



Environmental Protection Agency  
Office of Environmental Enforcement (OEE)

Guidance Note on Site Safety Requirements for Air  
Emissions Monitoring (AG1)

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## Preface

The Office of Environmental Enforcement (OEE) is one of the four offices in the Environmental Protection Agency. The OEE's functions include the regulation of activities licensed under the EPA and WMA Acts. It is the policy of the OEE to provide information and advice via published guidance to those it regulates to secure environmental improvements while ensuring value for money.

This *Guidance Note on Site Safety Requirements for Air Emissions Monitoring (AG1)* is one of a series of guidance notes that the OEE has planned on the general theme of air pollution monitoring (stack testing). It describes the facilities and work practices that must be in place for the safe and effective monitoring of emissions. Other guidance notes in this series are listed below. They may be downloaded at <http://www.epa.ie>:

- Air Emissions Monitoring Guidance Note (AG2)
- Air Emissions Monitoring Guidance Note (AG2) – Summary (published), no web version available
- Air Guidance Note on the Implementation of I.S. EN 14181 (AG3)
- Air Dispersion Modeling from Industrial Installations Guidance Note (AG4)
- Air Guidance Note 5 (AG5) Odour Impact Assessment Guidance at EPA Licensed Facilities

This guidance note is intended for use by the licensed operator, the environmental monitoring service provider and Agency staff that have an involvement in air emissions monitoring. It provides guidance on:

- The selection of a suitable sampling location
- Access, facilities and services required
- Safety considerations

The Health and Safety aspects of stack testing must always receive priority. The importance of monitoring environmental emissions should never be placed ahead of the health and safety of personnel whose job it is to conduct the monitoring.

### Revision of this document

This guidance note may be the subject of periodic review and amendment. The most recent version of this note is available on the Agency website: <http://www.epa.ie>/ if you have any particular queries on this document then please contact Mr. Tony Dolan (t.dolan@epa.ie)

## 1 Introduction

A standard condition is included in all IPC and IPPC licenses which requires the licensee to provide safe and permanent access to all sampling and monitoring points. This document provides guidance on the sampling facilities, which the licensee should provide to permit the safe and effective measurement of their emissions to air. It focuses primarily on the provisions that the licensee is expected to have in place when the EPA or its contractors are carrying out monitoring at the licensee's site. However, these facilities will be of equal relevance to the licensee's own staff and its contractors under the self-monitoring arrangements

**Chapter 2** describes how the types of pollutants to be monitored will influence the required lay out of the sampling location and the design of sampling ports.

**Chapter 3** deals with access to the sampling location, the services that need to be present, the need for the host site to make staff available to assist with the monitoring activity and the importance of conducting a site review in advance.

**Chapter 4** provides an overview to Irish Health and Safety law. The various parties involved in the monitoring exercise have discrete legal responsibilities in relation to the health and safety.

**Chapter 5** describe some aspects of health and safety that are particularly relevant to stack testing. Links are provided to sources of training and further information.

**Chapter 6** deals with risk assessment which is a prerequisite of all emission monitoring activities.

**Chapter 7** provides information on the EPA independent monitoring programme, the powers of authorised persons and the arrangements that the licensee must have in place in anticipation of an unannounced Agency visit.

### 1.1 This Guidance note and I.S. EN 15259:2007

This document is a revision of the Agency's 2005 publication "*Guidance Note No. 1 Air Emissions Sampling Facilities*". The main focus of the revision was to add Health and Safety guidance to the earlier version, but the guidance relating to sampling facilities (e.g. selection of sample location, sample ports, etc) has remained largely unchanged. The Agency requires that all existing plant shall, as a minimum, conform to the criteria set out in this document.

The standard I.S. EN 15259:2007<sup>a</sup> is a recent publication by the National Standards Authority of Ireland (NSAI) that deals with some of the subjects addressed in this document. The standard does not address Health and Safety but it does represent current best practice on topics such as sampling location, sampling ports, representative sampling, etc. The importance of the standard will increase over time as it becomes cited as a reference in new and revised CEN standard methods for the measurement of air pollutants. The Agency require that all new plant and changes

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<sup>a</sup> The full title of this standard is; *I.S. EN 15259:2007 Air Quality – Measurement of stationary source emissions – Requirements for measurement sections and sites and for the measurement objective, plan and report*. The standard is intended to ensure reliable and comparable results when used in conjunction with reference methods such as those that have been developed by CEN/TC 264.

The standard is one of a group of three documents that were prepared by CEN/TC 264 Working Group 19 on the measurement of stationary source emissions. The other two documents deal with the elaboration of standardized methods and the application of EN ISO/EC 17025:2005 to periodic measurements. All three are available from the NSAI online service.

to existing plant that affect the facilities for Air Emissions monitoring must have regard to I.S. EN 15259:2007<sup>i</sup> in addition to this document. A number of footnotes have been included in this document where further reference to I.S. EN 15259:2007 is recommended.

## 2 Sampling Location and Sampling Ports

It is the responsibility of the licensee to examine their current IPPC licence and to identify the air emission parameters which require measurement at each emission point.

The choice of sampling location and sample ports will depend on the parameters to be measured. The parameters can be divided into three categories:

- Particulates (or dust)
- Volume flow (or stack gas velocity)
- General gaseous pollutants

### 2.1 Particulate measurement

The sampling of particulates from stack emissions, together with the measurement of the volume flow rate demands the most rigorous selection of sampling location. Accurate sampling of particulates requires that the waste gas flow is laminar (free from turbulence) and that the sample is collected isokinetically. The principle of isokinetic sampling is that a sharp-edged nozzle is positioned in the stack facing into the moving gas stream and a sample of the gas is extracted through it, at the same velocity as the gas in the stack, for a measured period of time. To allow for non-uniformity of particulate distribution, samples are taken at a pre-selected number of points across the sample plane. The probes used for collecting particulate samples, using isokinetic collection, require a larger size of sampling port than that which is needed for the collection of gaseous samples<sup>b</sup>.

The following steps should be followed when installing sampling ports in stacks which are licensed for particulates:

- Sampling ports must be downstream of any abatement equipment.
- The best available sampling plane must be chosen<sup>c</sup>. The sampling plane should be positioned in a length of straight duct of uniform cross section. This plane should be located at least 5 duct diameters downstream of the nearest obstruction and at least 2 duct diameters upstream of the nearest obstruction<sup>d</sup>. If the sampling plane is positioned in a stack which is discharging to the open air, the distance between the sampling plane and the stack top should be at least 5 duct diameters. Every effort should be made to locate the sampling ports away from sources of turbulence such as fans, duct bends and duct junctions. Where suitable sample planes exist in both vertical and horizontal sections of ductwork, the former should be chosen.
- Having established the best available sampling plane, the exact position of the sampling ports within that plane must be decided. For smaller ducts, a single sampling port may be all that is practicable, but generally the recommended number of sampling ports is for:

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<sup>b</sup> I.S. EN15259 section 6.2.2 now requires the same sample port consideration for both isokinetic and gaseous species

<sup>c</sup> The sampling plane is defined as the plane normal to the centreline of the duct at the sampling position.

<sup>d</sup> Refer to I.S. EN15259 section 6.2.1 for the most up to date requirement.



- Circular ducts of diameter  $\leq 1.5\text{m}$ ; two ports positioned on the same sample plane but separated by an angle of  $90^\circ$ .
- Circular ducts of diameter  $> 1.5\text{m}$ ; four ports positioned on the same sample plane and separated by an angle of  $90^\circ$ .
- Rectangular ducts; the number of ports will depend on the size of the duct (2 to 4 for most ducts) and the ports should be equally spaced.

Sampling ports should not be located in confined spaces where it could be difficult to manoeuvre sampling probes. Sampling platforms must be of sufficient size to accommodate equipment and sampling personnel (cf: 0)<sup>e</sup>.

The size and design of sampling ports for the monitoring of particulates depend on the sampling probe to be used and these can vary with equipment manufacturer. Generally speaking, the recommended design for a sampling port is a 4-5 inch BSP parallel-threaded socket which should be welded to the duct wall, (cf: APPENDIX B) <sup>f</sup>. Sampling ports should be properly capped when not in use.

## 2.2 Volumetric flow measurement

The determination of volume flow rate is achieved through the measurement of gas velocities within the duct. The method normally involves the insertion of a pitot tube into the gas stream and the measurement of differential pressure to indicate the gas velocity<sup>ii</sup>.

The sampling plane, like that for the sampling of particulates, must be positioned in a length of straight duct in which the flow profile is free from turbulence<sup>g</sup>.

The following requirements should be met when installing sample ports in stacks for which the licence has stipulated a maximum volume flow rate:

- Sample ports should be installed in similar positions and in equal numbers to those described for particulate sampling in the earlier chapter (cf: 2.1).
- The required size of the sampling port can vary depending on the pitot tube to be used, but in most cases a 15mm circular hole drilled directly into the duct wall will suffice. If a more serviceable fixture is desired, then a 1 to 1½ inch BSP parallel-threaded socket should be welded to the duct wall (cf: APPENDIX B).

If sampling ports are already installed for particulate sampling, then these ports can also be used for velocity measurement. However, there are practical advantages to installing velocity ports in addition to those provided for particulates. Velocity ports should also be capped when not in use.

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<sup>e</sup> Further guidance on the design of sampling platforms and the location of sampling ports can be found in the technical monitoring guidance note M1 published by the England and Wales Environment Agency.

<sup>f</sup> I.S. EN 15259 now recommended a 125 mm flange port (PM<sub>10</sub> monitoring), the following link provides port design details: <http://www.s-t-a.org/Files%20Public%20Area/MCERTS%20EA%20docs/Standard%20port.pdf>.

Where PM<sub>10</sub>/2.5 monitoring is required, there may be a minimum requirement for a 6-inch BSP port in order to gain access with the dual cyclone sampling head

<sup>g</sup> Section 8.3 of I.S. EN15259 has a procedure for determination of stratification within the duct.

## 2.3 Gaseous pollutant measurement

Gases, unlike particulates, are not subject to momentum forces when moving in a gas stream. The following requirements should be met when installing sampling ports in stacks which are licensed for gaseous pollutants:

- Sampling ports must be downstream of any abatement equipment.
- The composition of the gas should be homogeneous across the area of the sampling plane (i.e. the waste gas should be thoroughly mixed<sup>h</sup>).
- A single port is usually sufficient for the collection of gas samples.

The size of the sample port can be the same as that described for the velocity ports (cf: section 2.2). Gas sample ports should be provided in addition to velocity ports, and should also be capped when not in use<sup>i</sup>.

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<sup>h</sup> Section 8.3 of I.S. EN15259 has a procedure for determination of stratification within the duct.

<sup>i</sup> I.S. EN 15259 does not distinguish between the ports for gaseous and particulate measurement. All ports should be 125mm flanged opening and a number of ports are required to permit the segmented sampling across the sample plane, (i.e. as per isokinetic methods).

### 3 Access Facilities and Services

The monitoring of licensed emissions may be a planned event or, in the case of Agency independent monitoring, it may be unannounced. The licensee is responsible for ensuring that the necessary facilities are in place at all reasonable times.

Access to sample ports The following access requirements must be satisfied for all licensed stacks:

- Access must be via secure stairway, permanent ladder or gangway.
- A working platform which is adjacent to the sampling ports and provides adequate space for handling of equipment. The platform surface area must not be less than 5m<sup>2</sup> with a minimum width at any point of 2m and a minimum length in front of access ports of 2m or the length of the appropriately sized probe (including nozzles, suction/support tubes and associated filter holders) plus 1m, whichever is the greater.
- Open sides of platforms must be fitted with safety handrails and kickboards.
- The Health and Safety aspects of working at height are dealt with in later chapters.

Shelter and protection from the elements may be required at exposed sites (cf: section 3.1). Lifting apparatus may be required to raise sampling equipment to elevated locations (cf: section 5.4).

Some IPC facilities have continued to use cherry pickers and forklift trucks as a means of allowing air monitoring to be carried out on their site. While cherry pickers and forklift trucks may be used to transport/lift equipment into place, they are generally not acceptable for use as a sampling platform except for very limited scopes of monitoring.

#### 3.1 Sampling platform

Inspection of working platforms which are 2 meters high and used in construction is covered by Regulation 119 (1)(c) of S.I. No. 299 Safety, Health and Welfare at Work (General Application) Regulations 2007. A platform must not be used unless inspected within the previous 7 days. Regulation 119 (1)(a) is a more general clause that requires that work equipment used for work at height to be inspected, thus it applies to sampling platforms, scaffolding, ladders, work restraint systems and others. The regulations do not specify a period of inspection but section 119 (1) (b) require inspection at "suitable intervals" where work equipment is exposed to conditions causing deterioration which is liable to result in dangerous situation, or, "as soon as practical" in exceptional circumstances where safety might be jeopardised.

The manner of the inspection of sampling platforms should fulfil the necessary legal requirements. Those requirements relate to the competency of the person conducting the inspection<sup>i</sup>, the format of the inspection report and its retention at the site. The HSA provide a form for the inspection of work equipment (scaffolds, guard-rails, toe-boards, etc) which may be used to assist with compliance with Regulation 119. The form may be downloaded at:

[http://www.hsa.ie/eng/Publications\\_and\\_Forms/Forms/GA3\\_form.pdf](http://www.hsa.ie/eng/Publications_and_Forms/Forms/GA3_form.pdf)

In addition to routine inspections the platform must be considered when preparing the risk assessment and safety statement pursuant to sections 19 and 20 of the Act. Thus a prior to use examination of the platform must be completed by a competent person<sup>i</sup>.

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<sup>i</sup> The Safety and Welfare at Work Act 2005 defines a competent person: *For the purposes of the relevant statutory provisions, a person is deemed to be a competent person where, having regard to the task he or she is required to perform and taking account of the size or hazards (or both of them) of the undertaking or establishment in which he or she undertakes work, the person possesses sufficient training, experience and knowledge appropriate to the nature of the work to be undertaken.*

Regulation 107 of the regulations imposes additional requirements that relate to the use of scaffolding.

### 3.2 Shelter

Where the opportunity exists to site the sampling location indoors it should be taken. It protects the monitoring personnel and equipment from the elements and avoids postponement of the monitoring programme due to bad weather. It is often possible to meet the criteria for gaseous pollutant monitoring (cf: section 2.3 ) at an internal location and then to use a separate external location for monitoring particulate and volumetric flow (cf: section 2.1 and 2.2).

It is not acceptable for sampling locations to be sited in areas of excessive heat or poor ventilation.

### 3.3 Power supply

A 110V power supply should be provided at the point of monitoring. The normal 110V safety socket is rated at 16 amps. This may not provide enough power for stack sampling which can demand up to 100 amps depending on the amount of equipment and types of tests being undertaken.

Extension cables increase the risk of accident and can be easily snagged on moving parts.

External power points should be weather proofed. If a transformer is used to step down a 220v supply it must be located at the power point. Extension cables carrying 220v should never be used.

When using steel probes with electrostatic dust precipitators, technicians have frequently received electrostatic shocks. This is due to poor earthing of abatement equipment.

### 3.4 Stack identification

All licensed stacks should be clearly labeled at the sample port. Labels should be weatherproof and identify the emission point as per its designation in the licence.

For example:

<i>EPA licensed emission point</i>	
Emission point description:	_____
Emission point reference number (in-house):	_____
Emission point reference number (licence):	_____

Note: Where possible the in-house numbering system should be the same as that used in the licence.

### 3.5 Person in charge

It is a standard requirement of all IPPC licenses that a suitably qualified and experienced manager should be employed, who shall be designated as the person in charge of the facility. The person or a nominated, suitably qualified and experienced, deputy shall be present on the installation at all times during its operation or as otherwise required by the Agency.

In the context of the Agency's independent emissions monitoring programme the designated person must be available to receive and assist Agency staff or their authorised contractors during the course of the sampling/monitoring visit.

The designated staff member should be in a position to provide information related to the following:

- The conformance of the site with the requirements set out in this guidance note.
- Health and Safety procedures for visiting contractors. The site Safety Officer shall implement a specific programme to ensure that the risk associated with emissions

testing are as low as reasonably practical. The programme should include a suitable two way communications system between site personnel and monitoring personnel that will remain open throughout the duration of the visit and in the event of an incident or emergency, (e.g. mobile phone and/or walkie-talkies).

- Processes that are due to operate during the period of the site visit and likely changes that would affect the emission levels. Where a process is out of operation, the reasons its non-operation and its next scheduled date of operation.
- Abatement plant and any associated control equipment.
- Continuous monitoring equipment and relevant historical emission data.

The licensee must ensure that all relevant personnel are familiar with the terms and conditions of the company's IPC/IPPC licence.

Please note that any proposed changes to the location of a sampling point (including any changes to be made as a consequence of an IPC/IPPC licence condition) must be notified to the Agency in writing.

### **3.6 The site review**

The site review or reconnaissance visit is a commonly used tool in advance of the monitoring visit. It has many practical benefits for the contractor and the host site and may be undertaken in advance of a final costing being agreed. The process is used to confirm the scope of the monitoring work and to conduct a preliminary examination of all the monitoring locations on site. The participants should include experienced members of the monitoring organisation and preferably members of the monitoring team, the site environmental officer who is commissioning the work and the site safety representative.

The purpose of a site review is to:

- Allow the host site, the contractor (and in some cases the regulator) to agree the scope of the monitoring, the number of emissions points, the time and date of measurement, the duration of the measurement. The monitoring programme must be designed to ensure that it will meet the monitoring objectives.
- Resolve any Health & Safety (H&S) issues with the licensee. Where circumstances exist that would present an unacceptable risk to the contractor's staff when carrying out monitoring then the host site should effect the necessary improvements before work begins.
- Collect information on the sampling facilities i.e. sampling ports, sampling plane, essential services (e.g. electric supplies), working platform and access.
- Collect information on stack gas conditions and identify stacks that may require the use of non-standard measurement techniques.
- Collect information from the licensee regarding process and abatement details that could affect the emission levels and suitability of the measurement methods.
- Identify the licensee's process operating and self-monitoring information that is to be collected and reported at the time of carrying out the required measurements.

The site review process is covered extensively in I.S. EN 15259<sup>i</sup>.

## 4 Health and Safety Law

It is a condition of all IPPC licenses issued by the Agency that safe and permanent access is provided to all sampling and monitoring points. This condition has in the past and will continue to be the focus of inspector's site visits and audits and failure to comply will result in enforcement action.

If persons involved in stack testing at Agency licensed sites have any concerns regarding Health and Safety they should raise the matter with the company immediately, and if their concerns are not adequately addressed within a reasonable time-frame, then they should contact the Agency for assistance. The Agency will seek to enforce the appropriate condition of the licence to effect the necessary improvements.

The following sections give an overview of Irish Health and Safety law as it pertains to stack testing, the reader should consult directly with guidance issued by the Health and Safety regulator.

### 4.1 Irish H&S law generally

The [Health and Safety Authority](#) (HSA) is the national body in Ireland with responsibility for securing health and safety at work. It is a state-sponsored body, operating under the Safety, Health and Welfare at Work Act, 2005. The HSA provide a [Guide to the 2005 Act](#) on their web site together with many other useful publications.

The law requires that premises, equipment, systems of work and articles for use at work (including tools, chemicals, etc.) are all safe and without risk to health. Employers are responsible for creating and maintaining a safe and healthy workplace and employees (including full or part-time, permanent or temporary) must be consulted on any matters dealing with their health and safety in the workplace. The Health and Safety Authority monitors compliance with legislation at the workplace and can take enforcement action (including prosecutions).

### 4.2 Irish H&S law most relevant to stack testing

In a typical stack testing scenario, staff from a testing house will visit a licensed site by prior arrangement with the licensee to conduct sampling/measurement procedures, most often to fulfill the self monitoring conditions of an IPPC licence. Monitoring visits are also conducted by Agency staff or their contractors and these visits will generally be unannounced.

The duration of a monitoring visit can range from a few hours to a few days. During the visit the stack tester will transport, set up and operate monitoring equipment at designated emission locations (these locations are frequently at height).

Selected sections of the SH&W at work Act 2005 that are most relevant to this scenario are summarised in the following section which describes the legal responsibilities of the parties involved.

- The stack testing organisation (test house)
- The organisation on whose site the testing is being conducted (the licensee)
- The field staff conducting the tests

The following is a summary interpretation of selected sections of the Act, the reader should refer directly to the [SH&W at Work Act 2005](#) for full details. A comprehensive collection of Acts, Orders, Regulations and Codes of Practice, etc. can be obtained from the [Health and Safety Legislation](#) link on the HSA website.

### 4.3 General duties of stack testing organisation as an employer

**Section 8** of the SH&W at work Act requires the test house to ensure, so far as is reasonably practicable, the safety, health and welfare at work of all of its field staff. The general duties of the test house include (but are not limited to):



- the management and conduct of work activities
- providing safe systems of work
- providing adequate instruction, training and supervision
- preparing risk assessments and safety statements as required by Sections 19 and 20 of the Act that taking account of the general principles of prevention as required in Schedule 3 to the Act
- Provision and maintenance of suitable personal protective equipment where risks cannot be eliminated, or where such equipment is prescribed.

**Section 9** sets out the types of information on safety, health and welfare that are required to be given by the test house to its field staff.

**Section 10** sets out the specific requirements that compel the test house to provide instruction, training and supervision of field staff;

In assigning a field technician to a specific task, the test house must take account of his or her capabilities in relation to safety, health and welfare. Field staff must not be put at risk by being given work that they do not have the competence to undertake.

Training must be provided to employees on recruitment, in the event of transfer or change of task, and when new work equipment, systems of work, or new technology, is introduced.

**Section 12** requires the test house to manage and conduct their undertakings in a manner to ensure that other individuals at the place of work (not being his or her employees) are not exposed to risks.

**Section 18** sets out the requirement for the test house to appoint competent persons. In this context "competent person", could include a person who is able to give informed and appropriate general advice on health and safety to management as well as a person with specialised technical knowledge of matters such as, working at heights, electrical work, lifting operations, etc. The appointment of a competent person does not absolve the test house of its responsibilities under the legislation.

**Section 19** requires that the test house identify the hazards under its control at the host site, assess the risks from those hazards and have a written risk assessment of those risks as they apply to the test house employees and other individuals at that work location. When identifying hazards and carrying out a risk assessment, account should be taken of the general principles of prevention set out in **Schedule 3** to the **Act**.

**Section 21** requires the test house and the host organisation to co-operate in complying with and implementing health and safety provisions. The two parties must coordinate their preventive activities and keep each other informed about the risks arising from the work, including the exchange of safety statements or relevant extracts of them.

#### **4.4 General duties of field staff as employees**

**Section 13** The field technician has a duty under this section to co-operate with other duty holders (e.g. the licensee's safety representative, his/her own employer and other colleagues with whom they work). They must co-operate so far as is necessary to enable those persons to comply with the relevant statutory provisions. The general duties of field staff as individuals include (but are not limited to):

- take reasonable care to protect their own safety, health and welfare and that of any other person who may be affected by their acts or omissions at work,
- if reasonably required by their employer, submit to any appropriate, reasonable and proportionate tests, by or under the supervision of a registered medical practitioner, as may be required by Regulations,

- co-operate with their employer or any other person, as necessary, to assist that person in complying with safety and health legislation as appropriate,
- not engage in improper conduct or other behaviour such as violence, bullying or horseplay, which could endanger another person at work or themselves,
- taking account of the training and instructions given by the employer, correctly use any article or substance and protective clothing and equipment provided for use at work or for their protection.

The field technician is required to report to their employer, or other appropriate person, as soon as they become aware of any instance:

- where work being carried on, or likely to be carried on, in a manner which may endanger them or another person,
- of any defect in the place of work, the systems of work or in any article or substance likely to endanger them or another person, and
- a breach of safety and health legislation likely to endanger them or another person which comes to their attention.

**Section 14** prohibits any person from intentionally or recklessly interfering with, misusing or damaging any thing provided under safety and health legislation. For example the field staff has a responsibility to refrain from misusing personal protective equipment supplied to them or their colleagues.

#### **4.5 General duties of the licensee as a host site.**

**Section 12** sets out the duty that licensees have to test house field staff who are not their employees but who may be exposed to risks while visiting their site. The duties include (but are not limited to):

- Attending to visiting field staff in the event of an emergency situation at the site.
- Ensuring that field staff receive appropriate instruction in any risks associated with the site. Short induction presentations may be a suitable way of giving this information.
- Making an assessment of the competence of the visiting field staff. The licensee may decide to seek details of experience, training and competencies of the field staff prior to the site visit.

The licensee will characteristically retain a high degree of control over the field staff during the course of their visit (e.g. the use of permitting systems for hot work, enclosed spaces and work at height).

**Section 15** require the licensee to ensure, so far as is reasonably practicable, that the place of work, the means of access, or egress, and any article or substance provided for use in the place of work, are safe and without risk to health.

**Section 19** requires the licensee to conduct a risk assessment on the proposed activities of the visiting field staff. In so doing they should fulfill their statutory duty to persons other than their own employees (Sec. 12) and their duty as a person in control of a place of work (Sec. 15), to the extent that they are in control of a workspace occupied by the test house field staff.

**Section 21** requires the licensee and the test house to co-operate in their respective approaches to health and safety.

#### **4.6 Work at height regulations**

The statutory instrument which applies to work at heights is the Safety, Health and Welfare at Work (General Application) Regulations 2007 (S.I. No. 299 of 2007). They require an employer to ensure that work at height is properly planned, appropriately supervised and carried out in a manner that



is, so far as is reasonably practicable, safe and without risk to health. The regulations also indicate that work should not be carried out at height where it can practicably be carried out safely by other means.

The topics covered by the regulations include:

- Requirement for existing places of work and means of access or egress at height
- Requirements for guard rails, toe boards etc.
- Requirements for working platforms.
- Additional requirements for scaffolding.
- Requirements for collective safeguards for arresting falls.
- Requirements for personal fall protection systems.
- Additional requirements for work positioning systems.
- Additional requirements for rope access, fall arrest, work restraint systems, ladders.
- Inspection of work equipment (i.e. working platforms) cf: 3.1.

The reader should refer to [www.hsa.ie](http://www.hsa.ie) for further details on the regulations. The HSA publish a useful guide that sets out the key requirements for safe working at height and provides guidance on the main types of work equipment available for work at height<sup>iii</sup>.

## 5 Health and Safety for Stack Testing

This chapter introduces some aspects of Health and Safety that are particularly relevant to stack testing. Table 1 sets out some fundamentals rules.

Table 1 Stack testing health and safety

1	The importance of monitoring environmental emissions should never be placed ahead of the health and safety of personnel whose job it is to conduct the monitoring.
2	The provision of safe monitoring facilities should be an inherent part of the design, costing and construction of new emission points.
3	Existing stacks should be assessed for compliance with the requirements of this note and related health and safety guidance. Monitoring should not proceed until all parties are satisfied that the risks are low as reasonably practical
4	The time and support structures necessary to do the job safely must be factored when the stack testing contractor is costing the monitoring programme.
5	Should any person, stack tester, licensee or regulator, identify an unacceptable risk then monitoring should be immediately suspended pending an assessment by qualified personnel.
6	Inadequate safety provisions should be communicated immediately to the licensee and where necessary to the Agency. Communication with the Agency may be conducted anonymously.

### 5.1 Safe Pass Programme

The FÁS Safe Pass Health and Safety Awareness Training Programme is aimed at the construction industry but it has relevance for the stack testing community. The training course provides a basic knowledge of health and safety, so that contractors can work on-site without being a risk to themselves or others. Many industrial facilities have adopted Safe Pass as an integral part of their contractor safety programme and visiting staff are bound to hold a valid Safe Pass card before being admitted onto site. Safe Pass training covers the following topics:-

- The Reasons for Promoting Safety
- Health and Safety At Work Legislation
- Accident Reporting and Emergency Procedure
- Accident Prevention
- Health and Hygiene
- Manual Handling
- Working at Heights
- Working with Electricity, Underground and Overhead Services.
- Use of Hand Held Equipment and Tools

- Personal Protective Equipment
- Safe Use of Vehicles
- Noise and Vibrations
- Excavations and Confined Spaces

Details of training courses are available at [FÁS Ireland - Irish National Training and Employment Authority](#).

## 5.2 PAT testing

PAT testing or portable appliance testing is scheme for the in-service inspection and testing of portable electrical appliances. It has particular relevance to stack testing because a variety of electrically powered devices are used for sampling and on-site measurement. PAT involves a systematic and regular program of maintenance, inspection and testing. The Code of Practice for PAT testing<sup>iv</sup> and details of qualified electrical contractors who conduct this type of testing can be obtained from the Register of Electrical Contractors of Ireland whose web link is [www.reci.ie](http://www.reci.ie).

## 5.3 Compressed gases

Compressed gases are frequently brought to the test site for the calibration and fuelling of portable monitoring devices. Gas cylinders are safe only if used correctly and transported safely. Information on the transport of compressed gases by road can be obtained from the British Compressed Gases Association [www.bcgga.co.uk](http://www.bcgga.co.uk) and from the European Industrial Gases Association [www.eiga.be](http://www.eiga.be). The Source testing association has published a safety bulletin that deals with the hazards associated with the use of compressed gases during stack testing (cf: section 5.5).

## 5.4 Lifting

Lifting equipment to an elevated sampling location should only occur where there are safe systems for raising and lowering the load and the area below is adequately cordoned off. Safe systems will involve trained personnel and the use of motorised hoists (particularly above 25 meters) or jibs and pulleys at lower levels. The load should be lifted to a sufficient height (2 metres above waist level) such that equipment can be pulled onto the platform without having technicians stretching over platform rails. Lifting infrastructure must be subject to regular inspection by qualified personnel. The STA supply a kit comprising ropes, pulleys, snaphooks and other fittings that reduce the risk of the lifting operation. The hoisting by hand using general ware ropes is not best practice and should be avoided if possible.

Items of stack testing equipment are frequently heavy and awkward to carry so manual lifting presents another hazard to personnel. Manual handling training is covered as part of the Safe Pass programme (cf: 5.1) however more detailed training can be obtained from a number of training institutions that have courses which are dedicated to the topic.

## 5.5 The Source Testing Association

The Source Testing Association (STA) was set up in 1995 and has grown to a membership of over 210 companies, which include regulators, plant operators, equipment suppliers and stack testing companies from the UK, Ireland and other countries.

The STA has produced a Health and Safety Manual for stack testers that has become an industry standard. The manual is entitled *Risk Assessment Guide: Industrial-Emission Monitoring* but is known colloquially as the “STA yellow book”, it was written by qualified safety professionals that have many years of stack testing experience. The book, which is reviewed and updated annually, is available free of charge from the STA.

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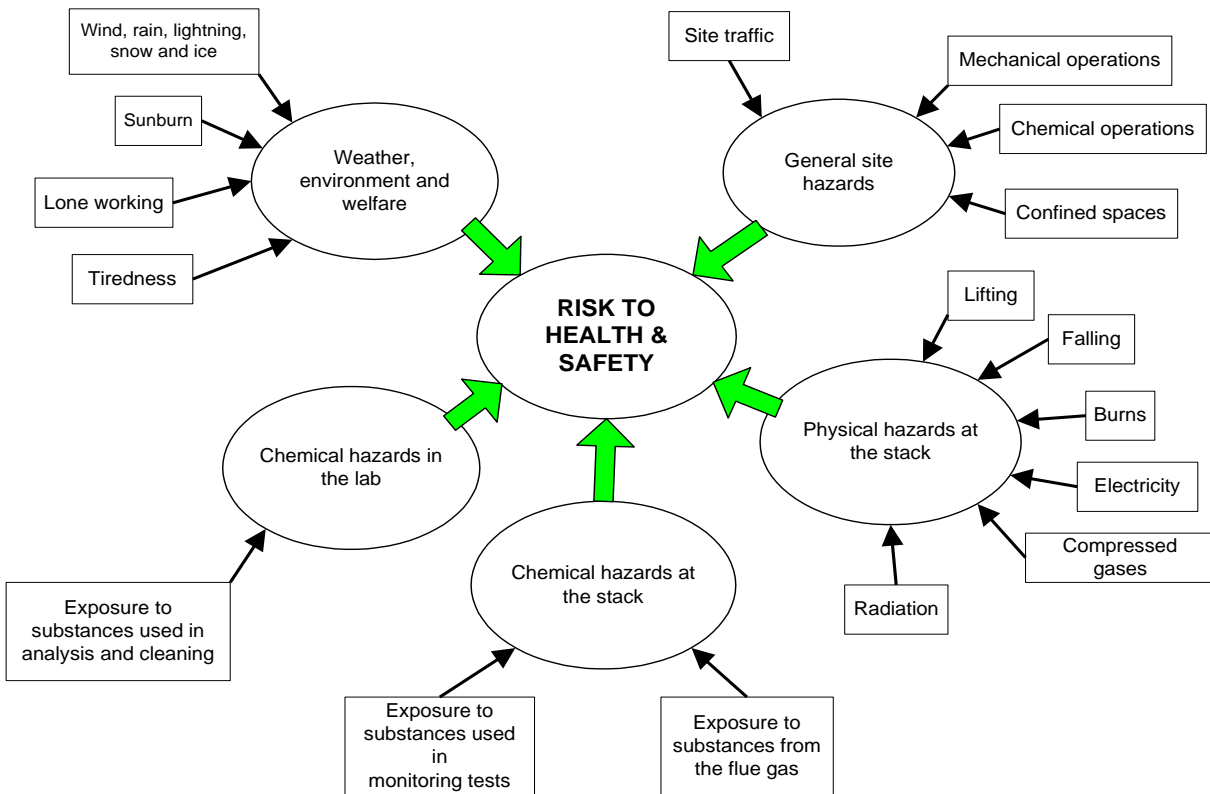
The STA provide a Health and Safety training programme for stack testers. The UK MCERTS scheme makes it mandatory for all personnel seeking certification to have taken this course and to pass the accompanying examination.

A range of valuable guidance is available on the Health and Safety section of the association's website [www.s-t-a.org](http://www.s-t-a.org).

## 6 Risk Assessment

Stack testing is an inherently hazardous occupation but it can be performed safely provided that rigorous Health & Safety rules are applied and adopted. Accidents, some causing fatalities, have happened due to inappropriate Health and Safety and Risk Assessment procedures. Figure 1 shows some of the many hazards that need to be considered when carrying out stack testing. The risks associated with these hazards can be managed through the application of appropriate control measures along with proper staff training, the use of suitable PPE and adherence to risk assessment methodologies.

Figure 1: Hazards associated with stack monitoring



### 6.1 The risk assessment process

The risk assessment process must always precede stack testing. The risk assessment process can be summarized as



Risk assessment begins by identifying the hazards to be faced, and then making a judgement on what the risk will be (i.e. the likelihood of an accident) in light of all the relevant factors. It is desirable that the hazard is removed altogether. However, if this is not possible and if the risk associated with a particular hazard is not acceptable then control measures must be put in place to reduce the risk to a level which is as low as reasonably practicable (ALARP). Control measures can be:

- Collective - such as engineering measures (e.g. a self closing gate to reduce the risk of falls from a platform) and procedural measures (e.g. permit-to-work systems; safety induction training provided by the licensee); or
- Personal – using personal protective equipment (PPE) (e.g. safety goggles to reduce the risk of eye injury when opening access ports).

In order to reduce risks to an acceptable level, control measures should be applied in the following order of priority:

1. Engineering,
2. Procedural, and finally
3. PPE.

Both the licensee (the host site) and the stack testing organization have a responsibility to conduct a risk assessment. When a test house is first engaged by a licensee to conduct monitoring it is likely (and advisable) that a site review be conducted to assess the risks, the visit can also be used to formulate a site specific protocol. Regardless of any advance visits, it is the appropriately trained field technician that will be best placed to assess the risks to the team and to others. This assessment should be conducted daily and immediately prior to starting work.

It is important to remember that the assessment should be of the risk as it stands now. Not as you think it will be when any necessary control measures are in place. The work risk assessment should be repeated or revised once the control measures have been implemented.

Monitoring work shall only commence when the work risk assessment has been completed and the control measures have been implemented to the satisfaction of the competent person carrying out the risk assessment (normally the monitoring Team Leader). The work risk assessment shall be communicated by the Team Leader to other members of the monitoring team before work commences.

## 7 EPA independent monitoring

Contractors employed by the EPA to carry out its programme of independent monitoring may be required, as part of the Agency's contractor quality assurance arrangements, to be accredited to ISO17025 and Technical Specification EN 15675 (which MCERTS is the equivalent of) for manual stack emission testing<sup>k</sup>. Any stack testers who are interested in attaining the relevant accreditation should contact INAB for more detailed information as to how this can be achieved.

The EPA requires its contractors to complete a reconnaissance visit, at all sites where the contractor is to carry out monitoring for the first time. Reconnaissance visits are announced and carried out on a date agreed with the licensee. Where circumstances exist that would present an unacceptable risk to the contractor's staff when carrying out monitoring then the EPA will employ its powers under the licence condition to effect the necessary improvements before work begins.

The contractor will produce a reconnaissance report that must be agreed with the Agency prior to the commencement of sampling visits. The reconnaissance report will conform to a template that will be agreed with the Programme Officer and should generally be consistent with ISO 17025 (or its equivalent) requirements. Can also refer to the preface section in the Air Monitoring Guidance Note No. 2 (AG2). <http://www.epa.ie/downloads/advice/air/emissions/>.

Licensees who follow this guidance note should reduce the number of adverse findings reported to the EPA following reconnaissance visits.

### 7.1 Authorised persons

The licensee should ensure that all relevant personnel are aware of the powers of Authorised Persons under Section 13 of the EPA Act 1992, as amended by the Protection of the Environment Act, 2003. These powers would also apply to those contractors who have been appointed as an authorised person by the Board of the Agency, and thus provide for prompt access to the EPA's contractor personnel when they call to the site. Site security and reception staff should be informed of arrangements for allowing the EPA's contractor personnel access to sampling locations in order to avoid site access delays. Where necessary, the EPA's contractor personnel should be accompanied by a designated staff member, and both site security and reception staff should be aware of who the appropriate designated staff member is. If the designated staff member is absent, alternative arrangements must be in place and communicated to both site security and reception.

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<sup>k</sup> CEN/TS 15675:2007-10: Air quality – Measurement of stationary source emissions –Application of EN ISO/IEC 17025:2005 to periodic measurements

**APPENDIX A**

**Checklist to establish suitability of an emission point for sampling**

This sheet should be copied and completed for each licensed air emission point on site.

Name of emission point \_\_\_\_\_

Licensed emission reference number \_\_\_\_\_

CONDITION REQUIRING VERIFICATION	Report (including action to be taken if appropriate)
<p>Does the emission point have an associated ELV for particulates. If so, are the requirements of section 2.1 of guidance note satisfied.</p> <p>(1). Port downstream of abatement</p> <p>(2). Sampling plane 5 diameters downstream and 2 diameters upstream of obstruction</p> <p>(3). 2 ports @ 90° in circular duct; multiple ports in rectangular duct</p> <p>(4). 4 inch BSP parallel-threaded socket, capped when not in use</p>	
<p>Does the emission point have an associated ELV for volume flow rate. If so, are the requirements of section 2.2 of guidance note satisfied.</p>	
<p>Does the emission point have an associated ELV for one or more gaseous substances. If so, are the requirements of section 2.3 satisfied.</p>	
<p>Is there suitable and safe access to the sampling point, (cf: section 0 )</p>	



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Are utilities provided, (cf: section 3.1 and 3.3)	
Is the emission point properly labeled, (cf: section 3.4)	
Are arrangements in place for a company safety representative to be available before monitoring begins, (cf: section 3.5)	
Are arrangements in place for a designated person to be available during the course of monitoring, (cf: section 3.5)	

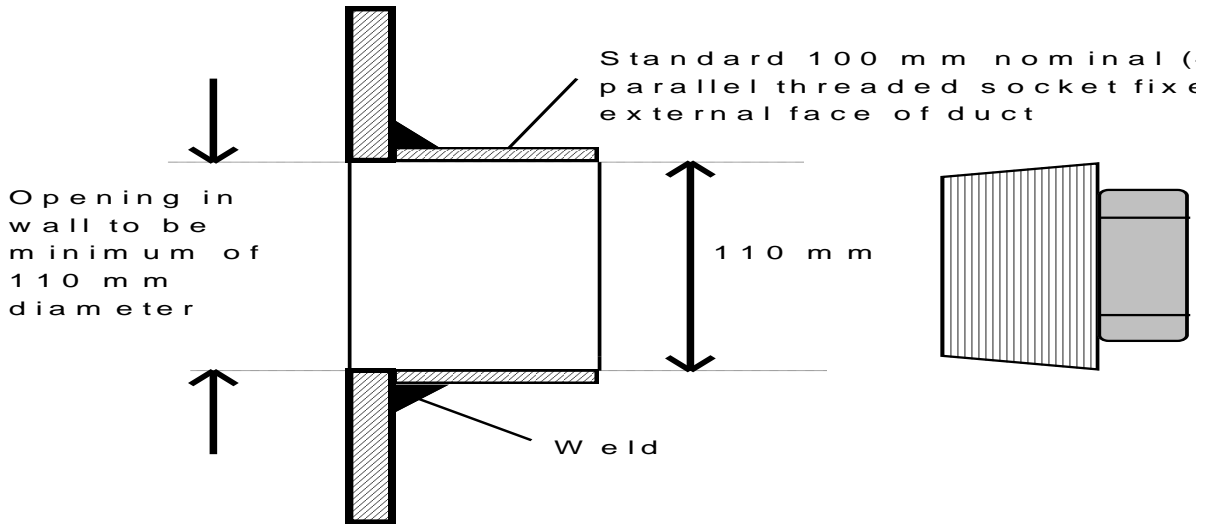
Signed: \_\_\_\_\_

Date: \_\_\_\_\_

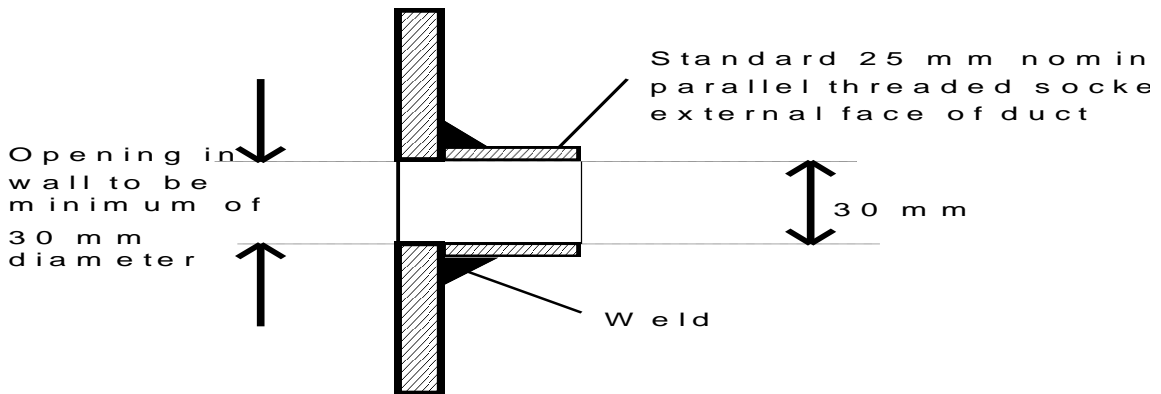
## APPENDIX B

### Typical sampling ports and fittings

**Note:** The drawings below describe the type of ports that should be in place at existing plant. When new ports are installed, or existing ports upgraded then it is recommended that they conform to the requirements of I.S. EN 59259



(a) A particulate sampling port fixed to a metal duct wall, plug fitting also shown.



(b) A gas sampling/velocity measurement port fixed to a metal duct wall.

#### Additional notes on installation of sockets

1. Steel BSP sockets and plugs are widely available from suppliers of industrial pipeline fittings.

2. The diagrams above show sockets which are welded to the outside surface of a narrow gauge metal duct. Other arrangements may be used in ducts where the wall thickness is greater, (e.g. a hole can be cut in the duct wall to suit the external diameter of the socket fitting, and the socket can be secured within the hole).
3. The opening in the duct wall must be free from weld flashes or other obstructions which would reduce the effective diameter of the opening.

The fitted socket should not protrude into the duct

## References

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- <sup>i</sup> *I.S. EN 15259:2007 Air Quality – Measurement of stationary source emissions – Requirements for measurement sections and sites and for the measurement objective, plan and report.*
- <sup>ii</sup> *ISO 10780 1994 (E), Stationary source emissions- Measurement of velocity and volume flow of gas streams in ducts*
- <sup>iii</sup> Health and Safety Authority, Guide to the Safety, Health and Welfare at Work (General Application) Regulations 2007  
Part 4: Work at Height
- <sup>iv</sup> The Institution of Electrical Engineers Code of Practice for In-service Inspection and Testing of Electrical Equipment.