



Abu Dhabi EHSMS Regulatory

Framework

(AD EHSMS RF)

Technical Guideline

Safe Work in Confined Spaces

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1. Introduction

- (a) This technical guideline provides additional information to assist entities comply with the requirements of *AD EHS RI - CoP 27.0 – Confined Spaces*. The content of this technical guide are not mandatory, however adopting the information within this guide will assist you in compliance to the CoP.

2. Definitions

- (a) An enclosed or partially enclosed space which:
- is at atmospheric pressure during occupancy; and / or
 - is not intended or designed primarily as a place of work; and / or
 - may have restricted means for entry and exit; and / or
 - may:
 - have an atmosphere which contains potentially harmful levels of contaminant; or
 - not have a safe oxygen level; or
 - cause engulfment.

Confined spaces include but are not limited to:

- storage tanks, tank cars, process vessels, boilers, pressure vessels, silos and other tank-like compartments;
- open-topped spaces such as pits or degreasers;
- pipes, sewers, shafts, ducts and similar structures; and
- any shipboard spaces entered through a small hatchway or access point, cargo tanks, cellular double bottom tanks, duct keels, ballast and oil tanks, and void spaces, but not including dry cargo holds.

3. Identifying Confined Spaces

- (a) Under *AD EHS RI – CoP 27.0 – Confined Spaces* - a 'confined space' has two defining features. Firstly, it is a place which is substantially (though not always entirely) enclosed and, secondly, there will be a reasonably foreseeable risk of serious injury from hazardous materials or conditions within the space or nearby.
- (b) Some confined spaces are fairly easy to identify, for example, closed tanks, vessels and sewers. Others are less obvious but may be equally dangerous, for example, open-topped tanks and vats, closed and unventilated or inadequately ventilated rooms and silos, or constructions that become confined spaces during their manufacture.
- (c) Some places which fall within the definition of a confined space may be so only occasionally, perhaps due to the type of work to be undertaken, for example, a room during spray painting. Also, a confined space may not necessarily be enclosed on all sides. Some confined spaces, for example vats, silos and ships' holds, may have open tops. Places not usually considered to be confined spaces may become confined spaces because of a

change in the condition inside or a change in the degree of enclosure or confinement, which may occur intermittently.

- (d) In addition to the places referred to above and the definition given in *AD EHS RI - CoP 27.0 – Confined Spaces*, the expression 'confined space' may also refer to the following examples and other similar places: ducts, vessels, culverts, tunnels, boreholes, bored piles, manholes, shafts, excavations, sumps, inspection pits, cofferdams, freight containers, ship cargo holds/tanks, ballast tanks, double bottoms, ships' engine rooms, buildings, building voids, some enclosed rooms (particularly plant rooms) and compartments within them, including some cellars, enclosures for the purpose of asbestos removal, and interiors of machines, plant or vehicles. However, application of the requirements in any of these places will depend on the presence of a reasonably foreseeable risk of serious injury.

4. Preventing the Need for Entry into a Confined Space

- (a) *AD EHS RI - CoP 27.0 – Confined Space* sets the requirements that no persons should enter a confined space unless it is not possible to achieve the purpose of the task without entering the confined space.
- (b) All employers have a duty to prevent employees, or others who are to any extent within the employer's control, such as contractors, from entering or working inside a confined space where it is reasonably practicable to undertake the work without entering the space.
- (c) In every situation, the employer must consider what measures can be taken to enable the work to be carried out without the need to enter the confined space. The measures might involve modifying the confined space itself to avoid the need for entry, or to enable the work to be undertaken from outside the space. In many cases it will involve modifying working practices.
- (d) Prior to entry of any confined space, the employer must consider what can be achieved without entering the confined space. If the task can be achieved from outside of the confined space, however this requires reasonably practicable modification(s) to working practices, engineering solutions or modification to the actual space itself, these must be implemented to avoid entry and therefore remove the risk from the confined space. Some examples of how working practices have been modified are shown below:
- (i) it is usually possible to test the atmosphere or sample the contents of confined spaces from outside using appropriate long tools and probes etc;
 - (ii) in some cases you can clean a confined space, or remove residues from it, from the outside using water jetting, steam or chemical cleaning, long-handled tools, or in-place cleaning systems;
 - (iii) blockages can be cleared in silos where grain or other solids can 'bridge' or where voids can form by the use of remotely-operated rotating flail devices, vibrators and air purgers which avoid the need to enter the space; and
 - (iv) in some cases it is possible to see what is happening inside without going in by looking in through a porthole, sightglass, grille or hole. If the sightglass tends to become blocked, it can be cleaned with a wiper and washer. Lighting can be provided inside or by shining in through a window. The use of closed circuit television systems (CCTV) may be appropriate in some cases.

4.1 Designer Duties

- (a) *AD EHS RI - CoP 20.0 – Safety in Design* places a duty upon designers to avoid foreseeable risk and where residual risk remains to provide such information and instruction to the end user on how to manage the risk.
- (b) The first priority for all designers should be to avoid introducing confined spaces into any design, however where this is not possible the designer should attempt to remove the need to enter the confined space.
- (c) Examples of how this can be done are shown below;
 - (i) work equipment should be located outside of confined space if possible; and
 - (ii) process controls, reading displays, calibrations adjustments, sampling etc should be located outside of confined space where possible.
- (d) Where entry to a confined space cannot be avoided, provision should be made for :
 - (i) safe entry – accessing tanks at ground level rather than height or depth, with suitable and safe means of entry and exit provided;
 - (ii) suitable and adequate ventilation in confined space. Details of mechanical system must be provided in O&M Manuals or Health and Safety File;
 - (iii) safe means to work in confined space e.g. sloping floors, slippery surface etc eliminated where possible; and
 - (iv) an assessment should be made for the size and number of entry points, which will depend on process requirements. The minimum sizes may have to be increased depending on what equipment will be used.

5. Permit Required Confined Spaces Program

- (a) *AD EHS RI - CoP 27.0 – Confined Spaces* places a duty upon employers to develop a Permit Required Confined Space (PRCS) Program. This program is to be developed to capture all necessary information relevant to the confined space(s) that the employer has interaction with.
- (b) The program should be an evolving document that is continually updated on each entry to a confined space and where circumstances change that require risk assessments or training to be updated.
- (c) The program documentation should be the first point of reference when looking at confined spaces. It may however, due to the needs of the entities EHSMS, be a referencing document that merely gives the location of the documents that should be included within the PRCS program documentation.
- (d) Below are the minimum requirements that must be included within the PRCS program, with a basic explanation of each item:
 - (i) List of all identified PRCS.
 - *The entity should list all the confined spaces that have been identified within his*

undertakings. The list should provide information on the access / egress information and specific locations. Each confined space should be given a unique reference number to ensure it is easily identifiable.

- (ii) Activities undertaken, under normal operation, within the confined space.
 - *For each confined space that has been identified, the entity should list out all the activities that would require entry into the confined space. The activities should be those that would occur under normal operation, not within an emergency situation.*
- (iii) List of competent confined space entry persons.
 - *The entity should include information in this section on all person(s) who have received training to enter confined spaces, including refresher training requirements. The list should also refer to the activities that have been identified in AD EHS RI - CoP 27.0.0 - Confined Spaces and identify those person(s) who are also trained to undertake the said task(s).*
- (iv) List of competent emergency rescue persons, in relation to confined spaces.
 - *As part of the emergency rescue arrangements, the entity shall provide information within this section on the competent persons they have within the organisation and to what level they have been trained.*
- (v) List of all associated equipment, including calibration requirements.
 - *A basic list is required of any associated plant and equipment that is used, under normal operation, for entry into and working within a confined space. This could include air testing/monitoring equipment, breathing apparatus or plant and equipment required for the tasks within the confined space. The list should include any testing requirements along with calibration certification where required.*
- (vi) Record of all entry into a confined space, including persons undertaking the entry and/or supervising the tasks.
 - *Each time a confined space is entered, a record of this should be made within the program documentation. The list should include all necessary information including;*
 - 1) date of entry;
 - 2) time of entry;
 - 3) time of completion;
 - 4) persons entering the confined space;
 - 5) emergency arrangements, personnel and equipment;
 - 6) supervision;
 - 7) activities permitted to be undertaken; and
 - 8) general comments on EHS Issues.
- (vii) Specific risk assessment and safe working procedures for each confined space identified in line with AD EHS RI - CoP 27.0 – Confined Spaces.
 - *For each confined space entry, a specific risk assessment and safe working practice must be developed (refer Sections 6 & 7).*

6. Risk Assessment

- (a) *AD EHS RI - CoP 27.0* places a duty upon all employers to undertake a specific risk assessment each time an employee is required to enter a confined space.
- (b) The risk assessment must be specific to the actual entry time and date and not generic and shall be undertaken in line with the requirement of *AD EHSMS RF - Element 02 – Risk Management*.
- (c) Where a number of confined spaces (e.g. sewers or manholes) are broadly the same, in terms of the conditions and the activities being carried out, and if the risks and measures to deal with them are the same, it may be possible to devise a ‘model’ risk assessment covering them all. Any differences in particular cases that would alter the conclusions of the model risk assessment must be identified. Failure to include relevant information in the risk assessment could lead to inadequate precautions in the subsequent system of work.
- (d) The risk assessment must be undertaken by a competent person. For the purposes of confined spaces this will be someone with sufficient experience of, and familiarity with, the relevant processes, plant and equipment so that they understand the risks involved and can devise necessary precautions to meet the requirements of the Confined Spaces CoP. In complex cases more than one person may be needed to conduct assessment of risks relating to specific required areas of expertise.
- (e) When carrying out an assessment, you should make use of all information available about the confined space. For example, there may be information from engineering drawings, working plans or about relevant soil or geological conditions. Assess this information in conjunction with information on any processes that have already taken place or will take place in the course of the work to be undertaken and which could affect the condition of the confined space.
- (f) Employees and their representatives shall be consulted when assessing the risks connected with entering or working in a confined space. Give particular attention to situations where the work circumstances are changing, for example at construction sites or steel fabrications, or where there are temporary workers who are likely to have limited knowledge of the conditions and dangers in the confined space.

6.1 Confined Space Hazards

- (a) Although each confined space will be different, you shall assess the general condition of the confined space to identify what might be present or not present, and what could cause a problem: for example, is the concentration of oxygen normal? Any records relating to the confined space should be checked for relevant information. Consideration should be given to:
 - (i) Previous Contents:

Information about any substances previously held, however briefly within the confined space, will give an indication of what kind of hazard(s) may be expected, for example, toxic or flammable gasses etc. Fires and explosions have been caused by ignition of substances thought to have been removed some considerable time ago, although they were, in fact, present.

(ii) Residues:

Dangers may arise from chemical residues or scale, rust sludge or other residues in a confined space. For example, dangerous gas, fume or vapour can be released when scale, sludge or animal slurry is disturbed. Where there are residues, safe working procedures should assume that disturbance of the residue etc will release gas, fume or vapour. Refer to Section 7.7.

(iii) Contamination:

Contamination may arise from adjacent plant, processes, gas mains or surrounding land, soil or strata. Gases and liquids may leak or may have previously leaked into the confined space from adjacent plant, installations, processes or landfill sites. This is a particular risk where confined spaces are below ground level because they can be contaminated by substances from many metres away. In certain circumstances, water in ground strata and/or gases may enter the confined space from surround land, soil or strata. For example, acidic groundwater acting on limestone can lead to dangerous accumulation of carbon dioxide. Also, methane can occur from a number of sources including the decay of organic matter and can be released from groundwater. Methane and other gases can leach into groundwater and be released over long distances by water surges, for example following heavy rainfall upstream where work is being carried out.

(iv) Oxygen Deficiency and Oxygen Enrichment:

There are substantial risks if the concentration of oxygen in the atmosphere varies significantly from normal (i.e. 20.8%). For example, oxygen enrichment will increase flammability of clothing and other combustible materials. Conversely a relatively small reduction in the oxygen percentage can lead to impaired mental ability. The effects are very rapid and generally there will be no warning to alert the senses. This can happen even in circumstances where only a person's head is inside a confined space. Very low oxygen concentrations (i.e. below 16%) can lead to unconsciousness and death. Any difference in oxygen content from normal should be investigated, the risk assessed, and appropriate measures taken in the light of the risk.

There are a number of processes that consume oxygen in a confined space. Oxygen is consumed during combustion of flammable materials, as in welding, cutting, or brazing. A more subtle consumption of oxygen occurs during bacterial action, as in the fermentation process. Oxygen can also be consumed during chemical reactions such as in the formation of rust on the exposed surfaces of a confined space. The number of people working in a confined space and the amount of physical activity can also influence oxygen consumption. Oxygen levels can also be reduced as the result of oxygen displacement by other gases.

(v) Flammable Atmospheres:

Flammable atmospheres are generally the result of flammable gases, vapours, dust mixed in certain concentrations with air, or an oxygen-enriched atmosphere.

Oxygen-enriched atmospheres are those atmospheres that contain an oxygen concentration greater than 22%. An oxygen-enriched atmosphere will cause flammable materials such as clothing and hair to burn violently when ignited.

Combustible gases or vapours can accumulate within a confined space when there is inadequate ventilation. Gases that are heavier than air will accumulate in the lower levels of a confined space. Therefore, it is especially important that atmospheric tests

be conducted near the bottom of all confined spaces. The presence of combustible gases or vapours lighter than air may complicate the atmosphere, and therefore it is always suggested that atmospheric tests be conducted by competent testers.

The work being conducted in a confined space can generate a flammable atmosphere. Work such as spray-painting, coating, or the use of flammable solvents for cleaning can result in the formation of an explosive atmosphere.

(vi) Physical Dimensions:

You must consider the possible effects of the dimensions and layout of the confined space. Air quality can differ if the space contains remote or low-lying compartments. You should also take account of isolated pockets or regions within the space when choosing ventilation methods (refer Section 7.6).

(vii) Mechanical and Physical Hazards:

Rotating or moving mechanical parts or energy sources can create hazards within a confined space. All rotating or moving equipment such as pumps, process lines, electrical sources, etc., within a confined space must be identified and assessed.

Physical factors such as heat, cold, noise, vibration, and fatigue can contribute to accidents. These factors must be evaluated for all confined spaces.

(viii) Ingress of Substances:

There may be a risk of substances (liquids, gases, steam, water, raw materials) from nearby processes and services entering the confined space. This could be caused by the inadvertent operation of machinery. Consequently, you should normally disconnect power to such equipment and measures should be taken to ensure that it cannot be reconnected until it is safe to do so, taking care not to isolate vital services such as sprinkler systems, communications etc. Also, measures are needed to prevent the substance normally held in the confined space from being automatically delivered (refer Section 7.9). There may also be a risk of carbon monoxide, carbon dioxide and nitrogen dioxide present in the exhaust of combustion engines that could enter the confined space (refer Sections 7.12).

(ix) Work Practices:

You should assess hazards that arise directly from the work to be undertaken in the confined space. The work itself may produce the hazard. Alternatively, conditions may become hazardous when work is done in conjunction with residues, contamination etc. Work being done on the exterior of the confined space (eg external welding) could also generate hazardous conditions within. Hazards that can be introduced into a space that may otherwise be safe include:

- Chemicals that might be used for cleaning purposes could affect the atmosphere directly or interact with residual substances present in the confined space; and
- Sources of ignition - Welding could act as a source of ignition for flammable gases, vapours (eg from residues), dusts, plastics and many other materials which may burn leading to a fire or explosion. Welding on the outside of a confined space can easily ignite materials in contact with the metal on the inside. Tools and equipment, including lighting, may need to be inherently safe or specially protected where they are likely to be used in potentially flammable or explosive atmospheres so that they do not present a source of ignition.

7. Work in a Confined Space

- (a) *AD EHS RI - CoP 27.0 – Confined Space* places a duty upon all employers to ensure that prior to entering any confined space a safe system of work, specific to the time and date of entry, shall be developed.
- (b) The information that is included within the safe system of work will depend upon the hazards identified during the risk assessment phase and the nature of the confined space. The level of detail within the safe system of work should be in line with the level of risk that the task presents and should be presented in a language that the person(s) supervising and undertaking the task shall easily understand and comprehend.
- (c) The main elements that should be considered when developing a safe system of work and subsequent permit to work are;
- (i) supervision;
 - (ii) competence for confined spaces working;
 - (iii) communications methods;
 - (iv) testing/monitoring the atmosphere (at multiple locations / heights if necessary);
 - (v) gas purging ventilation;
 - (vi) removal of residues;
 - (vii) isolation from mechanical and electrical equipment;
 - (viii) selection and use of suitable equipment;
 - (ix) personal protective equipment (PPE) and respiratory protective equipment (RPE);
 - (x) portable gas cylinders and internal combustion engines;
 - (xi) gas supplied by pipes and hoses;
 - (xii) access and egress;
 - (xiii) fire prevention;
 - (xiv) lighting;
 - (xv) static electricity;
 - (xvi) smoking;
 - (xvii) emergencies and rescue; and
 - (xviii) limited working time.
- (d) Each of the above areas will be discussed in more detail to provide guidance on some of the precautions that may be considered, however each entry to a confined space should be thoroughly assessed to ensure that the precautions selected are correct.

7.1 Supervision

- (a) The degree of supervision should be based on the findings of the risk assessment. In some cases an employer might simply instruct an employee how to do the work and then

periodically check that all is well, for example, if the work is routine, the precautions straightforward, and all the arrangements for safety can be properly controlled by the person carrying out the work. It is more likely that the risk assessment will identify a level of risk that requires the appointment of a competent person to supervise the work and who may need to remain present while the work is being undertaken. It will be the supervisor's role to ensure that the permit-to-work system, where applicable, operates properly, the necessary safety precautions are taken, and that anyone in the vicinity of the confined space is informed of the work being done.

7.2 Competence for Confined Spaces Working

- (a) To be competent to work safely in confined spaces, adequate training (refer Section 10) and experience in the particular work involved is essential. Training standards must be appropriate to the task, and to the individual's roles and responsibilities, so that work can be carried out safely. Where the risk assessment indicates that properly trained individuals can work for periods without supervision, you will need to check that they are competent to follow the established safe system of work and have been provided with adequate information and instruction about the work to be done.

7.3 Communication

- (a) An adequate communication system will be needed and should enable communication;
 - (i) between those inside the PRCS;
 - (ii) between those inside the PRCS and those outside the PRCS;
 - (iii) to summon help in case of an emergency;
 - (iv) from those outside the PRCS to raise the alarm to those inside the PRCS; and
 - (v) from those outside the PRCS to initiate emergency procedures.
- (b) Whatever system is utilised, and it can be based on a number of methods such as speech, tugs on a rope, telephone, radio etc, it is important that all the messages can be communicated easily, rapidly and without confusion between the relevant people. You should consider whether the communication methods are appropriate for any workers who are required to wear breathing apparatus. The communication system should also cover the need of those outside of the space to raise the alarm and set in motion emergency procedures. Equipment such as telephones and radios should be specifically protected to ensure they do not present a source of ignition where there is a risk of flammable or potentially explosive atmospheres.

7.4 Testing/Monitoring the Atmosphere

- (a) The atmosphere within a confined space may need testing for hazardous gas, fume or vapour or to check the concentration of oxygen prior to entry. Testing will be needed where knowledge of the confined space, for example, from information about its previous contents or chemicals used in a previous activity in the space, indicates that the atmosphere might be contaminated or to any extent unsafe to breathe, or where any doubt exists as to the condition of the atmosphere. It will also be needed where the atmosphere was known to be

contaminated previously, was ventilated as a consequence, and needs to be tested to check the result.

- (b) Where the atmosphere in the space may not be safe to breathe and requires testing, the findings of the risk assessment may indicate that testing should be carried out on each occasion that the confined space is re-entered, even where the atmosphere initially was found to be safe to breathe. Regular monitoring of the atmosphere may also be necessary to check that there is no change in the atmosphere while the work is being carried out, particularly where there is a known possibility of adverse changes in the atmosphere during the work. The conditions should be continuously monitored when, for example, forced ventilation is being used, and where the work activity could give rise to changes in the atmosphere. The exact testing, retesting and monitoring requirements should be defined by a competent person within the safe system of work.
- (c) The choice of testing equipment will depend on the circumstances and knowledge of possible contaminants. For example, when testing for toxic or asphyxiating atmospheres suitably calibrated chemical detector tubes or portable atmospheric monitoring equipment may be appropriate. However, in some cases equipment specifically designed to measure for flammable or explosive atmospheres will be required. All such equipment should be specially suited for use in these atmospheres. Testing equipment should also be in good working order and where necessary calibrated and checked in accordance with the intervals and recommendations accompanying the equipment, or at other suitable intervals. Explosimeters will need to be calibrated for different gases or vapours.
- (d) Testing to measure the oxygen content should be carried out before testing for concentration of flammable gases, followed by any further tests for toxic gases, vapours and dusts. Additional tests may be required for the presence of contaminants in liquid or solid form when the risk assessment indicates that they may be present. It is important not to overlook the flammable properties of substances that also have toxic properties, even if they are only slightly toxic.
- (e) Testing should be carried out by persons who are not only competent in the practice and aware of existing standards for the relevant airborne contaminants being measured but are also instructed and trained in the risks involved. Those carrying out the testing should also be capable of interpreting the results and taking any necessary action. Records should be kept of the results and findings.
- (f) The atmosphere in a confined space can often be tested from the outside, without the need for entry, drawing samples through a long probe. Where flexible sample tubing is used, ensure that it is not impeded by kinks, blockages, blocked or restricted nozzles and that sufficient time is allowed for samples of the atmosphere to displace the normal air in the probe. It is important that the atmosphere in sufficiently representative samples of the space is tested to check for pockets of poor air quality, especially if there is any doubt about the thoroughness of ventilation. If it becomes necessary for the tester to enter the confined space, the work then should be carried out in accordance with the advice in this guidance.

7.5 Gas Purging

- (a) Where the risk assessment has identified the presence or possible presence of flammable or toxic gases or vapours there may be a need to purge the gas or vapour from the confined

space. This can be done with air or an inert gas where toxic contaminants are present, but with inert gas only where there are flammable contaminants. You can only use inert gas for purging flammable gas or vapour because any purging with air could produce a flammable mixture within the confined space. Where purging has been carried out, the atmosphere will need to be tested to check that purging has been effective, and that it is safe to breathe before allowing people to enter.

- (b) In circumstances where the safest method of removing a flammable or explosive hazard is by purging with inert gas, for instance using nitrogen displacement, and the work cannot be carried out from a safe position outside the confined space, you will need to put in place a permit-to-work system that identifies the standard of protection of all exposed persons. This would include use of full breathing apparatus.
- (c) Take account of the possibility of exposure both to employees and non-employees from vented gases as a result of purging. When carrying out purging, take precautions to protect those outside the confined space from toxic, flammable, irritating gases and vapours etc.
- (d) Good ventilation and a supply of breathable air are essential. Inhaling an atmosphere that contains no oxygen can cause loss of consciousness in a matter of seconds because such an atmosphere not only fails to provide oxygen but may also displace oxygen in the bloodstream. When the atmosphere inhaled contains some oxygen, the loss of oxygen from the bloodstream takes place more slowly. Nevertheless victims will feel very fatigued and will find it difficult to help themselves because of the irrationality induced by lack of oxygen. Prolonged exposure to such an atmosphere can result in loss of consciousness. The speed at which unconsciousness can result after exposure to an inert atmosphere is seldom appreciated and may have been a factor in some fatalities where rescue without proper breathing apparatus or respiratory protection has been attempted in such atmospheres.

7.6 Ventilation

- (a) Some confined spaces are enclosed to the extent that they require mechanical ventilation to provide sufficient fresh air to replace the oxygen that is being used up by people working in the space, and to dilute and remove gas, fume or vapour produced by the work. This can be done by using a blower fan and trunking and/or an exhaust fan or ejector and trunking (provided that there is an adequate supply of fresh air to replace the used air). Fresh air should be drawn from a point where it is not contaminated either by used air or other pollutants. Never introduce additional oxygen into a confined space to 'sweeten' the air as this can lead to oxygen enrichment in the atmosphere that can render certain substances (e.g. grease) liable to spontaneous combustion, and will greatly increase the combustibility of other materials. Oxygen above the normal concentration in air may also have a toxic effect if inhaled.
- (b) When considering the ventilation method, take account of the layout of the space, the position of openings etc and the properties of the pollutants, so that circulation of air for ventilation is effective. Natural ventilation may suffice if there is a sufficient top and bottom opening in a vessel. For example, if a small tank containing heavy vapour has a single top manhole it may be sufficient to exhaust from the bottom of the tank with a ventilation duct whilst allowing 'make-up' air to enter through the manhole. For complicated spaces where several pockets of gas or vapour might collect, a more complex ventilation system will be needed to ensure thorough ventilation. Forced ventilation is normally preferable to exhaust

ventilation (which has only a local benefit). It is essential to ensure that extract ventilation is routed away from possible sources of re-entry. In all cases it is important that an airline or trunking should be introduced at, or extend to, the bottom of the vessel to ensure removal of heavy gas or vapour and effective circulation of air.

7.7 Removal of Residues

- (a) Cleaning or removal of residues is often the purpose of confined space work. In some cases residues will need to be removed to allow other work to be undertaken safely. Appropriate measures should be taken where risks from the residues are identified. For example, dangerous substances (such as hazardous gas, fume or vapour) can be released when residues are disturbed or, particularly, when heat is applied to them. The measures might include the use of powered ventilation equipment, specially protected electrical equipment for use in hazardous atmospheres, respiratory protective equipment (refer Section 9.2) and atmospheric monitoring (refer Section 7.4). The cleaning or removal process might need to be repeated to ensure that all residues have been removed, and in some cases might need to deal with residues trapped in sludge, scale or other deposits, brickwork, or behind loose linings, in liquid traps, joints in vessels, in pipe bends, or in other places where removal is difficult.

7.8 Isolation from Gases, Liquids, and other Flowing Materials

- (a) Confined spaces will often need to be isolated from ingress of substances that could pose a risk to those working within the space.
- (b) An effective method is to disconnect the confined space completely from every item of plant either by removing a section of pipe or duct or by inserting blanks. If blanks are used, the spectacle type with one lens solid and the other a ring, makes checking easier. When disconnection in this way cannot be done one alternative is a suitable, reliable valve that is locked shut, providing there is no possibility of it allowing anything to pass through when locked, or of being unlocked when people are inside the confined space.
- (c) Barriers such as a single brick wall, a water seal, or shut-off valves or those sealed with sand or loam to separate one section of plant from another, are sometimes present at a confined space and offer some degree of isolation of the space. However, these barriers are usually provided for normal working and may not provide the level of safety protection necessary for the high risks often found in confined spaces. A more substantial means of isolation may therefore be needed.
- (d) Whatever means of isolation is used it needs to be tested to ensure it is sufficiently reliable by checking for substances to see if isolation has been effective. *Refer to AD EHS RI – 24.0 – Lock-out / Tag-out* for more information.

7.9 Isolation from Mechanical and Electrical Equipment

- (a) Some confined spaces contain electrical and mechanical equipment with power supplied from outside the space. Unless the risk assessment specifically enables the system of work to allow power to remain on, either for the purposes of the task being undertaken or as vital services (i.e. lighting, vital communications, fire-fighting, pumping where flooding is a risk, or

cables distributing power to other areas) the power should be disconnected, separated from the equipment, and a check made to ensure isolation has been effective. This could include locking off the switch and formally securing the key in accordance with a permit-to-work, until it is no longer necessary to control access. Lock and tag systems can be useful here, where each operator has their own lock and key giving self-assurance of the inactivated mechanism or system. Check there is no stored energy of any kind left in the system that could activate the equipment inadvertently. Refer to *AD EHS RI - CoP 24.0 – Lock Out/Tag Out (Isolation)*.

7.10 Selection and Use of Suitable Equipment

- (a) Any equipment provided for use in a confined space needs to be suitable for the purpose. Where there is a risk of a flammable gas seeping into a confined space and which could be ignited by electrical sources (e.g. a portable hand lamp), specially protected electrical equipment needs to be used, for example, a lamp certified for use in explosive atmospheres. Note that specially designed low voltage portable lights, while offering protection against electrocution, could nevertheless still present ignition sources and are not in themselves safer in flammable or potentially explosive atmospheres. All equipment should be carefully selected bearing in mind the conditions and risks where it will be used. Earthing should be considered to prevent static charge build-up. In addition to isolation (refer Section 7.9), mechanical equipment may need to be secured against free rotation, as people may tread or lean on it, and risk trapping or falling. Further details on requirements for certain other equipment, including requirements for examination and maintenance, are dealt with in Sections 9.3 to 9.6.

7.11 Personal Protective Equipment and Respiratory Protective Equipment

- (a) So far as is reasonably practicable you should ensure that a confined space is safe to work in without the need for personal protective equipment (PPE) and respiratory protective equipment (RPE) which should be a last resort, except for rescue work (including the work of the emergency services). Use of PPE and RPE may be identified as necessary in your risk assessment, in which case it needs to be suitable and should be provided and used by those entering and working in confined spaces. Such equipment is in addition to engineering controls and safe systems of work. The type of PPE provided will depend on the hazards identified but, for example, might include safety lines and harnesses, and suitable breathing apparatus. Take account of foreseeable hazards that might arise, and the need for emergency evacuation. Refer to *AD EHS RI - CoP 2.0 - Personal Protective Equipment*.
- (b) Wearing respiratory protective equipment and personal protective equipment can contribute to heat stress. In extreme situations cooling air may be required for protective suits. Footwear and clothing may also require insulating properties, for example, to prevent softening of plastics that could lead to distortion of components such as visors, air hoses and crimped connections. Refer to Sections 9.2(b) and 8.1(c) for details of when 'escapes breathing apparatus' (or self-rescuers) are appropriate.

7.12 Portable Gas Cylinders and Internal Combustion Engines

- (a) Never use petrol-fuelled internal combustion engines in confined spaces. Gas cylinders should not normally be used within a confined space unless special precautions are taken.

Portable gas cylinders for heat, power or light, and diesel-fuelled internal combustion engines are nearly as dangerous as petrol-fuelled engines, and are inappropriate unless exceptional precautions are taken. Where their use cannot be avoided, adequate ventilation needs to be provided to prevent a build-up of harmful gas, and to allow internal combustion engines to operate properly. The exhaust from engines should be vented to a safe place well away from the confined space, downwind of any ventilator intakes for the confined space, and the means checked for leakage within the confined space. In tunnelling, normal practice is to provide a high level of ventilation and additional precautions to minimise emissions. Fuelling of portable engine-driven equipment should be conducted outside the confined space except in rare cases where it is not reasonably practicable, such as in some tunnelling work. Using such equipment within the space requires constant atmospheric monitoring of the space.

- (b) Check gas equipment and gas pipelines for gas leaks before entry into the confined space. At the end of every work period remove gas cylinders, including those forming welding sets, from the confined space in case a slow leak contaminates the atmosphere within the space.

7.13 Gas Supplied by Pipes and Hoses

- (a) The use of pipes and hoses for conveying oxygen or flammable gases into a confined space should be controlled to minimise the risks. It is important that at the end of every working period, other than during short interruptions, the supply valves for pipes and hoses are securely closed before the pipes and hoses are withdrawn from the confined space to a place that is well ventilated. Where pipes and hoses cannot be removed, they should be disconnected from the gas supply at a point outside the confined space and their contents safely vented.

7.14 Access and Egress

- (a) You should provide a safe way in and out of the confined space. Wherever possible allow quick, unobstructed and ready access. The means of escape must be suitable for use by the individual who enters the confined space so that they can quickly escape in an emergency. Suitable means to prevent access should be in place when there is no need for anybody to work in the confined space. The safe system of work should ensure that everyone has left the confined space during 'boxing-up' operations particularly when the space is complicated and extensive, for example in boilers, cableways and culverts where there can be numerous entry/exit points.
- (b) The size of openings to confined spaces needs to be adequate. Openings affording safe access to confined spaces, and through divisions, partitions or obstructions within such spaces, need to be sufficiently large and free from obstruction to allow the passage of persons wearing the necessary protective clothing and equipment, and to allow adequate access for rescue purposes. Guidance on the dimensions for manhole openings can be found in Section 9.1.
- (c) There should be a safety sign that is clear and conspicuous to prohibit unauthorised entry alongside openings that allow for safe access.

7.15 Fire Prevention

- (a) Wherever possible flammable and combustible materials should not be stored in confined spaces that have not been specifically created or allocated for that purpose. If they accumulate as a result of work they should be removed as soon as possible and before they begin to create a risk. Where flammable materials need to be located in a confined space the quantity of the material should be kept to a minimum. In most cases flammable materials should not be stored in confined spaces; however there may be special cases where this is necessary for example, in tunnelling. In these cases they should be stored in suitable fire-resistant containers. If there is a risk of flammable or potentially explosive atmospheres, take precautions to eliminate the risk such as removal by cleaning, effective use of thorough ventilation, and control of the sources of ignition.

7.16 Lighting

- (b) Adequate and suitable lighting, including emergency lighting, should be provided. For example, the lighting will need to be specially protected if used where flammable or potentially explosive atmospheres are likely to occur. Other gases may be present that could break down thermally on the unprotected hot surfaces of a lighting system and produce other toxic products. Lighting may need to be protected against knocks (e.g. by a wire cage), and/or be waterproof. Where water is present in the space, suitable plug/socket connectors capable of withstanding wet or damp conditions should be used and protected by residual current devices (RCDs) suitable for protection against electric shock. The position of lighting may also be important, for example to give ample clearance for work or rescue to be carried out unobstructed.

7.17 Static Electricity

- (c) Some equipment is prone to static build-up due to its insulating characteristics, for example, most plastics. There is also a high risk of electrostatic discharge from some equipment used for steam or water jetting. Static discharges can also arise from clothing containing cotton or wool. Consider selecting safer alternative equipment and anti-static footwear and clothing.

7.18 Smoking

- (d) Smoking shall be prohibited in confined spaces. The results of the risk assessment may indicate that it would be necessary to extend the exclusion area to a distance beyond the confined space, for example, 5–10 m.

7.19 Emergencies and Rescue

- (e) The arrangements for the rescue of persons in the event of an emergency, required under *AD EHS RI - CoP 27.0 – Confined Spaces*, need to be suitable and sufficient and, where appropriate, there will also be a need for the necessary equipment to enable resuscitation procedures to be carried out. The arrangements should be in place before any person enters or works in a confined space (refer Section 8).

7.20 Limiting Working Time

- (a) There may be a need to limit the time period that individuals are allowed to work in a confined space. This may be appropriate where, for example, respiratory protective equipment is used, or under extreme conditions of temperature and humidity; or the confined space is so small that movement is severely restricted. For a large confined space and multiple entries, a logging or tally system may be necessary to check everyone in and out and to control duration of entry.
- (b) To be effective a safe system of work needs to be in writing. A safe system of work sets out the work to be done and the precautions to be taken. When written down it is a formal record that all foreseeable hazards and risks have been considered in advance. The safe procedure consists of all appropriate precautions taken in the correct sequence. In practice a safe system of work will only ever be as good as its implementation.

7.21 Use of a Permit-to-Work Procedure

- (a) A permit-to-work system is a formal written system and is usually required where there is a reasonably foreseeable risk of serious injury in entering or working in the confined space. The permit-to-work procedure is an extension of the safe system to work, not a replacement for it. The use of a permit-to-work system does not, by itself, make the job safe. It supports the safe system, providing a ready means of recording findings and authorisations required to proceed with the entry. It also contains information, for example, time limits on entry, results of the gas testing, and other information that may be required during an emergency and which, when the job is completed, can also provide historical information on original entry conditions. A permit-to-work system is appropriate, for example:
 - (i) to ensure that the people working in the confined space are aware of the hazards involved and the identity, nature and extent of the work to be carried out;
 - (ii) to ensure there is a formal check undertaken confirming elements of a safe system of work are in place. This needs to take place before people are allowed to enter or work in the confined space;
 - (iii) where there is a need to coordinate or exclude, using controlled and formal procedures, other people and their activities where they could affect work or conditions in the confined space;
 - (iv) if the work requires the authorisation of more than one person, or there is a time-limit on entry. It may also be needed if communications with the outside are other than by direct speech, or if particular respiratory protective and/or personal protective equipment is required; and
 - (v) a permit-to-work should be cancelled once the operations to which it applies have finished.
- (b) Refer to *AD EHS RI - CoP 21.0 – Permit to Work Systems*.

7.22 Suitability for Work in Confined Spaces

- (a) The competent person carrying out the risk assessment, refer Section 7(d), for work in confined spaces will need to consider the suitability of individuals in view of the particular

work to be done. Where the risk assessment highlights exceptional constraints from the physical layout, the competent person may need to check that individuals are of suitable build. This may be necessary to protect both the individual and others who could be affected by the work to be done. The competent person may need to consider other factors about an individual, for example, concerning claustrophobia or fitness to wear breathing apparatus, and medical advice on an individual's suitability for the work may be needed.

8. Emergency Procedures

- (a) *AD EHS RI - CoP 27.0 – Confined Spaces* places a duty upon all employers to ensure that adequate arrangements have been prepared for the rescue of persons in the event of an emergency, whether or not arising from a specified risk.
- (b) Arrangements for emergency rescue will depend on the nature of the confined space, the risks identified and the likely nature of an emergency rescue. Account needs to be taken not only of accidents arising from a specified risk, but also any other accident in which a person needs to be recovered from a confined space, for example, incapacitation following a fall. To be suitable and sufficient the arrangements for rescue and resuscitation should include consideration of:
- (i) raising the alarm and rescue;
 - (ii) safeguarding the rescuers;
 - (iii) fire safety;
 - (iv) control of plant;
 - (v) first aid;
 - (vi) public emergency services; and
 - (vii) training

8.1 Rescue and Resuscitation Equipment

- (a) Rescue equipment provided should be appropriate in view of the likely emergencies identified in the risk assessment, and should be properly maintained. If resuscitation has been identified as a likely consequence, provision will need to be made for appropriate training to enable resuscitation procedures to be carried out (refer Section 10), and this may include use of appropriate resuscitation equipment (refer Section 8.1(d)). In determining if resuscitation is likely to be needed, consideration should be given to experience gained from knowledge of previous incidents.
- (b) Rescue equipment will often include lifelines and lifting equipment (since even the strongest person is unlikely to be able to lift or handle an unconscious person on their own using only a rope), additional sets of breathing apparatus (refer Section 9.2(a)) and first aid equipment.
- (c) 'Self-rescue' equipment, may be appropriate for use in situations where there will be time to react to an anticipated emergency situation, for example, smoke logging in tunnels or reacting to atmospheric monitoring devices. They should be made available only where the type provided is suitable for the hazard expected in the emergency situation. They are not a substitute for respiratory protective equipment (refer Section 9.2(a)).

- (d) Resuscitation procedures include respiratory and circulatory resuscitation procedures. These are simple procedures that most people would be capable of carrying out provided they have been trained. Training and refresher training are essential since the speed with which resuscitation is started is often as important as how well it is done. Ancillary equipment may be needed for oral resuscitation: these avoid direct contact between the mouths of the victim and rescuer, for example, by using special tubes and mouthpieces. However, if resuscitation is needed as a result of exposure to toxic gases, oral methods are not appropriate since they could put the rescuer at risk. In some cases equipment for artificial respiration as a follow-up to, or in place of, oral resuscitation is appropriate. This equipment should only be operated by someone with the necessary specialist training, or it can be kept available, properly maintained, on site for use by a person providing professional medical help.

8.2 Raising the Alarm and Rescue

- (a) There should be measures to enable those in the confined space to communicate to others outside the space that can initiate rescue procedures or summon help in an emergency. The emergency can be communicated in a number of ways, for example by the tug of a rope, by radio or by means of a 'lone worker' alarm. Whatever the system it should be reliable and tested frequently. If justified on grounds of risk or from knowledge of previous incidents involving similar work, one or more people dedicated to the rescue role, and outside the confined space will be required to keep those inside in constant direct visual sight in case of emergency.

8.3 Safeguarding the Rescuers

- (a) Multiple fatalities have occurred when rescuers have been overcome by the same conditions that have affected the people they have tried to rescue. To prevent this, it is essential that those who have been assigned a rescue role, for example, members of an in-house or works rescue team are themselves protected against the cause of the emergency. The precautions necessary to protect the rescuers should be considered during the risk assessment, and adequate provisions made when preparing suitable and sufficient emergency arrangements.

8.4 Fire Safety

- (a) Where there is a risk of fire, appropriate fire extinguishers may need to be kept in the confined space at the entry point. In some situations, a sprinkler system may be appropriate. In the event of a fire, civil defence should be called in case the fire cannot be contained or extinguished. Care is needed when deciding whether or not the ventilation system should be kept working or switched off because either course may affect the chances of escape or rescue. Continued use of the ventilation system may also affect the development of the fire, because forced air may fan the flames.

8.5 Control of Plant

- (a) There may be a need to shut down adjacent or nearby plant before attempting an emergency rescue, either because the plant could be the cause of the emergency or safe entry cannot be gained without the plant being shut down.

8.6 First Aid

- (a) Appropriate first aid equipment should be provided and available for emergencies and to provide first aid until professional medical help arrives. First aiders should be trained to deal with the foreseeable injuries.

8.7 Public Emergency Services

- (a) In some circumstances, for example where there are prolonged operations in confined spaces and the risks justify it, there may be advantage in prior notification to the local emergency services (e.g. civil defence or ambulance service) before the work is undertaken. If such notification is thought necessary, the emergency services should be consulted and confirmation obtained about the information they would find useful. In all cases, however, arrangements must be in place for the rapid notification of the emergency services should an accident occur. On arrival, the emergency services should be given all known information about the conditions and risks of entering and/or leaving the confined space before entering it to attempt a rescue. This information is then available at the scene of an incident where a necessarily dynamic risk assessment by the local emergency services can be undertaken. However, reliance on the emergency services alone will not be sufficient to comply with these regulations. Employers must put in place adequate emergency arrangements before the work starts.

8.8 Training

- (a) Those likely to be involved in any emergency rescue should be trained for that purpose. The training needs for each individual will vary according to their designated role. It is important that refresher training is organised and available on a regular basis, for example annually. Training should include the following, where appropriate:
 - (i) the likely causes of an emergency;
 - (ii) use of rescue equipment, e.g. breathing apparatus, lifelines, and where necessary a knowledge of its construction and working;
 - (iii) the check procedures to be followed when donning and using apparatus;
 - (iv) checking of correct functioning and/or testing of emergency equipment (for immediate use and to enable specific periodic maintenance checks);
 - (v) identifying defects and dealing with malfunctions and failures of equipment during use;
 - (vi) works, site or other local emergency procedures including the initiation of an emergency response;
 - (vii) instruction on how to shut down relevant process plant as appropriate (this knowledge would be required by anyone likely to perform a rescue);
 - (viii) resuscitation procedures and, where appropriate, the correct use of relevant ancillary equipment and any resuscitation equipment provided (if intended to be operated by those receiving emergency rescue training);
 - (ix) emergency first aid and the use of the first aid equipment provided;
 - (x) use of fire-fighting equipment;

- (xi) liaison with local emergency services in the event of an incident, providing relevant information about conditions and risks, and providing appropriate space and facilities to enable the emergency services to carry out their tasks; and
- (xii) rescue techniques including regular and periodic rehearsals/exercises. This could include the use of a full-weight dummy. Training should be realistic and not just drill based, and should relate to practice and familiarity with equipment.

9. Plant and Equipment

9.1 Size of Openings to Enable Safe Access to and Egress from Confined Spaces

- (a) Experience has shown that the minimum size of an opening to allow access with full rescue facilities including self-contained breathing apparatus is 575 mm diameter. This size should normally be used for new plant, although the openings for some confined spaces may need to be larger depending on the circumstances, for example, to take account of a fully equipped employee, or the nature of the opening.
- (b) Existing plant may have narrower openings. It will therefore be necessary to check that a person wearing suitable equipment can safely and readily pass through such openings. Choice of airline breathing apparatus in such cases offers a more compact alternative to bulkier self-contained apparatus. Examples of plant where there are narrower openings include rail tank wagons and tank containers where an opening of 500 mm diameter is common, and in road tankers where the recognised size is 410 mm. Even smaller openings can be found in the highly specialised nature of access to certain parts of aircraft, such as to fuel tanks in wings. Precautions need to take account of such special cases.
- (c) The size and number of access and egress points should be assessed individually dependent upon the activities being carried out and the number of people involved. Large-scale evacuations may need larger routes and openings to prevent them becoming bottlenecks. Top openings to vessels, tanks etc should be avoided due to difficulty of access and rescue. Bottom or low manholes are preferable and may need access platforms. There may be occasions when access and egress is so strenuous, for example, in the double bottom of a ship, that temporary openings may be needed.
- (d) Different criteria apply when the critical entry dimensions extend over a significant length or height, as in the case of sewers, pipes, culverts, small tunnels and shafts. For example, it is recommended that people should not normally enter sewers of dimensions smaller than 0.9 m high by 0.6 m wide. Even this 'minimum size' may in certain circumstances be too small for reliance on a safe system of work alone. Additional measures may be needed, for example if there is a long distance between access points or the siting of the sewer invert, where structural alterations to improve access may be appropriate. In the case of a shaft containing a ladder or step irons, 900 mm clear space is recommended between the ladder/steps and the back of the shaft. The spacing of manholes on sewers, or in the case of large gas mains etc, the absence of such access over considerable lengths may affect both the degree of natural ventilation and the ease with which people can be rescued.
- (e) Practice drills including emergency rescues will help to check that the size of openings and entry procedures are satisfactory.

9.2 Respiratory Protective Equipment

- (a) Where respiratory protective equipment (RPE) is provided or used in connection with confined space entry or for emergency or rescue, it should be suitable for the purpose for which it is intended, i.e. correctly selected and matched both to the job and the wearer. RPE will not normally be suitable unless it is breathing apparatus. For most cases breathing apparatus would provide the standard of protection for entry into confined spaces.
- (b) Where the intention is to provide emergency breathing apparatus to ensure safe egress or escape, or for self-rescue in case of emergency, the type commonly called an 'escape breathing apparatus' or 'self-rescuer' (escape set) may be suitable. These types are intended to allow the user time to exit the hazard area. They are generally carried by the user or stationed inside the confined space, but are not used until needed. This equipment usually has a breathable supply of only short duration and provides limited protection to allow the user to move to a place of safety or refuge. This type of equipment is not suitable for normal work. Examples of emergency breathing apparatus or self-rescuers include:
- (i) the rebreathable type which consists of a tube and mouthpiece; and
 - (ii) the 'escape set' which consists of a cylinder-fed positive pressure face mask or hood.
- (c) RPE of the canister respirator or cartridge type is not appropriate for entry into or work in most confined spaces. However, this type of equipment may have a role if account is taken of its limitations and where the risk is of exposure to low concentrations of hazardous contaminants. Such equipment does not protect against the risk of being overcome – for example, it does not provide adequate protection against high concentrations of gases and vapours – and should never be used in oxygen-deficient atmospheres. Canister or cartridge respirators also have a limited duration, in some cases about 15 minutes, which should be checked against the equipment supplier's recommendations. It is also important to check that they are still within their useable shelf life.
- (d) In some circumstances entry without the continuous wearing of breathing apparatus may be possible. Several conditions must be satisfied to allow work in confined spaces without respiratory protective equipment:
- (i) a risk assessment must be done and a safe system of work in place including all required controls, for example, thorough and continuous general ventilation;
 - (ii) any airborne contamination must be of a generally non-toxic nature, or present in very low concentrations well below the relevant occupational exposure limits;
 - (iii) the level of oxygen needs to be adequate (refer Section 6.1(a)).

9.3 Other Equipment

- (a) Ropes, harnesses, fall arrest gear, lifelines, first aid equipment, protective clothing and other special equipment provided or used for, or in connection with, confined space entry or, in case of emergency rescue or resuscitation, should be suitable for the purposes for which they are intended, and account taken of appropriate recognised standards where these exist.
- (b) When a safety harness and line are used, it is essential that the free end of the line is secured so that it can be used as part of the rescue procedure. In most cases the line should

be secured outside the entry to the confined space. The harness and line should be adjusted and worn so that the wearer can be safely drawn through any manhole or opening. Lifting equipment may be necessary for this purpose. An appropriate harness fitted to the line should be of suitable construction, and made of suitable material to recognised standards capable of withstanding both the strain likely to be imposed, and attack from chemicals.

9.4 Maintenance of Equipment

- (a) All equipment provided or used for the purposes of securing the health and safety of people in connection with confined space entry or for emergency or rescue, should be maintained in an efficient state, in efficient working order and in good repair. This should include periodic examination and testing as necessary. Some types of equipment, for example breathing apparatus, should be inspected each time before use.
- (b) The manufacturer or supplier's instructions will often provide advice on the frequency and type of examination.

9.5 Examination of Equipment

- (a) The examination of RPE and resuscitating apparatus normally will comprise a thorough visual examination of all parts of the respirator, breathing or resuscitating apparatus, looking particularly at the integrity of the straps, face pieces, filters and valves. Any defects discovered by the examination, and which would undermine safe operation, should be remedied before further use.
- (b) The examination of ropes, harnesses, lifelines, protective clothing, and other special equipment normally will consist of a thorough visual examination of all their parts for deterioration or damage, in particular of those parts that are load-bearing. Examinations should be carried out regularly. In the case of protective clothing that is used only occasionally or where the conditions of use are unlikely to damage it, the interval between examinations may be greater.
- (c) Atmospheric monitoring equipment and special ventilating or other equipment provided or used in connection with confined space entry needs to be properly maintained. It should be examined thoroughly, and where necessary calibrated and checked in accordance with the intervals and recommendations accompanying the equipment or, if these are not specified, at such intervals considered suitable. The manufacturer's instructions, where they are available, are also relevant. Keep reports of all thorough examinations and records of calibration.

9.6 Test Certificates and Examination Records

- (a) Properly supplied equipment used for lifting, such as ropes, harnesses, lifelines, rings, shackles, carabiners etc will have a certificate of test and safe working load when purchased. It is important to ensure they are not further tested (as this could weaken them). If they become damaged, they should be removed from service. Failing that, they should be returned to the manufacturer or other competent repairer who can carry out the necessary remedial work and supply a new certificate of test and safe working load for the repaired equipment.

- (b) The record of each thorough examination and test of equipment will normally include:
- (i) the name and address of the employer or other person responsible for the equipment;
 - (ii) particulars of the equipment and of the distinguishing number or mark, together with a description sufficient to identify it, and the name of the maker;
 - (iii) the date of the examination and the name and signature of the person carrying out the examination and test;
 - (iv) the condition of the equipment and particulars of any defect found;
 - (v) in the case of RPE and resuscitating apparatus incorporating compressed gas cylinders or electric motors, tests of the condition and efficiency of those parts, including tests of the pressure of oxygen or air in the supply cylinder;
 - (vi) in the case of airline-fed RPE, the volume, flow and quality of the air. Where this is supplied from a mobile compressor the test should normally be made immediately before the first use of RPE in any new location; and
 - (vii) a brief description of any remedial action taken.
- (c) Records of the examination and tests of equipment should normally be kept for at least five years. The records may be in any suitable format and may consist of a suitable summary of the reports. Records need to be kept readily available for inspection by the employees, their representatives, or by inspectors appointed by the relevant authority.

10. Training

- (a) *AD EHS RI - CoP 27.0 – Confined Spaces* places a duty on every employer to ensure that all employees that are required to enter or are affected by a confined space, trained to ensure they have the correct level of understanding, skills and knowledge necessary to undertake the tasks required by their role.
- (b) The level of training that is provided will depend upon the hazards identified during the risk assessment phase and the nature of the confined space, however every employer is required to provide such information, instruction, training and supervision as is necessary to ensure the health and safety at work of employees. Specific training for work in confined spaces will depend on an individual's previous experience and the type of work they will be doing. It is likely that this training will need to cover:
- (i) an awareness of the *AD EHS RI - CoP 27.0 – Confined Spaces* and in particular the need to avoid entry to a confined space, unless it is not reasonably practicable to do so, in accordance with Section 3.3.
 - (ii) an understanding of the work to be undertaken, the hazards, and the necessary precautions;
 - (iii) an understanding of safe systems of work, with particular reference to 'permits-to-work' where appropriate;
 - (iv) how emergencies arise, the need to follow prepared emergency arrangements and the dangers of not doing so.
- (c) Training should also take into account the practical use of safety features and equipment, the identification of defects and, where appropriate, it should involve demonstrations and

- practical exercises. It is important that trainees are familiar with equipment and procedures before working for the first time in confined spaces.
- (d) Practical refresher training should be organised and available. The frequency with which refresher training is provided will depend upon how long since the type of work was last done, or if there have been changes to methods of work, safety procedures or equipment.
- (e) Training in specific safety features may include any or all of the following:
- (i) use of atmospheric testing equipment, and the action to take depending on the readings;
 - (ii) use of breathing apparatus and escape sets (self-rescuers), their maintenance, cleaning and storage;
 - (iii) use of other items of personal protective equipment; and
 - (iv) instruction in the communication methods to be used while in the confined space.
- (f) Training in emergency rescue procedures is covered in Section 8.8.

11. References

- *AD EHSMS RF – Element 02 – Risk Management*
- *AD EHS RI - CoP 2.0 – Personal Protective Equipment*
- *AD EHS RI - CoP 21.0 – Permit to Work Systems*
- *AD EHS RI - CoP 27.0 – Confined Spaces*
- *L101 - Safe work in confined spaces – HSE Books – ISBN 97871766233 3*

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