

Confined Space Emergencies

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Introduction

Confined space emergencies should not occur. A well prepared and conducted entry into a confined space by a properly qualified crew with the appropriate resources should allow a safe and successful entry to be conducted. This unfortunately does not always occur. Also, the strict definition of emergencies used by OSHA in 1910.146¹ and ANSI Z117.1-2003² mean that occasionally even competent crews will experience at least minor emergencies.

The primary goal must be safe entries and the prevention of emergencies. The majority of our efforts should be dedicated to accomplishing this. We must, however, be prepared for emergencies.

Effective preparation can make the difference between keeping emergencies minor and resolving them quickly and effectively or allowing them to turn into fatalities.

Types of emergencies

Emergencies may occur in several different categories.

- Failure of monitoring equipment
- Failure of hazard control measures
- Introduction of an unforeseen hazard
- Problems with individual entrants
- Problems within the space
- External problems

Emergencies may also be categorized by their potential impact.

- Minor emergencies where entrants are capable of leaving the space without assistance
- Minor emergencies where entrants need some assistance but are not in serious danger

¹ "Emergency" means any occurrence (including any failure of hazard control or monitoring equipment) or event internal or external to the permit space that could endanger entrants.

² Any occurrence inside or outside of the confined space that could endanger the entry team.

- Major emergencies where an entrant is in serious danger from a personal medical problem
- Major emergencies where conditions in the space are life threatening

Failure of atmospheric monitoring equipment is an example of what is technically an emergency but should not pose a risk to personnel if they immediately leave the space. Once all the entrants are out of the space it is easy to solve the problem with the equipment and continue with the entry.

Failure of hazard control measures could cause either minor or major emergencies depending upon which type of hazard control is involved. If a ventilation system stops working effectively it is easy to notice the failure immediately and take appropriate action to restore ventilation. Even if the problem cannot be solved immediately in most spaces there would be sufficient time to evacuate the safe before the atmosphere became dangerous. Other hazard control failures could lead to major injuries or deaths in an instant. If lockout has not been completed properly on an agitator motor our first indication of the failure of the hazard control may be the agitator blade striking an entrant. If a blank installed in a pipe being isolated is made of the wrong material our first awareness that it has failed will be the material flowing into the space and exposing the entrants.

With a properly conducted hazard assessment prior to entry there should not be any truly unforeseen hazards. Things do sometimes get overlooked due to the limitations of human performance. In most cases this type of situation constitutes a major emergency because the specifics of the actual threat to personnel may not be understood at least initially.

Problems with individual entrants can range from a sprained ankle to a heart attack or severe bleeding. The sprained ankle is a good example of where the entrant will need assistance to get out of the space but is not in any immediate serious danger. With higher level medical emergencies it is critical that the entrant be removed from the space and provided with medical attention quickly.

Problems with the space can create some of the worst situations. Atmospheric hazards are the number one killers in confined spaces. If a hazardous atmospheric condition is missed on the initial assessment personnel will be exposed immediately upon entering the space. If the atmosphere changes abruptly the entrants are placed in serious danger and may not have time to exit the space before being exposed. These situations are the worst type of confined space emergencies.

External hazards may create a broad spectrum of issues with the space. The worst of these would be an atmospheric hazard introduced from an external source.

Roles and responsibilities during emergencies

All members of the entry team are responsible for helping to prevent emergencies.

Entrant duties emergencies include leaving the space immediately when they notice a problem or are told to evacuate by the attendant. They should also be prepared to help other entrants as needed.

Attendant duties during emergencies include notifying entrants of the need to evacuate, assisting them in exiting the space, and calling for emergency help. If retrieval is being used they operate this system.

Entry supervisor duties during emergencies involving helping the crew as needed.

Levels of emergency response

Three options are available for responding to confined space emergencies.

- Escape/evacuation
- Retrieval
- Rescue

Escape/evacuation

This option involves all of the entrants leaving the space without assistance. This option may be initiated by the entrants, the attendant, or be based upon the alarm on the atmospheric monitoring equipment.

Retrieval

In this situation one or more entrants is unable to leave the space without assistance. For this option to be available it must have been set up during preparations for the entry.

For horizontal entry spaces the retrieval system consists of the entrant in a full body harness with a rope attached. The rope is extended outside the opening of the space and under the control of the attendant.

For vertical entry spaces a mechanical advantage system is required. These are commonly either manual cable winches or rope block and tackle systems.

Rescue

This final option is for those emergencies where entrants cannot escape on their own and either retrieval was not in use or did not work effectively. Rescue involves personnel having to enter the space to get the entrant out.

Rescue Service Options

There are several options you may select to handle your rescue needs.

- In-house rescue service,
- Contract with a stand-by rescue service,
- Rely on public rescue service,
- Contract out all confined space work and require them to handle their own rescue needs, or
- Establish a group coverage team with neighboring industries.

This list is not intended to cover every conceivable option. It outlines the most common options that can be applied successfully to confined space issues in the majority of facilities.

An in-house rescue service is an extensive commitment of resources. It should be selected as the preferred option only by those organizations willing to make this commitment. Confined space rescue can be difficult and dangerous when attempted by poorly trained or equipped personnel. This is not an activity you can do half way without the potential for serious consequences. This can be the most effective of the options if necessary and handled properly. It can also be the worst option if handled poorly.

Contracting your rescue needs to an outside group is usually reserved for situations where the need is infrequent and public response capability is not adequate. This option can be cost prohibitive if the services are needed frequently but, may be the most cost effective if entries are made only occasionally or are grouped within a short period of time. For example, if all your entries occur during an annual shut down period.

Public response groups may be able to handle your rescue needs effectively. A detailed discussion of evaluating outside rescue groups is covered below.

A contractor organization that is involved in regular confined space entry operations may have their own rescue capability. If your need for confined space entry operations only involves infrequent, specialized tasks you may select contractors that can handle their own rescue needs. It is your responsibility to insure that they can handle these needs effectively. This option should not be selected if some of your employees will also be working in the confined space.

Establishing a group through the cooperation of several facilities in an area could meet the requirements of providing a rescue service capability. Several advantages and disadvantages can be identified for this option. One of the most significant challenges will be coordination and administration of this joint effort. One question may kill an effort of this type, "Who will cover costs and how the shared costs will be divided?" Industrial groups of similar type are functioning well in some other areas of emergency response. For example, sharing resources is common. If several large facilities in an area need firefighting foam they may each purchase and stock a certain amount for their own needs but, if a neighboring facility has a serious fire and needs additional foam they make it available to them. The facility that needed the foam will later replace the foam or reimburse the cost. This transaction is simpler than would be required for a joint confined space rescue response group.

In-house Rescue Team

If you decide to have an in-house rescue team you must deal with at least the OSHA requirements listed below:

- Provide PPE and rescue equipment
- Trained as entrants
- Trained to perform their assigned duties
- Trained in first-aid and CPR (one member must hold current certification)
- Practice rescues at least annually

Outside Rescue Service

Outside rescue service may be provided by any competent organization. The two most commonly available sources are your public fire/rescue service and contract services. If you select to make an agreement with an outside rescue service the following OSHA requirements must be met:

- Inform of hazards
- Provide access to your facility
- “Arrange”, the term used in the standard, implies mutual agreement
- Employer retains ultimate responsibility for rescue

Evaluating public response

Part of your evaluation will require an assessment of the capabilities and availability of public rescue services. A number of questions must be answered. What is the response time of the public group? While OSHA recognizes that the four to ten minute period an individual can survive in a life-threatening atmosphere is not always a realistic goal as a rescue time it is important to consider response time of outside groups. If response times are substantial the potential for a live rescue from a life-threatening atmosphere is slim. Realistically, the potential for live rescue from life-threatening atmospheres is slim no matter which rescue option you decide to use.

You must confirm the willingness of the public response group to assume the responsibility of being designated as your rescue organization. OSHA states that the employer “arranges” to have persons other than employees perform rescue. The term implies consent on the part of the response group. This point is further emphasized in the preamble to the regulation.

In addition to confirming their willingness to serve as your designated rescue group you should assess their commitment to this area. This commitment is essential if the group is to provide a realistic capability in this specialized area of rescue.

Training of rescue personnel must be evaluated. You must assess the amount, frequency, and effectiveness of the groups training. This is a specialized area of rescue that requires specialized training. If the response groups’ training is not adequate they will not only be incapable of performing an effective rescue but may increase the danger to the initial victim and themselves. Any training program for rescue must include hands-on practice of rescue skills. Ideally the response group should practice rescues at your facility at least once per year.

The response groups experience in handling specialized rescue in general and specifically confined space rescues will help you evaluate both their commitment and proficiency. Many organizations have been involved in special rescue operations since long before the OSHA regulation. This experience is a good indication that the groups assistance can be relied upon.

Equipment is not the most important part of preparing for rescue but it is a critical area. Given the option I would rather have a well trained group with limited equipment than a poorly trained but well equipped group. There is, however, no substitute for a basic equipment capability during a rescue. Many items used for confined space rescue may have limited application in other types of emergency response. Public response groups may have been taught

to create makeshift devices for confined space rescue from other items they normally have available. This is not always a problem, but caution is needed to insure that the technique does not compromise safety. For some tasks there is no substitute for the proper tool.

If this evaluation leaves you with the feeling that your facility is in good hands there is limited justification for developing your own rescue service. If you are unsure you may suggest a rescue drill for the response group's personnel at your facility. The results of this drill will provide a clear picture of the group's preparedness for this type of emergency. Another option is for your organization to assist the response group by helping with the cost of training and equipment.

These contributions could come from all industries in the area that require confined space rescue services. Spreading the costs will save each facility money and contributing to an existing response group may be more effective than starting your own.

Deciding on Rescue Services

With the evaluations you have just completed you should have a clear picture of the potential need for rescue in your organization. A thorough review of the various rescue service options should provide one or two selections that will meet your needs in the rescue area. Your final decision on a rescue service option will need to be based on all these considerations. Concentrate on the option that provides the most effective protection to your entry personnel within the constraints of the regulation and available resources. While your own in-house rescue service may frequently appear to be the best protection you can provide that is not a safe assumption. You may significantly increase the risk to your entrants and your rescue personnel if you form an in-house team without the necessary commitment of time, effort and resources.

Bibliography

ANSI Z117.1-2003 Safety Requirements for Confined Spaces, Secretariat American Society of Safety Engineers, 2003

OSHA 1910.146 Permit-required Confined Spaces, Occupational Safety and Health Administration