Better safety for rescuers: optimal approaches for rescue from confined spaces

Rescuing victims from confined spaces and vessels is a task that can put unprepared rescuers at extreme risk. This danger can be greatly reduced by putting professional and proven rescue approaches in place.

How rescuers become victims

In 2017, 166 people died while working in confined spaces, only in the USA.[1] This type of work is marked by narrow entryways, poor ventilation, low headroom and limited space for movement. These circumstances lead to specific dangers. If they are not recognized in time the likelihood of an accident increases. When an accident happens in a confined space, it can often end up deadly – thanks to toxic gas concentrations, lack of oxygen or explosions. Sometimes hazards occur due to movable parts, a fall from a ladder or the collapse of a platform. And even more treacherous: Very often rescuers meet with an accident for the same reason. They fail due to adverse conditions – the same conditions that caused the original accident. Insufficient training of rescuers and untested rescue approaches also often lead to serious accidents. According to EHS Today, two thirds of victims who die in confined spaces are in fact rescuers.[2]

Frequent causes of failed rescue attempts

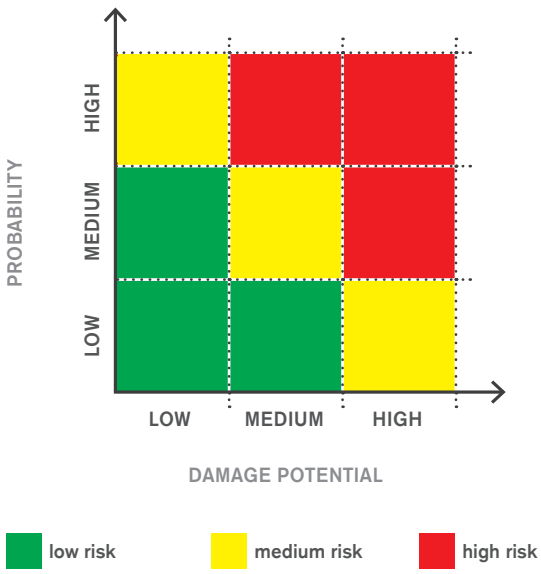
Rescues from confined spaces can be unsuccessful when rescue plans are non-existent or inappropriate. This results in the use of inappropriate safety equipment or the misuse of rescue devices. In addition, irregular training, lack of operational experience or insufficient knowledge about the location can hinder rescue efforts. Entry points could also be restricted in such a way that makes it difficult for rescuers to get to victims, especially when heavy respiratory gear is necessary. If emergency and contingency plans do not exist at all, the coordination of actions relies on spontaneous decisions and good luck.

Recognise hazards, evaluate risks, plan rescue approaches

What's clear: successful rescuing of victims from confined spaces requires professional safety management. For this, a good assessment of the specific dangers and the resulting risks is necessary. In addition, the probability of the occurrence of these dangers and the potential harm they could bring about must also be properly evaluated. Probability and injury potential can be quantitatively depicted as a numerical value or can be descriptively outlined in text form.

Here is a matrix that presents a risk assessment of an incident, based on classification of injury potential in relation to occurrence probability:

SIMPLIFIED REPRESENTATION OF A RISK MATRIX

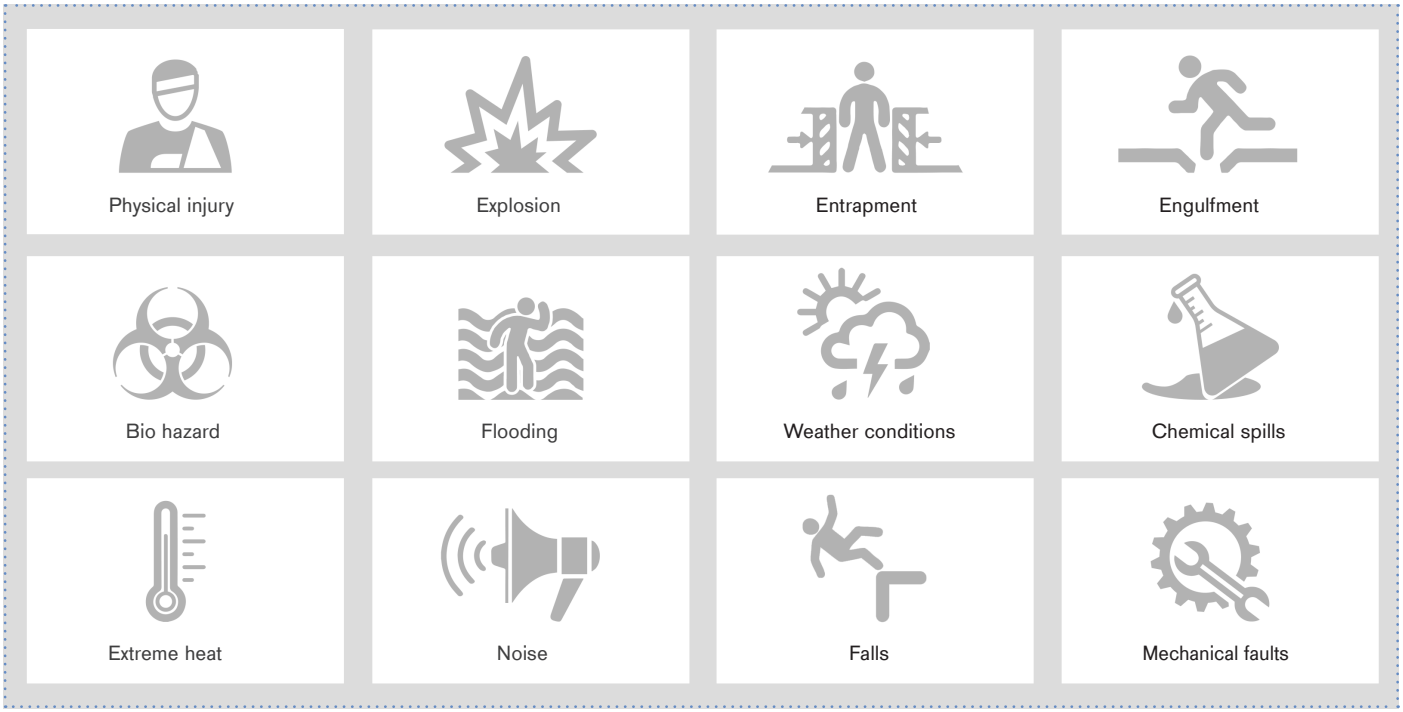


Resulting risks can now be reduced by means of the levers **prevention of damage occurrence** and **decreasing the severity of damage** as well as through the implementation of technical and organisational measures – and lastly through a range of relevant personal protective equipment.

From the information collected, essential protective measures can also be derived. These protective measures are equally important to consider when implementing a rescue. They are subject to – just like the training and action plans of rescuers – continuous ongoing development. Rescue approaches must be adequately and regularly tested and updated.

Standard processes can help to identify hazards and assess risk – for instance, a standard form which can systematically document potential hazards and occurrence probability. With the help of a risk matrix (see Fig. 1), the risks carried by individual work steps can be determined.

GENERAL HAZARDS AND RISKS OF WORKING IN CONFINED SPACES



Developing a specific rescue approach

The information that emerges from the risk assessment provides the basis for the overall evaluation of specific onsite working conditions. As a rule, when it comes to confined spaces, such an evaluation is carried out by a team of various experts that includes, among others: safety engineers, safety supervisors, gas analysts and occupational physicians. A rescue approach developed on this basis always assumes the worst case scenario so that all eventualities are considered, described, and handled appropriately. This includes:

- triggering a chain of rescue, internally (onsite fire department) and externally (official fire brigade),
- the provision of ready-for-use rescue equipment and
- a pre-determined point for handover to the external rescue chain.

For every individual workplace and for every area identified as a confined space, a corresponding and very specific rescue plan must be in place.

The four parts to a preventative approach

A tailored and detailed rescue plan for a specific confined space should always be based on the hierarchical **STOP Principle.** This follows a preventative approach in line with the so-called **"Safe System of Work"**. **S** stands for **substitution** of work processes, with the goal of completely eliminating specific risks. **T** stands for **technical measures**. **O** stands for **organisational measures**. And **P** stands for **personalised measures**.

The three parts to a rescue approach

The rescue approach resulting from the STOP Principle should follow the **TOP Principle** in emergency situations. Under **T** is the availability of appropriate **technical equipment**, such as a tripod with a pulley or pre-equipped fixed points where ropes are mounted. **O** stands for **organisational measures** such as, for example, training for rescue operations in vessels, silos, and confined spaces and the drafting of a seamless internal and external rescue chain. **P** stands for **personalised measures** in regards to self-rescue. This refers to a relatively easy rescue, also called a "basic rescue". The person learning these measures must be

provided with information so they have upfront knowledge on the topic "identifying and evaluating dangers". The correct application of escape equipment should also be practiced. What's more, external rescuers should also be trained with regard to first aid and the correct flow of the rescue chain.

From theory into practice: monitoring the efficiency of rescue approaches

A rescue approach is always subject to efficiency tests in order to verify that the theory also works in practice. In addition, the efficiency tests also clarify some important points: Who is the supervisor, who makes sure the room is clear from hazmats, who is the security officer, who is doing the work inside, who takes charge of the rescue mission in the case of an emergency and who initiates the internal and external rescue chain? It needs to be ascertained whether all these participants are trained and instructed adequately for these specific circumstances, and that includes the external rescue teams like voluntary firefighters, professional fire departments or first responders. If it emerges, during these efficiency tests, that the rescue approach does not function, it could be that the risk analysis was incomplete – in which case it must be redone. And all the consecutive steps must also be revised.

The rescue approach: tested, verified, binding

Once the rescue approach has successfully passed efficiency tests with no issues or changes, all concerned parties should be informed accordingly. The rescue plan may then no longer be modified – because that is the only way to be sure that all the proposed measures will work seamlessly with one another in a real emergency situation. For the maintenance and internalisation of the regulations outlined in the rescue approach, regular trainings on rescues from confined spaces should be given to specialised rescuers. In stationary or mobile training facilities, particularly realistic hazardous situations should be re-enacted and proper conduct should be practiced. With an effective rescue approach, appropriate rescue equipment and comprehensive training, the risks and, therefore, the frequency of accidents during rescue operations in confined spaces can be significantly reduced.

[1] *https://www.bls.gov/news.release/cfoi.nr0.htm, accessed: 02.01.2019*

[2] *http://www.ehstoday.com/construction/four-minutes-life-and-death-confined-spaces; accessed: 21.06.2018*

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