



City Safe

A Guide To Assist In Training
Employees About:

WORKING IN CONFINED SPACES

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Inside this issue. . .

Working In Confined Spaces	Pages 2, 3, 4 & 5
How to Lift and Carry Safely	Page 6 & 7
Payroll Audits Coming Soon	Page 7
Regional Supervisor Training	Page 7 & 8

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City Safe is a publication of the League of Kansas Municipalities and the Kansas Municipal Insurance Trust for the purpose of educating and informing cities about loss control methods and risk management. Contents herein are not intended to provide specific legal or medical advice. Readers should seek advice on specific concerns from a qualified professional.

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Safety First: Working in Confined Spaces

During the winter months when the weather turns colder, many cities turn their attention to various maintenance projects in anticipation of the onset of spring projects. It is often necessary to perform work in a confined space during maintenance and inspection processes. Oftentimes, the potential for danger is overlooked because of the brief time it takes to perform many of these tasks. Whether it be inspecting the inside of a storage tank, or running a small engine indoors, there are many dangers that present themselves. To identify these hazardous situations, we must first identify what constitutes a confined space. A confined space is any space that has the following characteristics:

A. It is large enough or configured such that an employee can enter and perform assigned work.

B. It has limited or restricted means for entry or exit. Confined-space openings are limited primarily by size and location. Openings may be small in size and may be difficult to



move through easily. However, in some cases openings may be very large; for example, open-topped spaces such as pits or excavations. An entrance and exit may be required from top, bottom, or side. In some cases, having to

access the work area by a fixed ladder may constitute limited or restricted entry or exit. Size or location will generally make rescue efforts difficult.

C. It is not designed for continuous employee occupancy. Most confined spaces are not designed for employees to enter and work on a routine basis. They may be designed to store a product, enclose materials and processes, or transport products or substances. Because they are not designed for continuous occupancy, frequently they will not have good ventilation or lighting.

Therefore, occasional employee entry for inspection, maintenance, repair, cleanup, or similar tasks can be difficult and dangerous. The danger associated with entry may come from chemical or physical hazards within the space.

Some examples of confined spaces:

- Storage tanks, tank cars, boilers, silos, or other tank-like compartments
- Pits or degreasers
- Pipes, sewers, sewer pump stations including wet and dry wells, shafts and ducts

When working in a confined space, various types of atmospheres may be present. Depending on which type of atmosphere is present and what type of work is being performed, the situation could be potentially life threatening. Always know what type of space you are entering and the dangers presented in each situation. Atmospheric testing equipment should be used to test air quality prior to entering a confined space. Below are four dangers that may be present when working in confined spaces.

Oxygen-Deficient Atmospheres

The normal atmosphere is composed of approximately 21% oxygen and 79% nitrogen. An atmosphere containing less than 19.5% oxygen is considered oxygen-deficient. The oxygen level inside a confined space may be decreased as a result of either consumption or displacement.

There are a number of processes that consume oxygen in a confined space. Oxygen is consumed during combustion of flammable materials, such as in welding, cutting, or brazing.

A more subtle consumption of oxygen occurs during bacterial action, as in the fermentation process. Oxygen can also be consumed during chemical reactions such as in the formation of rust on the exposed surfaces of a confined space. The number of people working in a confined space and the amount of physical activity can also influence oxygen consumption. Oxygen levels can also be reduced as the result of oxygen displacement by other gases.



Flammable Atmospheres

Flammable atmospheres are generally the result of flammable gases, vapors, dust mixed in certain concentrations with air or an oxygen-enriched atmosphere.

Oxygen-enriched atmospheres are those atmospheres that contain an oxygen concentration greater than 22%. An oxygen-enriched atmosphere will cause flammable materials such as clothing and hair to burn violently when ignited.

Combustible gases or vapors can accumulate within a confined space when there is inadequate ventilation. Gases that are heavier than air will accumulate in the lower levels of a confined space. It is especially important that atmospheric tests be conducted near the bottom of all confined spaces.

Work being conducted in a confined space can generate a flammable atmosphere. Activities such as spray painting, coating, or the use of flammable solvents for cleaning can result in the formation of an explosive atmosphere. Welding or cutting with oxyacetylene equipment can also be the cause of an explosion in a confined space. Oxygen and acetylene hoses may have small leaks in them that could generate an explosive atmosphere and, should be removed when not in use. The atmosphere should be tested continuously while **any** hot work is being conducted within the confined space.

Toxic atmospheres may be present within a confined space as the result of one or more of the following:

1. A Product Is Stored in a Confined Space

When a product is stored in a confined space, the product can be absorbed by the walls and give off toxic vapors when removed, or when cleaning the residual material. The product can also produce toxic vapors that will remain in the atmosphere due to poor ventilation.

2. Work Is Being Conducted in the Confined Space

Toxic atmospheres can be generated as the result of work being conducted inside the confined space. Examples of such work include: welding or brazing with metals capable of producing toxic vapors, painting, scraping and sanding, etc. Many of the solvents used for cleaning and/or degreasing produce highly toxic vapors.

3. Areas Adjacent to the Confined Space May Be Affected

Toxic fumes produced by processes near the confined space may enter and accumulate in the confined space. For example, if the confined space is lower than the adjacent area and the toxic fume is heavier than air, the toxic fume may “settle” into the confined space.

Other Considerations: Mechanical and Physical Hazards

Problems such as rotating or moving mechanical parts or energy sources can create hazards within a confined space. All rotating or moving equipment such as pumps, process lines, electrical sources, etc., within a confined space must be identified.

Physical factors such as heat, cold, noise, vibration, and fatigue can contribute to accidents. These factors must be evaluated for all confined spaces.

Excavations could present the possibility of engulfment. Employees should be protected from cave-ins by sloping, benching, or shoring systems when the depth of the excavation is more than four feet, in accordance with 29 CFR 1926.652. In some circumstances, air-monitoring may also be required.

Additional Dangers

The human instinct to assist colleagues in danger is very strong, often with fatal consequences. In general, more than half of those who died in confined spaces attempted to rescue colleagues who were in danger. Effective confined spaces training aims to control these natural instincts by instilling



in workers automatic emergency responses based on agreed procedures. These are usually unauthorized rescues attempted by work colleagues who react instinctively to a colleague's distress. There is documented evidence to show that qualified rescue workers have also perished because they did not follow established procedures.



Ultimately, the safety of the individual is a personal responsibility but the onus to provide all the risk control measures necessary to inform and direct the employee rests with the employer. Employers must provide a suitable and sufficient level of supervision, which reflects the competence of the worker, to ensure that correct decisions are being made, and safety procedures are being followed.

Ventilation

The easiest way to eliminate many of the dangers that are present in a confined work space is to provide proper ventilation. Although proper ventilation is a major component of safety in a confined space, it is not the only safety precaution necessary. In many situations, it is necessary to ventilate a confined space before entry and to maintain forced ventilation while the space is occupied. Forced ventilation is required to remove air contaminants, provide oxygen and to keep the air as clean as possible. Some confined spaces have a single opening, others have multiple openings, or are connected to tunnels, etc. The following is a guide to help ventilate confined spaces.

1. It is best to blow air into the confined space and draw it out simultaneously. This procedure generally requires two or more openings. For ventilation purposes, it is best to open as many of the adjacent entry points as possible.
2. With a confined space that has only a single entry point or when only a single fan is available, air should be blown into the confined space. A flexible hose is helpful in directing the air to the bottom of the confined space.
3. It is important that the fresh air intake not be contaminated. In some cases, a portable gasoline powered generator will be used to power ventilation fan(s). The generator should be located as far as possible away from the fan air intake. Motor vehicles or other internal combustion engines should not be allowed to operate with their exhaust pipes located near air intakes.

If you are ever unsure about the conditions present within a confined space, do not enter. The human body can be quickly overcome by toxic fumes or a lack of oxygen. If you suspect the area is not safe to enter, test the spaces' air quality with proper equipment, and take the necessary steps to ventilate the space or equip yourself with the proper breathing apparatus.

Although the information provided should give you a better understanding of the dangers that exist in confined spaces, it is by no means comprehensive. Seek the advice of a trained professional in any situation of which you are unsure.

How to Lift and Carry Safely

Lifting and carrying are power jobs—when you lift and carry the wrong way, you can damage your back. Back injuries are the most common type of injury in the workplace, causing approximately 900,000 disabling injuries in 1995. More than half of these injuries result from lifting. A 2003 Bureau of Labor Statistics report found that more than one million workers suffer back injuries each year, accounting for about one out of every five workplace injuries or illness.

Back injuries may be difficult to treat and may have lengthy and expensive rehabilitation times. Whether you are lifting at home or at work, make an effort to take care of your back. The National Safety Council recommends a number of tips to prevent unintentional injuries and keep your back strong and healthy.

Power Warm-Ups

You will work better if you start each day with slow stretches. These warm-ups let you ease comfortably into your workday and help you avoid injuries:

Leg and Back Warm-Up

1. Prop one foot on a chair or a stool for support
2. Take a deep breath
3. Ease forward slowly—keep your back slightly curved
4. Blow slowly outward as you ease forward to a seven count
5. Repeat seven times
6. Switch and do the same with the other foot

Backbend

1. Stand with your feet about 12 inches apart
2. Support the small of your back with your hands
3. Hold your stomach in firmly and take a deep breath
4. Arch backward—bend your head and neck as you go, blowing air slowly out for seven counts
5. Repeat seven times

Power Lifting Tips

Protect your hands and feet by wearing safety gear

Size up the load—tip it on its side to see if you can carry it comfortably. Get help if the load is too big or bulky for one person. Check for nails, splinters, rough strapping and sharp edges

Lift it right—make sure your footing is solid. Keep your back straight, with no curving or slouching. Center your body over your feet, get a good grip on the object and pull it close to you. Pull your stomach in firmly. Lift with your legs, not your back; if you need to turn, move your feet and don't twist your back

Tough Lifting Jobs

Oversized loads: do not try to carry a big load alone; ask for help. Work as a team by lifting, walking, and lowering the load together. Let one person call the shots and direct the lift. Use proper mechanical devices for heavy loads.

...continued on page 7



Regional Supervisor Training

The annual **KMIT Regional Supervisor Training Seminar** series resumes in February 2009. This highly successful, one-day training is intended for *all* 'supervisors'—from lead persons, to division and department heads, to city clerks, police and fire chiefs, city superintendents, city managers, and any and all others who supervise employees. *A flyer outlining dates is located on page 8.*

The training is actually broken down into stand-alone, half-day sessions, generally 1:00 p.m. to 4:15 p.m., covering **work comp management**. KMIT's professional partners at IMA are the primary presenters at both sessions, in conjunction with KMIT staff. Registration flyers and other reminders should be out very soon.

These are excellent training sessions for supervisors, and are VERY affordable. Please contact Deanna Myers at dmyers@lkm.org with any questions.



IMPORTANT - Payroll Audit Notice

KMIT's payroll auditors, from **The Audit Store**, will soon be contacting each member city. Actual payrolls for 2008 will be audited. PLEASE help the Pool by scheduling your auditor as quickly as possible. The payroll audit is the first step in a series of tasks that KMIT is required to do by law.

Delay of completion of the audits can lead to significant compliance issues for KMIT, and **ALL AUDITS** must be done before the next step in the process can occur. About one half of all KMIT members will be audited by phone; the other half must be on-site "desk" audits. The auditors will not need much time in your office, if your staff spends a bit of advanced preparation. This is **IMPORTANT**, and your cooperation and patience is greatly appreciated. As always, please contact Don Osenbaugh at (316) 259-3847, or e-mail him at dosenbaugh@cox.net with any questions about this process.

Lift and Carry Safely, ...continued from page 6

High loads: use a step stool or a sturdy ladder to reach loads that are above your shoulders. Get as close to the load as you can and slide the load toward you. Do all the work with your arms and legs, not your back.

Low loads: loads that are under racks and cabinets need extra care. Pull the load toward you, then try to support it on one knee before you lift. Use your legs to power the lift.

Always use your stomach as a low back support by pulling it in during lifting.

Remember, a strong, healthy, powerful back is vital to your job. It also helps you enjoy life. Take pains to avoid injuries by making it a full-time job to take care of your back!

The information in this article was obtained from the National Safety Council.

REGIONAL SUPERVISOR TRAINING

FEBRUARY/MARCH 2009

“Work Comp Management for Supervisors”

WAMEGO, FEBRUARY 5 - OSAWATOMIE, FEBRUARY 12
WELLINGTON, FEBRUARY 26 - ELLSWORTH, MARCH 5
THURSDAYS, 1:00 P.M. - 4:15 P.M.



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