

# Pressure Systems Safety Policy

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## 1. Introduction

The aim of this policy is to prevent serious injury from the release of stored energy as a result of the failure of a pressure system or one of its component parts.

With the exception of the scalding effects of steam, this guidance does not consider the hazardous properties of the contents released following system failure. This must be covered in respective risk assessments for these equipment.

The Health and Safety at Work, etc. Act 1974 requires employers to provide and maintain plant and systems of work that are safe and without risks to health. The Provision and use of Work Equipment Regulations 1998 aims to ensure that work equipment should not result in health and safety risks, regardless of its age, condition, or origin.

This policy informs Schools and Departments of the key requirements of the Pressure Systems Safety Regulations 2000. The aim of these Regulations is to prevent serious injury from the hazard of stored energy as a result of the failure of a pressure system or one of its component parts.

The policy applies to all staff, students, contractors, and visitors who are either controlling, using or that could be affected by pressurised systems used at London Metropolitan University.

## 2. Definition of a Pressure System

Pressure systems are defined as:

- a system comprising one or more pressure vessels of rigid construction, any associated pipework and protective devices
- the pipework with its protective devices to which a transportable pressure receptacle is, or is intended to be, connected
- a pipeline and its protective devices

The regulations are concerned with steam at any pressure, gases which exert a pressure in excess of 0.5 bar above atmospheric pressure and “relevant fluids”<sup>1</sup> which may be mixtures of liquids, gases and vapours where the gas or vapour phase may exert a pressure in excess of 0.5 bar above atmospheric pressure.

In the case of some storage systems where gas is kept in liquid form at very low temperatures in a tank, if the pressure above the liquid is below 0.5 bar then the regulations would not apply unless the pressure rises above 0.5 bar.

The Regulations do not apply simply as a result of pressure exerted by a head of liquid. The Regulations do not apply to vacuum conditions, pressure systems as a

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<sup>1</sup> Relevant fluid is a) steam at any pressure, b) compressed or liquified gas, including air, at a pressure greater than 0.5 bar above atmospheric pressure; pressurised hot water above 110 °C and c) a gas dissolved under pressure in a solvent (e.g. acetylene). Relevant fluids do not include hydraulic oils.

subject of research experiments and others (See [Schedule 1 of the PSSR 2000](#)).

**Kommentar [OK1]:** What about moving it to section 3.4?

### 3. Roles and responsibilities

#### 3.1 Owners

The ultimate responsibility for safe management of Pressure systems lays with the Dean or Director of professional services owning the system.  
Dean or Director has to nominate responsible user for each equipment.

#### 3.2 Users

The nominated responsible user has primary responsibility for the pressure system, in particular:

- a) Training and safe operation
- b) Maintenance
- c) Action in case of emergency
- d) Safe operating limits
- e) Written scheme of examination
- f) Periodic examination of the system
- g) Keeping records

**Kommentar [GC2]:** I started to write this in 'definitions' as a more natural place and then realised it was already here. It seems to make sense here in this context.

**Kommentar [OK3]:** I think leaving it here may just confuse reader. Bearing in mind that we are probably not leasing any of our such equipment and it is used by the respective school/dept, we can remove this information from the policy?

The responsible user has also to ensure that before the system is used by themselves or their employees the following is completed:

- a) A suitable and sufficient risk assessment.
- b) The system is, and remains, suitable for the purpose intended.
- c) Personal protective equipment (PPE) is provided to all users if required.

#### 3.3 Procedures for responsible users and owners of Pressure Systems on arranging maintenance, inspections, and examinations.

Most items of equipment will be owned directly by the University Estates. Some of this equipment will be owned by the School/ Department in which the equipment is situated; this equipment is the responsibility of that School.

However, certain equipment owned by the University Estates will be in a School/ Department premises but will not be the responsibility of that School/ Department. In these cases, the equipment will be the responsibility of Estates e.g. Hot water systems and steam mains.

It is the School or Department's responsibility to ensure that any system they own complies with the current Pressure Systems Safety Regulations and this guidance. A system must not be used until a written scheme of examination has been produced by a competent person.

Each School or Department must arrange for their equipment to be added to the University's pressure systems inventory/ asset list and inspected by the University's insurer's competent person. Instructions on how to add the equipment to the asset list can be found under the Pressure Systems Safety Policy tab on [H&S Policy page](#).

The written scheme of examination will be kept electronically by both the University's insurers and Estates.

Schools and Departments who are users and/ or owners of Pressure Systems must ensure that the system is properly maintained in good repair, to prevent danger. Maintenance should not be confused with the requirements of examinations under the written scheme. The maintenance will need to include the requirement for the system to be opened up for inspection by the University's competent person and for the rectification of works identified by the competent person as part of inspection.

### 3.4 Examples of Pressure Systems

Pressure systems may be fixed systems, usually a part of the University's plant or infrastructure:

- Boilers and steam heating systems
- Calorifiers
- Static gas tanks (liquid nitrogen, oxygen etc.)
- Air receivers
- Autoclaves
- Compressed gas distribution systems
- Refrigeration plant

Pressure systems may also be mobile, experimental, or temporary such as:

- Air receivers
- Gas receivers
- Autoclaves
- Pressure cookers
- Retorts
- Heat exchangers
- Calorimeter bombs
- Superheaters
- Sterilisers
- Experimental rigs
- Gas cylinder and associated valve gear

Pressure systems can be installed or a mobile.

- The term "**installed system**" means a pressure system other than a mobile system.

- The term “**mobile system**” means a pressure system which can be readily moved between and used in different locations.

### 3.5 Pressure Systems categories

There are three categories of Pressure System. In the laboratory environment, for example, most will fall into the minor or intermediate systems:

Minor Systems	Intermediate Systems	Major Systems
Small, simple systems containing steam, pressurised hot water, inert gases, or fluorocarbon refrigerants.	Anything that does not fall into minor or major categories	Steam generator over 10MW
Pressure should be less than 20 bar (2.0 MPa) above atmospheric pressure unless the system has a direct-fired heat source, when it should be less than 2 bar (200kPa)	Pipelines are included unless they fall into the major system category.	Any pressure storage system where the largest vessel is more than $10^5$ bar litres (100MPa m <sup>3</sup> )
Pressure-volume product for the largest vessel should be less than $2 \times 10^5$ bar litres (20 MPa m <sup>3</sup> )		Any manufacturing or chemical reaction system where the pressure-volume product for the largest vessel is more than $10^5$ bar litres (10Mpa m <sup>3</sup> )
Temperatures in system should be between -20°C to 250°C except in the case of small refrigeration systems operating at lower temperatures which are included in this category.		Pipelines are included if the pressure-volume product is greater than $10^5$ bar litres
Pipelines are not included		

## 4. Hazards and Risk

### 4.1 The principle causes of Pressure Systems incidents are:

- Poor equipment and/ or system design
- Poor maintenance of equipment
- An unsafe system of work
- Operator error, poor training/ supervision
- Poor installation
- Inadequate repairs or modifications.

### 4.2 The main hazards are:

- Impact from the blast of an explosion or release of compressed liquid or gas.
- Impact from parts of equipment that fail or any flying debris.
- Contact with released liquid or gas, such as steam.
- Fire resulting from the escape of flammable liquids or gases.

#### **4.3 The degree of risk from pressure system failure depends on these factors:**

- Skills and knowledge of the people that maintain, test, and operate the equipment.
- Pressure of the system
- Type of liquid or gas and its properties
- Suitability of the equipment and pipework that contains it
- Age and condition of the equipment
- Complexity and control of the operation
- Prevailing operating conditions (e.g. high-temperature processes)

#### **4.4 Daily Checks**

All checks should be in accordance with the manufacturer's recommendations.

The Daily checklist may include:

- Pressure settings and gauge readings
- Fluid levels
- Valve operations, including signs or regular discharges
- Control-system operation
- Condition of protective devices
- General cleanliness (housekeeping) in and around the system.

These regular checks should form part of a safe system of work and ensure that they:

- Provide safe and suitable equipment
- Ensure that equipment is suitable for the intended purpose
- Ensure that the materials of manufacture are suitable for the liquids or gases they will contain
- Ensure that the system can be operated safely without access difficulties
- Be careful when repairing or modifying a system

Consider

- What are the operating conditions?
- Is the gas or liquid toxic or flammable?
- What are the process pressures and temperatures?
- What are the safe operating limits?
- Is there a set of operating instructions for all of the equipment?
- Have the operators had suitable training on the operating instructions?

## 5. Fitting of Suitable Protective Devices

Protective devices include pressure relief valves and electronic gear which close the system down in case of malfunction.

Ensure:

- Protective devices cause shutdown when temperature, pressure or levels are exceeded
- Protective devices are adjusted to correct settings
- Audible and visual warning devices are noticeable
- Protective devices are always kept in good working order
- Safety valves and bursting disc discharge towards a safe place
- Once set, protective devices can only be altered by an authorised person

## 6. Operation and Maintenance

The user of a system must be provided with suitable instructions for its safe operation and for emergency action. This will often be provided by the manufacturer of a new system.

In an existing system those instruction should be verified as operable or rewritten if found to be inadequate by those responsible for managing the system.

The user must ensure that the system is operated according to those instructions.

Users of autoclaves and other high temperature equipment should be aware of the very high temperatures that may be reached and consequent risks or burns and scalds.

If identified in risk assessment, appropriate Personal Protection Equipment (PPE) will be provided and should always be worn as instructed. Further guidance on the selection and use of PPE can be found in SP38 PPE.

### 6.1 Written Scheme of Examination

No pressure systems to be used at work can be operated unless there is a written scheme for the periodic examination. The written scheme must state the nature and frequency of the examinations, specify any extra measures necessary to prepare the system for safe examination and, where appropriate, must provide the for the examination to be carried out before the system is first used.

Estates maintain an up to date inventory of all pressure vessels and systems in use within the University. They must be consulted prior to procurement of any system so that written schemes of examination can be devised and the necessary follow up arrangements can be put in place.

Every system will be subject to thorough examination by an insurance company competent person under the written scheme of examination.

**Kommentar [OK4]:** Are we saying users will need to fit smth separately?

**Kommentar [GC5]:** Having read this again maybe better in 3.2 under responsible user?



The written scheme may be authored in conjunction with that competent person. London Metropolitan University will ensure that the examination is carried out and must also ensure the safety of the examiner by performing the required preparatory work.

Examination periods will vary depending on the type of system, its age, and its use. Periods can vary between 12 and 14 months.

**Kommentar [OK6]:** Unnecessary info

For mobile systems the date of the next examination **must** be marked on the system.

## 6.2 Record Keeping

With regard to installed pressure systems, documents must be kept at the same site as the system by the responsible user or the owner, and for mobile pressure system by the owner of the system.

Where a system or part of a system changes ownership, the previous user/ owner must provide the new user/owner with all relevant documentation.

**Kommentar [OK7]:** Is it true? Document for school owned systems are probably not kept by estates... I would delete this sentence.

## 7. Information and Training

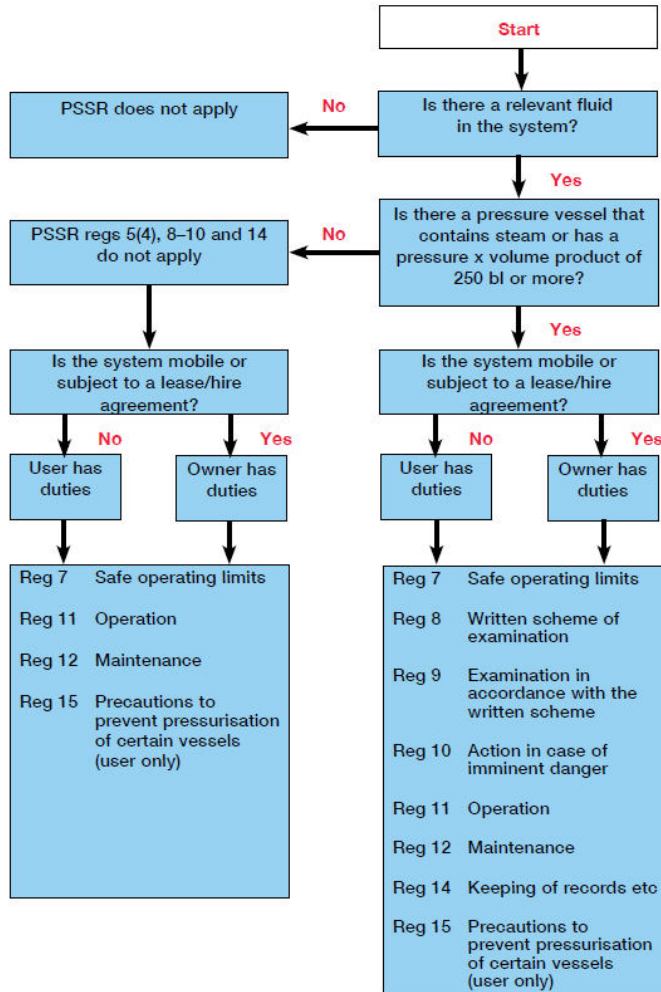
The Owner of the system must provide sufficient information, instruction, and training to all users and provide relevant information to those involved in maintenance, and examination of pressure systems. Records should be kept of any training given in compliance with statutory duties.

## 8. References and further reading

- Pressure Systems, HSE  
<http://www.hse.gov.uk/pressure-systems/>
- Approved Code of Practice, HSE:  
<https://www.hse.gov.uk/pubns/books/l122.htm>
- Pressure Systems, A brief guide to safety (HSE):  
<http://www.hse.gov.uk/pubns/indg261.pdf>
- Safety Requirements for Autoclaves (HSE):  
<http://www.hse.gov.uk/pubns/guidance/pm73.pdf>

## Appendix A: Do the Regulations apply to my Pressure System ?

Figure 1 User/owner decision tree: Do the Regulations apply to my pressure system?



Note: This diagram only covers type (a) pressure systems, as defined in regulation 2(1) under 'pressure system', 'one or more pressure vessels of rigid construction, any associated pipework and protective devices.'

It does not cover a type (b) pressure system, 'the pipework with its protective devices to which a transportable pressure receptacle is, or is intended to be, connected,' or a type (c) pressure system, 'a pipeline and its protective devices.' If your pressure system is as defined in (b) or (c), this diagram will not work.