



Ricardo  
Energy & Environment

## UK Air Quality Monitoring Networks Health and Safety Guidance

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Report for the Environment Agency  
Contract 21316

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# 1 Purpose and Scope

The purpose of this document is to provide consistent guidance for Defra and Environment Agency contractors regarding health and safety (H&S) at air quality monitoring sites in the UK. In particular, this will ensure that all sites in all networks are being addressed fully in terms of fire and electrical safety and that risk assessments and site safety have been addressed uniformly and to a satisfactory standard. The air quality monitoring networks covered by this guidance document are:

- The Automatic Urban and Rural Network (AURN)
- The Heavy Metals Network
- The Hydrocarbons Network
- The Polycyclic Aromatic Hydrocarbons (PAH) Network
- The UK Eutrophying and Acidifying Pollutants (UKEAP) Network
- The Black Carbon Network
- The Particle Numbers and Concentrations Network
- The Toxic Organic Micro-Pollutants (TOMPs) Network

All chapters of this guidance document are relevant to all readers, with the exception of section 3, 'Responsibilities of Stakeholders', where you need only read the responsibilities relevant to your role. The information contained within this guidance document has been provided by a large number of sources. As co-ordinator of health and safety information, Ricardo Energy & Environment has used all reasonable skill and care with regard to the collection and collation of this information, but makes no representation or warranty, expressed or implied, and accepts no liability concerning the fairness, accuracy or completeness of the information. The guidance on risk assessments and health and safety legislation is just a summary, or a signpost, of the risks that are involved and third parties are responsible for ensuring they meet UK Health and Safety legislation. Ricardo Energy & Environment accepts no liability whatsoever to any third party for any loss or damage arising from any interpretation, use of or reliance upon any information or view contained within this guidance document.

## 2 Health and Safety Database

A database has been developed to allow ESUs (Equipment Support Units), LSOs (Local Site Operators), network managers, site owners, Defra and the Environment Agency access to upload and download selected safety information including risk assessments. The database is available to the stakeholders in all Defra- and EA-managed national air quality networks listed in section 1. The login page is at <https://hnsdb.defra.gov.uk>. The database contains the following information:

- Site details including site name, site ID, site installation date, site owner and location
- Networks operating at each site
- Electrical test dates and electrical safety status
- PAT test dates
- Network Manager
- Special risks at each site
- Risk assessments
- An overall safety status (red/amber/green), based on the worst risks from all relevant risk assessments.

Safety information is uploaded to the database via online forms by the relevant contractors, and all stakeholders may view all information in the database. ***This is the main route by which information on all risks, even short-term ones, is communicated and disseminated.***

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**Please note: this document is not intended to provide detailed guidance on how to use the Health and Safety Database. For that, please refer to the separate document – “UK Air Quality Monitoring Networks Health and Safety Database User Notes”. The latest version of these guidance notes can be downloaded from the Health and Safety Database itself. All users of the Health and Safety Database must familiarise themselves with the Database and how to use it.**

## 3 Responsibilities of Stakeholders

Stakeholders are all contractors, subcontractors and volunteers who make visits to, own or manage air quality monitoring sites, namely:

- Network Managers
- Site Owners and/or Land Owners
- Local Site Operators (LSOs)
- Equipment Support Unit (ESU)
- Quality Assurance and Quality Control Unit (QAQC)

Please read the section appropriate to your role(s).

By law, everyone has a duty while at work to take reasonable care for the health and safety of him/herself and of other persons who may be affected by his/her acts. Individuals must also co-operate with employers or other persons so far as is necessary to enable them to perform their duties or requirements under the Health and Safety at Work Act 1974 (see section 5).

This means that every person who undertakes work under contract to Defra or the Environment Agency shall play their part in ensuring that safe systems of work are in place in accordance with health and safety laws and regulations for all locations where the work is carried out. The health and safety database only covers the air quality monitoring stations managed/ run on behalf of the Environment Agency or Defra and the work carried out at these locations. It does not cover associated laboratories or workshops. Defra or the Environment Agency may occasionally audit or ask that an audit be carried out on the monitoring station safe systems of work and request copies of relevant documentation.

### 3.1 Network Managers

Many sites contain equipment from multiple networks and therefore one site may have multiple network managers. For the purposes of health and safety, the lead network manager has additional responsibilities. At sites with AURN equipment, the lead network manager is the AURN CMCU (Central Management and Control Unit). At sites without AURN equipment, the lead network manager shall be determined by Defra or the Environment Agency (EA) as appropriate.

#### **Responsibilities**

- Familiarise yourself with the Health and Safety Database and how to use it.
- Upload safety information to the Health and Safety database, including electrical test dates and electrical safety status (lead network manager only), PAT test dates, special risks at each site and risk assessments.
- Provide information and support to ensure that LSOs and ESUs are able to carry out their responsibilities.
- Review risks and prepare a risk assessment for work carried out at each site, including transport to and from the site and the movement of gas cylinders into the site.

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- Ensure actions are taken to mitigate the risks identified in the risk assessment (e.g. purchase of safety equipment, display of H&S information at site, staff training and communication).
  - **Use the Health and Safety Database to check the safety status of the site before each visit.**
  - Ensure that LSOs and ESUs carry out a 'take two' risk assessment on arrival at the site. A 'take two' risk assessment is a short and simple visual check of the key risks to review whether it is safe to carry out work.
  - Follow the Cascade procedure (section 4) and notify the Health and Safety coordinator of any new or site-specific risks.
  - Follow advice from the Lead Network Manager and Ricardo Energy & Environment Project Health and Safety Coordinator.
  - Ensure contact details for your organisation and all other stakeholders are regularly updated and sent to the Ricardo Energy & Environment Project H&S Coordinator.
  - Other responsibilities as specifically identified in the Network manager's contract.
  - Comply with health and safety laws and regulations (see <http://www.hse.gov.uk>)

At Defra-owned or Environment Agency-owned sites, the responsibility of the site owner may have been delegated through contract to the network manager. Network managers should ensure that they are fully aware of their contractual obligations regarding health and safety responsibilities, including the notification of the fire service about the presence of gas cylinders at the sites.

## 3.2 Site Owners and Land Owners

At Affiliate AURN sites, the site owner may be the Local Authority or another body or individual, who is fully responsible for the actions below. For Defra/EA-owned sites, the responsibilities are passed on through contract to the lead network managers. It is possible that the Site Owner/Land Owner and Local Site Operator may be the same organisation or individual, in which case they should read and comply with the responsibilities for both roles.

### **Responsibilities**

- Liaise with the Network Manager to ensure that the air quality monitoring site infrastructure is safe and can be accessed safely.
- Carry out electrical testing in accordance with section 6.
- Liaise with the Network Manager to review risks and prepare a risk assessment for work carried out at each air quality monitoring site, including transport to and from the site and the movement of gas cylinders into the site.
- Where appropriate, ensure actions are taken to mitigate the risks identified in the risk assessment (e.g. purchase of safety equipment, display of H&S information at the air quality monitoring site, staff training and communication).
- **Use the Health and Safety Database to check the safety status of the site before each visit.**
- Follow the Cascade procedure (section 4) and notify the Network Manager and Health and Safety coordinator of any new or site-specific risks.
- Ensure contact details for your organisation are up to date and sent to the Network Managers
- Follow advice from the Network Manager and Ricardo Energy & Environment Project Health and Safety Coordinator.
- Comply with health and safety laws and regulations (see <http://www.hse.gov.uk>) .

## 3.3 Local Site Operators

### **Responsibilities**

- Familiarise yourself with the Health and Safety Database and how to use it.

- Review risks and prepare a risk assessment for work carried out at each site, including transport to and from the site and the movement of gas cylinders into the site. The risk assessment should be submitted via the online form in the Health and Safety database.
- Ensure actions are taken to mitigate the risks identified in the risk assessment (e.g. purchase of safety equipment, display of H&S information at site, staff training and communication).
- Use the health and safety database to check safety status of the site before each visit.
- Carry out a 'take two' risk assessment on arrival at the site. A 'take two' risk assessment is a short and simple visual check of the key risks to review whether it is safe to carry out work.
- Follow the Cascade procedure (section 4) and notify the Network Manager and Ricardo Energy & Environment Project Health and Safety coordinator of any new or site-specific risks.
- Follow advice from the Network Manager and Ricardo Energy & Environment Project Health and Safety Coordinator.
- Ensure contact details for your organisation are up to date and sent to the Network Managers.
- Other responsibilities as specifically identified in the LSO's contract.
- Comply with health and safety laws and regulations (see <http://www.hse.gov.uk>).

## 3.4 Equipment Support Unit

### **Responsibilities**

- Familiarise yourself with the Health and Safety Database and how to use it.
- Review risks and prepare a risk assessment for work carried out at each site, including transport to and from the site and the movement of gas cylinders into the site. The risk assessment should be submitted via the online form in the health and safety database.
- Ensure actions are taken to mitigate the risks identified in the risk assessment (e.g. purchase of safety equipment, display of H&S information at site, staff training and communication).
- Use the health and safety database to check safety status of the site before each visit.
- Carry out a 'take two' risk assessment on arrival at the site. A 'take two' risk assessment is a short and simple visual check of the key risks to review whether it is safe to carry out work.
- Follow the Cascade procedure (section 4) and notify the Network Manager and Health and Safety coordinator of any new or site-specific risks.
- Follow advice from the Network Manager and Ricardo Energy & Environment Project Health and Safety Coordinator.
- Ensure contact details for your organisation are up to date and sent to the Network Managers.
- Other responsibilities as specifically identified in the ESU's contract.
- Comply with health and safety laws and regulations (see <http://www.hse.gov.uk>).

## 3.5 Quality Assurance and Quality Control Unit

### **Responsibilities**

- Familiarise yourself with the Health and Safety Database and how to use it.
- Review risks and prepare a risk assessment for work carried out at each site, including transport to and from the site and the movement of gas cylinders into the site. The risk assessment should be submitted via the online form in the health and safety database.
- Ensure actions are taken to mitigate the risks resulting from the risk assessment (e.g. purchase of safety equipment, display of H&S information at site, staff training and communication).
- **Use the Health and Safety Database to check the safety status of the site before each visit.**
- Carry out an assessment on arrival at the site. A 'take two' risk assessment is a short and simple visual check of the key risks to review whether it is safe to carry out work.
- Follow the Cascade procedure (section 4) and notify the Network Manager and Health and Safety coordinator of any new or site-specific risks.

- 
- Update the Health and Safety Database with any new risks that have come to light.
  - Follow advice from the Network Managers and Ricardo Energy & Environment Project Health and Safety Coordinator.
  - Ensure contact details for your organisation are up to date and sent to the Network Managers.
  - Other responsibilities as specifically identified in the QA/QC Unit contract.
  - Comply with health and safety laws and regulations (see <http://www.hse.gov.uk>).

## 4 Cascade Procedure

In the event of a substantial risk being identified at any site, the person identifying the risk should immediately enter the information into the Health and Safety Database using the online risk assessment form. (You can do this either by adding a new risk assessment form, or by adding a new risk to an existing risk assessment). If the level of risk is 'Substantial' or 'Intolerable' (see section 11), the Database will immediately generate a warning email message to all stakeholders who have included the site in their 'My Sites' list. This is therefore the quickest way to start the cascade process, for all risks, even short-term ones such as a leaking roof or electrical fault.

You should also contact your Network Manager, who will make sure the cascade process has been started and that all stakeholders are notified. The Network Manager is responsible for advising the course of action and keeping stakeholders updated until the issue is resolved. The full cascade procedure is illustrated in Figure 1. Contact details may be found in section 13.

If for any reason you are unable to initiate the cascade procedure by entering the risk into the Health and Safety Database, contact your Network Manager and ask them to do this. If unable to contact them, the issue should be reported to the Ricardo Energy & Environment project Health and Safety Coordinator at [AQSafety@ricardo.com](mailto:AQSafety@ricardo.com). If this is the case, please let them know you have not been able to enter the risk into the Health and Safety Database.

**In the event of an accident or incident, local site procedures apply** – you should leave the air quality monitoring site immediately, and contact the emergency services if necessary before cascading this information to the Ricardo Energy & Environment project H&S coordinator and Network Manager.

### Notes:

- It is assumed that at AURN sites, the CMCU will take responsibility for contacting the site owner. At all non-AURN sites the lead network manager for the site will contact the site owner.
- Defra/the EA shall include the Devolved Administrations where relevant to monitoring stations (i.e. in their country and in lessons learned).
- The Ricardo Energy & Environment project H&S coordinator will ensure that the gas suppliers are informed as necessary about restrictions on site access/issues, if this has not already been done via the H&S Database.
- 'Relevant network' managers means network managers who have co-located instrumentation at that site. All network managers are to be included in 'lessons learned' emails. To contact the relevant network manager – please co-ordinate via the Environment Agency contact links in section 13.



**Figure 1 Cascade Procedure for Communication of high risks and issues**

Health and Safety Cascade for Defra Monitoring Networks					
Step 1: Person Identifying Risk or Issue:	LSO	ESU or QA/QC Unit	H&S Coordinator (Ricardo)	Network Manager	Site/land Owner
Personnel in Step 1 identifying the issue are required to contact all the personnel opposite.	Their network Manager H&S coordinator (Ricardo)	Their network Manager H&S coordinator (Ricardo)	All relevant network managers Defra	H&S coordinator (Ricardo) Defra/EA Their ESU Their LSO Site/land owner	Their Network Manager H&S coordinator (Ricardo)
	↓	↓	↓	↓	↓
Step 2 Cascade 1:	H&S coordinator (Ricardo)	H&S coordinator (Ricardo)	Network Managers	H&S coordinator (Ricardo)	H&S coordinator (Ricardo)
Personnel in step 2 required to contact the personnel opposite	Any other relevant network managers Defra	Any other relevant network managers Defra	Site/land owner Their ESU and QA/QC Their LSO	Any other relevant network managers	Any other relevant network managers Defra
	↓	↓		↓	↓
Step 3 Cascade 2:	Network Managers	Network Managers		Other Network Managers	Network Managers
Personnel in Step 3 required to contact the personnel opposite.	Site/land owner Their ESUs and QA/QC Their LSOs	Site/land owner Their LSOs Their ESUs and QA/QC		Their ESUs and QA/QC Their LSOs Site/land Owner if not already contacted.	Their ESUs and QA/QC Their LSOs
Step 4: Network Manager to provide updates on the issue and confirmation that issue has been resolved to be circulated by email to all parties including lessons learned. Ricardo Energy & Environment as H&S coordinator to ensure this step is taken.					

## 5 Health and Safety Legislation

### 5.1 Health and Safety at Work Act 1974

Many core health and safety requirements flow from the Health and Safety at Work Act 1974 which places responsibilities on both employers and employees.

#### 5.1.1 Employer Duties

Section 2 of the Act places the following duties on employers:

"It shall be the duty of every employer to ensure, so far as is **reasonably practicable**, the health, safety and welfare at work of all his /her employees" and in particular, that such a duty extends to:

- Provision and maintenance of plant and systems of work that are, so far as is reasonably practicable, safe and without risks to health;
- Arrangements for ensuring, so far as is reasonably practicable, safety and absence of risks to health in connection with the use, handling, storage and transport of articles and substances;
- Provision of such information, instruction, training and supervision as is necessary to ensure, so far as is reasonably practicable, the health and safety at work of his employees;
- So far as is reasonably practicable as regards any place of work under the employer's control, the maintenance of it in a condition that is safe and without risks to health and the provision and maintenance of means of access to and egress from it that are safe and without such risks;
- Provision and maintenance of a working environment for his employees that is, so far as is reasonably practicable, safe, without risks to health, and adequate as regards facilities and arrangements for their welfare at work. This means that the premises, and the means of entry and exit, must be, as far as reasonably practicable, safe and without risks to health.

#### 5.1.2 Employee Duties

Under section 7 of the Act all employees have a duty while at work to:

- Take reasonable care for the health and safety of him/herself and of other persons who may be affected by his/her acts or omissions at work; and
- Co-operate with employers or other persons so far as is necessary to enable them to perform their duties or requirements under the Act.

#### 5.1.3 Other Sections

Other sections of the Act clarify that the duties of all employers (and self-employed persons) extends to ensuring, as far as is reasonably practicable, the safety of persons other than employees, for example, contractors, visitors, the general public and clients.

Employers must also prepare and keep under review a safety policy and to bring it to the attention of their employees (s.2(2)). Trade unions may appoint safety representatives and demand safety committees. The representatives have a right to be consulted on safety issues (ss.2(4), (6) and (7)). Since 1996, employers have had a duty to consult all employees on safety matters. No employer may charge an employee for provision of health and safety arrangements (s.9).

### 5.2 Use of Risk Assessments

Defra and the Environment Agency require all contractors to use a risk assessment approach to all work to identify the applicable health and safety risks for each project, to prioritise those risks, and identify the means of eliminating or managing those risks. More information on risk assessments is given in section 11 of the current document.

## 5.3 Keeping up to date

Ricardo Energy & Environment recommends that all organisations involved in air quality monitoring review the current health and safety legislation at least annually and update their documented health and safety procedures to ensure these regulations are adhered to and are adequately and clearly explained to all employees.

It is good practice for all organisations to produce and regularly review procedures covering such health and safety legislation.

A list of known relevant legislation is included in Appendix 1.

## 5.4 More Information

More information about health and safety legislation produced by the Health and Safety Executive is available at <http://www.hse.gov.uk>.

# 6 Specification for Electrical Safety Testing

Electrical safety at monitoring stations is covered under two separate requirements; the need for the fixed electrical circuit to be tested for integrity and safe operation, and Portable Appliance Testing of all (non-fixed) electrical equipment.

Fixed circuit electrical testing is a requirement under the Electricity at Work Regulations 1989 (EaWR) with the testing regime described in IEE Wiring Regulations 17<sup>th</sup> Edition (BS7671:2008). The recommended frequency of testing for installations such as those used for air quality monitoring stations is five (5) years. EaWR states:-

- All systems shall at all times be of such construction as to prevent, so far as is reasonably practicable, danger.
- All systems shall be maintained so as to prevent, so far as is reasonable practicable, such danger.
- Every working activity ... shall be carried out in such a manner as not to give rise, so far as is reasonably practicable, to danger.
- Any equipment provided under these . Regulations for the purpose of protecting persons at work on or near electrical equipment shall be suitable for the use which it is provided.

The Health and Safety Executive (HSE) recommends that to comply with the regulations, an inspection and testing programme should be undertaken at all places of work. Periodic inspection and testing (5-yearly for fixed circuits and annually for portable appliances) is necessary because all electrical installations deteriorate due to a number of factors such as damage, wear, tear, corrosion, excessive electrical loading, ageing and environmental influences.

The 'Inspection and Testing of In-Service Electrical equipment' (usually referred to as Portable Appliance Testing or PAT), was introduced to comply with the Electricity at Work Regulations 1989 (EaWR).

The Health and Safety at Work Act 1974 puts the duty of care upon 'duty holders' which applies to both the employer and the employee to ensure the safety of all persons using the premises. Provision and Use of Work Equipment Regulations 1998 states that every employer shall ensure that 'the result of an inspection made under the regulation is recorded and kept until the next inspection'. The combination of these regulations applies to all electrical equipment used in, or associated with, places of work.

The IEE Code of Practice gives guidance on the various equipment types, which includes portable appliances, transportable equipment (moveable), hand held equipment, stationary equipment or IT equipment, fundamentally all electrical equipment that is not part of the fixed electrical circuit. Electrical testing of portable equipment will involve earth bond continuity tests, insulation resistance testing and functional checks.

Guidance is available on the frequency at which the tests shall be performed. For equipment used in EA/Defra and Devolved Administration monitoring stations, the maximum recommended period between tests has been set at 12 months.

## 7 Fire Extinguisher Policy

If you discover a fire at a monitoring site you must evacuate the site as quickly as possible and keep a safe distance away while you alert the emergency services and local residents (if there is any risk that the fire or smoke might spread to neighbouring buildings where people are present).

You should only tackle a fire **if you feel it is safe to do so, or a fire hinders your exit.**

Fire extinguishers should be provided at monitoring sites as follows:

- CO<sub>2</sub> extinguishers at all enclosed structures.
- CO<sub>2</sub> extinguishers at all other sites which have the potential to cause adjacent structures or nearby premises to set alight.
- There is no requirement for extinguishers to be installed in remote locations. Remote locations are places that could be defined as being far from any centre of population and with no other structures in close proximity.

## 8 Working at Height

The PM<sub>10</sub> and PM<sub>2.5</sub> monitoring instruments used in the AURN have inlets which require periodic cleaning. The LSO will usually need to use steps or a ladder to access the inlet for this purpose. This work is covered by the Work at Height Regulations 2005. ('At Height' is defined as a place where a person could be injured falling from it, even if it is at, or below, ground level.)

The information below is adapted from the AURN Health and Safety Bulletin on working at height, available on the AURN Hub and the Health and Safety Database.

The hierarchy below is used for managing and selecting equipment for working at height:

- AVOID working at height where possible.
- PREVENT falls using appropriate access equipment.
- REDUCE the impact. Where equipment or other measures cannot eliminate the risk of a fall, use appropriate equipment to minimise the distance and consequences of a fall should one occur.

Ladders should be used only in the following situations:

- Work duration is a maximum of 30 minutes
- Work is 'light' carrying no more than 10 kg up the ladder
- Where three points of contact can be maintained at the working position – where this is not possible other measures will be required to prevent a fall or reduce the consequences of one.

### 8.1 Ladder Safety

The following guidance should be followed when using a ladder:

- 
- Do not overreach – your navel should remain inside the stiles and both feet should be on the same rung
  - Don't overload it – consider workers' weight and the equipment or materials they are carrying.
  - Avoid holding items when climbing – Consider using a tool belt or other means of securing items
  - Do not use the top three rungs of the ladder
  - Ladders being used to access the roof of the cabin should be 1m above the landing point of the roof and should be secured. Make sure the ladder is long enough and high enough to reach.
  - Only use a ladder on firm ground, where the ground is not firm use a board to spread the load. Ensure the ladder rungs are level before stepping onto the ladder.
  - Always grip the ladder and face the ladder rungs while climbing or descending.
  - Ensure the surface the ladder is placed on is clean (no oil, moss or leaf litter) and free of loose material (sand, packing material) for the ladder feet to grip.
  - Secure the ladder
    - either through fixing the ladder to a suitable point (such as ladder restraints at the top of the housing)
    - or using appropriate ladder stability devices (such as the telestep stability arms)
  - If none of the above can be achieved then the ladder should be 'footed' by another person – this should be a last resort and should be avoided where possible.
  - Ensure that the ladder will not be pushed over by opening doors or pedestrians, or cause obstruction to pedestrians.
  - Ladders should be placed at the correct angle of 75° - 1 unit out for every 4 units up.
  - Do not rest ladders against weak surfaces such as glazing or plastic gutters.
  - Never attempt to dismantle or repair a ladder.
  - Keep the ladders at site clean. Following use, wipe with a dry cloth and remove contaminants.
  - Prior to using a ladder at any AURN site, the individual must ensure that they have received training appropriate to the task and equipment use from their employer. If requested to use a ladder without having received the appropriate training from your employer, please notify CMCU and do not undertake the work until training has been provided.
  - Any new ladder supplied by CMCU must conform to BS EN 131 and will be issued with a set of manufacturer user instructions. Prior to use the individual must read the instructions.
  - If issued with a new ladder from CMCU then you must inspect it before first use. Record the inspection of the new ladder using the **Ladder Pre-use Inspection Checklist** which should be kept on site and completed by the user prior to use. The QAQC team will audit ladder records to check the ladder check lists are available and being used when visiting AURN sites.
  - Prior to each use the individual is required to complete a dynamic 'take two' risk assessment (see section 3.2 above) which includes the completion of the Ladder Pre-use Inspection Checklist. Should the Take Two assessment identify an unsafe condition then the individual should **stop work** and report the condition to their employer and CMCU.
  - In addition, if during use the ladder is dropped or an event happens which may impact the ladder working safely then a further pre-use check must be completed. If any damage is found or the ladder is not working correctly then do not use it and report to CMCU.

A detailed visual inspection is completed every 6 months on all fully funded site ladders by the Equipment Support Unit and records of the inspections are held by CMCU. In addition, a ladder tag is installed on each ladder confirming when the next inspection is due. Should an individual notice that a ladder tag is missing then notify CMCU prior to use.

### 8.1.1 Additional Note on Telescopic Ladders

- Refer to manufacturer user instructions prior to use, if not available then contact CMCU.
- Always check that all opened rung sections are locked before you climb the ladder – checking all locking catches.
- Do not put your hands on or between the rungs when you are unlocking and closing the ladder. Close each rung section carefully.
- The ladder must be wiped clean including removing any moisture before being closed.
- Ensure that the ladders are stored completely closed.
- The ladder must not be used without the rubber feet and end caps in place.

The Health and Safety Executive (HSE) has published guidance on safe use of ladders which is available online at <http://www.hse.gov.uk/pubns/indg455.pdf>.

## 8.2 Working on the Cabin Roof

In the majority of cases there will be no need to access the cabin roof: all work can be done from a ladder. At a small number of AURN sites (London Marylebone Road, Manchester Piccadilly, Liverpool Speke, Chilbolton Observatory and Southend on Sea at the time of writing), work on the cabin roof is sometimes required. These sites have one or both of the following (as necessary) in place:

- Guard rails to prevent falls from the roof. These must fully meet the requirements of the Work at Height Regulations which include a main guard rail 950mm above the roof surface, one or more lower intermediate guard rails positioned so that there are no gaps greater than 470mm, and some means of preventing a person or objects falling under the lowest guard rail.
- A fall prevention system to prevent falls off the roof or from the ladder. This must be in good condition, tested annually. (At Chilbolton there is a fall arrest system which potentially leaves the person hanging in the event of a fall: procedures are in place for rescue should this happen. Lone working on the roof at this site is not permitted).

For all sites where roof access is required, site-specific procedures are in place and must be observed. Please contact the lead network manager for further information.

Getting on and off the roof is a major area of risk –ensure the ladder is secured. Be mindful of the roof becoming fragile over time: check the roof surface is safe before stepping on it.

## 8.3 Points to Consider:

- **Weather** - review undertaking work at height in weather conditions such as strong or gusty winds or slippery conditions (ice, snow, rain). Should the weather conditions endanger health or safety then the work should be postponed.
- **Inspection** - before undertaking any work at height the equipment to be used and the surfaces should have a visual inspection to check for visible defects such as missing or loose parts.
- **Maintenance** - ensure ladders are kept clean, particularly the feet to ensure good contact with the ground.
- **Falling Objects** –When undertaking work at height it is necessary to do all that is reasonably practicable to prevent anything from falling.

- **PPE** - ensure correct footwear is worn whilst on site such as safety shoes or boots. The laces should be tied. Shoes should be clean and free from mud or other slippery contaminants.
- **Emergency Rescue** - consideration should be given to emergency rescue should there be an incident.

## 9 Visitors to Monitoring Stations

Sometimes, people other than those listed in section 3 may need to visit a monitoring station. For example, visiting researchers from universities or other organisations. This section provides guidance on precautions that should be taken to ensure these visitors stay safe.

The risks depend on the nature of the visit, and here we consider three common scenarios.

1. **Informative visits.** These are occasions when a guest – e.g. a journalist, visiting dignitary or job applicant - is being shown around a monitoring station (indoors or outdoors), on a one-off visit, for informative purposes only. They are not undertaking any work at the site. A responsible person familiar with the hazards at the site (this could be e.g. the network manager, site owner, LSO or ESU) must 'host' the visit and:
  - carry out a risk assessment for the visit.
  - Provide any necessary PPE such as safety glasses and a high visibility vest.
  - Take reasonable precautions such as making sure the site is tidy and free from trip hazards.
  - Brief the visitor on necessary safety precautions to be observed.
  - Accompany the visitor at all times while at the monitoring station.
2. **Visiting researchers – outdoors.** These visitors are carrying out scientific work but this will not require them to enter the monitoring station or have any access to the monitoring instruments. Examples include the co-location of diffusion tubes or other samplers. All samplers are fixed to the inlet cage with temporary fixings e.g. cable ties, and no modification to the enclosure would be needed. The visitor may need to use steps or a ladder but would not need to go onto the roof. Recommended minimum precautions are as follows:
  - The visiting researcher must get permission from the network manager and site owner, providing an overview of the proposed research, what it will involve, how many visits they expect to make to the site and over what period.
  - The visiting researcher must provide a suitable risk assessment for the work. The network manager should satisfy themselves that the risk assessment is adequate for the purpose and all necessary information is captured.
  - A responsible person (the network manager, site owner or regular LSO as appropriate) must make sure the visiting researcher is advised of the hazards at the site.
  - The visitor should observe any necessary safety precautions advised by the responsible person.
  - The visitor must notify the responsible person in advance of each visit.
  - The visitor is responsible for checking the safety of any ladder or steps they bring to the site.
  - The visitor must carry a charged mobile phone with them to the site.
  - The visitor must let a 'buddy' know that they are going to the site, and how long they expect to be there. They should let their 'buddy' know when the work is completed and they are leaving the site.

- If the visitor notices any unusual risks they must report these to the site owner.

**Visiting researchers – indoors.** Rarely, a visiting researcher may need to carry out work within the monitoring station enclosure. For example, trialling a new type of automatic measurement technique by co-location with the reference method.

Because the visitor is going inside the enclosure, the risks are greater, due to the presence of electrical equipment, compressed gases etc. in a confined space. The risk assessment should reflect this.

The permission of Defra, the DA or the Environment Agency must be obtained for work of this nature, as well as that of the network manager. Any modifications to the monitoring apparatus or enclosure also requires such permission. Studies of this type are usually substantial research projects, and the visiting researcher(s) would normally be working closely with the network manager and/or site owner, who may well be involved in planning the work.

All the precautions listed above for 'outdoor' visiting researchers apply. In addition;

- The Environment Agency, Defra or the DA (as appropriate), must give their permission for the work and be kept informed of progress.
- The network manager and site owner should be involved with the planning.
- A specific check must be made that the visiting researcher's planned activities will not interfere with the routine measurements at the monitoring station. (e.g. if butanol is used for particle sizing measurements, the fumes must have a protocol for capture/removal so that they do not interfere with any volatile organic compound - VOC - measurements)
- The visiting researcher must provide a separate risk assessment for their planned activities, which the site manager should review, approve and keep a copy of.
- All visiting researchers should have a site induction at the beginning of their schedule of visits.
- The network manager (or other designated responsible person e.g. the regular LSO) must ensure that the visiting researcher is fully briefed about the risks they will encounter.
- Visiting researchers working inside the cabin or building must always be accompanied by either the network manager, site owner or LSO while doing so.

Please note that in addition to the above, there may be site-specific requirements in place; for example, the need to sign in and out at some sites on secure premises. These must be adhered to. Please also note that the precautions relating to the presence of gas cylinders, in section 11 of this document, must be adhered to by visitors.

The managers of the Particle Numbers and Concentrations network have requested the following be adhered to:

- All *new* visitors should inform the lead network manager for the site and be accompanied by a trained site operative such as an LSO.
- All *repeat* visitors should inform the lead network manager for the site so a judgement can be made if an escort is required.



## 10 Instruments Containing Sources of Ionising Radiation

Two instruments used in the monitoring networks covered by this document contain sources of ionising radiation:

1. The Beta Attenuation Monitor, used in the AURN.
2. The Scanning Mobility Particle Sizer (SMPS), used in the Particle Numbers and Concentrations Network (PNCN).

All instruments containing such sources **must** have the appropriate Environment Agency or SEPA documentation, and copies **must** be made available to all authorised persons e.g. LSOs and ESUs. The appropriate warning signage **must** be present on the instrument and not be removed.

All instruments containing sources of ionising radiation **must** be kept in secure buildings or monitoring station enclosures. Depending on the type of source further security may be needed, for example regular 'presence checks' to ensure the instrument has not been stolen or removed. (Some SMPS instruments have a daily 'presence check'). Defra/the Environment Agency and the Network Manager must keep accurate and up to date records of exactly where each relevant instrument is.

### 10.1 The Beta Attenuation Monitor

The Beta Attenuation Monitor (BAM) is one of several instruments used in the AURN for monitoring ambient concentrations of PM<sub>10</sub> and PM<sub>2.5</sub> particulate matter. The BAM contains a small, sealed source of beta radiation (carbon 14, or <sup>14</sup>C). This is the source of the beta particles used in the measurement process.

Carbon 14 is a radioactive material and is therefore dangerous if it gets inside the body (if swallowed, inhaled or absorbed through the skin). That is not a risk here, because the source is sealed and safely contained inside the BAM. For this reason, you must not attempt to access, modify or remove the BAM's sealed beta source for any reason.

It has been found that, when the door of the BAM's case is open, a detectable amount of beta radiation may emerge from the BAM, through the slit between the tape and the source, probably having been scattered by the tape and the material on it.

Beta radiation consists of fast moving electrons. The beta radiation from <sup>14</sup>C is of relatively low energy; it cannot penetrate through the case of the BAM, can only travel around 22 cm through air, and – most importantly - cannot penetrate even the outer layer of your skin.

However, it is known that direct exposure of the lens of the eye to beta radiation can increase the risk of developing the eye condition of cataracts (where the lens becomes opaque). This is a known risk for people whose eyes are directly and frequently exposed to beta radiation (such as health professionals regularly carrying out certain medical imaging procedures), and there exists an occupational exposure limit specifically for the lens of the eye.

When carrying out BAM maintenance tasks such as nozzle cleaning or tape changing, the operator will have the door open and may have their eyes close to the tape slit. While it is currently our understanding that any risk is very small, (because of the low energy of the beta radiation, and because such tasks are infrequent and do not take long), as a precaution we are recommending that

safety glasses are worn when carrying out such tasks. Beta particles will not be able to pass through the plastic material they are made of.

Therefore, the following recommendations apply to Local Site Operators and others who carry out work on a BAM1020 that involves opening its door:

1. You are reminded never to attempt to access, modify or remove the BAM's sealed beta source for any reason.
2. It is recommended to wear safety glasses when working on the BAM 1020 with its door open. As well as offering more than adequate protection for the extremely small risk of any long-term eye damage from exposure to radiation the beta source, this will also minimise any other risk of eye injury from other maintenance activities such as cleaning nozzles.

Safety glasses are already provided at all AURN monitoring stations that have BAMs (because they are necessary for other work at the sites). *BAMs are a safe method of measuring particulate matter and the above is an additional safety recommendation from Radiation Protection Advisors in the UK.* QAQC Unit (in their role as Health and Safety Co-ordinator) would be happy to answer any questions or concerns you may have.

For work with one BAM unit, the Ionising Radiation Regulations 2017 (IRR 17) regulations do not apply. If working with more than five units, the radiation source limit on five units qualifies under the IRR 17 Regulations. The Environment Agency's Radiation Protection Advisor (RPA) has provided the following advice for AURN stakeholders to follow, given considerations from the HSE as to how the IRR 2017 regulations apply to the AURN network:

1. As the owner of the instruments, the Environment Agency should provide some information from their RPA about the device and how to handle it safely, with advice about what to do should it get broken. This information should be passed to the subsequent sub-contractors so that they too are aware of the hazard. This information should be passed onto subsequent 'second tier' sub-contractors.

**If you deal with a BAM and have not had safety training, then please contact your CMCU to arrange this.**

2. If five or more devices, at activity 2.2 MBq per device (5 x 2.2 MBq >10 MBq Sch7 Part 1, col 3, value in total) are in storage and within the control of the CMCU, then the CMCU should provide the **Notification** (and **Register** as each source is calculated as being over the activity concentration  $10^4$  Bq/g (Given: activity is 2.2MBq with assumption that source mass is <220 g).

This has been done by each Management Unit and it is the Management Units' responsibility to keep this up to date.

All employers/subcontractors involved with work involving the AURN BAMs are required to register and comply with IRR17 regulations. However, this excludes the Environment Agency, because although in most cases they own the BAMs, they do not actually work with them.

3. 'Second tier' subcontractors who work with BAM's can work with work under the advice from the primary sub-contractor if this is contractually agreed.

## 10.2 The Scanning Mobility Particle Sizer

The SMPS is used by the Particle Numbers and Concentrations Network (PNCN). At the time of writing, the SMPS is present at only three sites in this network: Chilbolton Observatory, London Marylebone Road and London Honor Oak Park. (All three sites are also part of the AURN and some other networks).

The risk to anyone entering the monitoring station but not directly dealing with the SMPS instrument is negligible, and no additional precautions are required.

If the SMPS instruments need to be accessed by anyone other than the PNCN managers or trained LSOs then NPL should be contacted (using the contact details provided to LSOs etc.) for source and permit information.

There is an Environment Agency permit in place for these instruments due to the Radiation Source in the instrument; the IRR 2017 regulations also apply, so it is important that the PNCN Network Manager (currently NPL) is notified before attending to the instrument, and that the site rules put in place to comply with the Permit and IRR 2017 regulations are followed.

## 11 Regulators and Gas Cylinders in the AURN

The use of the regulators and gas cylinders in the AURN are managed by the relevant CMCUs, the QAQC team and the Standard Gases contractor to minimise risks, with relevant guidance within the LSO manual for safe practice.

Gas regulators are replaced or refurbished every five years as per the British Compressed Gases Association (BCGA) guidance.

To enhance the training and formalise regulator inspection, a "Written Scheme of Inspection" for EA-owned regulators and their use is under consideration.

The nitric oxide (NO) gas cylinders used at AURN sites for calibrating NO<sub>x</sub> analysers, and the VOC calibration cylinders at the Automatic Hydrocarbon Network sites, contain small concentrations of the relevant gas (e.g. NO), with the remainder ('balance') of the cylinder contents being nitrogen. Cylinders containing this type of gas mixture are called 'nitrogen balance' cylinders. In the very unlikely event that a nitrogen balance cylinder releases its contents in the confined space of an AURN enclosure, this could result in dangerously low oxygen levels in the enclosure. For anyone working in, or entering, the enclosure under these conditions, it could result in death from asphyxiation (lack of oxygen).

It is emphasised that this is a very low risk. However, given the severity of the consequences, (i.e. potential for fatality) the following updated instructions have been issued to LSOs, ESUs and others carrying out work in the enclosures of AURN monitoring stations, or in rooms where the gas cylinders are housed. These apply to all AURN monitoring stations where this risk exists (i.e. where it is possible to walk into the enclosure/room and where nitrogen balance cylinders are present), and to all visitors.

### Until further notice:

- An asphyxiation warning sign must be displayed on the outside of the enclosure.

- When entering an AURN monitoring station with a walk-in enclosure, all users should leave two minutes from opening the door to entering, to ventilate the area and minimise any risk of oxygen depletion.
- After two minutes, enter the cabin: but whilst undertaking work within the cabin, the door must be left fully open as sufficient ventilation is required in case of a release of nitrogen balance gas from gas cylinders stored within the cabin. If the door is going to be closed the user must have sufficient ventilation or risk management via other means, to mitigate the risk of creating a confined space within the air quality cabin.
- If the gases are stored in a gas cylinder store area, this gas cylinder store door should be left fully open instead, as the cabin and gas store area are linked air spaces.
- **If any symptoms such as nausea, shortness of breath or higher heart rate occur or any sound of gas escaping is heard, then all users should vacate the cabin as quickly as possible, even if the door is open.**
- Based upon advice from BOC (the AURN gas supply contractor) who have examined the risk further, they have made the recommendation for employers to consider: *“Personal oxygen monitors should be part of the personal protective equipment (PPE) for any employee planning on entering or working in the cabins.”*

At the time of writing (February 2020), the Environment Agency and the AURN Management Unit contractors are undertaking a review of walk-in cabins, to assess whether there is sufficient ventilation to mitigate this risk. However, this is not straightforward, due to variations in cabin configuration, ventilation rates, volume of equipment inside, etc. So, although the ‘two minutes’ procedure above is based on current Agency practice, it has not been possible to conclusively demonstrate that this is always sufficient to mitigate the risk.

Therefore, we are including BOC’s additional recommendation here. AURN site users and their employers should consider if personal oxygen alarms are required, to be sure there is no depleted oxygen atmosphere in a ‘walk in’ cabin upon entry or during work.

The Environment Agency and the AURN’s Management Units make no recommendation for any particular type of personal oxygen monitor.

## 12 Risk Assessments

Each monitoring station should have an up to date risk assessment that covers, in detail, all health and safety risks associated with the site. This risk assessment should be reviewed and updated at least annually. Risk assessments should include, but are not necessarily limited to the following:

- Fire hazards
- Lone working
- Driving and travel
- Slips, trips and falls
- Manual handling
- Use of electrical tools and equipment
- Use of gas cylinders
- Substances hazardous to health (COSHH)
- Site-specific risks (animals, water, machinery, personal safety etc)
- Weather.

Risk assessments are specific not only to the monitoring site but also to each organisation, dependent on the organisation’s equipment, staff, internal health and safety procedures, and responsibilities for work at the site. Therefore, each organisation should have a risk assessment for every site that they attend or manage.

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It is a good idea to use a standard monitoring site risk assessment as a starting point but the risks at each site will be different and therefore it is necessary to consider each site separately and generate a **site-specific risk assessment** for each site individually.

Risk assessments **must** be entered into the Health and Safety Database (using the online form). This is the route by which this information is stored and disseminated. This can be done quickly and easily by **any stakeholder with a user account**. (Changes to risk assessments will need approval by Network Managers). A separate risk assessment is required for each organisation visiting each site, although you may complete a single risk assessment for multiple sites if the risks are the same at each site.

An example risk assessment is given in Figure 2. This is neither exhaustive nor tailored to the individual site. Any moderate or higher risks must be communicated to the Network Manager (see section 13) and the Ricardo Energy & Environment Project Health and Safety Coordinator – again, this is currently done via the Health and Safety Database.

The Health and Safety Database is the route by which all risks – even short-term ones – are to be recorded and cascaded. The online form makes it easy to add, edit and remove risks.

If you are at a monitoring site and discover a substantial or intolerable risk, leave the site immediately and report the risk in accordance with the cascade procedure in section 4.

**Figure 2 Risk Assessment Example**

Risk	Cause (these may not all be applicable)	Countermeasure in place (refer to PPE, protocols, training, routine checks, provision of first aid kits, emergency procedures, equipment safety checks, fire extinguishers etc)	Likelihood	Impact	Rating (likelihood x impact)	Extra actions required
Fire hazards/explosions	Gas cylinders, arson, presence of litter, faulty electrics					
Lone worker accidents	No access to mobile phone, certain medical conditions					
Accident during travel to/from site	Road traffic accident, driving when tired, during bad weather conditions					
Fall from height	Inappropriate ladder, no guard rail, slippery surface					
Slips and trips	Untidy site, trailing wires, spillages, inappropriate footwear					
Manual handling	Lack of training, moving heavy or bulky items, lack of equipment or PPE					
Electrical accident	Degradation of wires, incorrect wiring, ingress of water					
Working with hand tools	Lack of PPE or training, faulty, old or badly maintained equipment					

<b>Risk</b>	<b>Cause (these may not all be applicable)</b>	<b>Countermeasure in place (refer to PPE, protocols, training, routine checks, provision of first aid kits, emergency procedures, equipment safety checks, fire extinguishers etc)</b>	<b>Likelihood</b>	<b>Impact</b>	<b>Rating (likelihood x impact)</b>	<b>Extra actions required</b>
Personal safety/security	Theft and personal assault					
Accidents due to bad weather	Icy, wet or windy conditions					
Site specific risks	Presence of animals, watercourses, insanitary rubbish, presence of substances hazardous to health, leaky gas cylinders, asbestos, chemicals					
General health and safety	Tiredness, lack of concentration, noise, cramped site					
Unsafe structure of building	Damage by vandalism, falling trees, traffic accidents, weather, general degradation					
Risks to members of the public	Equipment left on pavement					
Oxygen depletion risk	Accidental venting of nitrogen balance gas cylinder causing low oxygen levels in monitoring station cabin.					

**Likelihood**

- Highly Unlikely (1)
- Unlikely (2)
- Likely (3)

**Impact**

- Slightly Harmful (1)
- Harmful (2)
- Extremely Harmful (3)

**Rating**

- Trivial (1)
- Tolerable (2)
- Moderate (3)
- Moderate (4)
- Substantial (6)
- Intolerable (9)

## 13 The AURN Hub

The AURN Hub is a password protected area which also contains practical information for organisations who are directly involved in the operation of the Automatic Urban and Rural Network - the Central Management and Control Unit, Quality Assurance and Quality Control Unit, Equipment Support Units, Gas Supplier and Local Site Operators. The site contains Network team contact details, audit and service schedules, news and information, including reports and the LSO manual for the AURN.

The login page of the AURN Hub is at <https://aurnhub.defra.gov.uk/login.php> . If you are involved in the operation of the AURN, you should be given login details.

Users of the AURN Hub will see that there is a link from the Hub to the Health and Safety Database. However, please note that –

1. The Health and Safety Database, and the AURN Hub, are two separate things with two different functions. The AURN Hub is used only by those involved in the AURN, while the H&S Database covers all Defra networks.
2. You will still need to log in to the Health and Safety Database (using your login name and password).
3. Your user name and password for the Health and Safety Database are different from those for the AURN Hub, so please remember to use the correct ones.
4. You do **not** need to log in to the AURN Hub in order to access the Health and Safety Database.

## 14 Contact Details

The Health and Safety Coordinator for the air quality monitoring networks covered by this document is Ricardo Energy & Environment.

Contact details for the Health and Safety Coordinator are as follows:

**H&S Coordinator**

[AQSafety@ricardo.com](mailto:AQSafety@ricardo.com)

**01235 753220**

Contact details for EA Air Quality Network Manager for escalation of Health and Safety concerns on your network and for co-ordinating with other EA Network Managers are as follows:

**EA Air Quality Inbox**

[AQmonitoringUK@environment-agency.gov.uk](mailto:AQmonitoringUK@environment-agency.gov.uk)

**EA Contracts Team Officer -  
September 2018**

[robj.jones@environment-agency.gov.uk](mailto:robj.jones@environment-agency.gov.uk)

**020 30253096**



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## Appendix 1: Health and Safety Legislation

This section lists the most important health and safety legislation which is relevant to work at air quality monitoring stations, with links to where this can be found online (at the time of writing).

- **The Health and Safety at Work etc. Act 1974:** available online at <http://www.legislation.gov.uk/ukpga/1974/37/introduction>. Further guidance is provided by the Health and Safety Executive (HSE) website: the relevant page is at <http://www.hse.gov.uk/legislation/hswa.htm>.
- **The Health and Safety (First-Aid) Regulations 1981:** available online at <http://www.legislation.gov.uk/uksi/1981/917/introduction/made>. The Health and Safety Executive (HSE) website provides an overview of these Regulations at <http://www.hse.gov.uk/pubns/books/l74.htm>.
- **Electricity at Work Regulations 1989 (EaWR):** available online at <http://www.legislation.gov.uk/uksi/1989/635/introduction/made>. The HSE provides an overview at <http://www.hse.gov.uk/pubns/books/hsr25.htm>.
- **Manual Handling Operations Regulations 1992** as amended by the **Health and Safety (Miscellaneous Amendments) Regulations 2002:** the 1992 Regulations are available at <http://www.legislation.gov.uk/uksi/1992/2793/introduction/made>, and the 2002 Amendment document at <http://www.legislation.gov.uk/uksi/2002/2174/introduction/made>. The HSE provides a free guidance document (aimed primarily at employers, managers and safety representatives), downloadable from <http://www.hse.gov.uk/pubns/books/l23.htm>.
- **Provision and Use of Work Equipment Regulations 1998:** available online at <http://www.legislation.gov.uk/uksi/1998/2306/introduction/made>, with HSE guidance at <http://www.hse.gov.uk/work-equipment-machinery/puwer.htm>.
- **Management of Health & Safety at Work Regulations 1999:** available online at <http://www.legislation.gov.uk/uksi/1999/3242/introduction/made>.
- **Pressure Systems Safety Regulations 2000:** available online at <http://www.legislation.gov.uk/uksi/2000/128/introduction/made>, with HSE guidance available at <http://www.hse.gov.uk/pressure-systems/law.htm>.
- **Pressure Equipment Directive (Directive 97/23/EC) (PED):** available online at <https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CONSLEG:1997L0023:20031120:en:PDF>.
- **Control of Substances Hazardous to Health Regulations 2002 (COSHH):** available online at <http://www.legislation.gov.uk/uksi/2002/2677/introduction/made>. The HSE website provides online guidance on COSHH, at <http://www.hse.gov.uk/coshh/index.htm>.
- **Work at Height Regulations 2005:** available online at <http://www.legislation.gov.uk/uksi/2005/735/introduction/made>. The HSE website provides online guidance at <http://www.hse.gov.uk/work-at-height/the-law.htm>.

- **Regulatory Reform (Fire Safety) Order 2005:** this is applicable in England and Wales, and available online at <http://www.legislation.gov.uk/uksi/2005/1541/introduction/made>. The HSE website provides online guidance on fire safety in general, at <http://www.hse.gov.uk/toolbox/fire.htm>.
- **The Fire (Scotland) Act 2005:** available online at <http://www.legislation.gov.uk/asp/2005/5/introduction> - applicable in Scotland.
- **The Ionizing Radiation Regulations 2017:** available online at <https://www.legislation.gov.uk/uksi/2017/1075/introduction/made> with guidance on the HSE website at <http://www.hse.gov.uk/radiation/ionising/legalbase.htm>.



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