

# PRESSURE SYSTEMS SAFETY REGULATIONS 2000

## Legislation

- Pressure Systems Safety Regulations 2000
  - Health and Safety at Work etc Act 1974
  - The Management of Health and Safety at Work Regulations 1999.
  - Provision and Use of Work Equipment Regulations 1998
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## What is a Pressure System?

A piece of equipment or a system containing a **fluid** (including gas and steam) under pressure.

The Pressure Systems Safety Regulations 2000 defines three types of system:

- Pressure vessel plus associated pipe work and protective devices.
- Pipe work and protective devices intended for connection to a transportable gas cylinder.
- Pipe work and protective devices not intended for connection to a transportable gas cylinder.

## This will apply to:-

- Compressors (fixed and portable)
- Air receivers
- Valves, steam traps and filters
- Pipe work and hoses
- Pressure gauges and level indicator
- Boilers and steam heating systems
- Water heaters

- Calorifiers
  - Process plant and piping
  - Pressure cookers, autoclaves and retorts
  - Heat exchangers
  - Refrigeration plant
  - Coffee and Cappuccino machines
  - Beer pressure dispensing systems
  - Pipelines
  - Scuba diving and airgun/paintball bottles
  - Spray tanning equipment
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### **Types of Compressed Gas:**

- Steam at any pressure.
  - Any fluid or mixture of fluids which is at a pressure greater than 0.5 bar above atmospheric pressure, and which fluid or mixture of fluids is:
    - a gas; **or**
    - a liquid which would have a vapour pressure greater than 0.5 bar above atmospheric pressure when in equilibrium with its vapour at either the actual temperature of the liquid or 17.5 degrees C
    - A gas dissolved under solvent without the application of heat.
  - Hot water above 110C. Pressure systems operating between 100C and 110C are covered by the regulations. Users must prove that such systems do not contain (and are not liable to contain) steam under foreseeable operating conditions and that the temperature is not liable to exceed 110C.
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## **What do you have to do?**

- 1) You must identify 'pressure systems' which are subject to the regulations. A Written Scheme of Examination must be drawn up following a Risk Assessment of the system.

It must:-

- List all items of plant including their safe operating limits;
  - State the inspection frequency and the maintenance of relevant parts of the system. A working examination must be done which tests the equipment under pressure.
  - The whole system must be inspected by a competent person in accordance with the written Scheme of Examination.
- 2) All existing and proposed pressure systems must be designed and made from suitable materials. They must be suitable for the intended purpose(s), installed correctly and capable of being operated safely.
  - 3) Suitable protective devices must be fitted to all pressure systems and kept in good working order at all times.
  - 4) All pressure systems must be operated within the safe operating limits determined or approved by a competent person
  - 5) All pressure systems must be properly maintained under a programme determined by a competent person – to include a Written Scheme of Examination where necessary (see below).

## **Competent Person**

Someone with the appropriate qualifications, knowledge and/or experience to identify the risks associated with pressure systems and who knows how to control the risks.

They can:

- advise users what the written scheme covers
- draw up or certify such a scheme
- carry out examinations under the scheme

**Note: For a large or complex system** one person may not have the necessary knowledge and expertise. A competent person should be chosen who has available a team of employees with the knowledge and expertise. A "competent person" cannot legally be an individual employee but can be an in-house inspection department within a user's or owner's company.

The competent person does not need to be a chartered engineer if they work under the direction and supervision of a chartered engineer, or engineer of equivalent status.

6) Written instructions must be easily available to cover emergencies.

7) A Risk Assessment must be completed for all work and operations involving the use of air powered tools/equipment, use and maintenance of the pressure system.

8) Detailed records must be kept of the initial examination report, the most recent examination report as well as details of the regular maintenance and any modifications and repairs.

9) All staff must be given sufficient information, instruction and training in the use, operation, maintenance, etc. of pressure systems.

Although the main responsibility for compliance lies with the User, if the pressure system is leased or hired, the supplier also has responsibilities. The User must have the agreement confirmed in writing from the Supplier.

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## **Use of Gas Cylinders**

Gas cylinder pressure regulators must be fully inspected every five years.

A cheap way to do this is to use an exchange-reconditioning arrangement.

Equipment that has a possible source of ignition and a cylinder containing a fuel gas (e.g. hydrogen, LPG, acetylene, methane) something is needed to stop flame flashing back into the cylinder.

A common solution is to fit flashback arrestors on the outlet of the regulator. These should be replaced at an interval recommended by the manufacturer, or if this is not defined, on a five year cycle.

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## **DEFINITIONS**

### **Atmospheric pressure**

Atmospheric pressure is usually quoted in millibars (mb). 1 mb is equal to 100 Pa, so standard atmospheric pressure is about 1000 mb. But atmospheric pressure varies from place to place and day to day and is dependant on the weather. At sea level, this is usually between 970 mb and 1040 mb.

### **CE Marking**

Compulsory within the EEC. New equipment should normally come with a CE mark, and issued with a Declaration of Conformity. The CE mark shows that the system has been made and tested to recognised standards. Separate components or items which are not designed to be stand-alone will not be CE marked. These must be made and tested to a recognised standard to meet a specification and should be accompanied by a Declaration of Incorporation.

## **Pressure systems**

One of the following:

- A pressure vessel of rigid construction + associated pipe work + protective devices
- Pipe work + protective devices + a transportable pressure vessel,
- Pipelines

Transportable pressure vessels are not pressure systems until they are connected to other apparatus. They must meet safety standards and they are subject to a scheme of examination.

To qualify as a **pressure system** the equipment must contain either

- Steam at any pressure, **or**
- A gas or mixture of gases at more than 0.5 bar, **or**
- A liquid with a vapour pressure more than 0.5 bar at its actual temperature or at 17.5 °C, **or**
- A gas dissolved under pressure in a solvent contained on a porous substance which could be released without application of heat.

## **Pressure Vessel**

A vessel containing, or intended to contain, a relevant fluid.

## **Pipe work**

A pipe or system of pipes together with associated valves, pumps, compressors and other pressure containing components and includes a hose or bellows but does not include a pipeline or any protective devices.

## **Protective Devices**

Devices designed to protect the pressure system against failure and devices designed to give warning that system failure might occur, and include bursting discs, safety valves, pressure gauges etc.

## **Risk Assessments**

These are needed at numerous times in the life of a pressure system. These include:

- Installation and commissioning
  - Normal use
  - Maintenance and repair, and eventually
  - Decommissioning and scrapping (particularly relevant if the system has contained toxic substances).
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## **Transportable Gas Container**

Gas cylinders with an internal volume of between 0.5 litres and 3000 litres if refillable and a cylinder with an internal volume of between 1.5 and 5 litres if designed to be discarded after use.

## **Written Scheme of Examination**

Specifies the nature and frequency of the examination along with any measures necessary to prepare the system for safe examination other than those which the user or owner could be reasonably expected to take without specialist advice.

## **When is a written Scheme of Examination needed?**

**If the pressure is above 250 bar per litre or if the gas is steam**

The system must be entered on the Insurance register and subject to a Written Scheme of Examination by a competent person.

## **If the pressure is below the 250 bar litre**

It doesn't have to be named on the Insurance register, or subject to a written scheme of examination.

But regardless of which category a system fits into, it is the users responsibility to conduct a risk assessment to define how to install it safely, use it safely and maintain it in safe condition.

The system should also be examined before it is used for the first time. Suggested intervals between examinations are:

- 14 months for Steam and Pressurised Hot Water Boilers
- 26 to 38 months for Receivers (normally 26 months recommended)
- 24 to 48 months for Compressed Air Receivers (normally 26 months for a thorough examination recommended)

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## **Imminent Danger**

Whilst carrying out an examination, a Competent Person may find that part of a system is dangerous unless immediate repairs are made or the operating conditions are suitably changed.

'Imminent danger' means a risk of imminent failure of the pressure system. The pressure system does not even need to be working e.g. corrosion could be found on part of the system when it was shut down which could lead to system failure if it returned to normal service.

## **Reporting to the Local Authority**

The Competent Person should send a report specifying the repairs, modifications or changes concerned to the local enforcing authority within 14 days of the examination.

## Exemptions

**Prime movers:** Cylinders with an integral piston or ram actuated by steam or compressed air are exempted from the regulations.

**Fire extinguishers** Portable fire extinguishers with a working pressure below 25 bar at 600C and having a total mass not exceeding 23 kg. This includes fire extinguishers mounted within racing cars and operated remotely by the driver in the event of an emergency.

**Hand-held tools** The regulations only apply to parts of a hand-held tool which are pressure vessels and not to the tool itself. The hand-held lance of an oxy-acetylene welding set is not a pressure vessel because it only "contains" a relevant fluid in the sense of directing gases to the flame; there is no storage of gas. The hand-held lance should be considered part of a pressure system as "pipe work to which a transportable gas container is, or is intended to be connected".

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## Compressed Air Equipment

- The operator must know how to check the equipment before using it.
- The pressure of the compressed air supplied from the receiver should be as low as practicable.
- Air lines should be fitted with at least 6 feet of hose between the bayonet socket and pressure gauge/control.
- Flexible airlines must be in good condition. Any damage especially at connection points may result in rupture causing the hose to 'whip' or 'snake' dangerously.
- Jubilee clips must not be used to connect hoses to fittings. They don't grip the hose evenly. They will allow air to leak and will allow the hose to blow off.
- If hoses are over 10mm diameter, over 10m long or work at a pressure over 7 bar (100psi); they should be fitted with a coupling with a self venting socket.

- Pressure relief valves, gauges and compressed air metering devices must be checked regularly.
  - Air receivers must be clearly marked with the safe working pressure and hold a current test certificate. If they have to be repaired they will then need to be recertified.
  - Tank drain valves must be tested to ensure that they open and close correctly.
  - Ensure that the receiver is drained of condensate (water) regularly, usually daily. Water in an air receiver causes rust/corrosion which will seriously weaken it.
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## **Safe Use of Compressed Air**

### **Compressed air can kill or maim.**

- Safety glasses or goggles must be worn when using compressed air.
- Overalls must never be cleaned down with compressed air. Many people have been killed by compressed air from a blow gun piercing the skin and collecting in the bloodstream. The air bubble will either maim or kill the user when it reaches the brain.
- Only reduced pressure compressed air blow guns should be used for cleaning.
- If faulty items explode, the power of the explosion can be enough to destroy buildings and kill people