

THE ENGINEERING EQUIPMENT AND MATERIALS USERS' ASSOCIATION

Guide to the UK Pressure Systems Safety Regulations (2000)

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ENGINEERING EQUIPMENT AND MATERIALS USERS' ASSOCIATION

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- Promoting and presenting members' views, and encouraging the application of good sound engineering practices
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- Facilitating members' participation in national and international standards making
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Comments are considered by the relevant EEMUA Technical Committees and may be incorporated in future editions of this Publication. New editions are publicised on the EEMUA website.

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1. Introduction

1.1 Purpose

This Publication is intended to give practical guidance on the use of the UK Pressure Systems Safety Regulations.

The Pressure Systems Safety Regulations 2000¹ (otherwise referred to herein as the Regulations), together with the Health & Safety Executive "Approved Code of Practice, Safety of Pressure Systems" (hereinafter referred to as the ACOP), comprise a package of documents, which in this Publication are collectively referred to as the PSSR.

The PSSR contains a complex series of requirements, for which EEMUA considered that a statement of common policy would be of value to its members as a reference document, since the PSSR allows for a significant element of experienced, professional judgement by the User and/or Competent Person, together with a demand for especially careful interpretation. It is considered that such a statement could form the basis for a Guide that would be useful to a wider section of industry, hence EEMUA 177 has been published.

1.2 Scope

This Publication gives guidance on the interpretation of the Pressure Systems Safety Regulations 2000 relating to the periodic examination of pressure systems and certain associated aspects, and considers in particular Regulations 2, 7, 8, 9 and 10, plus Schedule 2; it does not refer in detail to the other regulations already clearly expounded in the ACOP published by the Health & Safety Executive (HSE). This Guide, therefore, should not be read in isolation, but should be used to augment the existing HSE documents where appropriate.

Throughout this Guide, the terms contained within single quotation marks when first used are meant to be interpreted as defined in Regulation 2 of the PSSR.

Transportable pressure receptacles (transportable gas containers) are not within the scope of this Publication.

Whilst this Publication refers throughout to UK regulations and practice, much of the general advice is relevant to practice outside the UK. However readers outside UK jurisdiction should abide by local regulations and codes of practice.

1.3 About this Edition

The authors of this Publication are members of EEMUA's Committee of User Inspectorates (CUI). CUI also contributed to the 1993 revision of the Institute of Petroleum (now the Energy Institute) Model Code of Safe Practice Part 12 Pressure Vessel Examination (IP 12) and Part 13 Pressure Piping Systems Examination (IP 13) and this Guide makes reference to these for detailed

¹ For the purposes of this Publication the Pressure Systems Safety Regulations 2000 is construed to refer also to the Pressure Systems Safety Regulations (Northern Ireland) 2004. The latter regulations contain the same technical content and vary only in reference to Northern Ireland legislation and some minor editorial changes.

recommendations on the management of Schemes of Examination for in-service equipment.

This second edition revises and updates the original 1993 edition. The principal changes are to take account of the revised Regulations which came into force in February 2000, together with important points based upon actual use of the Regulations. In addition, the references have been updated.

The 02-2013 imprint of the second edition updates information on EEMUA and makes some changes to the references to Regulation 10 dealing with action in the case of Imminent Danger.

2. Regulation 2 - Interpretation

2.1 Mobile System

Mobile pressure systems can be confused with transportable pressure receptacles or tank containers moved by road or rail in the UK, however the latter come under the Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations. If equipment is inspected under these regulations, it does not require inspection under the Regulations as well (see ACOP Exception 9).

Essentially, if pressure receptacles are filled and then moved elsewhere on the site where they are used, then they are 'Mobile Systems' under the Regulations. If however the pressure receptacles are transported offsite to be refilled, then the Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations apply.

2.2 Pressure System

The Regulations are founded on the concept of 'Pressure Systems', not solely pressure vessels.

A Pressure System is defined in Regulation 2 as:

- a) a system comprising one or more pressure vessels of rigid construction, any associated 'Pipework', and 'Protective Devices';
- b) the Pipework with its Protective Devices to which a transportable pressure receptacle is, or is intended to be connected; or
- c) a 'Pipeline' and its Protective Devices which contains or is liable to contain a 'Relevant Fluid', but does not include a transportable pressure receptacle.

It is thus apparent that the equipment necessary to comprise a Pressure System under the Regulations is bounded by lower limits but there are no maxima. A Pressure System may therefore encompass the whole of a process plant or small portions thereof, providing the latter include the minimum elements noted in (a), (b) or (c) above. Precisely how a complex industrial plant is segregated into Pressure Systems in terms of Regulation 2 is a matter of individual preference and convenience, but it is recommended that the number of such systems be minimised to avoid unnecessary complication of administration and records. In many cases, therefore, substantial parts of the whole process plant would be designated as a Pressure System.

2.3 Protective Devices

The Regulations define Protective Devices as those designed to protect the Pressure System against 'System Failure' and devices designed to give warning that System Failure might occur. Bursting discs are included.

ACOP paragraph 25 explains clearly that the definition of Protective Device does not include every device that has a control or measuring function. Rather it includes any protective control or measuring equipment which is essential to prevent a dangerous situation from arising. Instrument and control equipment should be considered as a Protective Device subject to the Regulations where it has to function correctly in order to prevent the 'Safe Operating Limits' being exceeded where no other Protective Device is provided.

Table 1 offers typical examples of Protective Devices which may be considered as essential to prevent System Failure and which therefore should be included in a 'Scheme of Examination'. It should be stressed that the examples given in Table 1 are for the purpose of illustration and should not be regarded as definitive.

There are other devices that are used to prevent physical damage to equipment. These are not necessary to prevent a sudden discharge of pressure energy that may cause danger to persons, because either there is a backup device to prevent overpressure or the subject components are non-pressure containing - such devices therefore do not come within the scope of the Regulations.

The decision to apply the Regulations to a device is dependent upon whether or not the correct operation of that device is essential for the mechanical integrity of the Pressure System. In general, devices that monitor normal operating parameters, such as pressure gauges and temperature indicators, would not be included in a Scheme of Examination.

Table 1 Examples of Protective Devices to be considered for inclusion in a Scheme of Examination

Description of function	Typical examples	Possible consequence of device failing to operate
devices to prevent under-pressure	vacuum breakers	failure due to collapse
devices to relieve excess internal pressure	relief valves bursting discs	failure due to over-pressurisation
devices to prevent a predetermined temperature level from being exceeded	a) high temperature trips and fusible plugs b) low temperature trips	a) failure due to loss of strength as a result of exposure to high temperature b) loss of fracture toughness at low temperature
warning devices	pressure alarm or recording systems which identify a pressure excursion beyond the approved limit	the Competent Person should be informed of such incidents to ensure that a suitable operation review is conducted
rapid isolation of excessive pressure source	slam shut valves	failure due to over-pressurisation
restriction device to limit the flow rate from a high pressure source	restriction orifice plate control valve	failure due to over-pressurisation
device to protect against low level of water in boiler	level gauge low level alarm/ shutdown device	failure due to over heating of boiler

3. Regulation 7 - Safe Operating Limits

The Safe Operating Limits are defined in the PSSR as the operating limits (incorporating a suitable margin of safety) beyond which System Failure is liable to occur. In addition to pressure and temperature, the following have to be considered: flow rates, volumes, heat input, coolant flow, cyclic conditions, process changes and the like. The aim of Regulation 7 is to require the 'User' to know the safe limits of operation of the Pressure System and to ensure it is operated within these limits and properly maintained. (See ACOP paragraphs 89 to 100).

Many Pressure Systems are either:

- designed to contain the maximum pressure that can be generated; or
- protected by appropriate devices, to safely limit the pressure that can be generated.

In these latter cases, the Safe Operating Limits are defined by the design rating of the Pressure System and/or the settings of the Protective Devices.

For Pressure Systems where the operating parameters can be adjusted such that it is reasonably foreseeable that System Failure could occur if certain limits are exceeded, then these have to be specified as Safe Operating Limits.

Examples are:

- For an oil lubricated air compressor system, air/oil explosions can occur if the machine operates with the incorrect oil temperature combination; the Safe Operating Limits may include the maximum operating temperature and oil specification.
- For a fired boiler, the Safe Operating Limits may include the minimum water level or the minimum feed water flow rate to avoid overheating.
- For limited life equipment (e.g. due to fatigue or creep) the Safe Operating Limits include the number of pressure cycles, or the hours of operation at specified temperatures.
- For some piping systems a temperature limit may need to be imposed to prevent excessive thermal stresses.