially hazardous vapors released because of the heating of a process line that formerly contained a chemical product.

Lines containing flammable liquids or gases must be cleaned or purged before starting hot work. They also should be tested with a combustible gas meter before any hot work begins.

Workers doing hot work in confined spaces must wear approved respiratory protection and should make sure proper ventilation exists. Local exhaust ventilation will control fumes from burning and welding materials. These materials contain lead, beryllium, floride, cadmium, mercury, chromium, zinc, nickel-all can cause hazardous fumes and smoke. For example, cutting or welding galvanized pipe or conduit is a common practice that is hazardous.

WELDING AND CUTTING PROCEDURES

Cutting and Welding Permits are required in confined spaces. Existing local procedures for cutting and welding permits should be used. An employee trained in rescue procedures and outfitted in rescue equipment must be stationed at the entrance of the confined space whenever welding or cutting is being done inside.

Be sure to:

- ✓ Keep all welding and cutting equipment, such as gas cylinders and machines, outside the confined space and securely blocked to prevent accidental movement
- ✓ Keep all equipment clear of the entry and exit paths of the confined space
- ✓ Turn off all torch and gas supply valves if the equipment is to be unattended and remove torches and hoses from the space if practical
- ✓ Ventilate the confined space when welding is in progress since welding creates very t toxic fumes.
- ✓ Use a sign or other warning to mark all hot metal
- ✓ Lay down all torches carefully

Since confined spaces capture gases, torches should always be carefully checked for leaks before being used in a confined space.

LINE BREAKING

Line breaking can produce a hazardous condition which requires extra precaution. Line breaking means the intentional opening of a pipe, line, or duct that has been carrying a hazardous material. Many lines carry flammable, corrosive or toxic material, inert gases, or fluids at a pressure or temperature that can cause injury.

Line breaking, blanking/blinding, and double block and bleed are used to make pipes that carry hazardous materials safe for hot work.

PREVENTION OF FIRE AND EXPLOSION

Even when purging and ventilation have been done and safe welding procedures followed, the possibility of fire exists. Make sure that proper extinguishing equipment is nearby.

Verify that sprinklers, where provided, are working and will not be taken out of service while this work is being done. Sweep surrounding floors clean and wet them down if combustible materials exist.

Move all combustibles at least 35 feet from the operation and protect those that cannot be moved with metal guards or flameproof curtains or covers (not ordinary tarpaulins).

Assign responsible personnel to watch for dangerous sparks and check the area for at least one-half hour after all work is completed.

Remember! Confine the work to the area or equipment specified on the entry permit.

POSTING NOTICES AND FIREFIGHTING EQUIPMENT

When working in or near confined spaces where there is a possibility of fire or explosion, be sure to observe the following.

- ✓ Verify that clear warning signs have been posted to caution against open flames and smoking in the work area
- ✓ Ensure the availability of adequate firefighting equipment
- ✓ Notify firefighting personnel when the work is to begin and make sure they are available

POWER TOOLS AND LIGHTING

Power tools can be extremely hazardous within confined spaces. Therefore, all tools must be approved by the permit issuer for the work environment where they will be used. The following guidelines will ensure safe use of power tools in a confined space:

- ✓ Use double-insulated or grounded electrical tools
- ✓ Use ground fault circuit interrupters

For explosive or flammable atmospheres, consult with the plant safety engineer for guidance. The air should be ventilated whenever possible until safe atmospheres are achieved. When that is not possible, use the following:

- ✓ Explosion-proof, plug-in lights or flashlights
- ✓ Shielded portable lights with protective guards
- ✓ Battery powered equipment or an approved low voltage system in flammable atmo spheres
- ✓ Non-sparking tools and totally enclosed electrical motors in flammable or explosive atmospheres
- ✓ Bond and ground conductive objects and equipment which may produce static electricity to prevent static sparks

EXITING CONFINED SPACES

The permit issuer has final responsibility for the confined space after the work ends, but attendants and entrants also have key roles. The written plan may not require an attendant for some confined spaces. In such cases, an entrant will be designated to do the attendant's tasks while completing the confined space exit.

The steps for exiting and concluding a confined space operation are as follows:

1. Entrant(s) vacates the confined space.

2. Attendant (or designated entrant) makes sure that all employees are out of the confined space.

3. Attendant (or designated entrant) checks the confined space and notifies the supervisor that the operation is complete.

4. Entrant(s) closes the opening (where one exists) to secure the confined space.

5. Entrant(s) removes all lockout devices.

6. Entrant(s) and attendant inspect all equipment, remove and report items that need repair, and return the rest to storage.

7. Permit issuer informs plant security and rescue team (if notified earlier) that operation is complete.

8. Attendant (or designated entrant) returns the entry permit to the permit issuer who verifies the completion of the operation.

9. Permit issuer sends the entry permit to the employee responsible for the confined space program who keeps it on file for **ONE YEAR.** If there was an injury, serious health problem or death, the entry permit stays on file until further notice.

Remember that future confined space teams will use the same equipment you used for your confined space operation. That equipment must be inspected, items needing repair removed and reported, and the rest returned to storage.

SECTION VI

EMERGENCIES AND RESCUES IN CONFINED SPACES

29 CFR Section 1910.146 -- PERMIT-REQUIRED CONFINED SPACES

Paragraph k -- RESCUE AND EMERGENCY SERVICES

(1) The following requirements apply to employers who have employees enter permit spaces to perform rescue services.

(i) The employer shall ensure that each member of the rescue service is provided with, and is trained to use properly, the personal protective equipment and rescue equipment necessary for making rescues from permit spaces.

(ii) Each member of the rescue service shall be trained to perform the assigned rescue duties. Each member of the rescue service shall also receive the training required of authorized entrants under paragraph (g) of this section.

(iii) Each member of the rescue service shall practice making permit space rescues at least once every 12 months, by means of simulated rescue operations in which they remove dummies, manikins, or actual persons from the actual permit spaces or from representative permit spaces. Representative permit spaces shall, with respect to opening size, configuration, and accessibility, simulate the types of permit spaces from which rescue is to be performed.

(iv) Each member of the rescue service shall be trained in basic first-aid and in cardiopulmonary resuscitation (CPR). At least one member of the rescue service holding current certification if first aid and in CPR shall be available.

(2) When an employer (host employer) arranges to have persons other than the host employer's employees perform permit space rescue, the host employer shall:

(i) Inform the rescue service of the hazards they may confront when called on to perform rescue at the host employer's facility, and

(ii) Provide the rescue service with access to all permit spaces from which rescue may be necessary so that the rescue service can develop appropriate rescue plans and practice rescue operations.

(3) To facilitate non-entry rescue, retrieval systems or methods shall be used whenever an authorized entrant enters a permit space, unless the retrieval equipment would increase the overall risk of entry or would not contribute to the rescue of the entrant. Retrieval systems shall meet the following requirements.

(i) Each authorized entrant shall use a chest or full body harness, with a retrieval line attached at the center of the entrant's back near shoulder level, or above the entrant's head. Wristlets may be used in lieu of the chest or full body harness if the employer can demonstrate that the use of a chest or full body harness is infeasible or creates a greater hazard and that the use of wristlets is the safest and most effective alternative.

(ii) The other end of the retrieval line shall be attached to a mechanical device or fixed point outside the permit space in such a manner that rescue can begin as soon as the rescuer becomes aware that rescue is necessary. A mechanical device shall be available to retrieve personnel from vertical type permit spaces more than 5 feet deep.

(4) If an injured entrant is exposed to a substance for which a Material Safety Data Sheet (MSDS) or other similar written information is required to be kept at the worksite, that MSDS or

written information shall be made available to the medical facility treating the exposed entrant.

EMERGENCIES AND RESCUES

Confined space hazards can and must be identified and managed. Ventilation of hazardous atmospheres, isolating (locking out) power sources, managing hazardous chemicals and using appropriate safety procedures and equipment will help prevent accidents.

But if something does go wrong, a clear understanding of the roles entrants and attendants will play in emergency and rescue responses is vital.

Remember! If the entrant or attendant notices <u>any</u> of the following symptoms, the entrant should immediately evacuate or be removed from the confined space and emergency help must be summoned.

___ **dizziness**

___ **disorientation**

___ **weakness in the knees**

___ **shallow, rapid breathing**

___ **blurred vision**

___ **exaggerated sense of feeling good**

___ **profuse sweating**

___ **chest pains**

___ **inability to work as skillfully as normal with hands and arms (loss of manual dexterity)**

___ **loss of coordination**

___ **change in heartbeat**

___ **ringing in the ears**

___ **skin irritation**

___ **nausea**

ENTRANTS

Entrants can do much to prevent the need for rescue by the rescue team.

The entrant should leave the space (self-rescue) when:

- The attendant orders an evacuation
- An automatic alarm sounds
- The entrant senses danger
- Physical distress symptoms occur

Whenever anything in the work environment changes — new odors, escaping liquids or gases, or the smell of smoke — the entrant should leave the confined space immediately.

The entrant saves time by leaving the confined space at the first sign of trouble or at the request of the attendant. The time saved can be the difference between life and death. Also, it is often easier for the entrant to exit through narrow openings. It is more difficult for the rescue team to pull or carry the entrant out.

ATTENDANT

The attendant (or any other unauthorized personnel) must never enter the confined space to attempt to rescue an entrant when an emergency occurs!

The attendant has a crucial role in preventing and responding to emergencies:

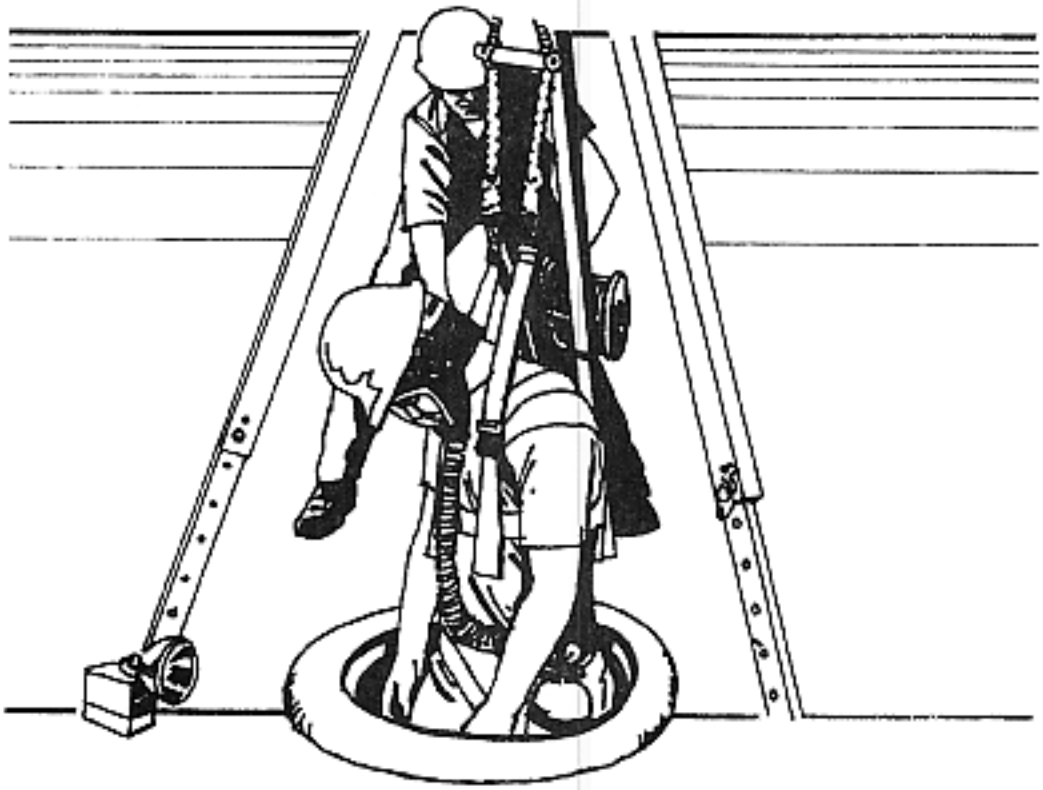
- Always know the number of workers in the confined space
- Monitor all activities inside and outside the permit space
- Keep effective and continuous contact with all entrants and the rescue team
- Order an evacuation of the confined space if:
  - You observe a condition unauthorized in the entry permit
  - The entrant shows behavioral effects of exposure to hazards
  - Testing detects a change for the worse in the atmosphere or an undetected hazard becomes evident
  - You must leave the work area for any reason

If an emergency occurs inside the confined space (contact is lost with the entrants, workers are observed unconscious or unresponsive, fire, explosion, etc.), the attendant:

1. Summons the emergency rescue team immediately.
2. Begins rescue procedures from outside the confined space.
3. Is aware of approaching unauthorized workers — instructs them to leave the area, and prevents them from entering the confined space. If necessary, requests assistance from security. Informs the rescue team if unauthorized personnel have entered the confined space.

4. Remains outside the confined space while the rescue team conducts the rescue.

5. Assists (outside the space) with rescue equipment and emergency duties.



Confined Spaces Appendix

Common Substances Glossary

COMMON SUBSTANCES FOUND IN CONFINED SPACES

HAZARDOUS* SUBSTANCES	EXPOSURE** LIMITS AND HAZARDS (PEL/TLV-TWA)	FLASH*** POINT	LOWER EXPLOSIVE LIMIT (LEL) PERCENT(%)
Acetylene	asphyxiant and narcotic; highly flammable and explosive	gas	2.5
Butane	800 ppm; asphyxiant and narcotic; highly flammable and explosive	gas	1.6
Carbon dioxide	5,000 ppm; 30,000 ppm; asphyxiant	n/a	n/a
Carbon monoxide	35 ppm; 200 ppm; toxic; flammable and explosive	gas	12.5
Chlorine	0.5 ppm; 1 ppm; highly toxic and corrosive; flammable and reactive with other materials	n/a	n/a
Formaldehyde	1 ppm; 1 ppm; irritant; toxic	gas	7.0
Gasoline	50-300 ppm; 500 ppm; highly flammable irritant	-45°F	1.6

Hydrogen	asphyxiant; highly flammable and explosive	gas	4.1
Hydrogen sulfide	10 ppm: 15 ppm; highly toxic; flammable	gas	4.3
Methane	asphyxiant; highly flammable and explosive	gas	5.0
Nitrogen	asphyxiant	n/a	n/a
Nitrogen Oxides	3-25 ppm; 1-35 ppm; gas toxic	n/a	n/a
Ozone	0. 1 ppm; 0.3 ppm; highly toxic	n/a	n/a
Propane	asphyxiant; narcotic; highly flammable	gas	2.3
1,1,1-Trichloroethane (Methyl chloroform)	350 ppm; 450 ppm; narcotic, may emit highly toxic fumes in presence of hot work	n/a	n/a
Trichloroethylene	50 ppm; 200 ppm; narcotic; may emit highly toxic fumes in presence of hot work	n/a	n/a
Welding fumes	5 mg/ml or less; may contain lead, zinc, nickel, cadmium, or chromium	n/a	n/a
Xylene	100 ppm; 150 ppm; highly flammable and narcotic	81°F	1.1

(Notes on next page)

Notes:

* It should be made clear that substances which may be present in a specific confined space must be judged on consideration of the particular circumstances.

** Where two values are shown, the lower value is the eight-hour time-weighted average exposure limit and the higher value is the STEL (15-minute exposure limit) or ceiling limit, whichever is lowest.

*** Any material that is a gas does not have a flash point since it is already in vapor form.

In case of fire, or the presence of a toxic atmosphere, all nonessential personnel must be evacuated. The atmosphere should be tested before work begins.

NOTE: This list does not include all possible substances that can create hazardous atmospheres in a confined space.

GLOSSARY

Acceptable Environmental Conditions

Work spaces in which uncontrolled hazardous atmospheres are not present.

Action Level

A legal exposure level which triggers specified activities in the cases of lead, arsenic, vinyl chloride, and asbestos. Industrial hygienists generally consider the action level to be 50% of the permissible exposure limit. Although actions are not legally mandated for contaminants other than those four listed, when exposure exceeds the action level, it is a concentration at which controls should be investigated. On a random sampling basis, if an exposure exceeds the action level, it may exceed the permissible exposure level.

Acute (Health Hazard)

Marked by a single dose or exposure, generally having a sudden onset for a course of time (acute toxicity, acute exposure).

Air Horn

A Venturi system which is a short, tapering tube that allows an increase in airflow velocity with a decrease in pressure. (See Venturi-type Air Mover).

Asphyxiants

Any vapor or gas that causes unconsciousness or death by suffocation. Asphyxiants can be categorized as simple or chemical. Simple asphyxiants act on the body by diluting or reducing the oxygen in the air required for normal breathing. Examples include carbon dioxide, nitrogen, and natural gas. Chemical asphyxiants upset or disturb the normal body chemistry processes which control respiration. They can range from chemicals which inhibit oxygen transfer from the lungs to the respiratory system (carbon monoxide) or prevent respiration at the cellular level (hydrogen cyanide) to those which totally paralyze the respiratory system (hydrogen sulfide).

Asphyxiating Atmosphere

An atmosphere related to oxygen deprivation and/or asphyxiation within the body.

Atmospheric Analyzers

Specialized instruments for testing confined space atmospheres.

Attendant

An individual stationed outside a confined space. The attendant monitors the authorized entrants inside the confined space.

Authorized Entrant

The person authorized to enter a confined space. Also referred to as the entrant.

Body Harness

A system of adjustable straps and buckles to remove an entrant from a confined space.

Blanking

The absolute closure of a pipe, line, or duct.

Blinding

See Blanking.

Calibration

Fixing, checking, or correcting the graduations of an instrument. Calibration of gas detectors is done in the laboratory.

Chemical Asphyxiants

Substances which prevent the body from receiving or utilizing an adequate oxygen supply.

Chemical Cartridge Respirator

A respirator that filters out gases and vapors through a cartridge or canister that is specific to the chemical hazard encountered.

Chronic (Health Hazard)

Marked by a long or permanent duration, consistent or continuous (chronic toxicities are usually permanent or irreversible); often occurs from repeated exposures over a period of time.

Combustible Gas Analyzers

Electrical direct-reading instruments for detecting combustible gases, vapors, or mists.

Confined Space Hazards

Hazards of confined spaces result from hazardous atmospheres or displacement of oxygen, lack of identifying confined spaces, and lack of rescue/emergency plans.

Control Operations

All procedures that make a confined space safe after a rescue has been made. Control operations must be completed before a secondary search for victims in a confined space is made.

Direct-reading Instruments See Atmospheric Analyzers.

Double Block and Bleed

Closing a line, duct, or pipe by locking a drain or vent which is open to the atmosphere. The place of opening is between two locked-closed valves.

Dust

A solid, mechanically produced particle with a size ranging from submicroscopic to macroscopic.

Emergency

Any occurrence inside or outside a confined space that could endanger entrants.

Engulfment

Surrounding and capture of a person by a liquid or finely divided solid substance. Confined spaces with a risk of engulfment require the presence of an attendant.

Entrant

The person authorized to enter a confined space. Also called the authorized entrant.

Entry

Intentionally passing through an opening into a confined space. This includes working in that

space. A worker has entered the space as soon as any part of the worker's face breaks the plane of an opening into the space.

Entry Permit

An entry permit is a written authorization to enter a confined space. It is designed as a system under which confined space entry will be authorized, supervised, and terminated.

Entry Permit System

The written procedures for preparing, issuing, and completing permits for confined space entry.

Explosimeters

See Combustible Gas Analyzers.

Explosive Atmosphere

An atmosphere with an oxygen concentration above 23.5%, or a concentration of other gases, vapors, mists, or dusts between their LEL and UEL (see Flammable Limits).

Exposure Hazards

Hazards existing from the inhalation, ingestion, or absorption of the material involved.

Face Velocity

The velocity of air at the face of an opening. This is important information when ventilating a confined space.

Field Testing

Testing of atmosphere monitoring equipment to ensure proper reading during testing of an atmosphere. This test is performed by the permit issuer.

Flammable Atmosphere

An atmosphere which poses a hazard because flammable gases, vapors, mists or dusts are present at a concentration greater than 10% of their lower explosive limit.

Fit Testing

Fit testing is concerned with demonstrating the effectiveness of the face seal of a respirator.

Flammable (Explosive) Limits

The term flammable limits is used interchangeably with explosive limits. The lower flammable limit (LFL) is the minimum concentration of vapor to air below which propagation of a flame will not occur in the presence of an ignition source. The upper flammable limit (UFL) is the maximum vapor to air concentration above which propagation of flame will not occur. If a vapor to air mixture is below the LFL, it is described as being "too lean" to burn. If it is above UFL, it is "too rich" to burn, When the vapor to air ratio is somewhere between the LFL and UFL, fires and explosions can occur and the mixture is said to be in the flammable or explosive range.

Flammable Range

The range of gas or vapor concentration (percentage by volume in air) that will burn or explode if an ignition source is present. Limiting concentrations are commonly called the "lower flammable (explosive) limit" and the "upper flammable (explosive) limit. " Below the flammable limit, the mixture is too lean to burn. Above the upper flammable limit, the mixture is too rich to burn.

Flash Point

The lowest temperature at or above the point where a flammable liquid will give off enough vapors to form an ignitable mixture with the air above the surface of the liquid or within its container.

Fume

A solid condensation particulate, usually of a vaporized metal.

Gas

An aeriform fluid that is in a gaseous state at standard temperature and pressure.

Hard Hats

See Protective Helmets.

Hazardous Atmosphere

An atmosphere which exposes employees to a risk of death, incapacitation, injury, or acute illness.

Hot Work

Operations which could provide a source of ignition (riveting, welding, cutting, burning, heating).

Hypothermia

A condition of extreme cold which causes numbness in the extremities. Always remove the entrant to a warmer location and provide first aid if necessary.

Ignition Temperature

The minimum temperature required to ignite gas or vapor without a spark or flame being present.

Immediately Dangerous to Life or Health (IDLH) IDLH conditions are those that are immediately life-threatening or result in an acute exposure-related reaction to a chemical within three days of exposure. They also include conditions that may produce eye and lung irritation. Irritation might not be serious in itself, but could delay or impair escape from a confined space.

Immediate-severe Health Effects

Any acute clinical sign of a serious, exposure-related reaction within 72 hours after exposure.

Incident Commander

The individual in charge of an emergency operation. Responsibilities include developing an effective organizational structure: making appropriate assignments of personnel and equipment, managing information, and continually attempting to achieve the basic command objectives.

Inerting

Making a confined space non-flammable, non-explosive, or otherwise chemically non-reactive.

Ingestion

The introduction of a chemical into the body through the mouth. Inhaled chemicals may be trapped in saliva and swallowed. Exposed workers should be prohibited from smoking, eating, or drinking except in designated rest areas after being decontaminated.

Inhalation

The introduction of chemical vapors or toxic products of combustion into the body by way of the respiratory system. Inhalation is the most common exposure route and often the most damaging.

Injection

Injection of a toxic material can result from being cut by a contaminated object or coming in contact with solvents and other materials. Cover any cuts, sores, burns, or scratches before entering a confined space.

In-plant Rescue Team

A group designated and trained to perform rescues in confined spaces.

Intrinsically Safe

Equipment, lighting, and tools designed to be used in areas which might have, or have potential for, an explosive atmosphere. Intrinsically safe equipment, lighting, and tools won't create a source of ignition.

Irritants

Any gas or vapor which causes an inflammatory reaction.

Isolation

Removal of unwanted forms of energy which could be a serious hazard to an entrant.

Lanyard

A safety line. This can be a lifeline or a retrieval line.

Lifelines

Safety equipment designed to lower and lift workers in and out of a confined space.

Line Breaking

The intentional opening of a pipe, line, or duct that is or has been carrying flammable, corrosive, or toxic material, an inert gas, or any fluid at a pressure or temperature capable of causing injury.

Lower Explosive Limit (LEL) See Flammable Limit.

Lower Flammable Limit (LFL) See Flammable Limit.

Mechanical Lifting Devices

Hoists or winches for removing entrants from confined spaces.

Medically Qualified

Employees must have a medical evaluation prior to assignment to tasks requiring respirators to determine if they are physically able to perform work while wearing a respirator.

Mists

Liquid condensation particles.

Non-permitted Condition

Any condition or set of conditions where the hazard potential exceeds the limits stated in the entry permit.

Ongoing Work Space

Space modified to permit greater access through widening of openings and/or increased permanent air supply and exhaust ventilation.

Oxygen-deficient Atmosphere

An atmosphere containing less than 19.5% oxygen by volume.

Oxygen-enriched Atmosphere

An atmosphere containing more than 23.5% oxygen by volume.

Particulate Filter Respirator

A respirator that filters out dusts, mists, and fumes through a mechanical filter.

Permissible Exposure Limit (PEL)

The airborne concentration of a substance above which exposure is not legally permitted.

PELs are established by OSHA or its equivalent state agency. PELs are normally eight-hour time-weighted average values. However, there are also short-term exposure limits (15-minute averages) and ceiling limits (exposure concentrations not to be exceeded at any time).

Personal Alert Safety System (PASS)

Motion detectors to sense body movement and provide a warning if movement stops.

Post-incident Analysis

The reconstruction of a confined space incident to provide a clear picture of the events that took place. This helps establish the details of the emergency response procedures for further study.

Precautionary Signs

Warn that the nearby area is, or may become, hazardous.

Pre-entry Briefing

A meeting during which all employees who will be entering a confined space are informed of the hazards and safety conditions of the particular job by the permit issuer.

Protective Helmets

A safety item, also called hard hats.

Retrieval Line

A line or rope secured to a worker at one end and an anchor or lifting (or retrieval) device at the other end.

SAR

See Supplied-air Respirator.

SCBA

See Self-Contained Breathing Apparatus.

Self-contained Breathing Apparatus (SCBA)

A totally independent supplied-air respirator.

Self-rescue

An entrant rescue without the assistance of the attendant or rescue personnel.

Simple Asphyxiants

Substances which induce a deficiency in the supply of oxygen to the body tissue by displacing oxygen in the air.

Skin Absorption

The introduction of a chemical or toxic product into the body by way of the skin. Skin absorption can occur with no sensation to the skin itself.

Standby

See Attendant.

Suffocation

Lack of oxygen.

Supplied-air Respirator

Any of three types of respirator that supplies breathable air for working inside a potentially hazardous confined space.

Threshold Limit Value (TLV)

A term used to express the airborne concentration of a material to which most people can be exposed day after day without adverse effects.

Toxic Atmospheres

Atmospheres containing gases, vapors, or fumes known to have poisonous physiological effects.

Toxicity

Those events related to toxics and poisons. Some chemicals affect the body by causing damage to specific internal organs or body systems.

Upper Explosive Limit (UEL) See Flammable Limit.

Upper Flammable Limit (UFL) See Flammable Limit.

Vapor

The gaseous form of any substance which is usually a liquid or a solid.

Vapor Density

The weight of a pure vapor or gas compared with the weight of an equal volume of dry air at the same temperature and pressure. If the vapor density is less than one, the material is lighter than air and may rise. If the vapor density is greater than one, the material is heavier than air and will stay low to the ground.

Venturi-type Air Mover

A ventilating unit with a short, tapering tube that allows an increase in airflow velocity with a decrease in pressure, (See Air Horn).

Warning Properties

Toxic gases and vapors that cause immediate irritation upon contact with the upper respiratory tract. Their presence is noticed immediately so appropriate measures can be taken to control exposure.

Wristlets

Loops of strong strapping material attached to a lifeline or lanyard.

Written Plan

The plan prepared to provide information about a confined space.

HIGHLIGHTS OF OSHA CONFINED SPACE STANDARD

SCOPE—

covers general industry workers including 1.6 million who enter confined spaces annually and an additional 10.6 million employed at the 240,000 worksites covered by the standard. Expected to prevent about 85 percent of deaths and injuries—54 deaths and 10,949 injuries each year.

CONFINED SPACE—

defined as an area which 1) has adequate size and configuration for employee entry, 2) has limited means of access or egress, and 3) is not designed for continuous employee occupancy.

PERMIT-REQUIRED CONFINED SPACE—

is a confined space that presents or has the potential for hazards related to atmospheric conditions (toxic, flammable, asphyxiating), engulfment, configuration or any other recognized serious hazard.

PROHIBITED CONDITION—

defined as any condition not allowed by permit during entry operations.

EVALUATION—

requires employers initially to evaluate their workplaces and determine if there are any permit-required confined spaces, inform employees through signs or other equally effective means and prevent unauthorized entry.

PERMIT-REQUIRED CONFINED SPACE PROGRAM—

mandates a written Program to prevent unauthorized entry, identify and evaluate hazards and establish procedures and practices for safe entry including testing and monitoring conditions. Calls for an attendant stationed outside permit spaces during entry; procedures to summon rescuers and prevent unauthorized personnel from attempting rescue; and a system for preparing, issuing, using and canceling entry permits. Requires coordinated entry for more than one employer, procedures for concluding entry operations and canceling entry permits and review of permit program at least annually and additionally as necessary.

PERMIT SYSTEM—

requires an entry supervisor to authorize entry, prepare and sign written permits, order correc-

tive measures if necessary and cancel permits when work completed. Permits must be available to all employees and extend only for duration of the task. They must be retained for a year to facilitate review of the confined space program.

PERMITS—

must include: 1) identification of space, 2) Purpose of entry, 3) date and duration of permit, 4) list of authorized entrants, 5) names of current attendants and entry supervisor, 6) list of hazards in the permit space and 7) list of measures to isolate permit space and eliminate/control hazards. Permit must also state 8) the acceptable entry conditions, 9) results of tests initialed by the person(s) performing tests and an indication of when the tests were performed, 10) rescue and emergency services and means to summon, 11) communication procedures for attendants/entrants, 12) required equipment (such as respirators, communications, alarm, etc.), 13) any other necessary information and 14) any additional permits (such as for hot work).

TRAINING—

mandates initial and refresher (when duties change, hazards in space change or whenever evaluation determines inadequacies in employee's knowledge) training to provide employees understanding, skills and know- ledge to do job safely. Employer certification of training must include employee's name, signature or initials of trainer, and date of training.

AUTHORIZED ENTRANTS—

must know the hazards they may face, be able to recognize signs or symptoms of exposure and understand the consequences of exposure to hazards. Entrants must know how to use any needed equipment, communicate with attendants as necessary, alert attendants when a warning symptom or other hazardous condition exists and exit as quickly as possible whenever ordered or alerted (by alarm, warning sign or prohibited condition) to do so.

ATTENDANTS—

must know hazards of confined spaces; be aware of behavioral effects, signs, symptoms, and consequences of potential exposures; maintain continuous count/i.d. of authorized attendants; remain outside space until relieved; communicate with entrants as necessary to monitor entrant status. Attendants also must monitor activities inside and outside the permit space and order exit if required, summon rescuers if necessary, prevent unauthorized entry into confined space, and perform non-entry rescues if required. They may not perform other duties that interfere with their primary duty to monitor and protect the safety of authorized entrants.

ENTRY SUPERVISORS—

must know hazards of confined spaces (including signs, symptoms, and consequences of

potential exposures), verify that all tests have been conducted and all procedures and equipment are in place before endorsing permit, terminate entry and cancel permits and verify that rescue services are available and the means for summoning them are operable. Supervisors are to remove unauthorized individuals who enter confined space. They also must determine—at least when shifts and entry supervisors change—that acceptable conditions as specified in permit continue.

RESCUE SERVICES—

may be on-site or off-site. The employer shall ensure that each member of the rescue service is provided with, and is trained to use properly, the personal protective equipment necessary for making rescues from permit spaces. They must receive the same training as authorized entrants plus training to use personal protective and rescue equipment and first aid training, including CPR. They must practice simulated rescues at least once every 12 months. Outside rescue services must be made aware of hazards, receive access to comparable permit spaces to develop rescue plans and practice rescues. Employer must provide hospitals or treatment facilities any MSDSs or other information on a permit space hazard exposure situation that may aid in treatment of rescued employees.

CONTRACTORS—

calls for host employers to provide information to contractors on permit spaces, the permit space program and procedures and likely hazards that the contractor might encounter. Joint entries must be coordinated and the contractor debriefed at the conclusion of entry operations.

ALTERNATIVE PROTECTION PROCEDURES—

for permit spaces where the only hazard is atmospheric and ventilation alone can control the hazard, employers may use alternative procedures for entry. To qualify for alternative procedures employers must 1) ensure that it is safe to remove the entrance cover; 2) determine that ventilation alone is sufficient to maintain the permit space safe for entry—and work to be performed within the permit-required space must introduce no additional hazards; 3) gather monitoring and inspection data to support 1) and 2); 4) if entry is necessary to conduct initial data gathering, perform such entry under the full permit program; 5) document the determinations and supporting data and make them available to employees. Entry can take place after a) it has been determined safe to remove the entrance cover; b) any openings are guarded to protect against falling and falling objects; c) internal atmospheric testing; d) air remains without hazard whenever any employee is inside the space; e) continuous forced air ventilation has eliminated any hazardous atmosphere; f) space is tested periodically. Employees must exit immediately if a hazardous atmosphere is detected during entry, and the space must be evaluated to determine how the hazardous atmosphere devel-