

Despite safety warnings and regulations...

Confined-Space Deaths Continue

Lack of hazard awareness and unplanned rescue attempts led to the following recent deaths in the U.S.:

- Two workers (a father and son) at a waste-water treatment plant were working on a digester that was being drained. They went on top of the digester and opened a hatch to check the sludge level. To provide light in the digester, they lowered an extension cord with an exposed 200-watt light bulb. The light broke and caused the methane gas in the digester to explode, killing both men instantly.
- A self-employed plumbing contractor entered an underground water-line vault to inspect the back flow device, and collapsed shortly afterward. A supervisor noticed the man down, and entered the vault in a rescue attempt. Both men had entered an untested oxygen-deficient atmosphere, and died as a result.
- A worker entered a septic tank to clean the residue from the bottom and collapsed shortly afterward. Two workers went in to rescue him. All three

SEE "DEATHS" ON PAGE 2...

Editor's Note: This Special Issue of Excavation Safety News is devoted to confined spaces. Each year, dozens of people are injured or killed throughout the U.S. in confined-space related accidents, and virtually all of them could be avoided. We hope the information presented here will prove valuable to you in creating the safest environment possible for all your workers.

The Ins & Outs of Confined Spaces

If you are required to construct or work in a sewer, septic tank, sewage digester, pumping/lift station, sewage holding tank, storage tank, silo, vat, duct, utility vault, manhole, pipeline, excavated trench, or similar type of structure or enclosure, you may be working in a confined space.

OSHA's general industry standard, 1910.146, defines a confined space as:

- A space large enough and so configured that a person can bodily enter and perform assigned work.
- A space which has limited or restricted means for entry or exit.
- A space that is not designed for continuous occupancy by work personnel.

OSHA's research arm, the National Institute for Occupational Safety and Health, has a similar definition: "... A space which, by design, has limited openings for entry and exit; unfavorable natural ventilation, which could contain or produce dangerous air contaminants; and which is not intended for continuous employee occupancy..."

WHAT IS MEANT BY "LIMITED OPENINGS FOR ENTRY AND EXIT"? Confined-space openings are limited by size and/or location. Openings are usually small. However, there are many variations. A space with an opening the size of a standard door will usually not qualify as a "confined" workspace. With, however, the addition of safety clothing, breathing apparatus, and other equipment to workers, a door-



Workers enter a very active 42" sanitary sewer at a recent project in Memphis. They had completed training, and conducted a thorough hazard analysis before entry. The workers utilized multiple ventilators, a gas monitor, a fall-protection/retrieval system, personal protective equipment, and a Confined Space Entry Permit to safely complete the job.

SEE "CONFINED SPACES" ON PAGE 2...

Save Lives: Always Check Air Quality Before – and During – Entry

The importance of checking air quality inside a confined space with a properly calibrated gas monitor cannot be overemphasized. Approximately two-thirds of the fatalities in confined spaces are a result of “bad air.” Most of these fatalities could be prevented, if the air quality was checked before — and during — entry.



“CONFINED SPACES” FROM PAGE 1

size opening restricts free and easy egress, and the space suddenly has one characteristic of a confined space. The point to remember is this: The size of the opening must allow easy and/or unrestricted egress by workers, no matter what their stature and no matter what they are wearing.

Openings can be very large in some “confined” spaces. Common examples are open-topped spaces such as pits, degreasers, excavation sites, and ship and barge holds. Free and unrestricted egress from such spaces may be difficult, or even impossible, in an emergency.

WHAT IS MEANT BY “NATURAL-VENTILATION”?

Because air may not always circulate properly in and out of a confined space (due to geometry, design, etc.), the atmosphere inside can be very different from the one outside. Deadly gases may accumulate, particularly if the workspace is used to store or process chemicals or organic materials that may decompose. As a result, there may not be enough oxygen in the confined space to support human life. Or, the air can become so oxygen-rich that it significantly increases the likelihood of a fire or explosion if a source of ignition is introduced.

WHAT IS MEANT BY “NOT DESIGNED OR INTENDED FOR CONTINUOUS OCCUPANCY BY WORKERS”?

Most confined spaces are not designed or intended for workers to enter and work on a continuous basis. They are usually designed to store a product, to process materials, or to transport products or substances. Occasional entry that may be needed for inspection, maintenance, cleaning, or similar tasks that are often difficult and dangerous because of chemical or physical hazards in the space.

SEE “CONFINED SPACES” ON NEXT PAGE...

“Deaths” from page 1

were dead when pulled from the tank.

- A worker entered a chemical degreaser tank to clean the bottom, and collapsed shortly thereafter. Two fellow workers noticed the man was down and went in to rescue him. All three workers died.
- A self-employed worker died after entering the top of a 22' high by 15' square sawdust bin. He suffocated when the sawdust inside the bin collapsed and buried him.
- A city worker was removing an inspection plate from a sewer line in a 50' deep pump station when the plate blew off, allowing raw sewage into the room. Two co-workers and a policeman attempted a rescue, but were unsuccessful. All four men were dead when taken from the pumping station.

Excavation Safety News

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This newsletter provides a brief overview of safety regulations and systems. It is not intended to provide specific legal or engineering advice. Please refer to OSHA CFR29, Part 1926, Subpart P, “Excavation and Trenches,” and to other governmental regulations, and to manufacturers’ instructions for specific information.

Construction techniques and equipment usage must be in accordance with all governmental regulations and manufacturers’ instruction. All orders placed with TrenchSafety are subject to the terms, conditions, and warranty limitations contained in TrenchSafety’s Rental and Sales Agreements.

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“CONFINED SPACES” FROM PAGE 2

EXAMPLES OF POTENTIAL HAZARDS IN CONFINED SPACES

Potential confined space hazards are grouped into three broad categories—atmospheric, physical, and psychological.

Atmospheric Hazards

» **Oxygen-Deficient Atmosphere** — Normal air is 20.9% oxygen. An atmosphere with 19.5% oxygen or less is considered deficient. An insufficient level of oxygen can result in difficult breathing, can impair judgment, can cause rapid fatigue, and if sufficiently low, can result in death in minutes. *(Refer to the chart on page 7.)*

There can be many causes of an oxygen-deficient atmosphere. In underground and utility-type work, rusting, rotting, decomposing, and fermentation are common causes.

» **Oxygen-Enriched Atmosphere** — An atmosphere with 23.5% or more oxygen is considered oxygen enriched. An excessive level of oxygen can readily support a fire or explosion.

A leaking welding-oxygen hose in a confined space could create an oxygen enriched atmosphere.

» **Flammable Atmosphere** — Different gases have different flammable ranges. If a source of ignition—such as a flame, spark from a hammer blow, etc.—is introduced into a confined work space containing a flammable atmosphere, an explosion will result.

Methane gas is a highly explosive gas frequently found in and around sewers.

» **Toxic Atmosphere** — A product stored in a confined workspace can be absorbed into the walls, and later give off toxic gases when residues are removed during cleaning. A good example is removing sludge from holding tanks, during which the decomposed material can give off hydrogen sulfide, a deadly gas generated by sewage.

Also, the work itself can generate toxic gases. Examples include welding, torching metal, brazing, painting, sanding, degreasing, etc. Solvents can release highly toxic vapors. In properly ventilated work areas, these processes may not pose a hazard, but within a confined space the by-products of these processes can be deadly.

Finally, toxicants produced by work being performed near a confined work space can enter and accumulate to levels that can pose a significant health hazard. For example, a portable air-ventilation blower, when used improperly, can introduce carbon monoxide from street level into an underground sewer or utility space.

Physical Hazards

» **Temperature Extremes** — Extremely hot or cold temperatures can pose a hazard to workers. For example, if a space has been steamed, it should be allowed to cool before entering.

» **Engulfment Hazards** — Loose, granular material stored in bins and hoppers—grain, sand, sawdust, as examples—can engulf and suffocate a worker. The loose material can form a crust or “bridge over” in a bin, then break under the weight of a worker.

Likewise, sewage or water in a storm sewer can drown a worker.



If possible, always try to perform the work from outside the space. Michael Verner of TrenchSafety, demonstrates a Cherne remote placement plug designed for plugging lines in a sewer manhole from outside the space. Aluminum extension poles are available in lengths up to 24 feet.

» **Noise** — Noise can be amplified because of the design and acoustic properties of a confined space. Excessive noise cannot only damage hearing, but can also affect communication, such as causing a shouted warning to go unheard.

» **Slick/Wet Surfaces** — Slips and falls can cause injury or even death. Also, wet surfaces increase the likelihood for, and the effect of, electrical shock.

» **Rodents, Snakes, Spiders, and Infectious Agents** — These factors can present a work hazard.

» **Falling Objects** — Workers in confined spaces should be mindful of falling objects, particularly in spaces that have topside openings for entry, and where work is being done above the worker.

SEE “CONFINED SPACES” ON PAGE 4...

“CONFINED SPACES” FROM PAGE 3

Psychological Hazards

These include claustrophobic feelings, or other problems associated with being in a dark, cramped, or isolated space. Such hazards can be magnified by a worker’s physical condition. For example, a large person may have more difficulty in certain confined spaces than a smaller person. Or, a person in poor physical condition may become fatigued more easily. Or, a person with a hearing disability may have difficulty hearing, even under the best of conditions.

A clearly written, comprehensive Confined-Space Procedure is required on all job sites where confined spaces exist. **See the box at the bottom of page 7** for guidelines on what, exactly should be in your Confined-Space Procedure document.

WHAT ARE THE TRAINING REQUIREMENTS?

Employers are responsible for providing proper training for all workers who are required to work in a confined space. Such workers must have specific training in the:

- nature of the hazards involved,
- necessary precautions to take,
- use of protective equipment,
- use of the emergency equipment required, and
- implementation of the emergency plan.

CHOOSING LIFE OR CHOOSING DEATH

When you recognize that a confined space exists, or could be expected to exist, you must take action to prevent unauthorized entry. You must:

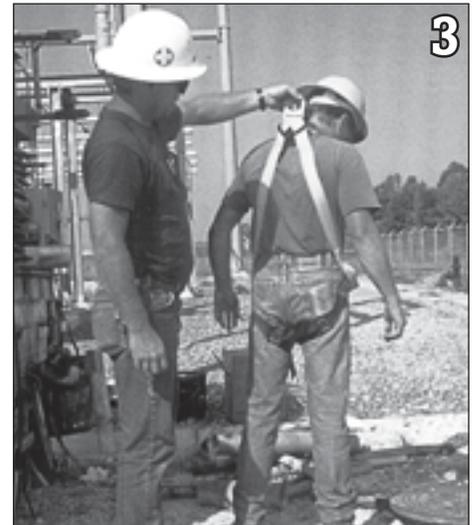
- identify confined spaces,
- conduct atmospheric testing,
- implement the confined-space entry plan, and
- prepare for emergencies.

By taking these important steps, you can reduce potential dangers and provide your workers with a safe place to work. Your failure to take these steps could cause serious injury or could even be fatal. Know what a confined space is, and what you should do when you encounter one!

TRENCHSAFETY CAN HELP

When you are confronted with the formidable challenges of putting your workers in a confined space, call us. We have the knowledge and the necessary equipment and supplies, and we offer training classes for you and your personnel in the ins and outs of confined spaces.

Visit our web site – www.trenchsafety.com – for ideas and useful information on how we can help you with confined space challenges, as well as money-saving trench shoring and shielding, safety training, rental equipment, and service and repair of your laser and machine control equipment.



Because it can be impossible to feel, taste, or smell a hazardous atmosphere, it’s important to use a properly calibrated gas monitor to check the air inside a confined space before entry (photo 1). Continuous ventilation is used most often to insure a safe atmosphere in such spaces. The atmosphere is tested prior to each entry, then is periodically re-tested to make certain that ventilation is complete and the atmosphere is safe.

Example of a full-body harness (photos 2 & 3), with back “D” ring used for rescue. This harness is used with a tripod or other retrieval system that allows a worker to be removed from a confined space without the need for rescuers to enter the space. More than 65 percent of fatalities in confined spaces involve would-be rescuers who are not trained or properly equipped for a rescue.

The National Utility Contractors Association's checklist/permit for confined spaces is an excellent tool for use by all employers who place workers in confined spaces. In fact, TrenchSafety presents the permit in all its Confined Space training seminars and materials. The reverse side of the permit is shown on page 6.

National Utility Contractors Association 	<h3 style="margin: 0;">CONFINED SPACE ENTRY PERMIT</h3> <p style="font-size: small; margin: 0;">Copyright © 1992 by National Utility Contractors Association All Rights Reserved</p>																																																																																		
INSTRUCTIONS (** Nobody will enter a confined space until permit is complete.) 1) Complete permit before entry begins. 2) Post permit at entrance to confined space until work in the confined space is complete. 3) Send permit to safety coordinator for review within 24 hours of completion of the work in the confined space.																																																																																			
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Oxygen Deficiency Can Be Life Threatening

Potential Effects of Oxygen-deficient Atmospheres

Oxygen Content (% by volume)	Effects and Symptoms (at atmospheric pressure)
19.5%	Minimum permissible oxygen level.
15-19%	Decreased ability to work strenuously. May impair condition. May induce early symptoms in persons with coronary, pulmonary, or circulatory problems.
12-14%	Respiration increases during exertion; pulse increases; impaired coordination, perception, and judgment.
10-12%	Respiration increases further, both in rate and depth; poor judgment; lips turn blue.
8-10%	Mental failure, fainting, unconsciousness, ashen face, blueness of lips, nausea, and vomiting.
6-8%	4-5 minutes — recovery with treatment. 6 minutes — 50% fatal. 8 minutes — 100% fatal.
4-6%	Coma onset in 40 seconds, convulsions, respiration ceases, death.

The values above are approximate, and vary depending upon an individual's state of health and his/her physical activities.

Exposure to atmospheres containing 12% or less oxygen can bring about unconsciousness without warning, and may cause such symptoms so quickly that the individual cannot help or protect himself.



Trenches may be classified as confined spaces or may contain hazardous atmospheres. It is important to be particularly cautious when operating gasoline- or diesel-powered equipment, or when working around swamps, leaking sewer lines, broken gas lines, near hazardous waste sites, and leaking petroleum tanks.

WHAT ARE THE "BASICS" OF A CONFINED-SPACE PROCEDURE?

To effectively setup a proper Confined-Space Procedure you should:

- Identify all possible confined spaces,
- Notify workers that they should not enter these spaces,
- Post warning signs at all entrances, and
- Implement your company's, your utility's, or your city's confined-space entry plan.

WHAT SHOULD BE INCLUDED IN A CONFINED-SPACE ENTRY PROCEDURE?

The plan should be written to ensure its usefulness, and should include:

- Times when the space may be entered,
- Name of the Authorized Confined-Space Entry Supervisor,
- Procedures for evaluating the space before entry,
- Specific conditions that must be met to classify the space as either permit-required or non-permit-required,
- Methods for eliminating or controlling any hazards in the space before entry,

- Training requirements for entrants, attendants, and entry supervisors,
- Names of the authorized entrants and attendants, and their specific duties,
- Emergency procedures, including a site-specific Emergency Plan,
- Procedure for coordinating the Emergency Plan with local fire and rescue teams,
- Procedure for issuing a permit, when required,
- Procedures that must be followed during entry into the confined space, and
- Procedure for canceling the permit when the work is completed.

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**SPECIAL ISSUE:
CONFINED SPACE**

Add Fresh Air!

Blowing fresh air into a confined space is often the best method for addressing a potentially hazardous atmosphere.

The objective is to insure that workers have plenty of this necessary ingredient, and that contaminants are sufficiently diluted to provide a safe workplace.



Safety Training Class Schedule

“COMPETENT PERSON” TRAINING

- Tuesday, February 8, 2005 – Memphis
- Tuesday, February 15 – Little Rock
- Tuesday, March 8 – Memphis
- Tuesday, March 15 – Little Rock
- Tuesday, April 5 – Memphis
- Tuesday, April 12 – Little Rock
- Tuesday, April 19 – Fort Smith, Ark.

“CONFINED SPACE” TRAINING

- Tuesday, March 22 – Memphis

Space is limited! Contact us **today** to register and reserve classes for your staff.

TRENCHSAFETY AND SUPPLY, INC.

(901) 346-5800 or (800) 865-5801

www.trenchsafety.com

TrenchSafety Solutions...

*How's this for BIG trench shield?
This installation was on a water tank construction site in Little Rock, Ark.*

*The shield is 32' long and 8' tall.
The spreaders are 20' wide.*

*Check our web site for other
TrenchSafety Solutions...*

www.trenchsafety.com/JobPhotos/default.asp

