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Construction Safety in Hazardous Confined Space

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ABSTRACT: The paper presents the concept of hazardous confined space by identifying hazards in construction areas, with special emphasis on dangerous gases commonly found there, and construction safety measures that involve: testing the air, cleaning and ventilation, separating enclosed spaces, personal protections, entry control, blocking mobile device and rescuing casualties. Since rescue operations in confined spaces are unique hazards, proper training of personnel and the availability of specialized equipment are required to protect persons attempting rescue from injury and death For only 8 years in America, there has been an average of 89% work-related deaths in confined spaces per year, and approximately 23 (25.5%) of those who died were persons attempting rescue. Asphyxiation by gases was the primary cause of death.

Keywords: construction safety, hazardous confined spaces.

1 Introduction

Confident spaces are present everywhere in the construction, and they are the places where accidents occur frequently. The term confident space is used to designate certain structures such as tanks, vessels, tanks, sewers, etc. Every space in which people work may be or may become confident space. The term actually describes the environment in which hazard can occur – it can be structural, process, mechanical, atmospheric, physical, chemical, biological and ergonomic hazard, and dangers from liquid or solid material. Many conditions that cause these hazards do not refer only seemingly minor changes in conditions can Instantly change the status of these jobs from harmless to life threatening.

2 Hazards in Confined Space - Hazard Identification

Hazardous enclosed spaces are those that are only partially open and in which gases and vapours, heavier than air, may accrue. They can be: deep pit, boilers, reactors with open passages, channels detected with a lid, manholes, elevators, etc. Accidents in enclosed spaces differ from the accidents in everyday environments. Seemingly minor error or omission in the preparation area, selection or maintenance of equipment or work a

3 Oxygen in A Confined Space

The air we breathe have about 21% oxygen. If the percentage of oxygen in breathing is reduced below 16%, one feels discomfort. Respiration is accelerated,

and also pulse, while the buzzing in the ears occurs. When oxygen is decreased to concentration of 15-10%, the man is still conscious, but his reasoning is wrong and he becomes tired very easily. If the amount of oxygen in the air falls to 10% or lower, there is a sudden fatigue, weakening pulse and loss of consciousness (collapse). If he is quickly brought to fresh air and given necessary emergency assistance, he can still be saved. In case of oxidizing in normal conditions, such as the open air, the oxidation material takes oxygen from the surrounding air and persons who come into contact with such material are not exposed to any danger. However, if the oxidation process happens in a confined space for longer period of time, percentage of oxygen content in the air is reduced, and the air loses oxygen and becomes enriched other gases and vapours.

Oxygen is the most prevalent element, colourless, odourless and tasteless; therefore, our senses can even remotely assess neither the presence nor the amount of the gas in very active element.

4 Other Gases in A Confined Space

In chemical industry, there are hundreds of types of flammable and explosive gases. All of these gases and vapours are flammable and explosive in a wide range, scale mixture with air, i.e. within the boundaries between the so-called lower and upper limits. These values are determined experimentally in the laboratory and are expressed in percentages. Out of all toxic gases, carbon dioxide, which is already in low concentrations and life-threatening, caused the most casualties. It is a gas that acts insidiously because no taste or smell, so if the air and with low gas contents of this long inhalation, leads to its accumulation in the lungs. Other gases in this group of toxic gases, for example, hydrogen sulphide, have a fragrance that reveals them, but, unfortunately, their smell quickly becomes dull, thereby increasing risk. The third group of gas-noxious gases is characterized mainly, by the air enclosed space. It reduces the percentage of oxygen necessary to the health and lives of people. We have already mentioned carbon dioxide and other inert gases. After extinguishing the fire in small confined spaces, which are filled with carbon dioxide, there happens suffocation and unprotected workers due to lack of oxygen figure1, or due to reduced percentage of required gas. Accidents with a tragic ending happen in cases with closed tanks, boilers and if there is nitrogen in the room. Deaths in hospitals are also evident, and also deaths that as consequence of the replacement of unmarked steel tanks which housed oxygen bottles filled with carbon dioxide.

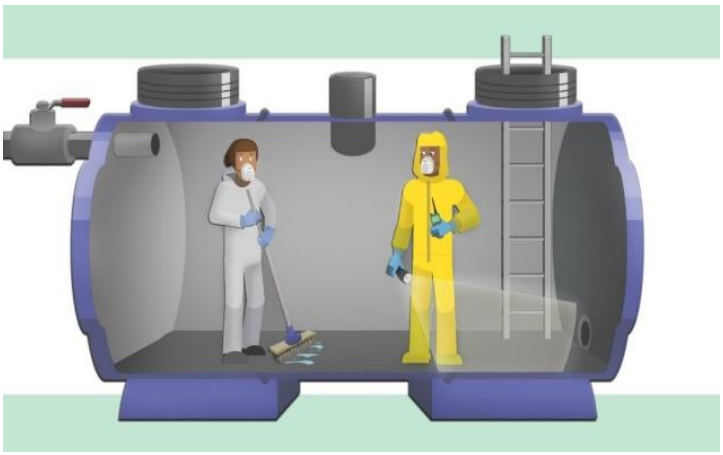

Figure1. Examples of confident space.

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6 Occupational Safety in Confined Space

Entry into hazardous confined spaces, especially the performance in such areas poses a major threat to the health and lives of people. Therefore, in many technically developed countries operating in such areas is subject to previous approval of the competent authority. Measuring and testing the indoor air of enclosed spaces in terms of explosiveness, toxicity and oxygen content must be done before any entry into the area, and during workers occupancy in a confined space. It is necessary to first control working conditions by an occupational safety expert. If there is danger for workers in confined space, it is necessary prior to their entry, to clean and ventilate this space. As a worker could enter into a hazardous confined space it is necessary to execute a sequence of procedures, Measuring and testing the indoor air of enclosed spaces in terms of explosiveness, toxicity and oxygen content must be done before any entry into the area, and during workers occupancy in a confined spacesome of which should be allocated as follows,

- Testing of the air;
- Cleaning and ventilation;
- Personal protective equipment for workers; • entry control;
- blocking of mobile devices;
- Rescue.

The system works best with permissions where the hazardous conditions are recognized from previous experiences, and control measures tried and proven to be effective. The system of permits allows the division of expert resources in an efficient manner. Limitations permits are located at the places of previously unrecognized hazard. If there is no qualified person, this danger may remain untreated. All kinds of mobile tanks and similar devices can become a source of danger and in different ways. They can, for example fig2, while in sleep mode, be moved to the city at the moment where one or more workers are present at the place, or can become a source of danger due to various repairs that require the use of electricity. For this reason, moving the

vessel must be prescribed and blocked to prevent unwanted motions and movements.

Figure 2. Symbol of hazard

Lack of oxygen in the workplace, as well as the presence of toxic and flammable gases, can cause loss of consciousness among the workers. Therefore, in each company an organized system of rescue workers and casualties may be established and organized. Rescue groups need to be practically well trained. In connection with the work of rescue groups, the following guide needs to be overlooked: Figure 5. Rescue from confined spaces In each entry, jeopardized workers in confined space must be located next to the entrance of another worker who will constantly observe and take account the worker inside a confined space, and immediately help them if necessary. Practical exercises for members of the rescue group for casualty rescues in confined spaces must be maintained regularly and within the deadlines. All appropriate personal protective equipment, such as protective breathing masks, protective zones with associated rope, lamps, etc. must be ready and near the entrance to the confined space.

Appendix written approval to enter into a hazardous confined space and the use of special forms that are provided for all moving parts are blocked. The main engine will include devices for mixing in large rotating drums or tanks for the boot device. They are fixed in such a way that the motor could not be activated until workers are present in the confined space.Figure3 It is best to turn off the engine by a single key which is delivered to a particular worker who is doing his job in confined spaces. In this way, the worker will perform his tasks without fear of possible sudden movements. If you happen to be in the endangered area and if there are many workers who entered, each of them must have their own padlock placed on the main switch in the off position and reserve keys for them until the work continues.

Figure 3.Rescue from confined spaces

In the event that an employee who is performing indoor surveillance loses consciousness, or is not able to go outside, a worker-observer should act in accordance with predetermined rescue mode, as follows:

•To immediately alert the surrounding workers, rescue group, party fire and health centre;

• to slip inside the tube inlet for clean air, thereby providing increased ventilation and closed the endangered area; worker, which shouldindicate a vigilant eye, cannot enter into hazardous areas without adequate means of personal protection and if not provided workers who will watch from the doorway; after the rescue worker enters, other workers outside buildings urgently need to prepare all the aids to pull the killed and fingering first aid; workers, observers must continuously through the inlet view monitor employee-rescuers, and in the case of invisibility must be with him regarding using agreed signals; Ifthe injured worker is unconscious, it is necessary to immediately proceed with artificial respiration “mouth to mouth”, or using breathing apparatus. If there is a respirator at hand, in these cases the doctor does not have to always be near.

When CPR must be renewed and during transport the injured health center or hospital, and artificial respiration was discontinued as soon as the victim for consciousness returned. Proper application of the described method and experience prevents the loss of many human lives to which, otherwise, with entry and retention in the surveillance indoors, often.

7 Conclusion

Unavoidable obligation of work organization is to train these workers to identify the hazards to which they may be exposed in hazardous confined space, as well as in the maintenance of labour discipline. A lot of workers lost their lives for not following the basic instructions. They arbitrarily entered dangerous confined space, without informing their superiors and the associates. There has been cases that workers who were dead could not be found for hours; sometime, in cases where the records about workers was bas, it took them days to find the bodies. General safety regulations, logically, can not cover all the possible cases for different typesof works in a variety of hazards in confined spaces in various industries.

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