Health & Safety

Working Safely in Confined Spaces Policy

Version	1.0
Version date	February 2023
Review date[1]	February 2026
Authorised signature	Bob Rennie, Head of Health & Safety

[1] *or earlier if change in legislation or on risk assessment*

Amendment Control

Version	Date	Amendments
1.0	Feb 2023	

Health & Safety Office
Finance & Operations

health&safetyoffice@napier.ac.uk

Policy Summary

The policy of Edinburgh Napier University is to provide and maintain safe and healthy working conditions, equipment and systems of work for all staff, students and others, and to provide such resources, information, training and supervision as needed for this purpose.

The University will provide resource and maintain appropriate management systems, systems of work and equipment to ensure that confined spaces risks to all staff, students and others are controlled. Suitable information, instruction, training and supervision will be provided to all those involved with work in confined spaces.

The University will adopt the principles of control as set out in the Confined Spaces Regulations.

The management of confined spaces risk will be a continual commitment by the University and will involve regular monitoring and progress meetings, a risk assessment programme, monitoring, inspection and record keeping.

This policy is formally accepted by the University.

The University will do all that is reasonably practicable to comply with its requirements, and will make the necessary resource available.

Step by step guide to Working in a Confined Space

Can work be carried out from outside? → Yes → Carry out work

↓

Consider all the foreseeable risks

- *Previous contents, residues, contaminants*
- *Physical dimensions of space*
- *Fire/explosion*
- *Asphyxiation*
- *Drowning – ingress of materials*
- *Loss of consciousness*
- *Excessive heat*

↓

Is there a significant risk to health? → No → Carry out work

↓

Yes

↓

Ensure a **risk assessment** is completed and a **safe system of work** implemented (including emergency arrangements) →

- *General condition of the confined space*
- *Hazards arising from the work*
- *Hazards arising from outside the space*
- *Safe working in confined spaces*
  - *Precautions*
  - *Supervision*
  - *Competent personnel*
  - *Communications*
  - *Testing/monitoring the atmosphere*
  - *Monitoring equipment*
  - *Emergencies – raising the alarm*
  - *Ventilation*
  - *Suitable equipment*
  - *PPE and RPE*
  - *Access and egress*
  - *Fire prevention, equipment and procedures*
  - *Lighting/static electricity*
- *Health surveillance*
- *Monitoring activities/personnel*
- *Permits to Work (Enter)*
- *Ventilation, maintenance, examination of plant and equipment*
- *Emergency procedures*
  - *Communications*
  - *Training of personnel*
  - *Rescue plan/resuscitation procedure*
  - *Communications to/from a confined space*
  - *Fire safety precautions*
  - *First aid requirements*
  - *Emergency services*
  - *Practice drills*
  - *Maintenance of rescue equipment*

↓

Ensure control measures are implemented and in place before work / entry starts

↓

Staff, students and contractors are trained and consulted on activities

↓

Implement a Permit to Work (Enter)

↓

Carry out work

↓

Close the Permit to Work

Policy Contents

1. Executive summary

Work in confined spaces, due to its confined nature, can cause fatalities if not properly managed. A confined space is somewhere which is substantially enclosed (so that one couldn't escape easily), and where there is significant or reasonably foreseeable risk for serious injury by fire, explosion, asphyxiation, poisoning or drowning. Property & Facilities staff and Contractors might have to enter confined spaces such as drains and sewers, tunnels, boilers and undercrofts or where a process causes a space to become dangerous.

The Confined Spaces Regulations obliges Edinburgh Napier University to ensure that entry to confined spaces is prevented and restricted to those occasions where the work cannot be easily done any other way. Before entry, **a risk assessment and permit to work** must be completed. This will determine the 'safe system of work' and appropriate emergency and rescue arrangements.

Since it is Edinburgh Napier University's policy to comply fully with such duties, Property & Facilities must ensure that the requirements of the Regulations are discharged, and that the policy on confined spaces is incorporated into the permit to work, safe systems of work, rescue plan and risk assessment. Individual staff who organise, arrange or lead such work must acquaint themselves with, and act upon, the requirements of the local safety statement in force in their department. The effectiveness of these arrangements will be monitored periodically by Property & Facilities and Health & Safety.

2. Introduction

The Confined Spaces Regulations (the "Regulations") are designed to protect those involved in work activities that could lead to a high risk of death or injury. Much of the 'confined spaces' work in Edinburgh Napier University is, of course, maintenance work performed by personnel from Property & Facilities (either Edinburgh Napier University employees themselves or employees of outside contractors brought in to work for us). For some of this work, all the precautions described in this policy are necessary.

The Confined Spaces Regulations place substantial duties on the University to prevent or safely control entry into, or work within, confined spaces. In law a confined space is defined by both the confining nature of the space and the possibility of the atmosphere becoming unbreathable. Having identified where such situations could occur, it is vital to prevent unnecessary entry into confined spaces. If the desired result can be achieved without entry, then this must be what happens, if entry is unavoidable then risks to those entering must be rigorously guarded against by a combination of technical and managerial procedures, up to and including a full formal permit-to-work system. The strategy for the control of risks must be the result of a risk assessment.

It is the duty of all staff to observe these requirements and act upon its instructions.

3. What is a confined space

The term confined space means much more than simply 'a tiny volume where you might get stuck'. There is a legal definition given in Regulation 1(2):- "'Confined Space' means any place, including any chamber, tank, vat, silo, pit, trench, pipe, sewer, flue, well or other similar space which by virtue of its enclosed nature, there arises a reasonably foreseeable specified risk." The concept of a confined space in law is therefore twofold:

- It must be a space which is substantially (though not always entirely) enclosed; and
- One or more of the specified risks must be present or reasonably foreseeable.

There is a definition of the term a 'specified risk' given in the Regulations too:

a) Serious injury to any person at work arising from a fire or explosion.
b) The loss of consciousness of any person at work arising from an increase in body temperature.
c) The loss of consciousness or asphyxiation of any person at work arising from gas, fume, vapour or the lack of oxygen.
d) The drowning of any person at work arising from an increase in the level of liquid. Or
e) The asphyxiation of any person at work arising from a free flowing solid or the inability to reach a respirable environment due to entrapment by a free flowing solid.

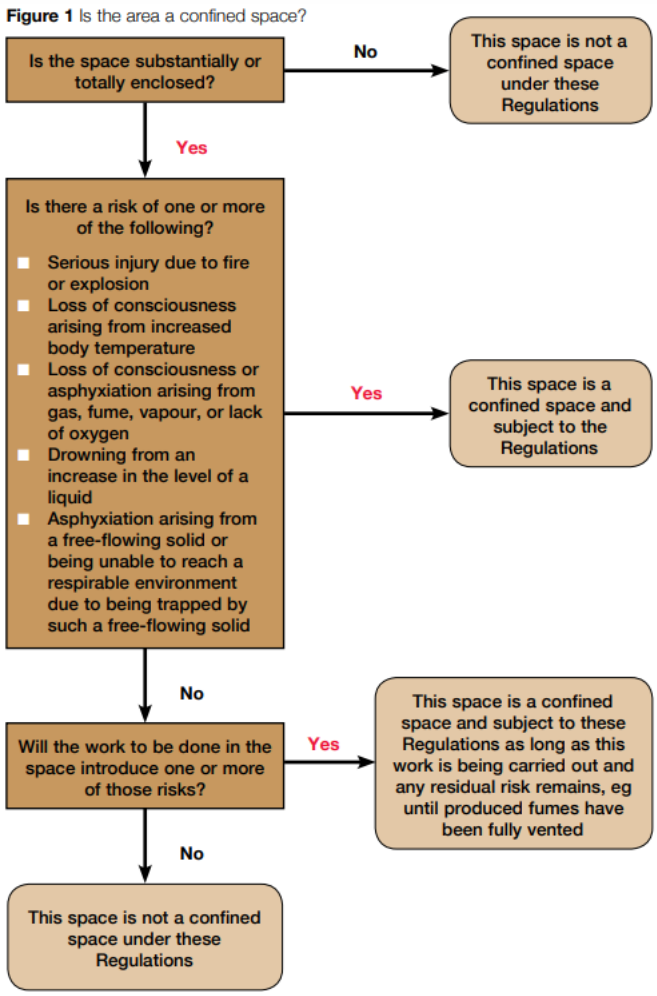
Thus, in the Regulations the confined space has two defining features, enclosure to a substantial degree, and the significant possibility of being drowned, injured in a fire or explosion, or asphyxiated or poisoned, or any combination of these.

Note: The expression “confined space” may also refer to the following examples and other similar places:

- Vessels
- Culverts
- Tunnels
- Manholes
- Shafts
- Sumps
- Excavations
- Inspection pits
- Building voids
- Some enclosed rooms (particularly plant rooms) and compartments within them, including cellars, interiors of machines, plant, vehicles or structures that could be confined spaces during fabrication or manufacture
- Unventilated or inadequately ventilated rooms

This is not an exhaustive list and there may be other types of confined space.

Figure 1 can help you with the decision-making process. It describes the specified risks – there must be at least one of these present or reasonably foreseeable to make any enclosed space a confined space within these Regulations.



Source: [Safe Work in Confined Space - HSE ACOP]

4. Hazards

The hazards of working in a confined space arise through a combination of the nature of the working space itself, and the possible presence of substances or conditions which, taken together, increase the risk to workers' health and safety. Remember that a serious risk can be introduced to a substantially enclosed space that otherwise would be safe. The most likely hazards (but not the only ones) are the following.

4.1. Oxygen deficiency

Below the usual level of about 20.9%, people become less able to function properly and eventually lose consciousness. Oxygen deficiency can be caused by biological or chemical processes consuming

the oxygen in an enclosed chamber; as a result of purging with an inert gas to remove contaminants; or as a result of the work itself, e.g. welding; or even the respiration of workers if the fresh air is inadequate.

Other oxygen levels:

23.5% and above	high oxygen level	(oxygen enrichment)
19.5% and below	low oxygen level	(oxygen deficiency)

4.2. Toxic gases, fumes or vapour

Toxic vapours of many types can accumulate in a confined space for a variety of reasons. These include:

- Vapours from disturbed deposits or sludge, remains from previous processing or storage, or residues from cleaning.
- Vapour produced by the work itself, e.g. welding fume, lead fume, brush or spray painting, solvents from cleaning, lay-up of GRP mouldings.
- Vapour produced by work outside the confined space can also cause fumes to be given off inside, e.g. by welding on the outside.
- Vapour can seep in from surrounding areas while the work is in progress.
- Similarly, exposure to plant and equipment exhaust fumes.

If the presence of contaminated air is known or suspected, stringent precautions must be taken to protect those inside or about to enter.

4.3. Ingress of water, other liquids or free-flowing substances

Work in a tunnel or duct could result in someone inside finding themselves in water (or another liquid) which is rising dangerously. Inadvertent operation of machinery could result in a gas or steam being allowed to enter where people are at work.

4.4. Flammable substances and oxygen enrichment

Biological or chemical processes can also cause the oxygen concentration in a confined space to rise. If this is coupled to the presence of flammable or explosive gases (or dust) and a source of ignition, then there is a real risk of a fire or explosion.

4.5. Excessive heat

The presence of elevated (or rising) temperatures will exacerbate the exhausting effects of strenuous work and increase the possibility of fire or explosion, or increase the generation of toxic fume or vapour

4.6. Other regulatory requirements

The requirements of other Regulations should not be forgotten. They might highlight similar or allied hazards to those outlined above, or place parallel duties on those managing the work. Some of the relevant legal requirements include:

- The Control of Substances Hazardous to Health Regulations as amended (see 'General COSHH ACoP L5)
- The Electricity at Work Regulations
- The Provision and Use of Work Equipment Regulations
- The Control of Asbestos Regulations
- The Control of Noise at Work Regulations
- The Construction (Design and Management) Regulations
- The Workplace (Health, Safety and Welfare) Regulations
- The Personal Protective Equipment at Work Regulations

5. Who could be at risk

Of university staff, those at risk could include any tradesman, contractor or manager active in the field: fitters, plumbers, electricians, etc. They perform a variety of tasks - cleaning, painting, welding, and 'pipe freezing'.

The relative experience or abilities of those entering a confined space must be taken into account when the venture is being planned. It is for this reason that the responsibilities of those in charge of the work have to be stipulated so precisely.

The personnel who are to enter a confined space need to be competent for the task at hand. The specific training appropriate for more complex or risky tasks depends on the outcome of the risk assessment, but ought to include:

- What the Regulations say, in particular what their own legal obligations are and especially the need to avoid unnecessary entry to a confined space.
- The work to be done and the precautions appropriate in each case.
- The operation of the system of work to be followed, and in particular the operation of any permit-to-work system.
- How emergencies might arise, what arrangements are in force, and what their duties are in each case.

6. Risk assessment

6.1. Preventing the need for entry

The main priority is to establish whether work can be carried out without anyone entering the confined space. If it is necessary to carry out work in a confined space, then a safe system of work needs to be put into place. All of the University confined spaces are clearly signposted and controlled by Property & Facilities. Note – there will be other confined spaces as generated by various types of

work activity involving such locations as drains, sewers, tunnels, boilers and under crofts. However all to be alert to other types of confined spaces that may arise and working arrangements may have to be modified.

In more complex environments, work should be organised such that it prevents the need for entry, this can be done by various methods.

a) Testing the atmosphere or sampling the contents of the confined space from outside using long tools, probes and carrying out continuous monitoring.
b) If possible, cleaning or removing residues from the outside using water jetting, steam or chemical cleaning with long-handled tools or in-place cleaning systems.
c) Portholes, sight glasses, grilles or holes can be used to see inside the space without going in. If the sight glass becomes 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.
d) Using remote visual inspection (RVI) to carry out examinations but only if this will provide the same results and safeguards as entry would.

The safe system of work must give priority to eliminating the source of danger before deciding what precautions are needed for entry.

6.2. Formal risk assessment

If work must be done in a 'confined space', then an assessment of risk must be carried out and a **formal risk assessment completed** and recorded by the competent person prior to entry and work being carried out. The competent person who carries out the assessment of risk must have sufficient knowledge, experience, training and familiarity with the relevant processes, plant and equipment to ensure the identification of the hazards and risks involved in the work, thus allowing them to devise the necessary precautions required. In complex cases more than one person may be needed to assess the risks relating to specific areas.

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' or generic 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.

All information available should be used to carry out the risk assessment, including drawings, plans, records and information about relevant soil or geological conditions. These should be assessed in conjunction with details of any processes that have or will take place during the work that could affect the condition of the confined space. Everyone who enters or works in confined space must be consulted on the risks associated with the confined space. Particular attention must be given to situations where work circumstances are changing or where there are temporary workers who are likely to have limited knowledge of the conditions and dangers of the space.

The assessment must also identify the risks to any others, for example other workers including staff, students, contractors and the public in the vicinity who could be affected by the work to be undertaken.

6.3. General condition of the confined space

The general condition of the confined space must be assessed to identify what might or might not be present and might cause a problem, for example, whether the concentration of oxygen is normal. Consideration must be given to:

a) Previous contents

Any substances previously held, however briefly, in the confined space, must be investigated to establish what potential hazards and risks may be encountered, e.g. toxic or flammable gases, etc. Fires and explosions can be caused by the ignition of substances thought to have been 'removed' some considerable time before but were still present.

b) Residues

Any residues, scale, rust, or sludge within a confined space must be investigated to establish whether there are any specific risks due to disturbance of the residue or mixing with other substances. Unless proved otherwise it should be assumed that disturbance of the residue will release gas, fume or vapour. Where possible and appropriate the confined space must be purged prior to the commencement of work.

c) Contamination

Contamination may arise from adjacent plant, processes, gas mains or surrounding land, soil or strata. Gases and liquids may leak from adjacent plant, installations, processes or landfill sites. Confined spaces below ground may be contaminated by substances from installations metres away.

Water and/or gases in ground strata may enter from the surrounding land, soil or strata, e.g. acid groundwater acting on limestone can lead to dangerous accumulations of carbon dioxide. Also, methane can occur from several sources, including the decay of organic matter, and can be released from groundwater. Methane and other gases can leach into groundwater and be released at distances remote from the source. Sewers can be affected over long distances by water surges, e.g. following sudden heavy rainfall upstream of the work.

Where contamination may arise, the effects of this contamination must be analysed. Remember that contaminants may be introduced in a number of manners, e.g. decay of organic matter and water surges. Also interactions can lead to the production of harmful substances e.g. acid ground water on limestone can produce dangerous quantities of carbon dioxide.

d) Oxygen deficiency and oxygen enrichment

There are substantial risks if the concentration of oxygen in the atmosphere varies significantly from normal (20.9%). 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. 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 (below 16%) can lead to unconsciousness and death. Any difference in oxygen content from normal must be investigated, then risk assessed, and appropriate measures taken in the light of the risk.

Particular care should be taken in environments created with a specifically reduced oxygen concentration in the atmosphere produced by removing oxygen or increasing concentration of another gas, usually nitrogen (a hypoxic environment). This should include restrictions on access and alarm systems to alert workers when oxygen limits drop below a safe limit.

e) Physical dimensions

The possible effects of the dimensions and layout of the confined space must be considered, air quality can differ if the space contains remote or low-lying compartments. When choosing ventilation methods, isolated pockets or regions within the space should also be considered.

6.4. Hazards arising from the work

Hazards that arise directly from the work to be undertaken in the confined space should be assessed. The work itself may produce the hazard or conditions which may become hazardous when work is done in conjunction with residues, contamination etc. Work being done on the exterior of the confined space (e.g. external welding) could also generate hazardous conditions within.

Hazards that can be introduced into a space that may otherwise be safe include:

a) Cleaning chemicals

Chemicals that might be used for cleaning purposes could affect the atmosphere directly or interact with residual substances present in the confined space.

Chemicals in stores, cupboards and unventilated areas require to be assessed and properly managed, especially oxygen depletion chemicals, e.g. liquid nitrogen storage.

b) Sources of ignition

Welding can act as a source of ignition for flammable gases, vapours (e.g. from residues), dusts, plastics and many other materials 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 used in potentially flammable or explosive atmospheres.

If there is a risk of a flammable or explosive atmosphere in the confined space expert advice must be taken to ensure that suitable precautions are adopted. These precautions may include the use of intrinsically safe lighting, non-spark tools and equipment, bonding and earthing, and the prohibition of certain materials and devices etc.

c) Increasing temperature

Hot work may cause a significant increase in temperature within the confined space. Welding for example, either within the confined space or on the outside, can increase the temperature. Strenuous work activity can also influence thermal comfort of workers, particularly where personal protective equipment is worn to protect workers from other risks to safety and health.

6.5. Hazards arising from outside the space

a) Ingress of substances

The need to isolate the confined space must be assessed to prevent dangers arising from outside such as the inadvertent operation of machinery. Power must be disconnected to such equipment and measures must 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, firefighting equipment, pumps (where flooding is a risk) etc. if necessary, measures must be put in place to prevent the substance normally held in the confined space from being automatically delivered. There may also be a risk of carbon monoxide, carbon dioxide and nitrogen dioxide from the exhaust of engines entering the confined space.

In addition, the confined space must be assessed to identify any risk of injury from falls or falling materials. If identified, reference must be made to the Working at Height Policy.

6.6. Safe working in confined spaces

a) Precautions to be included in the safe system of work

The precautions required in a safe system of work will depend on the nature of the confined space and the results of the risk assessment. For example, the risks involved and precautions needed for cleaning car interiors with solvents will be relatively straightforward by comparison with those involved when undertaking welding work inside a chemical reactor vessel or work in a sewer. The main elements to consider when designing a safe system of work, and which will form the basis of a 'permit-to-work', are:

- supervision
- competence for confined spaces working
- communications
- testing/monitoring the atmosphere
- gas purging
- ventilation
- removal of residues
- isolation from gases, liquids and other flowing materials
- isolation from mechanical and electrical equipment
- selection and use of suitable equipment
- PPE and RPE
- portable gas cylinders and internal combustion engines
- gas supplied by pipes and hoses
- access and egress
- fire prevention
- lighting
- static electricity
- smoking
- emergencies and rescue
- limited working time

b) Supervision

The degree of supervision will be based on the findings of the risk assessment. 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 also 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.

c) Competence for confined spaces working

Workers must have adequate training and experience in the particular work involved to be competent to work safely in a confined space. 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, checks will be made to ensure 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. If the work is not completed within the prescribed time period, the risk assessment will be reviewed by the responsible person and a further permit issued.

d) Communications

Entry into a confined space must be controlled. No lone working will be permitted. A communication system must be established and maintained to ensure that any problem within the confined space is immediately identified and rectified. If electronic systems are used, they must be intrinsically safe, i.e. they do not present a source of ignition near a risk of flammable or potentially explosive atmospheres.

An adequate communication system will be needed and must enable communication:

- Between those inside the confined space
- Between those inside the confined space and those outside; and
- To summon help in the event of an emergency

Is it essential that good teamwork and communication be maintained for the durations of the works. Whatever system is used, it can be based on speech, the tug of a rope, by radio, etc, but it is important that all messages can be communicated easily, rapidly and they are clear between all parties. The system must be reliable and frequently tested. Equipment such as telephones and radios must be specially protected so that they do not present a source of ignition where there is a risk of flammable or potentially explosive atmospheres. Consideration must be given to any workers wearing breathing apparatus. If justified, one or more people dedicated to the rescue role outside the confined space will be required to keep those inside in constant direct visual sight.

e) Testing and monitoring the atmosphere

Prior to entry, the atmosphere within a confined space must be tested to check the oxygen concentration or for the presence of hazardous gas, fume or vapour. Testing must be carried out where knowledge of the confined space (e.g. 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. Testing must also be carried out if the atmosphere was known to be contaminated previously, was ventilated as a consequence, and needed to be tested to check the result.

f) Retesting

Where the atmosphere in the space may not be safe to breathe and requires testing, the findings of the risk assessment must indicate whether 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 may be necessary to ensure that there is no change in the atmosphere while the

work is being carried out, particularly where there is a known potential for adverse changes during the work.

The conditions must 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 must be defined by a competent person within the safe system of work. This regular monitoring of the atmosphere in a confined space may be using fixed monitors used within an area to protect a number of workers or through the use of personal/portable monitors worn by individual workers.

g) Monitoring and detecting equipment

The choice of monitoring and detecting equipment will depend on the circumstances and knowledge of possible contaminants and advice from a competent person may need to be sought when deciding on the type that best suits the situation. For example, when testing for toxic or asphyxiating atmospheres suitably calibrated chemical detector tubes or portable atmospheric monitoring equipment may be appropriate.

Monitoring equipment must be in good working order. Where necessary, it must be calibrated and tested at least in accordance with the manufacturer's recommendations, or in line with some other schedule (identified from the findings of the risk assessment) that may differ from the manufacturer's requirements. Testing and calibration may be included in daily operator checks (a response check) where identified as necessary.

Where there is a potential risk of flammable or explosive atmospheres, equipment specifically designed to measure for these will be required. All such monitoring equipment must be specifically suited for use in potentially flammable or explosive atmospheres. Explosimeters/flammable gas monitors must be calibrated for the different gases or vapours which the risk assessment has identified could be present and these may need alternative calibrations for different confined spaces. The manufacturer will be able to identify the appropriate calibrations for the possible gases.

h) Oxygen content

Inhaling an atmosphere that contains no oxygen can cause loss of consciousness in a matter of seconds. Testing to measure the oxygen content must 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. Some flammable substances also have toxic properties, which may need to be considered as part of the testing process.

i) Competent testers

Testing must be carried out by people who are competent in the practice and aware of the existing standards for the relevant airborne contaminates being measured and are also instructed and trained in the risks involved in carrying out such testing in a confined space. Those carrying out the testing must also be capable of interpreting the results and taking any necessary action. Records will be kept of the results and findings.

j) Testing from outside

The atmosphere in a confined space can often be tested from the outside, without the need for entry, by drawing samples through a long probe. Where flexible sample tubing is used, ensure that it is not impeded by kinks, blockages, or blocked or restricted nozzles and that sufficient time is allowed for samples of the atmosphere to displace the normal air in the probe. The atmosphere in sufficiently representative samples of the space must be 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 must be carried out in accordance with the advice in this guidance.

k) Emergencies

Local emergency services attending an emergency incident may necessarily require the immediate use of self-contained breathing apparatus, under controlled and monitored entry conditions, without following the testing procedures. This is due to the constraints on affecting an immediate rescue.

l) Gas purging

Where the risk assessment has either identified the presence or possible presence of flammable or toxic gases or vapours, the confined space must be purged of any gases or vapours remaining. For toxic contaminants, air or inert gases can be used but for flammable contaminants only inert gases must be used. Once purged, the atmosphere must be tested to check that the purging has been effective and the air is safe to breathe before entering. Care should also be taken for those outside the confined space who could also be exposed to these toxic, flammable, irritating gases or vapours.

m) Ventilation

Some confined spaces 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 must 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.

When considering the ventilation method, account should be taken 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 are sufficient top and bottom openings 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 while 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 or ventilation providing a combination of exhaust and supply of fresh air may be more effective.

Extract ventilation must be routed away from possible sources of re-entry, and to a place that will not create additional risks. In all cases 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 - such airline or trunking should not hinder access to or egress from the confined space.

Where mechanical ventilation is provided to supplement existing fresh air, care must be taken to ensure that an excessive amount of oxygen is not introduced which might lead to 'oxygen enrichment'. Care must be taken to ensure that pockets of gas or vapour do not build up in complex ventilation systems.

n) Removal of residues

Appropriate measures must be taken where risks from the residues are identified. The measures might include the use of powered ventilation equipment, specially protected electrical equipment for use in hazardous atmospheres, respiratory protective equipment and atmospheric monitoring. The cleaning or removal process might need to be repeated to ensure that all residues have been removed and may need to deal with residues trapped in sludge, scale or other deposits, brickwork, or behind loose linings, in liquid traps, in joints in vessels, in pipe bends, or in other places where removal is difficult.

o) Isolation from gases, liquids and other flowing materials and mechanical electrical equipment

Confined spaces must be securely isolated from ingress of substances that could pose a risk to those working within the space. 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, firefighting, pumping where flooding is a risk, or cables distributing power to other areas), the power must be disconnected, separated from the equipment, and a check made to ensure isolation has been effective.

Isolation 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.

p) Selection and use of suitable equipment

Any equipment provided for use in a confined space must 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 must 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 still present ignition sources and are not in themselves safer in flammable or potentially explosive atmospheres. All equipment must be carefully selected bearing in mind the conditions and risks where it will be used. Earthing must be considered to prevent static charge build-up. In addition to isolation, mechanical equipment may need to be secured against free rotation, as people may tread or lean on it, and risk trapping or falling.

q) Personal protective equipment and respiratory protective equipment

So far as reasonably practicable, a confined space must be made safe to work in without the need for personal protective equipment (PPE) and respiratory protective equipment (RPE). PPE and RPE must be a last resort, except for rescue work (including the work of the emergency services), because its use can make movement more difficult, it can add to the effects of hot temperature and can be heavy. The risk assessment may identify the need for PPE and RPE, in which case it must be suitable and must 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 (self-contained or constant flow airline). Foreseeable hazards that might arise and the need for emergency evacuation must be taken into account.

Wearing RPE and PPE 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.

r) Portable gas cylinders and internal combustion engines

Never use petrol-fuelled internal combustion engines in confined spaces because of the fumes they produce and the ease with which petrol vapour ignites. Gas cylinders must 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 hazardous as petrol-fuelled engines and are inappropriate unless exceptional precautions are taken.

Where the use of diesel internal combustion engines cannot be avoided, adequate ventilation must be provided to prevent a build-up of harmful gas and to allow them to operate properly. The exhaust from engines must be vented to a safe place well away from the confined space, downwind of any ventilation intakes for the confined space, and the exhaust ducting or pipes must be 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. Using such equipment within the space requires constant atmospheric monitoring.

Portable diesel engine-driven equipment must only be fuelled outside the confined space except in rare cases where it is not reasonably practicable to do so, such as in some tunnelling work.

Check gas equipment and gas pipelines for leaks before taking them 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.

s) Gas supplied by pipes and hoses

The use of pipes and hoses for conveying oxygen or flammable gases into a confined space must 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 must be 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 must be disconnected from the gas supply at a point outside the confined space and their contents safely vented.

t) Access and egress

A safe way in and out of the confined space must be provided. 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 must be in place when there is no need for anybody to work in the confined space. The safe system of work must 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).

The site of openings to confined spaces should be sufficiently large and free from obstruction to allow the passage of persons wearing the necessary PPE and to take account of emergency rescue requirements. Where there are reduced dimensions into and out of a confined space this can lead to movements also becoming restrictive, increasing exertion levels.

An appropriate, clear and conspicuous safety sign that prohibits unauthorised entry should be placed alongside openings that allow for safe access.

u) Fire prevention

Flammable and combustible materials must not be stored in any confined spaces unless they are specifically created or allocated for use in the confined space. Accumulation of such materials must be kept to a minimum and be removed as soon as possible before they become a risk. Where flammable materials are required to be used in a confined space, they must be stored in suitable fire-resistant containers.

v) Lighting

Adequate and suitable lighting, including emergency lighting, must be provided. The positioning must be such that there is ample clearance for work or rescue is provided. Where flammable or potentially explosive atmospheres are likely to occur, including in wet or damp conditions, the lighting will need to be specially protected.

w) Static electricity

Exclude static discharges and all sources of ignition if there is a risk of a flammable or explosive atmosphere in the confined space. All conducting items, such as steel trunking and airlines, must be bonded and effectively earthed. If cleaning operations are to be carried out, assess the risks posed by the use or presence of high-resistivity materials (such as synthetic plastics) in and adjacent to the confined space.

Some equipment is prone to static build-up due to its insulating characteristics, e.g. 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.

x) Suitability for work in confined spaces

The competent person carrying out the risk assessment for work in confined spaces must 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 must 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.

All persons working in confined spaces must be competent and suitably trained. Account must be taken of the health and ability of those who are to work in the confined space, for example concerning pre-existing medical conditions (claustrophobia, respiratory conditions like asthma etc.) or physical strength and abilities (e.g. wearing heavy breathing apparatus). Persons may also be requiring inoculations for the environments in which they are working. An occupational health assessment or doctor's assessment may be required if someone has any pre-existing medical condition, to ensure that they are fit enough to carry out this type of work. This can be organised by the line manager through Human Resources.

There may be a need to limit the time period that individuals are allowed to work in a confined space, for example where RPE is used, or under extreme conditions of temperature and humidity, or if 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. There should also be consideration given to the use of other equipment, including any decontamination requirement identified.

There may be additional risks to consider when entry to a confined space is required. These could include the integrity of the confined space (e.g. corroded structure, cold temperatures, loss of rigidity when a tank is drained, trip hazards, noise etc). While these are not specific risks or limited to confined spaces, they must still be considered as part of the general risk assessment and tackled as far as reasonably practicable.

6.7. Permits to work

Work in a confined space must be carried out under cover of a Permit to Work. This Permit is to be completed by a responsible, suitably trained person. This person will control operations in, and relating to, confined spaces. Prior to work commencing this Permit must be passed to the person directly in charge of the works, who will return it to the responsible person on completion of the work or on expiry of the prescribed time limit, whichever occurs first. The permit to work system is an extension of the safe system of work, not a replacement for it.

A permit-to-work system must be appropriate, for example:

- 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.
- To ensure there is a formal check undertaken confirming elements of a safe system of work are in place. This must take place before people are allowed to enter or work in the confined space.
- 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.

- 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.

The permit-to-work must be cancelled once the operations to which it applies have finished.

6.8. Ventilation, maintenance and examination of plant and equipment

Confined spaces must be adequately ventilated. Where a mechanical system is installed and there is a possibility of failure there must be a visible and/or audible warning in the event of such failure. If considered necessary after assessment of risk, suitable gas detection equipment must be provided in conjunction with the specific monitoring procedures.

Where considered necessary after the assessment of risk, suitable PPE must be provided e.g. breathing apparatus, self-rescuers, safety harnesses, lifelines etc. Where RPE is to be used, a Fit Test must take place with additional training if required.

All special equipment and PPE provided, such as fall arrest gear, lifelines, first aid equipment, protective clothing etc. must be suitable for the purpose for which they are intended and must meet the appropriate recognised British Standard and must be maintained in good repair. The equipment must be examined regularly and tested as necessary, consisting of a thorough visual examination of all parts for deterioration or damage.

Records of each thorough examination and test should include:

a) The name and address of the company responsible for the equipment.
b) Particulars of the equipment, distinguishing numbers or marks, a description sufficient enough to identify it and the name of the maker.
c) The date of the examination and the name and signature of the person carrying out the examination and test.
d) The condition of the equipment and details of any defect found.
e) For RPE and resuscitating apparatus, results of tests on compressed gas cylinders, electric motors and the pressure of oxygen or air in the supply cylinder.
f) For airline-fed RPE, the volume, flow and quality of the air.
g) A brief description of any remedial action taken.

Records of all equipment examinations or calibrations must be kept for at least five years and be readily available for inspection.

Canister respirator or cartridge type RPE must not be used in confined spaces, as they do not protect against high concentrations of gases and vapours and must never be used in oxygen-deficient atmospheres.

In some circumstances entry may be possible without wearing breathing apparatus, but certain conditions must be satisfied:

- A risk assessment has been done and a safe system of work is in place including all required controls.

- Any airborne contamination is non-toxic, or present in very low concentrations well below the relevant exposure limits.
- The level of oxygen is adequate.

The use of oxygen or flammable gases must be minimised. Where these are required, the risk assessment must ensure that the method of supply is as safe as possible. Cylinders must not be used unless essential and special precautions will need to be adopted.

Flammable and combustible materials must not be stored in confined spaces. If this is unavoidable, e.g. this being the purpose of the confined space, then advice must be sought and suitable precautions put in place. Where there is an accumulation due to work such materials **must be removed** as soon as possible and must not be allowed to remain after the end of the shift.

Smoking, drinking and eating are strictly prohibited within confined spaces and in some cases, a further exclusion zone may be required at a distance beyond the confined space.

a) Respiratory protective equipment

Where respiratory protective equipment (RPE) is provided, it must be suitable for the purpose for which it is intended, i.e. matched to the job, the environment and the wearer, including face-fit testing. Both RPE and resuscitating apparatus are to be given a thorough visual examination of all parts before use, looking particularly at the integrity of the straps, face pieces, filters and valves. If airline-fed, the volume, flow and quality of the air must be tested. Where this is supplied from a mobile compressor, the test must be made immediately before the first use of RPE in any new location. Any defects discovered by the examination must be remedied before further use.

Some types of respiratory equipment are not appropriate for entry into or work in most confined spaces. It may not adequately protect against the risk of being overcome, for example it does not provide adequate protection against high concentrations of gases and vapours. Respirators must never be used in oxygen-deficient atmospheres. A detailed risk assessment would be needed to assess the possibility of high gas concentration or oxygen deficiency which would be likely to require specialist breathing equipment and training. If it is uncertain what equipment is appropriate, the RPE manufacturer must be consulted.

However, respirators may have a role if their limitations are considered and where the risk is of exposure to low concentrations of hazardous contaminants. These limitations include duration of use, in some cases only about 15 minutes, which must be considered to see whether it would be sufficient to allow escape. This must be checked against the equipment supplier's information. Checks must be made to ensure they are still within their useable shelf life.

In some circumstances entry into a confined space will require the continuous wearing of breathing apparatus. To determine whether RPE is necessary:

- A risk assessment must be carried out and a safe system of work put in place including all required controls, for example thorough and continuous general ventilation.
- The nature of any airborne contamination must be established, i.e. whether it is toxic/non-toxic, or present in high concentrations or concentrations well below the relevant occupational exposure limit.
- It must be established whether the oxygen level is adequate.

Emergency breathing apparatus must not be used for normal work. It should be carried or stationed inside the confined space only to ensure safe egress in an emergency when there is only a short duration of breathable air left. Examples of emergency breathing apparatus or self-rescuers include:

- The re-breathable type which consists of a tube and mouthpiece.
- The 'escape set' which consists of a cylinder-fed positive pressure face mask or hood.

b) Other equipment

Equipment provided or used for or in connection with confined space entry, or for emergency rescue or resuscitation, must be suitable for the purposes for which it is intended, and account taken of any appropriate recognised standards. Such equipment could include ropes, harnesses, fall arrest gear, lifelines, first-aid equipment, and protective clothing etc.

If a safety harness is used, it is essential that the free end of the line is secured so it can be used as part of the rescue procedure, in most cases outside the entry to the confined space. The harness and line should be worn so the wearer can be safely drawn through an opening. Lifting equipment may be necessary for this purpose. The appropriate harness must be of suitable construction and made from a material of a recognised standard capable of withstanding both the strain and attack from chemicals.

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 in case this weakens them. If they become damaged, they must be scrapped or be returned to the manufacturer/other competent repairer who can carry out the necessary remedial work and supply a new certificate of test and safe working load.

c) Maintenance of equipment

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, must be maintained in an efficient state, in efficient working order and in good repair. This must include periodic examination and testing as necessary. Some types of equipment, for example breathing apparatus, must be inspected each time before use. The manufacturer or supplier's instructions will often provide advice on the frequency and type of examination.

d) Inspection and testing of equipment used in connection with confined space entry

The inspection and testing of RPE will comprise a visual inspection of all parts of the respirator or breathing apparatus, looking particularly at the integrity of any straps, face-pieces, filters and valves or other attachments including hoods, masks and visors. Any defects discovered on inspection, and which would undermine safe operation, must be remedied before further use.

The inspection and testing of resuscitation equipment must be undertaken in accordance with the manufacturer's instructions and must include all accessories and ancillary equipment. Automatic external defibrillators (AEDs) must also be tested in accordance with the manufacturer's instructions and must include regular battery checks. Many pieces of resuscitation equipment (including defibrillator pads) are single-use and care must be taken during inspection to ensure that packaging is not damaged and that the product is within its expiry date.

The inspection and testing of other special equipment, including protective clothing, will consist of thorough visual inspection of all parts for deterioration and damage, and testing where appropriate. Inspection and testing must 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 inspections may be greater.

Atmospheric monitoring and special ventilating equipment provided needs to be properly maintained, examined thoroughly and, where necessary, calibrated and checked to the manufacturer's instructions. Records of all inspections and thorough examinations must be kept, including details of any significant findings or defects and remedial action taken.

7. Responsibilities

Property & Facilities will ensure that the requirements of the Regulations and associated "Permits to work/entry" are complied with within their area of responsibility, and incorporate this policy and arrangements into the permit to work, safe systems of work, rescue plan and risk assessment.

Members of staff who plan, organise, or lead maintenance which unavoidably entails entry into a confined space must ensure that a suitable risk assessment has been performed and an appropriate control strategy implemented.

Any member of staff who enters a confined space must be trained, competent and conform to the safety instructions issued to them.

7.1. Director of Property & Facilities

The Director of Property & Facilities is responsible for:

- Executing the principle functions of confined space management by assembling and maintaining a suitably qualified team consisting of staff and consultants/contractors.
- Discharging to the Maintenance Operations Manager operational requirements within the agreed policy.
- Ensuring that staff under their direct control have sufficient and suitable initial and update training with respect to confined space issues where appropriate.

7.2. Maintenance Operations Manager

The Maintenance Operations Manager is responsible for:

- Maintaining an up to date register of all confined spaces and ensure cautionary signage is posted at access points.
- Identifying all the work which could require entry to confined spaces.
- Ensuring entry to confined spaces is effectively precluded unless entry is unavoidable for the purposes of duly authorised maintenance.
- Ensuring that, where entry into any confined space cannot be avoided, a suitable and sufficient assessment of the risks to health has been carried out.

- Ensuring that prior to entry into a confined space, a written safe system of work, including emergency procedures has been developed and a permit to work issued.
- Be satisfied that the control measures outlined in these risk assessments accurately reflect the degree of risk likely to be encountered by those entering the confined space.
- Ensuring the staff and/or contractors who will be entering the confined space receive appropriate information and training. Make arrangements for the supervision of the inexperienced.
- Ensuring that all staff involved in entry into confined spaces are aware of this policy, understand its contents and comply with local procedures and safe systems of work.
- Developing appropriate emergency plans for each entry into a confined space and communicated to all those involved.
- Ensuring that all staff that will enter confined spaces and those who issue permits to work, have appropriate information, instruction, training and supervision in confined space working.

7.3. All managers and supervisors who issue permits

It is the responsibility of each member of staff who plans, organises or otherwise leads maintenance or project work which could involve entry into or work within confined spaces to prevent such entry wherever this is reasonably practicable. Where entry into a confined space cannot be avoided, ensure that all the relevant requirements of the law are adhered to, as described in this document. This will entail:

- Assessing all associated risks involved in the entry into confined spaces.
- Preparing a risk assessment for the proposed work.
- Ensuring that a suitable safe system of work has been devised.
- Ensuring that those involved are suitably trained and supervised.
- Ensuring all staff that will enter a confined space are fit to do so.
- Ensuring that there are appropriate emergency procedures in place.
- Comply with departmental requirements on the technical and managerial monitoring of such activities.
- The issue of the permit to work and its cancellation.
- Checking safety at each stage of the work.
- Provide such information as may be asked for by Edinburgh Napier University on the nature and safe management of such activities.

7.4. All staff

It is the responsibility of each member of staff whose work requires them to enter into or work in a confined space to:

- Adhere rigorously to the safe system of work developed through risk assessment and requirements of any work permit issued to them, or any verbal instruction from the Maintenance Operations Manager about entry into or work within any confined space.
- Use any suitable and sufficient personal protective or work equipment issued to them in a proper manner (and report any defects in such equipment).
- Take all reasonable steps to ensure the health and safety of themselves and others when entering or working in a confined space including informing their managers if they suspect that the system of work in place is ineffective or inadequate.

8. Control methodology

8.1. Control strategies for ensuring safety in confined spaces

Regulation 4 says that:
(1) No person at work shall enter a confined space to carry out work for any purpose unless it is not reasonably practicable to achieve that purpose without such entry.

The approved code of practice also states:
Dutyholders should not enter a confined space and should prevent employees, or others who are to any extent within their control, such as contractors, from entering or working inside a confined space where it is reasonably practicable to thoroughly undertake the work without entering the space.

In every situation, the dutyholder must consider what measures can be taken to enable the work to be carried out properly 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.

The first question is therefore whether the desired outcome can be achieved without entry. For example:

- Can the confined space itself be modified so that entry is not necessary?
- Can the work be done from the outside? For example:
    - blockages might be cleared by 'rodding' or air purging
    - inspection, sampling and cleaning might be done by machines operated externally
    - remote cameras might be used for internal inspection

It is only when such alternatives have been considered and rejected as not being 'reasonably practicable', that entry is permissible, under a 'safe system of work'.

Risk assessment is the management tool specified in the Regulations for identifying what has to be done to ensure safety - the 'safe system of work'. This section indicates what protective and preventive measures might need to be considered, depending on the nature of the hazards and people at risk.

Most confined spaces within Edinburgh Napier University are controlled by Property & Facilities. These include various tanks, ducts, voids and boilers. These confined spaces are kept locked and casual attempts at entry are discouraged by 'no entry' signs.

For most situations, the risk assessment will demand that a selection of management and technical strategies be adopted. This constitutes the 'safe system of work'. It is part of the function of the risk assessment to identify specifically which strategies are appropriate and necessary.

In summary, any control strategy for entry into or work within a confined space will amount to:

- Restrict access to the confined space. If access is not justifiable, do the work remotely.
- Reduce the number of people exposed to the risks, and ensure that those who do enter are properly trained and/or supervised.
- Test and monitor for the presence of contaminants in the atmosphere.
- Have effective emergency procedures.

8.2. Management strategies for ensuring safety in confined spaces

Again, it must be stressed that entry to a confined space must be prevented if the desired outcome can be achieved by another means, hence the person in charge of the confined space must ensure that no-one who is not authorised can enter the confined space. Thus, entry by members of the general public (or, indeed, any unauthorised person) must be effectively prevented.

a) Restrict the number of people at risk.
b) Train those who have to enter a confined space. The training has to be consistent with the job in hand, the individual's role and responsibilities. For the novice, a high level of supervision will be necessary to allow them to build up experience and confidence safely.
c) The Permit-to-Work system is required:
    - To tell people what significant risks they could encounter in the confined space.
    - To ensure that the elements of the safe system of work are in place.
    - If there is a need to coordinate the activities of several workers and exclude potential problems posed by the presence or activities of others.
    - If complex authorisations, communications or procedures are required.

9. Emergency procedures

When things go wrong, people may be exposed to serious and immediate danger. Regulation 5 stipulates that:

> *no person at work shall enter or carry out work in a confined space unless there have been prepared in respect of that confined space suitable and sufficient arrangements for the rescue of persons in the event of an emergency, whether or not arising out of a specified risk.*

Clearly these arrangements will depend on the nature of the confined space, the hazards identified and the risk assessment. All the possible aspects of confined space emergency procedure and planning cannot be examined in a brief guide such as this, but to be 'suitable and sufficient', the emergency plans and procedures need to focus on the following:

- The type, quantity and location of any rescue and resuscitation equipment. The actual equipment clearly needs to be appropriate to the foreseeable needs as identified by the risk assessment.
- Communications, and in particular the means of raising the alarm;
- Training for all those who might be involved in a rescue:
    - Safe use of RPE, lifelines, harnesses etc.
    - Resuscitation and first aid, First Aider(s) present
    - Firefighting equipment
    - Atmospheric testing equipment
    - Liaison with the local emergency services
    - Record keeping

Under both the Management of Health and Safety at Work Regulations and the Confined Spaces Regulations it is a requirement to record the results of a risk assessment. It is not necessary to record every aspect of every assessment, but only those aspects relating to a significant specified risk. It is therefore recommended that risk assessments made under the Confined Spaces Regulations are

recorded as an adjunct to similar assessments made under the Management Regulations or similar legislation (e.g. COSHH). The overall object is to assure ourselves that we are doing what we must do to comply with this aspect of the law.

The main features of a risk assessment record under the Regulations are:

- The justification for entry into a confined space
- The nature of the work
- The significant risks which could be encountered
- The appropriate control strategy
- Permits-to-work
- The safe system of work
- PPE and RP
- The various duties of those involved
- The training and experience of those with 'safety critical' task
- The emergency procedures

9.1. Communications

Where necessary communications must be established with the emergency services. No person shall enter or carry out work in a confined space unless arrangements and suitably trained operatives for the rescue of persons in the event of an emergency have been prepared **before** any person enters or works in the confined space.

9.2. Training

Those likely to be involved in any emergency rescue must be trained according to their designated role with refresher training organised on a regular basis. Training must include the following, where appropriate:

a) The likely causes of an emergency.
b) Use of rescue equipment, e.g. breathing apparatus, lifelines, etc. and a knowledge of its construction and working.
c) The check procedures to be followed when donning and using apparatus.
d) Checking of correct functioning and/or testing of emergency equipment (for immediate use and to enable specific periodic maintenance checks).
e) Identifying defects and dealing with malfunctions and failures of equipment during use.
f) Works, site or other local emergency procedures including the initiation of an emergency response.
g) Instruction on how to shut down relevant process plan.
h) Resuscitation procedures and, where appropriate, the correct use of any ancillary and resuscitation equipment provided.
i) Emergency first aid and the use of the first aid equipment provided.
j) Use of fire-fighting equipment.
k) 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.

l) Rescue techniques including regular and periodic realistic rehearsals/exercises. This could include the use of a full-weight dummy.

9.3. Emergency rescue plan

Prior to commencing the work, an emergency rescue plan shall be drawn up by the responsible person and all operatives involved briefed in its use. This plan is to clearly state the individual responsibilities of all those likely to be involved.

Wherever possible a secondary means of emergency escape/access must be provided.

Suitable arrangements must be made for emergency rescues and they will depend on the nature of the confined space, the risks identified and the likely nature of an emergency rescue. The public emergency services should not be relied on. Accidents arising from a specified risk and any other accident in which a person needs to be recovered from a confined space, for example incapacitation following a fall, should be considered. To be suitable and sufficient the arrangements for rescue and resuscitation must cover:

a) Rescue and resuscitation equipment
b) Raising the alarm and rescue
c) Safeguarding the rescuers
d) Fire safety
e) Control of plant
f) First aid
g) Public emergency services
h) Training

The emergency rescue plan must, as a minimum, indicate that:

- In case of emergency immediately raise the alarm.
- Rescue operations should not be attempted until the necessary equipment and assistance have been obtained.
- Rescue personnel must be immediately available and adequately trained in the use of the appropriate rescue equipment.
- Available equipment may include additional breathing equipment, self-rescuers, lifelines, intrinsically safe hand torches or cap lamps and where necessary a resuscitator.

9.4. Rescue equipment

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.

Any rescue equipment provided must be appropriate in view of likely emergencies and be properly maintained. If resuscitation is a likely consequence, provision needs to be made for the appropriate training including the use of appropriate resuscitation equipment.

Rescue equipment will often include lifelines and lifting equipment (since even a strong 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 and first-aid equipment, including automatic external defibrillators (AEDs) and other resuscitation equipment.

'Self-rescue' equipment will not be a substitute for respiratory protective equipment but may be appropriate for use in situations where there will be time to react to an emergency situation, for example, reacting to an atmospheric monitoring device. The type provided should be suitable for the hazard expected. They are not a substitute for PPE.

9.5. Resuscitation procedure

Resuscitation procedures must include respiratory and circulatory resuscitation that most people would be capable of carrying out with training and refresher training. Ancillary equipment may be needed for oral resuscitation to avoid direct contact between the mouths of the victim and rescuer if resuscitation is needed as a result of exposure to toxic gases. This equipment must only be operated by someone with specialist training or kept available on site, properly maintained, for use by a person providing professional medical help.

9.6. Communications to/from a confined space

Measures must be in place for communicating to others outside the space to initiate rescue procedures or summon help. These could be by the tug of a rope, by radio or by means of a 'lone worker' alarm. Whatever system is used, it must be reliable and frequently tested. If justified, one or more people dedicated to the rescue role outside the confined space will be required to keep those inside in constant direct visual sight.

It is essential that those who have been assigned a rescue role are themselves protected against the cause of the emergency. Multiple fatalities have occurred when rescuers have been overcome by the same conditions that have affected the people they have tried to rescue. Precautions must cover risks any rescuer might face in the rescue plan.

9.7. Fire safety precautions

Advice on fire safety precautions and measures can be obtained from the University's Fire Safety Adviser. This can include ensuring that these measures do not create additional risks, i.e. using carbon dioxide extinguishers may displace the oxygen which is also being depleted by the fire. Inert gas flooding of the confined space must not take place when people are within the space.

Where there is a risk of fire, appropriate fire extinguishers need to be kept at the entry point to the confined space. In some situations, a sprinkler system may be appropriate. In the event of a fire, the local fire service 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, as forced air may fan the flames. Advice on fire safety measures may be obtained from the University's Fire Safety Officer.

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.

9.8. First aid equipment

Appropriate first aid equipment must be provided and available for emergencies. First aiders must be trained to deal with the foreseeable injuries.

9.9. Emergency services

Emergency services should be notified prior to work starting and they should be consulted about the information they would find useful. Arrangements must be in place for rapid notification of the emergency services should an accident occur. On arrival, the emergency services must be given all known information about the conditions and risks of entering and/or leaving the confined space before attempting a rescue.

Reliance on the emergency services alone will not be sufficient to comply with these Regulations. The University must put in place adequate emergency arrangements before the work commences.

9.10. Practice drills

Adequate and unobstructed access and egress must be provided to confined spaces so that people who enter do so safely and without risk of injury and can escape quickly in event of an emergency. Consideration should be given to the size of openings and any passageways within the confined space. The minimum size of an opening to allow access with full rescue facilities including self-contained breathing apparatus is 575mm in 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.

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. The choice of airline breathing apparatus may offer a more compact alternative to bulkier self-contained apparatus. Precautions need to take account of such special cases.

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.

Practice drills including emergency rescues will help to check that the size of openings and entry procedures are satisfactory.

A major cause of death and injury in confined spaces incidents is due to ill-conceived attempts to save others who have collapsed or ceased to respond. No one should enter a confined space without ensuring they will not also be affected.

10. Training and competency

All persons entering the confined space will be competent to work safely, and they will be trained in the possible risks and the measures taken to prevent such risks, and to a level that enables them to fulfil any responsibilities outlined in the rescue plan. Training will need to cover:

- Awareness of the Confined Spaces Regulations and the need to avoid entry to a confined space, unless it is not reasonably practicable to do so.
- An understanding of the work to be undertaken, the hazards and the necessary precautions.
- An understanding of safe systems of work, with particular reference to 'permits-to-work' where appropriate.
- How emergencies arise, the need to follow prepared emergency arrangements, and the dangers of not doing so.

Training must take into account the practical use of safety features and equipment, the identification of defects and, where appropriate, involve demonstrations and practical exercises. It is important that trainees are familiar with both equipment and procedures before working for the first time in a confined space.

Practical refresher training must be provided, the frequency depending 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.

Training in specific safety features may include any or all of the following:

- Use of atmospheric testing equipment, and the action to take depending on the readings.
- The use of personal protective equipment, breathing apparatus and escape sets (self-rescuers), their maintenance, cleaning and storage.
- Use of other items of PPE.
- Instructions in the communication methods to be used while in the confined space.

Similarly, contractors are required to ensure that their employees are competent to carry out their activities. Edinburgh Napier University will periodically monitor contractor competence records to ensure they are being maintained.

11. Monitoring compliance

Any management system, if left alone, will deteriorate over time - where entry into confined spaces is concerned this could prove fatal. It is therefore a requirement of this Code of Practice that where such entry occurs, the Director of Property & Facilities will periodically monitor that this statement remains relevant and effective and will, from time to time, require certain information from the Maintenance Management Team. This will include (inter alia) as part of a formal audit: copies of statements of local safety statements; risk assessments relating to entry into and work within confined spaces; systems of work (including permits to work); records of these and other related activities.