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A Confined Space Entry Program You Can Live With and Won't Cost an Arm and a Leg.

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Introduction

Confined spaces programs that are comprehensive can be very costly, involving personnel taking hours and sometimes days to classify confined spaces, evaluate and control the hazards, train the entry team members and equip and train the rescue personnel, secure testing and any special personal protective equipment including rescue equipment and organize a permit system. In large facilities that have many permit spaces like refineries, chemical plants, large foundries, or workplaces that have many sewers, large air cleaners and water treatment operations, there may not be a way around having a very comprehensive permit space program. The larger programs spend time and money in training entry team members, proper testing techniques, permit documentation tasks and training and equipping an in house rescue team on call or ready to enter when the time comes or paying an outside rescue team to comply with the rescue requirements. This session will focus on the smaller operations and facilities that have only a few confined spaces, and even fewer Permit-required spaces. This encompasses the majority of workplaces.

The cost saving techniques discussed in this session will serve to assist in developing a confined space entry program for small employers, however the larger more comprehensive programs can also benefit by implementing some of these simple techniques. This session will show the employer when certain confined space activities are not necessary and the employer can still have employees enter safely and operate within the law and reduce costs associated with involving additional personnel that are not needed, arranging for outside rescue services that may not be necessary or taking the time to fill out a permit that may not be required.

The first place to start is to understand why the facility needs a confined space entry program. Does the facility have spaces or areas that meet the definition of a confined space? If so, does the space contain or have the potential to contain serious hazards enough to be able to cause workers serious injury or possibly death? Studies have been conducted of hazards found in confined spaces that have caused death to workers and of those hazards, 60-70% are atmospheric, and unfortunately may give little or no warning that they are present; in other words, they are invisible hazards. This is why you cannot rely on your senses to let you know if it is safe to enter. The employer must use a calibrated air testing instrument equipped with the correct media or sensors. Atmospheric hazards include oxygen deficiency, toxic, flammable, and combustible dusts. The scientific community has developed instruments that can test for the commonly found, but not all, atmospheric hazards. For more information on the 10-year study, please review the following governmental study.

The National Institute for Occupational Safety and Health (NIOSH), the research arm of the Occupational Safety and Health Administration (OSHA), has studied fatalities that occurred in confined spaces. By researching death certificates from 1980-1989 and actual cases from 1983 to 1993, NIOSH published the Worker Deaths in Confined Spaces in 1994.[1] It revealed that approximately 60-70% of the fatalities were due to atmospheric hazards i.e. oxygen deficiency, flammable/ explosive or toxic atmospheres and 25%-35% were due to: engulfment, entrapment, falls, electrocution, and 5%-10% to other. Approximately 60-85 employees were dying in confined spaces annually and this did not cover agriculture or government. Armed with these statistics, OSHA developed and enacted a Permit-required confined space (PRCS) standard 29 CFR 1910.146 [2] for general industry in January of 1993. This is the minimum standard required for employers to follow when entering PRCS in general industry.

In developing a program, it is necessary for us to understand some basic definitions that are applicable to confined spaces.

These definitions are taken from the Code of Federal Regulations OSHA's General Industry Standard - 29 CFR 1910.146.[2]

Confined space: means a space that:

1. Is large enough and so configured that an employee can bodily enter and perform assigned work; and
2. Has limited or restricted means for entry or exit (for example, tanks, vessels, silos, storage bins, hoppers, vaults, and pits are spaces that may have limited means of entry.); and
3. Is not designed for continuous employee occupancy.

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

1. Contains or has a potential to contain a hazardous atmosphere;
2. Contains a material that has the potential for engulfing an entrant;
3. Has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor which slopes downward and tapers to a smaller cross-section; or
4. Contains any other recognized serious safety or health hazard.

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

1. Flammable gas, vapor, or mist in excess of 10 percent of its lower flammable limit (LFL);
2. Airborne combustible dust at a concentration that meets or exceeds its LFL; NOTE: This concentration may be approximated as a condition in which the dust obscures vision at a distance of 5 feet (1.52 m) or less.
3. Atmospheric oxygen concentration below 19.5 percent or above 23.5 percent;
4. Atmospheric concentration of any substance for which a dose or a permissible exposure limit is published in Subpart G, Occupational Health and Environmental Control, or in Subpart Z, Toxic and Hazardous Substances, of this Part and which could result in employee exposure in excess of its dose or permissible exposure limit; NOTE: An atmospheric concentration of any substance that is not capable of causing death, incapacitation, impairment of ability to self-rescue, injury, or acute illness due to its health effects is not covered by this provision.
5. Any other atmospheric condition that is immediately dangerous to life or health (IDLH).

NOTE: For air contaminants for which OSHA has not determined a dose or permissible exposure limit, other sources of information, such as Material Safety Data Sheets that comply with the Hazard Communication Standard, section 1910.1200 of this Part, published information, and internal documents can provide guidance in establishing acceptable atmospheric conditions.

IDLH - Immediately dangerous to life or health: means any condition that poses an immediate or delayed threat to life or that would cause irreversible adverse health effects or that would interfere with an individual's ability to escape unaided from a permit space.

Testing: means the process by which the hazards that may confront entrants of a permit space are identified and evaluated. Testing includes specifying the tests that are to be performed in the permit space.

There are three basic kinds of atmospheric hazards that can be tested for prior to and during the permit entry:

- Oxygen (Deficiency and enrichment)
- Flammable gases and vapors
- Toxic contaminants

1. The first order of business when you have been tasked with developing a confined space entry program is to ensure the individual classifying the spaces as; confined spaces, permit-required confined spaces (PRCS) or non-permit confined spaces needing a SWAP (Discussed later) is competent to conduct the classifying. If **you do not feel competent**, then an outside expert needs to be secured (see consultant listing in ASSE, or AIHA for their specialty, you will need to pay for their services, so choose wisely) If you have time, and are a small employer, the state governmental safety and health consultative services can assist for free, contact your local OSHA office for the contact information and phone number.

2. After you have classified the spaces, assign a number to that space and develop a list of all the spaces under your control in your program. The hazards that required a space to be classified as a Permit-required confined space needs to be evaluated as to the type of hazard (atmospheric or non-atmospheric) and the potential or actual presence of the hazard and the severity of the hazard. The fact that a space is classified as only a confined space means that any hazard in that space, or could potentially enter that space is not going to cause death or serious physical harm. This hazard evaluation needs to be documented on a list in your written program.

3. Can the space be engineered out of the confined space standard? Can industrial stairs be built in an area or pit that was accessed by a fixed or portable ladder, thereby removing the limited entry and exit part of the definition? Can ventilation be engineered to control any atmospheric hazards? Is it possible to install fixed lighting and a phone or communication system as part of the employer's system of designing the space to be continually occupied? Usually lights and a phone are not enough by themselves, but add continuous ventilation and the employer has a good argument for designing the space for continuous occupancy under the definition of confined space. If the entry task was to turn a valve or view a float level then can those operations be moved out side the space or for the viewing task, possibly use an internal fixed camera? If engineering controls are possible, then the employer does not have to follow the general industry permit-required confined space standard 1910.146.

4. Non-permit confined space. If the space meets the definition of confined space, but does not contain or have the potential to contain a serious hazard then it is only a confined space or non-permit confined space. If the serious hazards are eliminated then the space is back to just a confined space and the employer is not required to follow the requirements in 1910.146. However, it is recommended that the employer follow ANSI Z117.1 2009 [3] Section 4 by developing a SWAP and training the entry team on the safeguard of the SWAP. ANSI realizes that procedures need to be followed even for entry into non-permit spaces because unpredictable evens happen and these procedures offer the entrants some protection where the OSHA standard 1910.146 has no requirements for entering into a non-permit space.

A space that is classified as a non-permit space but the employer wants the safeguard of having some entry procedures followed by the workers, then develop a Safe Work Authorized Practice (SWAP) specific for that space. This is addressed in the American National Standards Institute (ANSI) Z117.1 2009 [3] Section 4, specifying safe procedures to be developed by the employer, testing of the space prior to entry and training of personnel. An example of a SWAP would be the following: 1. Test prior to entry and use a buddy system when entering, 2. Wear a 3 or 4 gas atmospheric monitor when in the space, 3. Inform someone responsible (supervisor, foreman, safety manager etc.), when you are going into the space and when you are out, 4. Ventilate the entire time anyone is in the space, 5. Have a communication device that works in the space with the entry team or person entering. The employer decides what are the safe work practices necessary for that space. This could be one or two procedures or maybe half a dozen.

5. The space that is classified as a PRCS, this needs to be documented on the list and the type of hazard listed and it's severity. For example #3 Sewer manhole #14 -oxygen content 18% and engulfment by sewer water hazard. Space is 18 feet deep and running water can be 6 feet deep. Entry is by a fixed ladder. This particular space needs the protection of a permit system unless the employer is able to engineer it out of being a PRCS. The severities of these hazards are serious injury or even death.

So lets say we have 6 PRCS that we have classified due to their configuration, type and severity of the hazards. In two of those spaces, the only hazard is atmospheric. Further evaluation indicates that one could be a candidate for entry under 146(c)(5) because the tank could be cleaned and ventilation could be use to control any residual flammable vapors. This eliminated the requirement to fill out a permit, have an attendant present and the need to arrange for rescue services. This is a real cost savings to the employer.

Lets take an example of a pit below a large mechanical power press. The entry is by a fixed ladder going under the support structures into a large concrete drainage area that is 20 feet by 10 feet by 6 feet deep. The pit collects unwanted scrap from the press operation that must be cleaned out every two weeks. It usually involves 4 or 5 employees in the present permit required program because someone years ago put a sign on the entryway ladder stating a permit is required. Re-evaluation by reviewing past permits, air monitoring results and talking with the past entry team members indicated that no hazardous atmosphere ever existed and the only hazard was non atmospheric and any entry was always done with the press locked out. This is a perfect candidate for a 1910.146(c)(7) entry by eliminating the non-atmospheric hazard (mechanical power press punching out stock with rotating, cycling and moving parts and some waste falling into the pit) It was eliminated by LOTO and posting a certificate stating all non-atmospheric hazards have been eliminated, and the space contains no atmospheric hazards.

This cost saving entry is using OSHA's 146(c)(5) or (c)(7) entry procedures and not taking the time to fill out a permit, not paying an attendant to watch the entry operation and not having a rescue service available. The employer just has to fill out a certificate of entry.

The next area of cost saving is in the initial classification stages. Many employers play it on the safe side and classify all confined spaces as permit spaces. This is an extremely costly decision because many can be engineered out of the confined space standard and if it doesn't meet the definition of a confined space it cannot be a Permit-required confined space. This still doesn't mean there are no serious hazards present that the employer needs to control but if the space does not meet the definition of confined space, then it cannot be classified as a Permit-required confined space. Consider the following scenario; The space tested, in various depths of the 10 foot pump room of a waste water treatment facility, indicated oxygen levels of 18-20%/ volume. By OSHA's definitions of a hazardous atmosphere it is an oxygen deficient space. There are no other hazards that are not controlled (all electrical is approved for the location and is in good repair) There is no water present or ever was any water in this space and there is no floor drain connected to a sewer system. Entry is by a fixed ladder down to the floor containing the pump system. This space could be engineered out of the permit space standard by designing a continuous ventilation system; installing some lights and a hard-wired phone system. This space was engineered to have continuous ventilation provided, like a dry well, completely controlling the oxygen deficient hazard and designing it to be continuously occupied. This space is not even a confined space by definition although the employer may still want a SWAP used discussed previously.

Conclusion

The employer can save thousands to tens of thousands of dollars by instituting these 5 basic re-evaluation and application approaches to confined space entry.

1. Classify your confined spaces by a knowledgeable competent individual.
2. Label and list spaces with an accurate hazard assessment.
3. Can the space be engineered out of the confined space definition, or the task be done without entering the space?
4. After re-classification for entry into non-permit spaces consider SWAP for peace of mind and it is certainly less costly than entry under PRCS.
5. If the space is definitely a PRCS then consider entry under 146(c)(5) or (c)(7) OSHA's alternate entry or reclassification procedures.

The employer spends quite a bid of money buying 3 or 4 gas monitors; detector tubes systems and tubes or chips. After the purchase, the employer will spend approximately $300.00 or 400.00 a year to maintain the gas meters such as; battery packs, gas sensors, calibration gases, detector tubes or chips and this is per unit. So if you have three meters, after the purchase price, it will cost over $ 1000.00 a year to maintain. Depending on the usage and the number of units the employer has, serious consideration should be given to renting when needed. It is a tremendous saving especially if entry is only a couple times a year or atmospheric testing is only required in a couple areas a few times a year. I recently rented a 4 gas meter equipped with % oxygen, LEL, CO and H2S for one day at a total cost of $ 70.00 including pre and post calibration. Remember, if you engineer out some of your spaces fewer tests will be required. If you require a rescue

service, consider hiring, on an as needed basis, a professional rescue service. They will have all the equipment necessary and you will be only paying for their time acting as the rescue service (this may be only a couple of hours although they may have a minimum). Another approach is to contact the local fire service and ask if any firemen offer a rescue service on their off hours and would consider acting as your rescue service. You may need to purchase some equipment or they may already have set up a service already equipped. Another approach is to train and equip in house personnel.

By following these recommendations and approaches to re-evaluate your confined spaces and written permit program you can finally have **A Confined Space Entry Program You Can Live With and Won't Cost an Arm and a Leg.**

Bibliography

[1]NIOSH. 1994. *Worker Deaths in Confined Spaces*, Washington, DC: NIOSH.

[2] Occupational Safety and Health Administration (OSHA) 2011. 29 CFR 1910.146, Permit-required confined spaces. http://www.osha.gov/pls/oshaweb/owasrch.search_form?p_doc_type=STANDARDS&p_toc_level=1&p_keyvalue=1910.

[3]American National Standard Institute (ANSI). 2009. Z117.1-2009.