December 2020

Guidance note

EBRD Performance Requirement 4

Safe working in confined spaces

European Bank
for Reconstruction and Development

Acknowledgements

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Disclaimer

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Background

Every day approximately **1,000 men and women worldwide die from work-related accidents and more than 6,500 workers die from diseases related to work.**[1] Developing countries face the greatest burden, with a higher rate of accidents due to economic challenges. In these countries, the informal economy accounts for a large percentage of economic activity. As a result, many work-related accidents and occupational diseases go unreported.

Working in confined spaces is considered to be a high-risk working activity

Working in confined spaces is considered to be a **high-risk** working activity and when unplanned events occur they often have **fatal consequences**. In many cases fatalities are associated with workers attempting to conduct a rescue from a confined space and therefore the consequences of a **poorly planned rescue** can be far greater than the original event.

Any business activities that require a worker to enter any confined space are considered high-risk. When carrying out this type of work it is important that **suitable measures** are in place to ensure that these risks are adequately controlled. It is critical that anyone working in or around these types of areas is well aware of the hazards, risks and control measures needed. Unless workers have received adequate training and have the correct equipment to carry out work safely, entry into a confined space should not be attempted.

This good practice guidance note offers advice on how to manage entry into a confined space. Although there may be references to the water and wastewater industry, the principles and guidance in this document can be applied to any industry.

EBRD expectations

The protection of workers and communities is of great importance to the EBRD. All of the Bank's investments are subject to the EBRD Environmental and Social Policy (ESP) Performance Requirements to ensure that clients manage the health and safety risks associated with project activities in line with good international practice. This includes the management of competent contractors carrying out work in confined spaces.

The protection of workers and communities is of great importance to the EBRD

Confined space working is covered by the requirements within the EBRD's Performance Requirement 4 (Health, Safety and Security). These require all projects to take steps to identify and prevent accidents, injury and ill health to workers and affected communities that arise from, are associated with or occur during the course of the project activities. The preventative and protective measures and plans to manage health and safety risks in line with good international practice and following the hierarchy of risk control are as follows:

- eliminate the risk
- reduce the risk by substituting something less harmful
- isolate the risk
- introduce engineering controls to collectively control the risk
- provide information, instruction and training
- introduce personal protective equipment (as a last resort and preferably not as the only control).

This good practice guidance note should be read in conjunction with all Performance Requirements within the Bank's Environmental and Social Policy requirements, which are available at www.ebrd.com.

Definition of confined space

A confined space is not always obvious and, therefore, there are a number of definitions to help identify if work will be carried out in a confined space.

A confined space is not always obvious

A confined space is a place that is substantially enclosed (though not always entirely), and where serious injury can occur from exposure to hazardous substances or conditions, **for example, from a lack of oxygen**. It is also not suitable for continuous human occupation.

Confined-space working should never be carried out alone

Unless effectively controlled, it is **highly likely that serious injury or illness can occur** from exposure to hazardous substances or conditions within the space or nearby.

Examples include:

- tanks
- vessels
- sewers

[1] See P. Hämäläinen, J. Takala and T. B. Kiat (2017), *Global Estimates of Occupational Accidents and Work-Related Illnesses 2017*, Workplace Safety and Health Institute, and Ministry of Health and Social Affairs Finland, Singapore.

- wells
- culverts
- silos
- pits
- cellars
- excavations.

However, many more places might be classed as a confined space and each space should be considered individually.

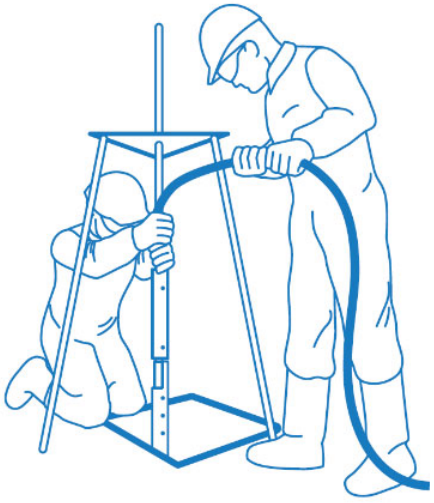
Typical confined space hazards include:

- a lack of oxygen
- flammable gases and vapours, such as fuel vapour or methane
- combustible dusts, such as wood dust or grain dust
- toxic gases and vapours, such as hydrogen sulphide or chlorine
- the ingress or presence of liquids or free-flowing solids, such as grain, wood pellets or powders
- thermal temperatures, such as extreme heat or cold
- physical hazards within the space, such as valves, electrical equipment, machinery or steam pipes.

It is important **to assess a confined space** for risks before someone enters this area. More information on the best way to approach assessment is provided in the "Risk assessment" section of this document.

Before entering a confined space the **hierarchy of risk control should be followed**, with elimination being the first control. Consider whether the work can be carried out practically without entering the confined space. An example could be using a video camera rather than a worker to enter a confined space.

Figure 1. **An intrinsically safe video is one method of avoiding entry into a confined space.**



Note: Such equipment is commercially available, although it needs to be appropriate for the environment into which it enters.

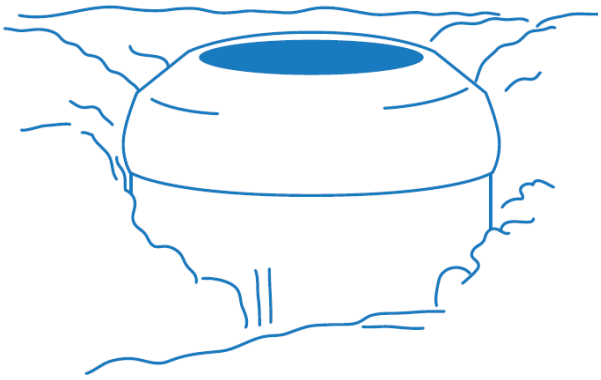
Can the work be carried out practically without entering the confined space?

Carrying out the work from the outside **should always be the first choice**. Entry into a confined space should not take place until the right equipment is available and the right training has been given, including understanding the safe system of work for entering a confined space.

Confined-space register

It is good practice for all confined spaces at the company premises or under the company's control to be identified and entered into a register of confined spaces (See **Annex A**). The register should record specific information to be gathered about **all known confined spaces** to confirm **the category of risk** and also the potential hazards.

Figure 2. **Typical manhole chamber into a confined space**



Information that should be recorded includes:

- location
- key risks and considerations when planning work
- guide classification
- suggested personal protective equipment (PPE).

This register acts as an initial identification guide for each specific confined space when planning work in the confined space. It is important to note that not all confined spaces will be on a register as **some will become confined spaces due to the works being undertaken or even over a period of time due to change of use**, for example, welding, coatings, high-pressure cleaning or the storage of hazardous materials.

Confined space environments

The category of a confined space and the risks that may exist can be wide-ranging and it is important to understand **what makes an environment a confined space** and how dangerous it can be. Although all confined-space work is high risk, confined spaces can be broadly **categorised into three types of risk:**

- **low-risk**
- **medium-risk**
- **high-risk.**

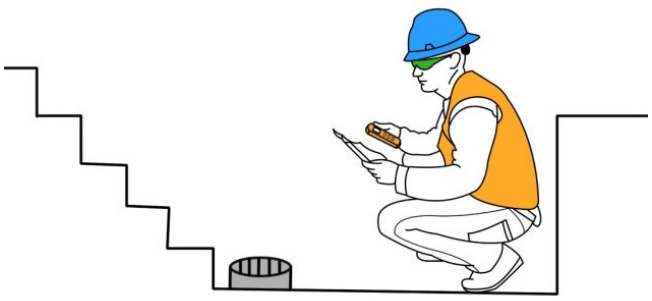
Categorisation may change and any work inside the area needs to be appropriately assessed to confirm if a **low-risk** space may develop into a **medium-risk** or even **high-risk space** during the work activity. For example, if a work activity such as welding is carried out in a **low-risk** space, it may result in the space actually becoming a **medium-risk** space because of additional risks introduced by the work. This may mean that the equipment or safe system of work for this job needs to change. See more details on this in the section about "Risk assessment".

Annex B provides more information on the typical equipment and site set-up of each type of environment below.

Low-risk confined space

A low-risk confined space is a space where there is easy access to and egress from the area, and adequate natural or forced (mechanical) ventilation. Care should be taken to make sure that any ladders fixed in place are in good condition. Access to the work area **must be unobstructed** and the space should have **no risk of flooding**, nor should it present other possible risks. Examples of such locations could include boiler houses, valve chambers and cellars.

Figure 3. **Example of a low-risk confined area**



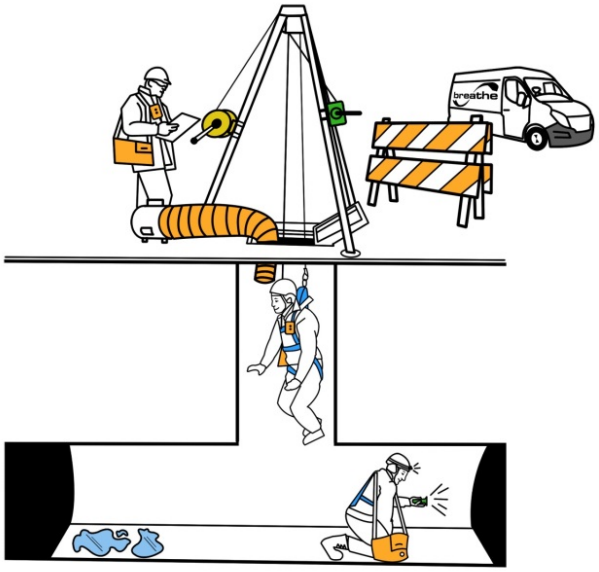
A risk assessment will determine exactly what equipment is required for entry.

Medium-risk confined space

This is usually characterised by **problems with access** and the potential of **hazards being encountered** while workers are entering or working within the space, for example, a lack of oxygen and/or the presence of flammable or toxic gas. If entering a sewer it is also good practice to consider opening other access points up or downstream to create through-ventilation.

Workers should **remain connected to a winch and lifeline unless this creates further risks** or it is not practical to do so, but this decision should also be risk-assessed. The example in Figure 4 shows that when traversing horizontally the entrant has disconnected from the lifeline.

Figure 4. **Example of a medium-risk confined area**



An **entry controller** is required for **all medium-risk** entries.

Whenever someone is disconnecting from a lifeline, consideration should be given to **communication and emergency arrangements** (such as escape breathing apparatus). Tagging workers who enter the confined space may also be required to ensure that all persons who entered the confined space have been confirmed as having exited.

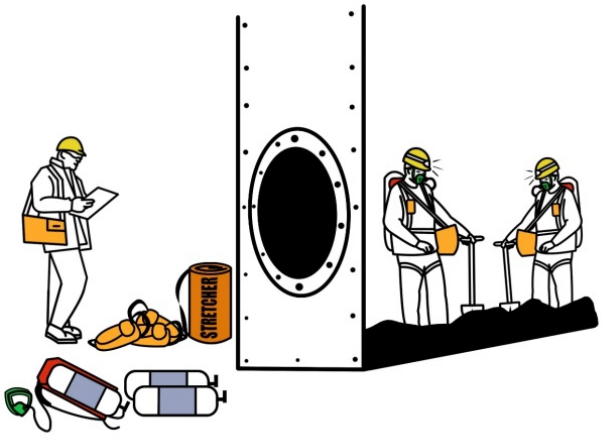
High-risk confined space

When a known hazard is present within the confined space and it cannot be eliminated or adequately controlled the space is categorised as **high-risk**. This could be due to the **continued presence of flammable and/or toxic gas, electrical or mechanical hazards or complex access arrangements**. Even if access is easy

and unobstructed, where a known hazard is present, the space still needs to be considered **high-risk**.

Entry to a high-risk confined space should only be carried out by specialist staff or contractors

Figure 5. **Example of a high-risk confined area**



Where a known hazard is present, the confined space is categorised as high-risk

People operating in these environments will usually be **required to wear either self-contained or airline breathing apparatus** and have an **emergency rescue team on standby**.

Once a confined space environment has been identified, a risk assessment can be prepared to identify the hazards, risks and the necessary control measures required to conduct a safe entry.

Risk assessment

Once a confined space has been identified and before any confined space activities are carried out, a **risk assessment needs to be undertaken**. A risk assessment is the term that is used to describe the overall approach to managing risks. A risk assessment template is available in **Annex C**. Assessment is not about stopping the work going ahead or removing all risk but rather about providing a method of managing the risks to which workers may be exposed, as follows:

- identify hazards
- recognise who could be harmed and how
- evaluate the risks
- decide on sensible control measures to manage the risks
- review the effectiveness of the control measures after the risk management methods have been implemented.

A risk assessment is **not a tick-box exercise** or a process for generating huge amounts of paperwork. The development of the risk assessment should include workers involved in the task or activity and should be used during any site induction for new workers. The general approach to a risk assessment is carried out in five key steps.

Step 1. Identify hazards

The first step in developing a risk assessment is to **identify the hazards**. This will require a clear understanding of the work environment, the tasks being carried out and the work equipment being used. It is good practice to walk around the workplace looking for activities, processes or substances that are in the work area that could cause injury or illness to workers or third parties. This may require a review of various documents, such as manufacturer's instructions for equipment, in order to better understand the risks of particular items, and a look back at what incidents have occurred in the workplace or when undertaking a particular task. The **identification process should consider routine and non-routine tasks**, look beyond immediate hazards and think of those tasks that can also result in ill health due to prolonged exposure, for example, to noise or hazardous waste. Lastly, take a step back and look around the work area, looking beyond the immediate or typical hazards. Simultaneous operations carried out by **other contractors in the immediate area** should also be considered to ensure that these activities do not create additional risks.

Look beyond the immediate and typical hazards!

Step 2. Who and how

The environment of the confined space will help identify who may be at risk. Consideration should be given to all the workers entering the confined space and whether they should undertake the work activity or not, with regard to their **fitness to undertake the work** and those who may be working there or in close proximity. If the confined space is in a public area, such as a sewer, then careful consideration should be given to protecting members of the public. For each category of person, their risk of being harmed by the confined space should be considered, for example, a member of the public falling into an open chamber or drivers in vehicles unable to see workers.

Consider workers and others in close proximity!

Step 3. **Evaluate**

It should be decided **how likely it is that a person might be harmed and how severe the harm might be** if it occurs. For example, someone exposed to a gas in a confined space could easily be killed, so consideration should be given to how people in confined places will identify changes in gas levels and how they will protect against these in the confined space. In this example, they would use a gas detector with pre-defined alarms and an escape device that provides them with clean air to exit safely from the area. Consideration should also be given to what training they will need to understand and operate this type of equipment safely.

Step 4. **Record**

All the findings from the first three steps need to be recorded. This will allow the determination of all existing control measures and additional control measures that need to be introduced.

Keep focus on significant hazards and not on trivial ones

Keep focus on significant hazards and not on trivial ones. Recording findings will also help **communicate these to all workers** at the relevant work area. Information should also be shared with any new workers entering the worksite as part of the site induction and advice provided on hazards, risks and necessary control measures.

Step 5. **Review**

The risk assessment should be **reviewed periodically at least annually and when any changes occur** to ensure that it remains fit for purpose. The review should identify any new and emerging hazards. For example, if a new work activity in a confined space is to be carried out, or a change in the working layout is needed, this would require a review and update of the risk assessment to identify new hazards and risks and ensure that the workers remain safe.

Review the risk assessment when changes occur!

To help with carrying out a risk assessment, a template available in **Annex C** of this guidance document can be used.

Developing a risk assessment

For each confined space task, a separate risk assessment must be created that correctly identifies the risks and hazards of that individual space and assesses ways in which they will be controlled and mitigated.

A key factor to consider during the development of the risk assessment is to **identify the current conditions** and how the work activity to be undertaken may change or impact the condition in the confined space. For example, if an activity disrupts material on the floor surface in the confined space it might produce vapour that was not present previously and which may pollute the whole space. Key areas to consider are as follows:

- the type of work to be done
- the suitability of those doing the work
- present and previous contents in the confined space
- rates of flow of any liquids or flowing solids
- the weather (wind, rain, heat, frost, and so on)
- amount of ventilation
- quality of the atmosphere in the space
- the duration of the planned work task
- safe tools and equipment
- the generation of fumes, gases and dust during the work task
- the distance to be travelled
- lighting levels
- noise levels
- plant and machinery present
- difficulties with movement during access or egress
- suspension points for the winch
- underfoot conditions
- structure (damage, obstructions, loose debris, and so on)
- any other local conditions
- liaison with local emergency services.

This information should be entered in the confined space risk assessment.

From this risk assessment a safe system of work should be created, which details the steps that will be taken to ensure that the work is carried out safely. **Annex D** gives an example of a safe system. The purpose of a safe system of work is to:

- list all the actions in the order in which they must be taken to set up the job safely
- complete the work in the confined space safely
- detail how to secure the area after work.

A safe system of work should include a section on emergency planning that details what procedures should be taken if an emergency event occurs within the confined space, and the emergency points of contact.

For any entry into a confined space a procedure needs to be adopted. An example of an entry procedure flowchart is available in **Annex E**. This entry procedure will include a confined space permit, which must be completed. A typical confined space permit is available in **Annex F**. A permit should only be **valid for one shift or up to 12 hours**. The permit may need to be reissued if conditions change in the confined space or if the work party completely exits the confined space and then requires re-entry.

Confined-space permits must be completed!

If working conditions are particularly bad, such as excessive heat or strenuous work, then the **allowable entry time may be restricted**. This should be controlled by the safe system of work. In addition, the permit should identify these control measures.

Once all the relevant planning and documentation has been completed, a short safety briefing, commonly known as a toolbox talk, should be delivered to the work party, **communicating all the arrangements** associated with the work activity. This toolbox talk should cover:

- key risk areas
- the roles and responsibilities of each team member
- key safety equipment and practices to be used
- emergency arrangements.

It should also discuss any work activities that may increase the risk level within the space.

Health and safety hazards

To help prepare a risk assessment, this section explains the potential hazards and risks that may be present. A confined space may contain a **number of health and safety hazards** that can result in serious injury and/or ill health and it is important to perform an assessment of what potential may be present in the confined space to be entered.

Remember to avoid entering a confined space in the first instance and carry out the work from outside

The table below lists some **examples of typical confined-space hazards and the risks** if these are not adequately controlled. This list is not exhaustive and there is a need to look carefully at the environment and identify the hazards and risks associated with each specific confined space.

Hazard	Risk
Oxygen deficiency	Initially dizziness and headaches, ultimately death by asphyxiation
Oxygen enrichment	Increased likelihood of a flash fire, leading to burns and ultimately death
Flammable gas or vapour	Explosion or flash fires leading to burns and ultimately death
Toxic gas or vapour	Poisoning – long-term consequences include cancers, short-term impairment of judgement, unconsciousness and death
Free-flowing liquid or solid	Entrapment, suffocation, drowning, an asphyxiating environment
Poor access and egress	If another risk occurs, poor access or egress can make it difficult to escape quickly and lead to serious injury, disablement or death from falls and other risks
Poor communications	If the team cannot communicate with each other they will be unable to warn each other of hazards, and may become lost
Poor ventilation	More likely to occur due to issues associated with a build-up of gas and vapour leading to the risks detailed above
Excessive heat	Dehydration, heat stress, loss of concentration, heat stroke, collapse, lung damage
Complex layout	Possibility of becoming trapped or lost
Sludge, debris, contaminated liquids	Likely to cause slips, trips and falls; dermal contact with contaminated products can result in biological infections and other health effects

Roles and responsibilities

All individuals carrying out confined-space work should have **defined roles.** In some cases this might result in some workers having two or more roles and responsibilities (for example, being part of the work party but also part of the rescue team). Each of these roles will have responsibilities so that everyone is aware of **what they need to do during the work activity**, but more importantly, if an unplanned event occurs. Below is a summary of these roles.

Competent person

- Can also be called the team leader or entry control supervisor. They may also be the site supervisor.
- Responsible for carrying out the risk assessment for the confined space working.
- Responsible for developing a safe system of work for the confined-space entry.
- Provides supervision for the confined-space-entry work activity.
- Provides guidance and assistance to work parties to organise and plan work in the confined space.
- Completes the 'permit to work' for the confined-space entry and ensures that it has been authorised prior to entry.
- Ensures that the confined space is safe for entry, for example, isolations have been completed, pre-entry air test has been completed, equipment is serviceable and still within its expiry date, training for all people and workers is suitable for the role and up to date.
- Responsible for ensuring the risk assessment and safe system of work are carried out correctly.
- Cancels and signs off the permit to work once the work activity has been completed. If the work task alters such that it no longer fits within the safety limits of the permit to work, the competent person is responsible for ensuring that any changes to the permit are communicated to the whole team.
- Reports any discrepancies with regard to the risk assessment and safe system of work as they arise.
- Adjusts onsite arrangements if they feel it is within their capability, documenting and agreeing with the work party any changes (anything that they are unsure about should be discussed with the safety team before proceeding).
- Reports and documents details of any near-miss, accident or incident that occurs during the work activity.
- Maintains the confined-space register for the site to which they are assigned.
- Has undergone training on supervising work in confined spaces.

Work party

- Responsible for undertaking work in a confined space that they are trained to enter.
- Must have been provided with confined-space training for medium-risk or high-risk environments, depending on the type of work they are required to do.

Rescue team

- Responsible for providing rescue cover to the work party undertaking high-risk confined-space entry.
- Training for these groups includes specific confined-space rescue training.

Safety team

- Responsible for authorising and approving the risk assessment and the complete safe system of work.
- Acts as a point of contact to whom the competent person can refer for advice and guidance in situations where they feel there is a need for assistance.
- Responsible for approving and authorising work to be carried out by all sub-contractors.
- Responsible for ensuring that suitable and sufficient emergency arrangements have been considered and implemented for all work being carried out.
- Questions and improves any safety documentation for the work activity as they see fit, referring where necessary to the head of safety.
- Has undergone training in managing work in confined spaces.

Head of safety

- Responsible for developing and guiding the safety team, providing additional support on complex issues.
- Responsible for ensuring that an adequate procedure for confined-space working is in place.
- Develops and maintains the company's confined-space procedure.
- Has undergone training on managing work in confined spaces.

Training and suitability

Training is required to ensure that workers **learn about the hazards, risks and control measures** so that confined-space entry is carried out safely. Training informs workers about what to do, but **more importantly what not to do**. It is essential to provide the correct training on the relevant roles and responsibilities of all workers involved in planning, supervising and working in a confined space entry.

It is essential to have the correct training and experience to carry out work safely!

There are various types of training course for specific roles and more information on this has already been discussed in the section on "Roles and responsibilities". Identifying a trainer who can deliver the training courses is important, and depending on the type of training, this might be carried out by an internal trainer or external training provider.

Training for confined-space entry and awareness

This training should be provided to **all people** involved in confined-space working and should usually last for one day.

This training provides workers with a **solid knowledge of confined-space working** and should target the work party, although it should also include those involved in supervising and managing confined-space working as it provides a basic foundation to build on.

The training should cover the fundamental principles of confined-space working, which should include:

- understanding best practice in confined-space working
- an ability to understand the confined-space classifications
- understanding the hazards and risks associated with confined-space working
- how to identify and control such risks
- safe use and understanding of gas-monitoring equipment
- safe use and pre-use inspection of confined-space entry equipment – tripod, winch, fall-arrest mechanisms, harnesses and safety lines
- safe use of compressed-air escape breathing apparatus
- working to a safe system of work
- reacting safely and effectively in an emergency situation.

Breathing apparatus training

This training course should build on the previous course and should provide knowledge for workers and competent persons to work in **high-risk confined-space environments** where entry with working breathing apparatus is required. This should be a one-day course and should include:

- an overview of compressed-air breathing apparatus
- the theory of self-contained breathing apparatus (SCBA), looking at component parts and correct usage and maintenance
- cylinder theory, including duration calculations
- SCBA pre-use checks, including donning and doffing (putting on and taking off) procedures
- airline breathing apparatus, covering theory aspects and pre-use checks
- entry control for breathing apparatus work
- practical uses of working breathing apparatus in a high-risk environment.

Supervision of work

The training will provide the ability for a person to **competently supervise all work in confined spaces**. The trainees should have completed the first two courses. This should be a one-day course and include the following:

- applying industry best practice, including the hierarchy of hazard control and employer duties
- undertaking the risk assessment of work in confined spaces
- working with permits to work
- developing a basic safe system of work
- selecting, installing and maintaining control measures, including hygiene procedures
- creating, implementing and maintaining rescue plans and emergency procedures
- control of records and documents relating to confined-space working.

Management of work training

Building on the previous training, this course would give those managing confined-space working the ability to **competently manage and supervise all work in confined spaces**. It would give the person the tools for classifying and managing all types of confined-space projects. This should be a two-day course and include the following:

- assessing and classifying confined-space environments

- undertaking an advanced risk assessment of work in confined spaces
- developing a complex safe system of work
- creating, implementing and maintaining rescue plans and emergency procedures
- control of records and documents relating to confined-space working.

Advanced technical rescue training

This training will build on the training provided on the confined-space awareness and entry and the confined-space entry with working breathing apparatus. The training would be specific, **given to those who intend to work as part of a confined-space rescue team.** This training should be a one-day course and include the following:

- rescue team roles and responsibilities
- the safe use of rescue stretchers and casualty splinting devices
- the safe use of basic casualty-care equipment
- the safe use and maintenance of resuscitation and defibrillation equipment
- safely augmenting an air supply
- the application of casualty assessment and basic life support to confined-space casualties
- practical application of rescue techniques in vertical and horizontal extractions.

Equipment

The completion of a risk assessment will **identify the equipment that is needed to undertake the confined space entry safely**. It is therefore important that the typical equipment that might be used in confined-space entry is identified as well **as the equipment's limitations**. The equipment used can also be dictated by the type of entry and other factors and the risk assessment should identify what equipment should be selected. The information below is not comprehensive; the **manufacturer's information should also be reviewed prior to use** and all equipment should meet recognised international or national standards. In some countries it might be difficult to obtain the correct equipment and this may require further risk assessment and consultation with a local specialist to ensure that the work can be undertaken safely.

Ensure that all equipment is correctly selected for the task, serviced, calibrated and maintained as per manufacturer recommendations.

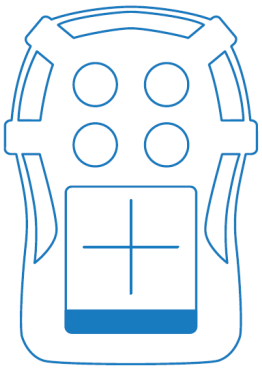
Remember that conditions can change and this may also require a change in the equipment to be used

The key equipment or arrangements reviewed below include:

- gas detection (portable and personal)
- A-frame or tripod
- winch
- fall arrest
- lifeline
- safety harness
- breathing apparatus
- air mover or ventilation
- communication device
- lighting or torch
- protective barriers.

Personal gas detection

Gas-detection equipment is used to **alert users to unsafe levels** of gases (including oxygen) and to the flammability of the environment in confined spaces. These devices have alarms set to warn workers when rising or falling levels of gases (including oxygen) and flammability are beginning to make the environment unsafe. When the unit alarms are set off, users **must exit** to a safe area.



No person should attempt to enter any confined space without testing the atmosphere

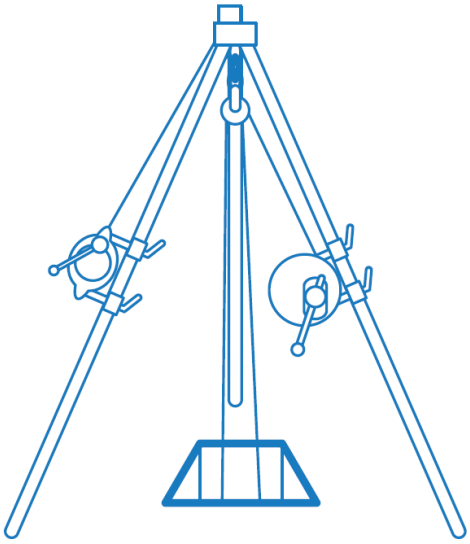
Pre-entry tests should be carried out and the personal gas-detection equipment should be lowered into the area for a period of time (for example, 30 minutes) to monitor the atmosphere **before entry**. Ensure that results of any pre-entry test are checked, and remember that this provides **no guarantee that the atmosphere will remain safe** and therefore regular checks should be made. The event log in **Annex G** provides a template for recording your findings. It is recommended that everyone wears their own gas monitor.

Do not rely on your own sense of smell as high levels of toxic gas may not be detected by the human nose

It is important that the correct detectors are used for each specific environment and gases and that the detectors are correctly positioned.

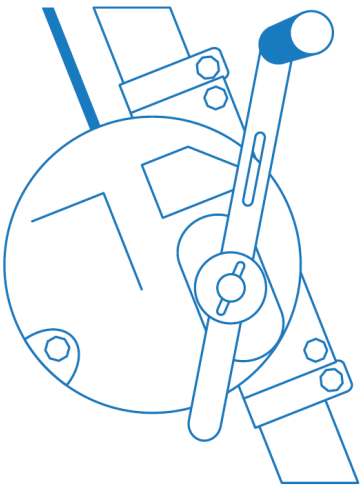
A-frame or tripod

An A-frame or tripod is used during a **top or vertical confined-space entry** and connects a safety line to the person entering the confined space. The equipment acts as an anchor point above an entry point into a confined space and aids rescue **without anyone else entering** the confined space.



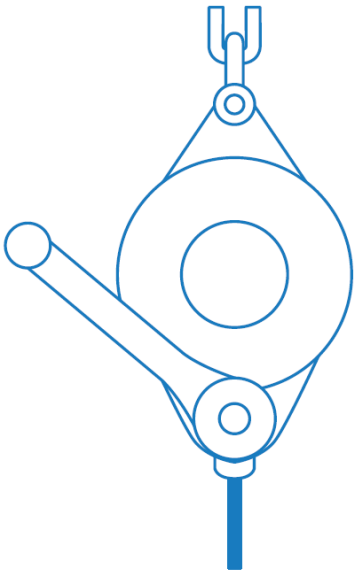
Winch

A winch is used to raise and lower the worker into a confined space. The winch is connected to the worker's **safety harness** and connected to the A-frame or tripod. These devices will have weight limits that should never be exceeded.



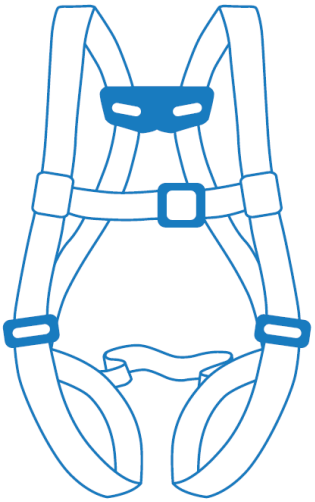
Fall arrest with recovery winch

A fall arrest is a secondary winch that is provided to slow a person's descent, should the winch fail. It can also be used as a winch in this event.



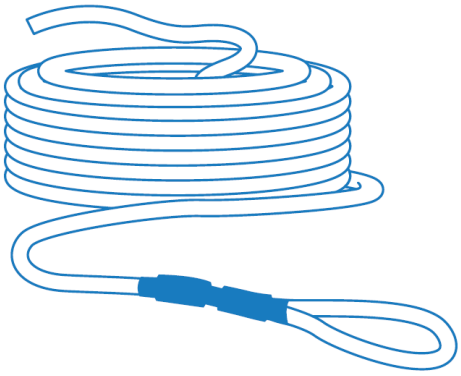
Safety harness

A safety harness is worn by a worker and attached to the winch or lifeline to **aid rescue.** The equipment can also be used to prevent falls from height. Safety harnesses **can cause injury to the worker if the worker is suspended for any length of time** (suspension trauma).



Lifeline

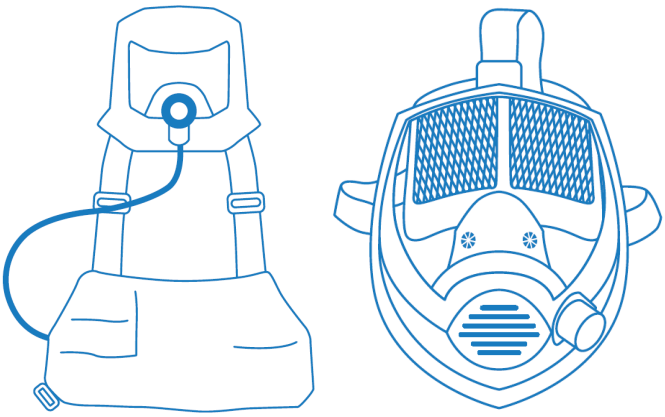
A lifeline is typically used for horizontal entries and connected to a **worker's safety harness.** This will allow a worker to be pulled out from the confined space and aid rescue without anyone else entering the confined space. Lifelines should be **regularly inspected due to exposure to materials** in the confined space that may cause damage.



Breathing apparatus

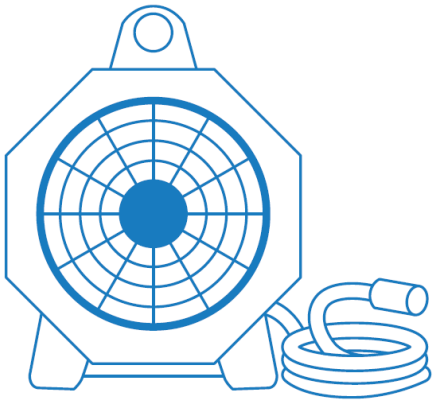
Breathing apparatus provides clean breathable compressed air either from a small cylinder or from a compressed airline. The clean breathable air is delivered to the worker's face mask.

There are two types of breathing apparatus: escape breathing apparatus is used to self-rescue from a space that has become unsafe, and should only be used for emergency self-rescue. The other type is working breathing apparatus and allows workers to enter hazardous areas to work or to rescue others. Remember to only conduct rescue if trained to do so.



Air mover or ventilation

Air movers **force clean air from outside a confined space into the area to disperse unclean air**. Always ensure air being forced into the confined space is **clean and does not include any contaminated air** that could contain exhaust fumes.

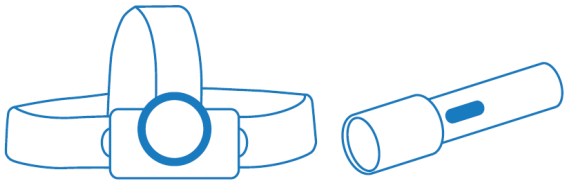


Communication devices

Where communication is difficult, consider using other methods, such as air-horns, torch flashes or pulling on a rope. Radios may be used to ensure that the person in a confined space can still talk easily to those outside, but **need to be appropriate** for the confined space they are used in.

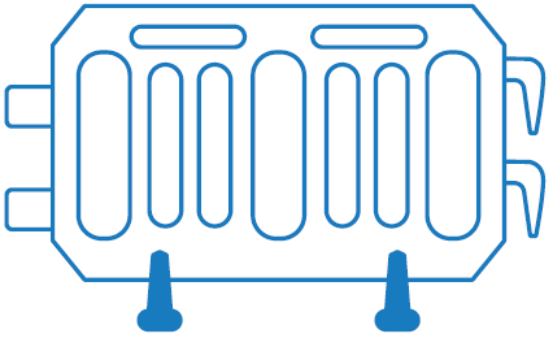
Lighting or torch

Torches or lights can be used to light up confined spaces so that workers can see what they are doing and work safely. However, these devices can also **act as an ignition source** and therefore the equipment should be intrinsically safe and have the appropriate ingress protection (IP) rating for the environment in which it will be used.



Barriers

Barriers prevent unauthorised people **getting too close to unsafe areas** and show areas where people should not be entering. The positioning of barriers needs to be well defined to prevent vehicle exhaust fumes reaching the entry to the confined space.



Annex B shows the typical equipment that might be used for each type of entry.

Emergency planning and rescue

Once roles and responsibilities have been assigned and the correct equipment selected, before any entry is carried out suitable rescue arrangements need to be developed to plan for **any foreseeable emergency situations**. Many emergency events in confined spaces have resulted in **multiple deaths** due to failed rescue attempts and those entering the confined space to rescue workers can quickly become casualties themselves.

The rescue procedure will be detailed in the rescue planning section of a safe system of work. For **most low- and medium-risk entries, self-rescue is likely to be suitable**, although the following areas should be considered:

- method of communication
- method of rescue
- rescue equipment
- medical equipment.

People entering the confined space should be able to exit by themselves in any emergency situations. They would usually carry an escape breathing apparatus set which they would wear in the event of an emergency occurring.

People entering the confined space should be able to exit by themselves!

For **high-risk** confined spaces **a rescue team would normally be required**. The rescue team should be **trained in handling casualties and working with full breathing apparatus.** In the event of a worker inside the confined space becoming incapacitated, the rescue team would enter and recover the person.

The use of a rescue team should also be considered where there is **insufficient access to emergency services** or the local emergency services do not have the equipment or capability to deal with the types of risk involved.

A rescue plan must detail **what will happen in the event of self-rescue going wrong** for a low- or medium-risk confined space. This will usually rely on emergency services as the likelihood of this occurring in these types of confined space should be extremely rare.

Always consider whether work areas are inaccessible or difficult for emergency services to access

In these areas additional rescue cover should be introduced

Consideration should also be given to cases where the **emergency services may not have the capacity or capability** to rescue casualties from confined spaces. For companies undertaking regular confined-space entry, it is suggested that they **speak with their local emergency services** to identify what capacity they have or even to conduct rescue scenarios to train for foreseeable emergencies. These entries should be considered high-risk and rescue cover should be provided.

An emergency action flowchart in **Annex H** can assist in developing and documenting emergency arrangements. Before any confined-space work starts, the emergency plan will need to be communicated to **all team members** so that they are fully aware of what action they must take during any emergency.

Summary

This good practice guidance note provides an **overview to the approach** to be followed when working in a confined space. This section provides a step-by-step summary of the process of undertaking confined-space entry.

Step 1. **Confined-space register**
Identify all confined-space locations using a confined-space register, which will help in the event of any future entry into these confined spaces (see **Annex A** for a confined-space register template).

Step 2. **Risk assessment**
If work in a confined space is required, a risk assessment should be carried out, applying the hierarchy of risk controls (where possible all efforts should be made to prevent entry into a confined space and work should be carried out from the outside to prevent injury). (See the section on risk assessment for guidance and **Annex C** for a risk assessment template).

Step 3. **Training and suitability**
Identify the workers who will be involved in planning, authorising, supervising and working in the confined space and check that they possess the correct training, experience and physical and mental fitness to carry out the work safely.

Step 4. **Equipment**
Check that the necessary equipment to complete the task safely is available and in good working order. This equipment will have been identified in the risk assessment.

Step 5. **Emergency plan**
Develop an emergency plan that takes into account all foreseeable emergency situations. (See the **Annex H** emergency action flowchart.)

Step 6. **Communication**
Bring all the team members together and communicate the findings of the risk assessments, confirm their roles and responsibilities and their roles in the event of any emergency situation.

Step 7. **Confined-space permit**
Complete the confined-space permit confirming all pre-entry checks. The confined-space permit should be authorised and closed out on completion of the work by the competent person. (See **Annex F** for a confined-space permit template.)

Step 8. Event log
Complete the event log during the confined-space entry and record the relevant events and gas-monitoring levels. (See **Annex G** for an event log template.)

Further information

IOSH
https://www.iosh.com/

Health and Safety Executive
https://www.hse.gov.uk/toolbox/confined.htm

Health and Safety Authority
https://www.hsa.ie/eng/Topics/Confined_Spaces/

Breathe Safety
https://www.breathesafety.com/

EU ATEX Directive
https://ec.europa.eu/growth/single-market/european-standards/harmonised-standards/equipment-explosive-atmosphere_en

Annex A. **Confined-space register**

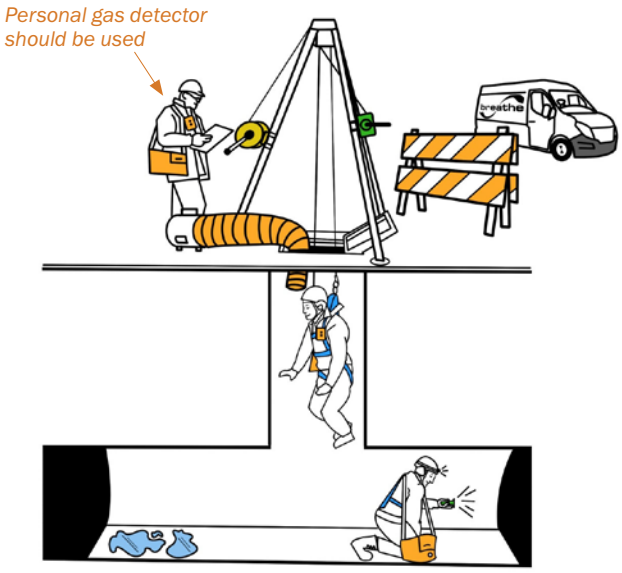
Confined-space register					
Site location and type of confined space					
Location:				**Date:**	
Carried out by:		**Accompanied by:**		**Review date:**	

Number	**Location**	**Activity**	**Hazard identification**									
			A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**Category**

Hazard description		
A. Flammable and oxygen enrichment environment	**D.** Ingress or presence of liquids	**G.** Access/egress problems
B. Toxic gas, fumes or vapours	**E.** Solid materials that can flow	**H.** Physical dimensions and layout
C. Oxygen deficiency	**F.** Presence of excessive heat	**I.** Ventilation problems
Category: **(low-risk)** **(medium-risk)** **(high-risk)**		

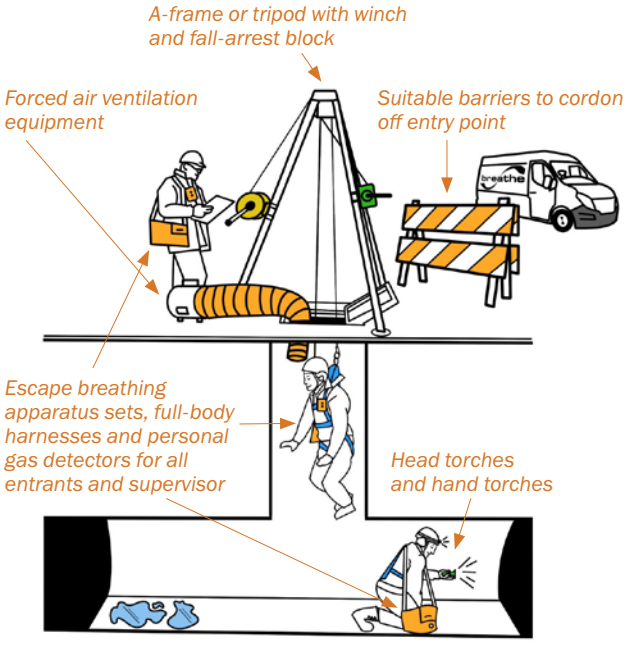
Annex B. **Entry classifications**

Example: **Low-risk-categorised confined space**



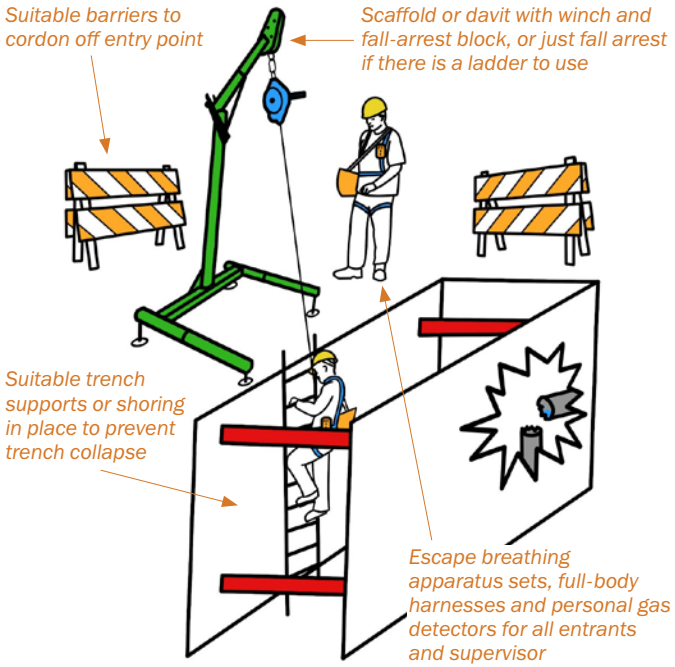
- Unobstructed access
- Adequate natural ventilation
- No risk of flooding

Example: **Medium-risk confined space**



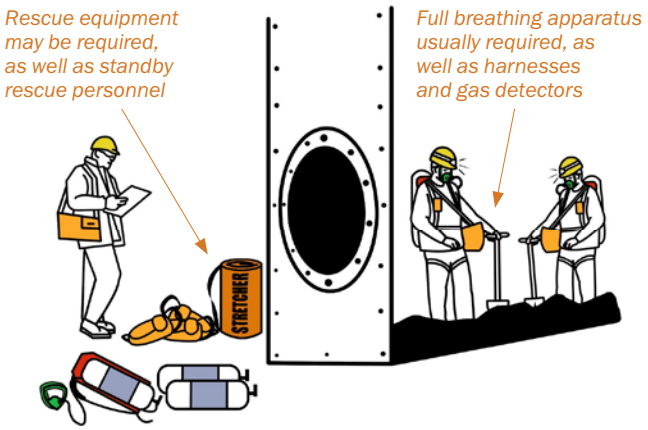
- Access issues
- Realistic likelihood of encountering a specified risk (oxygen deficiency, toxic gas and so on)
- Safety equipment used to access the space

Example: **Medium-risk confined space: Excavation**



- Access issues despite being an open-top area
- Specific attention to support of the ground is required
- Realistic likelihood of encountering a specified risk (oxygen deficiency, toxic gas and so on)
- Safety equipment used for accessing the space

Example: **High-risk confined space**
(This work should only be carried out by specialist contractors - see also page 5.)



- Known present hazard that requires specific protection such as breathing apparatus
- Often requires a standby rescue team with relevant equipment to rescue entrants as required

Annex C. **Risk assessment template**

Risk assessment	
Site location	**Type of activity**

Prepared by	**Position**	**Reviewed by**	**Position**

Risk rating matrix			
HIGH			
MEDIUM			
LOW			
	LOW	MEDIUM	HIGH

Consequences		**Frequency**	
(C)		**(F)**	
HIGH	Fatal	HIGH	Probable
MEDIUM	Major	MEDIUM	Possible
LOW	Minor	LOW	Negligible

Risk rating		
(RR)		
HIGH	Intolerable	STOP
MEDIUM	Tolerable	
LOW	Trivial	

Hazard	**Risk**	**Before controls**			**Critical action to mitigate hazards**	**After controls**		
		C	**F**	**RR**		**C**	**F**	**RR**

Authorisation			
Name:		Position:	
Signed:		Date:	

Annex D. **Sample safe system of work**

Safe system of work			
Client:		**Location:**	
Address:		**Signed off by:**	

Task brief (safe system of work for a generic confined-space entry – permit is task-specific)	
1. Report to [XXXXXX] on arrival and obtain site passes and permits as required.	
2. Do a final check of all documents, which is required by [XXXXX], and cross-check against our procedures.	
3. Conduct a short meeting to decide on the exact order of work and verbally run through the written procedures.	
4. Barricade the entrance points, including manholes, to the area in order to control entry to hazardous areas.	
5. External hatches, for example manhole covers, can then be lifted and the area allowed to vent, and calibrated gas detection equipment can be placed inside each hatch to monitor the air for a period of time (for example, 30 minutes).	
6. View the peak flow to see the maximum amount of gas seen by the monitor during this period.	
7. If at any point the monitor alarm sounds, check the monitor immediately and reassess the situation. In most cases, additional venting will be required and a re-test will then be conducted.	
8. Once venting is complete, carry out pre-entry testing at each entry point. a. Pre-entry testing consists of placing a calibrated gas monitor into the confined space to record any gases that are present.	
9. Record results on the confined-space permit.	
10. Depending on the entry point, it may be necessary to set up a tripod, winch and fall-arrest system to allow safe access.	
11. All entrants are required to wear or carry the following: a. Harness – whether entering on the fall-arrest system or not, this will aid in the recovery of casualties if required b. Personal gas detector calibrated to detect hydrogen sulphide (H_2S), oxygen (O_2), methane (CH_4) and carbon monoxide (CO) c. Escape breathing apparatus d. ATEX hand or head torch e. ATEX radio f. PPE and respiratory protection equipment (RPE) as specified.	
12. To ensure that the job can progress safely in the event of traces of flammable gases being present additional equipment may be required: a. ATEX lighting – in the case of flammable gas, existing light installations must be isolated immediately and replaced with temporary ATEX b. Venting equipment – as applicable.	
13. All operatives who are present on the job will sign onto the permit; entry into and out of the space will be monitored with an entry sentry board.	
14. Entry can now take place.	

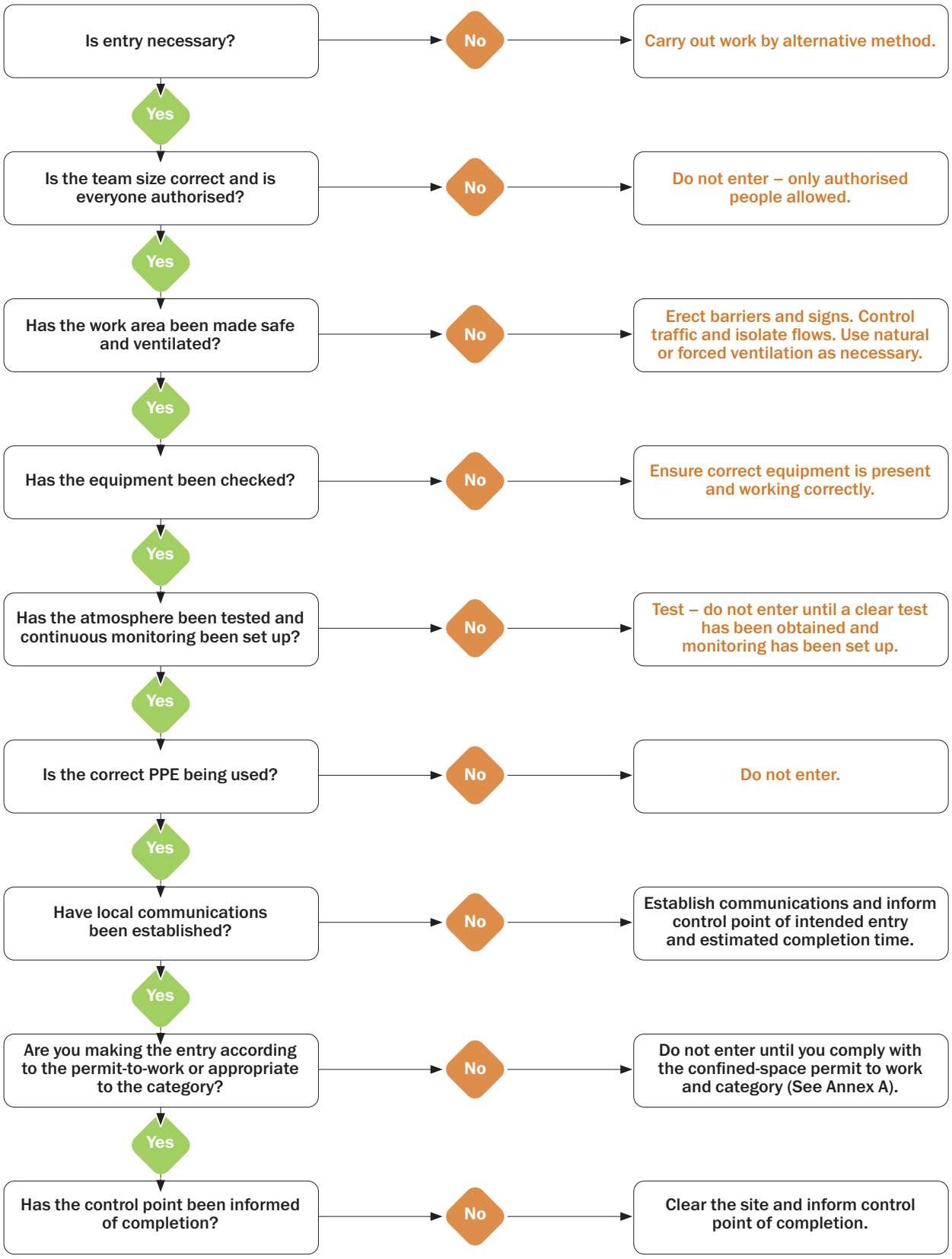
Safe system of work			
Client:		**Location:**	
Address:		**Signed off by:**	

Considerations while working	
1. [XXXXX] will then conduct their work in accordance with their Method Statement.	
2. Communication must be maintained with the topman on a regular basis.	
3. Due to the heat in the confined space, entrants should take regular rest breaks and remain hydrated through the provision of bottled water.	

Emergency planning	
1. Three main types of hazard may occur to create an emergency scenario: a. Depletion of oxygen or introduction of toxic gas – risk of asphyxiation or intoxication. b. Enrichment of oxygen or introduction of flammable gas – increased risk of fire. c. Presence of steps and pipework in the space – risk of slips, trips and falls.	
2. In the event of 1(a) the following steps will be taken: a. Entrants will be notified of the hazard by an alarm from their personal gas-detection equipment. b. They must immediately don their escape breathing apparatus, notify the topman of the event and exit the space as quickly as possible.	
3. In the event of 1(b) the following steps will be taken: a. Entrants will be notified of the hazard by an alarm from their personal gas detection equipment. b. They must immediately don their escape breathing apparatus, notify the topman of the event and exit the space as quickly as possible. c. The topman will then arrange for the lighting in that space to be immediately isolated.	
4. In the event of 1(c) the following steps will be taken: a. Entrants will notify entry control of the incident and assess the severity. b. If possible, the casualty will exit the space by themselves.	
5. If, in any of the above situations, self-rescue is compromised, the standby rescue team will be deployed. a. The rescue team will initially stabilise and isolate the casualty, using equipment as necessary, and await the emergency services. b. If recovery from the space is required to prevent further injury or death, the casualty will be recovered to a safe area.	
6. The task will then be reassessed, following the safe rescue.	

Post-task	
1. Following the successful completion of the task, and the safe exit of all entrants, the confined space must be sealed.	
2. All barriers, doors and manholes must be replaced and their integrity checked.	
3. All temporary warning signage and cordons must be removed.	

Annex E. **Entry procedure flowchart**



Annex F. **Confined-space permit**

Confined-space permit (low-risk and medium-risk entry)	**Permit number:**	
Site location and type of confined space	**Purpose of entry**	

Permit duration and validity (maximum 12 hours)					
Date:		**Start time:**		**Finish time:**	

Entry and control team names			
Supervisor:		**Manager:**	
Worker 1:		**Worker 2:**	
Worker 3:		**Worker 4:**	

Potential hazards					
Atmospheric hazards	**YES**	**NO**	**Physical hazards**	**YES**	**NO**
Oxygen deficiency			Mechanical or moving		
Oxygen enrichment			Electrical		
Toxic gas or vapour			High or low temperature		
Flammable gas or vapour			Noise		
Other (please state)			Engulfment by solids or liquids		
			Access or egress limitations		

Pre-entry preparation					
	YES	**NO**		**YES**	**NO**
Affected personnel notified			Briefing of entry and support personnel completed		
Incoming pipelines “blanked" by plates			Safe system and method statement seen by all workers		
Space ventilated			Barriers and signage in place		
Isolation completed			Emergency plan in place		

Safety equipment (other than standard personal protective equipment)			
	Yes / Specification		**Yes / Specification**
Head and eye protection		Full-body harness	
Safety lifeline		Tripod and winch	
Personal gas monitors		Escape breathing apparatus	

Pre-entry gas testing						
Date:		Equipment:		**Results**		
Time:		Make/model:		O_2		% vol
Name:		Serial number:		LEL		% LEL
Signed:		Calibration date:		H_2S		ppm
				CO		ppm
				Other (please specify)		ppm or %

Authorisation (by entry control supervisor or client):			
Name:		Date:	
Signed:		Time:	

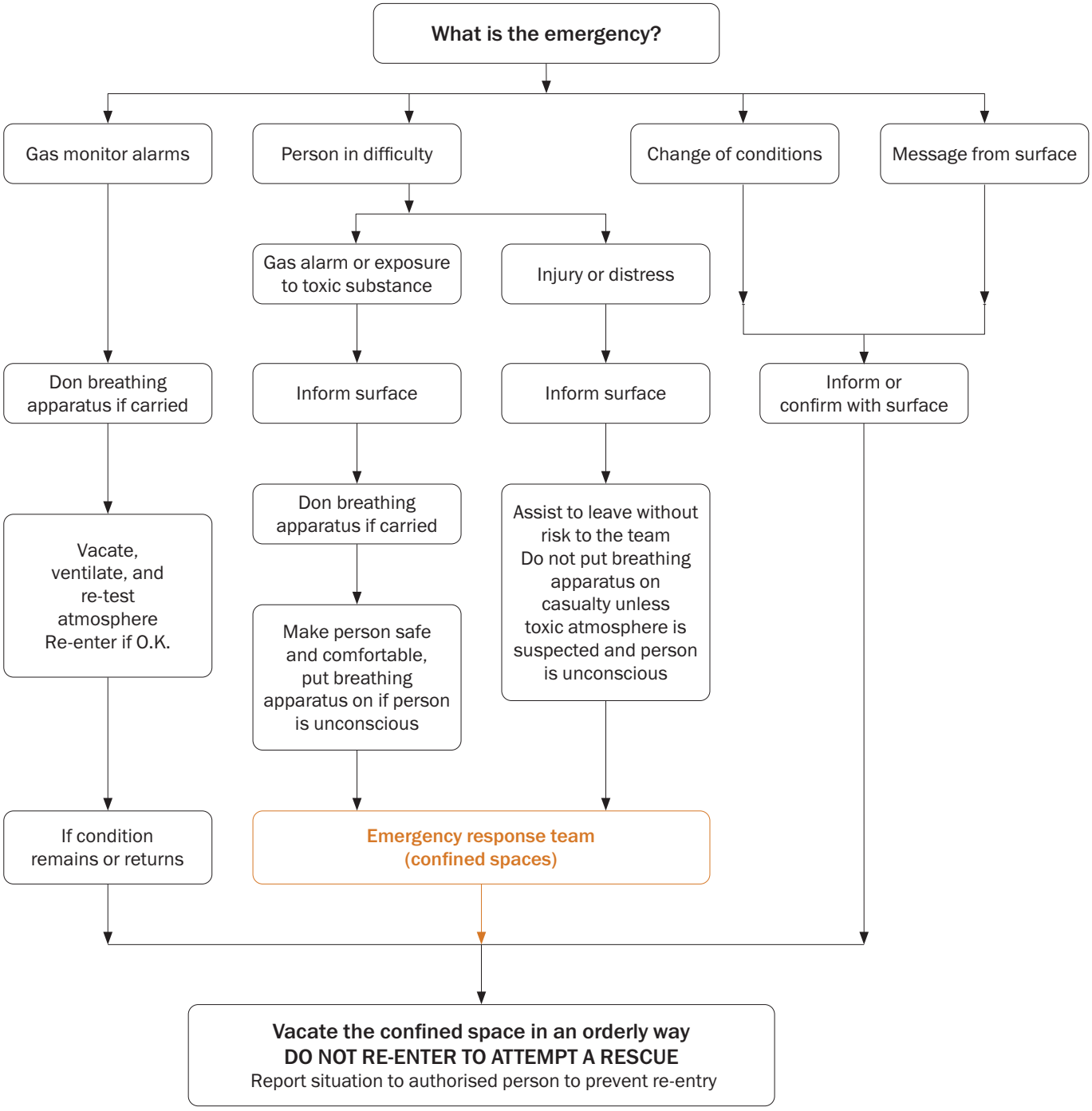
Cancellation (by entry control supervisor or client):			
Name:		Date:	
Signed:		Time:	

Annex G. **Event log**

Event log						
Time	Event/gas levels					Recorded by
	O_2 (oxygen)	LEL (lower explosive limit)	CO (carbon monoxide)	H_2S (hydrogen sulphide)	Other — please specify	

Time offsite:	

Annex H. **Emergency action flowchart**



Abbreviations and definitions

ATEX	ATmosphere EXplosible, as defined under European Directive 2014/34/EU
Confined space	A place that is substantially enclosed (though not always entirely) and where serious injury can occur from hazardous substances or conditions within the space or nearby, for example due to a lack of oxygen. A confined space usually has three key features, namely, (i) it is large enough for an employee to enter and perform work; (ii) it has limited or restricted means of entry or exit; and (iii) it is not designed for continuous occupancy.
The EBRD, the Bank	the European Bank for Reconstruction and Development
Hazard	The intrinsic property or ability of something (for example, work materials, equipment, work methods and practices) with the potential to cause harm.
Hierarchy of controls	Also known as the principles of prevention and refers to (i) elimination of the risk; (ii) reduction of the risk by replacing the hazardous condition or substance with a non-hazardous or less-hazardous substance; (iii) isolation of the risk to prevent exposure; (iv) introduction of engineering controls that collectively protect the workforce and community; (v) provision of information, instruction and training to workers and communities, as appropriate, on risks, safe systems of work, emergency plans, reporting requirements and mandatory supervision; and (vi) personal protective equipment (PPE).
Permit to work	A document procedure that is used to manage high-risk work that requires strict controls, and which is authorised by a number of competent individuals from the start to the end of the work activity.
Risk	The likelihood that the potential for harm will materialise under the conditions of use and/or exposure, and the possible extent of that harm.
Risk assessment	The process of evaluating the risk to the health and safety of workers while at work, arising from the circumstances of the occurrence of a hazard at the workplace.
Safe system of work	A set of procedures according to which work must be carried out.

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