



CODE OF PRACTICE 34

**THE APPLICATION OF THE PRESSURE
EQUIPMENT REGULATIONS TO
CUSTOMER SITES**

Revision 1: 2014

British Compressed Gases Association

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PREFACE

The British Compressed Gases Association (BCGA) was established in 1971, formed out of the British Acetylene Association, which existed since 1901. BCGA members include gas producers, suppliers of gas handling equipment and users operating in the compressed gas field.

The main objectives of the Association are to further technology, to enhance safe practice, and to prioritise environmental protection in the supply and use of industrial gases, and we produce a host of publications to this end. BCGA also provides advice and makes representations on behalf of its Members to regulatory bodies, including the UK Government.

Policy is determined by a Council elected from Member Companies, with detailed technical studies being undertaken by a Technical Committee and its specialist Sub-Committees appointed for this purpose.

BCGA makes strenuous efforts to ensure the accuracy and current relevance of its publications, which are intended for use by technically competent persons. However this does not remove the need for technical and managerial judgement in practical situations. Nor do they confer any immunity or exemption from relevant legal requirements, including by-laws.

For the assistance of users, references are given, either in the text or Appendices, to publications such as British, European and International Standards and Codes of Practice, and current legislation that may be applicable but no representation or warranty can be given that these references are complete or current.

BCGA publications are reviewed, and revised if necessary, at five-yearly intervals, or sooner where the need is recognised. Readers are advised to check the Association's website to ensure that the copy in their possession is the current version.

This document has been prepared by BCGA Technical Sub-Committee 1. This document replaces BCGA CP 34, 2003. It was approved for publication at BCGA Technical Committee 148. This document was first published on 13/02/2014. For comments on this document contact the Association via the website www.bcgaco.uk.

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* Throughout this publication the numbers in brackets refer to references in Section 13. Documents referenced are the edition current at the time of publication.

CODE OF PRACTICE 34

THE APPLICATION OF THE PRESSURE EQUIPMENT REGULATIONS TO CUSTOMER SITES

1. INTRODUCTION

The Pressure Equipment Directive (97/23EC) (1) was adopted by the European Commission on 27th May 1997 and has been published in the Official Journal of the European Communities.

The Pressure Equipment Directive (PED) (1) provides a legal structure whereby ‘Pressure Equipment’ can be manufactured and sold throughout the European Economic Area (EEA) without having to go through a local approval process in every member state. Its purpose is the harmonisation of technical standards throughout the European Union, aimed at providing the free trade of goods or services between member countries. The PED (1) has the premise that all pressure equipment and assemblies placed on the market for the first time comprise of only new items. It is long standing gas industry practice to re-use pressure equipment in new assemblies and installations. This document gives a methodology for complying with the PED (1), acknowledging the re-use of pre-PED (1) equipment in new assemblies.

The PED (1) is applicable to the design, manufacture, testing and conformity assessment of ‘Pressure Equipment’ and ‘Assemblies of Pressure Equipment’ placed on the market and put into service for the first time after 29th May 2002. It does not apply to maintenance and in-service examination, which are covered by the Pressure Systems Safety Regulations (PSSR) (10).

The PED (1) is implemented in the UK as the Pressure Equipment Regulations (PER) (9) and has been mandatory since the 30th May 2002.

The PER (9) categorises pressure equipment based on the degree of hazard, which is defined by the pressure, volume, nature of the fluid and the type of equipment. The higher the hazard the more stringent the control requirements that have to be met.

The industrial gases industry generally supplies pressure systems that it owns, leases and maintains at customer premises, where the customer operates this pressure system to supply a process. This equipment is usually neither sold outright to the customer nor supplied to be transferred from one customer to another. i.e. it is dedicated to a particular customer. A feature of such systems is that they may comprise of a combination of pre-PER (9) and PER (9) compliant equipment. This code of practice provides a methodology for the application of the PER (9) both in terms of used equipment and the classification of the complete pressure system, particularly in respect of ‘Assemblies of Pressure Equipment’.

The principles behind this document have been reviewed by the relevant government agencies and the Health & Safety Executive (HSE).

NOTE: The HSE has responsibility for the enforcement of these regulations in the UK.

Whilst this code of practice can be used as a stand-alone document for the industrial gases industry it shall be read in conjunction with the PER (9), and further guidance may be obtained from the official PED website and the Department for Trade and Industry (DTI) Guidance Note URN 99/1147 (12) on Pressure Equipment.

NOTE: PED Website link: <http://ec.europa.eu/enterprise/sectors/pressure-and-gas/documents/ped/>

2. SCOPE

This code of practice provides a methodology for the application of the PER (9) to new installations of industrial gas pressure equipment, which could incorporate used equipment, for use at user premises.

New installations of industrial gas pressure equipment comprising of wholly new equipment shall be subjected to a global conformity assessment and CE marking where applicable. For these types of installations no further guidance is given within this document.

3. DEFINITIONS

Whilst all main definitions are referenced in the PER (9) it has been necessary to develop certain industry-specific terminology within this Code of Practice to take account of current safe practice within the industrial gases industry. Such terms are defined below:

3.1 Assemblies

An assembly is defined in PER (9) as several pieces of pressure equipment assembled by a manufacturer to constitute an integrated and functional whole.

The extent of an assembly is not clearly defined.

The PER (9) definition assumes that only all new equipment is used to form an assembly.

Used equipment and assemblies which are relocated are excluded from the PER (9) provided that these complied with the regulations in force when originally placed on the market.

The PER (9) does not make provision to incorporate used pre-PER (9) equipment into new assemblies. Assemblies comprising PER (9) compliant equipment and pre-PER (9) equipment are considered by BCGA to be 'pressure systems' and are assessed in accordance with this Code of Practice.

3.2 Pre-PER equipment

Equipment and assemblies that were manufactured and placed on the market prior to the 30th May 2002 in accordance with approved design codes and regulations in force at the time of manufacture.

3.3 Used PER equipment

Equipment and assemblies that have been previously placed on the market in compliance with the PER (9).

3.4 Pressure system

New assemblies comprising PER (9) compliant equipment and pre-PER (9) equipment.

A pressure system may be divided into a number of assemblies or items of pressure equipment, comprising used and new equipment. New equipment may be:

- CE marked in accordance with the PER (9); or
- manufactured to Sound Engineering Practice (SEP) and thus not CE marked; or
- marked in accordance with other applicable legislation e.g. π (pi) marked to the Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations (11).

Used equipment may not be marked and will require assessment before incorporation into a new pressure system.

The pressure system may be made up of a number of items of pressure equipment and the integration and protection against reasonably foreseeable hazards is detailed in the Pressure System Design Review.

3.5 Pressure system design review

A structured, documented assessment of the pressure system and its constituent parts that ensures all equipment items are properly designed and suitable for the service, satisfy system design parameters, and are integrated in a safe manner to assure the overall safety of the system.

This Pressure System Design Review has the same intent as and is equivalent to the Global Conformity Assessment but is applied to combinations of pre-PED (1) and PER (9) compliant pressure equipment on user sites. Therefore the procedures detailed in this document for the Pressure System Design Review can be considered to be equivalent to the Global Conformity Assessment and meets the requirements of the PSSR (10).

3.6 Global conformity assessment

This term, as applied to assemblies, means:

- a) The assessment of each item of pressure equipment making up the assembly which has not been previously subjected to a conformity assessment procedure and to a separate CE marking.

- b) The assessment of the integration of the various components of the assembly, determined by the highest category applicable to the equipment concerned other than that applicable to any safety accessories.
- c) The assessment of the protection of an assembly against exceeding the permissible operating limits shall be conducted in the light of the highest category applicable to the items of equipment to be protected.

3.7 Statement of compliance document

This document demonstrates that a suitable and sufficient Pressure System Design Review has been carried out for all equipment within the pressure system. It specifies all the equipment within the pressure system, indicates the standards used in the manufacture and that it is safe for a period of further use.

3.8 Placed on the market

Equipment or assemblies are considered to be placed on the market when made available for the first time by transfer from the manufacturer to:

- the importer / distributor established in the community, or
- the consumer / customer/ owner.

Transfer is considered to be:

- physical handover, or
- transfer of ownership.

NOTE: Payment is not a necessary requirement of transfer since it may be based upon a legal instrument, sale, loan, hire, leasing or gift.

Transfer is deemed not to have taken place when:

- Manufacture is outside the European Economic Area (EEA) and possession is taken by the manufacturers agent in the EEA.
- Additional manufacturing (assembly, processing, labeling, packaging) is performed by another manufacturer - in stock at the manufacturer (unless covered by other applicable directives).
- Manufactured for export outside EEA.
- Displayed, demonstrated at exhibitions, trade fairs etc.

3.9 Manufacturer

This is the person who is responsible for the design and manufacture of an item of pressure equipment which is to be placed on the market within the EEA. A

manufacturer who subcontracts some or all of his activities may in no circumstances discharge himself of his responsibilities to, for example, authorised representatives, distributors, retailers, wholesalers, customers or subcontractors.

The manufacturer has sole and ultimate responsibility for the conformity of the product to the applicable directives whether or not he designed and fabricates the product himself.

In terms of new assemblies of industrial gas pressure equipment the supplier is the manufacturer irrespective of whether any actual site work is subcontracted.

3.10 Installation

The definition of an installation does not appear in the PER (9), however it has been defined within the official guidance section published on the PED website.

This official guidance section defines an industrial installation as an assembly of individual items of pressure equipment installed on the user site by and under the responsibility of the user, and is excluded from the PER (9).

Since most customer installation activities are not directly under the responsibility of the user, but remain the supplier's (often the gas companies) concern, this exclusion does not apply to the customer installations considered within this code.

3.11 Supplier

For the purpose of this document the supplier is the entity responsible for managing the installation of a pressure system to the point of handover to the user. The specific responsibilities of the supplier will include:

- Design of the pressure system;
- Pressure System Design Review;
- Equipment conformity assessments;
- Technical design dossier including certification, drawings, operating instructions etc.

4. PRESSURE EQUIPMENT REGULATIONS - OVERVIEW

The PER (9) categorises pressure equipment based on the degree of hazard, which is defined by the pressure, volume, nature of the fluid and the type of equipment. The higher the hazard the more stringent the control requirements that have to be met.

There are three types of pressure equipment and assemblies.

- (1) Those that are excluded, i.e. below the threshold limit for pressure, or listed in the PER (9) as exempt for other reasons.

- Those that are categorised as Sound Engineering Practice, where pressure equipment and assemblies are below the specified pressure / volume or pressure / nominal pipe size thresholds. These have to:
 - be safe;
 - be designed and manufactured according to sound engineering practice;
 - bear specified markings (but not the CE marking).
- (3) Those that must comply with all aspects of the PER (9). Such pressure equipment and assemblies are categorised as Category I, II, III or IV in accordance with the PER (9), Schedule 3. These have to:
- be safe;
 - meet ‘essential safety requirements’ covering design, manufacture and testing;
 - satisfy appropriate conformity assessment procedures;
 - carry the CE marking and other information.

Manufacturers shall consider all applicable Directives in order to CE mark their pressure equipment or assemblies, that may include, but are not limited to:

- Simple Pressure Vessels (3).
- Machinery (5).
- Electromagnetic Compatibility (4).
- Low Voltage (6).
- Medical Devices (7).
- Potentially Explosive Atmospheres. (ATEX) (8).
- Transportable Pressure Equipment Directive (TPED) (2).

5. INTERFACE BETWEEN PRESSURE EQUIPMENT REGULATIONS AND PRESSURE SYSTEMS SAFETY REGULATIONS

HSE L122 (13), *Safety of Pressure Systems. PSSR 2000. Approved Code Of Practice*, provides comparison and guidance on the relationship between the PSSR (10) and the PER (9) and how they inter-relate. The PSSR (10) applies to the ongoing operation and maintenance of pressure systems and it will also apply to the design and construction of pressure equipment not covered by the PER (9).

For further guidance on the application of the PSSR (10) to industrial gas systems refer to BCGA CP 23 (19), *Application of the Pressure Systems Safety Regulations 2000 to industrial and medical pressure systems installed at user premises*, BCGA CP 24 (20), *Application of the Pressure Systems Safety Regulations 2000 to operational process plant*, and BCGA CP 39 (22), *In-service requirements of pressure equipment installed at user premises*.

6. CLASSIFICATION OF EQUIPMENT

Classification of equipment should be in accordance with the PER (9), Schedule 3, using classification charts based on pressure / volume or pressure / nominal pipe size relationships for different equipment and fluid types.

6.1 Product hazard

The majority of fluids used within the industrial gases industry are classified as gases and can be either Group 1 or Group 2 according to the degree of hazard.

NOTE: Liquefied and refrigerated liquid gases are classified as gases for the purpose of the PER (9).

Group 1 gases are:

- explosive,
- extremely flammable.
- highly flammable,
- flammable (where the maximum allowable temperature is above flashpoint),
- very toxic,
- toxic, or
- oxidising.

Examples are: oxygen, hydrogen, acetylene, carbon monoxide, natural gas.

Group 2 gases are:

Gases which are not in Group 1.

Examples are: argon, nitrogen, air, carbon dioxide.

6.2 Equipment hazard

Pressure is defined as the maximum pressure for which the equipment is designed (PS).

The type of pressure equipment defines the degree of pressure hazard either based on pressure and volume for vessels (PS.V) or pressure and nominal diameter for piping (PS.DN) and components for example, piping, safety accessories, pressure accessories and assemblies.

The PED (1), Article 1, Section 2.6, defines DN as follows:

'Nominal size (DN)' means a numerical designation of size which is common to all components in a piping system other than components indicated by outside diameters or by thread size. It is a convenient round number for reference purposes and is only loosely related to manufacturing dimensions. The nominal size is designated by DN followed by a number. Piping or tubing which does not have an official DN rating should assume a DN rating which is equivalent to its internal diameter.

Therefore the DN rating for copper tube will relate to the internal diameter, for copper tube purchased to, for example, BS EN 1057 (14), *Copper and copper alloys. Seamless, round copper tubes for water and gas in sanitary and heating applications*. Due to the variations in wall thickness and manufacturing tolerances it is not possible to obtain an accurate DN rating for every length of copper tubing. Therefore it is considered that 42 mm is equivalent to DN 40 and 28 mm is equivalent to DN 25.

For scheduled piping the same approach should be adopted, however this does present an anomaly when 1" schedule pipe is considered. The break point between SEP and category I is DN 25 for class 1 gases and DN 32 for class 2 (inert) gases. 1" NB schedule 80 pipe has a bore less than 25 mm, 1" NB schedule 10 pipe has a bore greater than 25 mm. It is not believed the intention of the regulations is to expect these to be dealt with differently. Therefore 1" NB pipe may be considered as DN 25.

6.3 Categorisation

Determining the product and equipment hazards enables the appropriate category and therefore conformity assessment route to be obtained. The flow charts and tables reproduced in Appendix 1 give details of how to apply these hazards for gases.

NOTE: The flow charts are a simplified version of information given in the PER (9) that must be consulted for an exact representation of the requirements of the regulations.

7. OVERVIEW OF HAZARD ANALYSIS AND ESSENTIAL SAFETY REQUIREMENTS

To comply with the PER (9) the manufacturer is obliged to analyse the hazards in order to identify those that apply to his equipment, on account of pressure, under reasonably foreseeable conditions. This hazard analysis shall be carried out for a complete pressure system as well as any individual assembly or component placed on the market.

The purpose of conducting the hazard analysis is to identify specific hazards that need to be addressed using the Essential Safety Requirements (ESR). For a complete list of the Essential Safety Requirements refer to the PER (9), Schedule 2. Pressure equipment must be designed, manufactured and checked, and if applicable equipped and installed, in such a way as to ensure its safety when put into service in accordance with the manufacturer's instructions, or in reasonably foreseeable conditions.

In choosing the most appropriate solutions, the manufacturer must apply the principles set out below in the following order:

- 1) Eliminate or reduce hazards as far as is reasonably practicable.
- 2) Apply appropriate protection measures against hazards which cannot be eliminated.
- 3) Where appropriate, inform users of residual hazards and indicate whether it is necessary to take appropriate special measures to reduce the risks at the time of installation and / or use.

Where the potential for misuse is known or can be clearly foreseen, it shall be addressed as part of the overall design.

8. EQUIPMENT COMPLIANCE

8.1 New equipment - either CE marked or Sound Engineering Practice

This is equipment that has been designed and manufactured to the appropriate category and conforms to the applicable sections of the PER (9).

NOTE: CE marking must not be affixed to a SEP item of equipment.

8.2 Equipment imported from outside the EEA

If equipment is imported from outside the EEA and the manufacturer declines to CE mark, it can only be used if the importer ensures that all the requirements of the PER (9) are met. This will require the relevant conformity assessment procedures to be carried out to ensure that the Essential Safety Requirements are met. The importer then assumes the responsibilities of the manufacturer and may CE mark the item. (This may only be possible for items in the lowest category where notified body requirement is not

required). Typically this would require material certificates, welder approvals and qualifications, design calculations etc.

NOTE: This approach is not recommended as the importer then takes on all the legal responsibilities of the manufacturer. For new equipment imported that would be SEP the importer shall ensure that it is safe and fit for purpose.

8.3 Used equipment

The PER (9) is only concerned with placing on the market for the first time and therefore used equipment is not covered by these regulations. Items that have been CE marked and are re-used do not lose their original status.

It is impossible to retrospectively CE mark used equipment such as an existing pressure vessel, manufactured prior to the PER (9), as for example, weld procedures and welders would not have been approved by an appropriate notified body to the PER (9) requirements, and material characteristics may not meet the current PER (9) requirements.

However, used equipment is permitted provided it conformed to the regulations in force at the original time of manufacture and is fit for continued service. Verification and assessment processes for used equipment in new pressure systems are detailed below in Section 9.2.

9. CLASSIFICATION OF THE EQUIPMENT AND ASSEMBLIES AT USER SITES

9.1 Systems installed on user sites.

Systems that are to be installed on user sites are classified into three types.

(1) A pressure system comprising all new equipment

The combination of all new equipment and assemblies installed at a user's site shall be classified as an Assembly, and therefore subjected to a global conformity assessment and CE Marking where applicable.

(2) A pressure system comprising used equipment that has previously been placed on the market and is being relocated.

The industrial gases industry is characterised by considerable customer turnover where assemblies are removed, they are broken down into their constituent parts and either refurbished or stored ready for re-use. A new 'pressure system' may comprise of different combinations of 'used' equipment from former assemblies re-assembled in a new user location with new pipework or hose(s) to create a new system.

The guidance in Appendix 9 has been developed to help determine whether changes during the relocation of an assembly's constituent parts should be

classified as minor or major modifications. Minor modifications to pressure equipment / assembly are excluded from the PER (9) whilst major modifications require full PER (9) compliance.

Each relocated component part shall be subject to review by the manufacturer of the new pressure system. They are assessed in their own right either as an assembly or an item of equipment, and then an overall Pressure System Design Review is carried out on the complete pressure system. Any new equipment introduced shall be PER (9) compliant including new interconnecting piping. If the pressure system contains pre-PER (9) non CE marked equipment then a verification process is required on these items prior to undertaking the Pressure System Design Review, to confirm they are fit for continued service.

This approach aligns closely with the PER (9) Global Conformity Assessment, which ensures compliance with the PSSR (10). Such relocated assemblies need not and cannot be CE marked, although individual items could well be.

(3) A pressure system comprising a combination of new PED (1) compliant equipment and used equipment which has previously been placed on the market and is being relocated.

The extent of ‘used’ equipment in the new pressure system shall determine whether the ‘relocated assembly’ approach can be followed, and needs to be reviewed on a case by case basis.

It is not acceptable to exclude assemblies from the PER (9) by the use of minor item(s) of ‘used equipment’ in a system when all other major items are new. An example of a minor item could be piping.

The guidance in Appendix 9 has been developed to help determine whether changes during the relocation of an assembly’s constituent parts should be classified as minor or major modifications. Minor modifications to pressure equipment or assemblies are excluded from the PER (9) whilst major modifications require full PER (9) compliance.

9.2 Pressure systems design review at user premises

The Pressure System Design Review of the overall pressure system, shall confirm as a minimum:

- System design, analysis of hazards, incorporation of essential safety requirements and the setting of safe operating limits.

If the tank safety system is changed it should be reassessed to ensure the essential safety requirements are met, i.e. a standard set of relief valve sizing calculations with the specified safety accessories to achieve the pressure relief criteria

- Pressure equipment specification against system design parameters.

- Appropriate integration of equipment items and jointing methods.
- Adequate overpressure protection of system.
- New pressure equipment is PER (9) compliant (CE marked and ‘Declaration of Conformity’ if required) and ‘fit for purpose’.
- Used equipment is compliant with previously recognised design codes and verification that it is safe and suitable for the intended product service or duty. This should include an ageing pressure equipment assessment, refer to BCGA CP 39 (22).
- Completion of a ‘Statement of Compliance’ with the PER (9) (not to be confused with a ‘Declaration of Conformity’ that is applicable to any CE-marked equipment or assembly used within the system).

9.3 Validation of used pre-PER non-CE marked equipment

Recommendations for verification of key equipment are specified below.

9.3.1 Tanks

Using assessment checklist in Appendix 6.

- Verify that the tank has been manufactured to a recognised pressure vessel code acceptable at the time of manufacture and that design meets the key applicable essential safety requirements of the PED (1) as demonstrated in Table 1.
- The pressure vessel nameplate must be intact, with the design / working pressure, manufacture code and date of manufacture clearly visible. Verify that the nameplate data corresponds to the vessel certification reviewed.
- Verify that the tank has been revalidated in accordance with BCGA CP 25 (21), *Revalidation of cryogenic static storage tanks*, and BCGA CP 39 (22).
- Confirm that the tank is suitable for the intended product.
- Carry out an ageing pressure equipment assessment in accordance with BCGA CP 39 (22).

NOTE: Smaller vessels often only have batch certification rather than individual dossiers. It is therefore permitted to validate the manufactured batch via ‘type approval’ of their design using the same criteria as in Appendix 6.

ESR Clause	PED Essential Safety Requirement	Method of compliance	Yes / No	Comment
2.1	General – Pressure equipment designed to ensure it is safe throughout its intended design life and that all appropriate safety factors have been incorporated.	Vessel designed to recognised code and approved by independent authority?	Yes	See vessel assessment Section 3.
2.2	Design for adequate strength	Safe operating limits specified in certification?	Yes	See vessel assessment Section 1 & 2.
	2.2.3 – Calculation method.	Formula according to design code?	Yes	Recognised code
2.3	Provisions to ensure safe handling and operation.	Incorporated in approved design?	Yes	Vent / relief valve discharge to ground.
2.4	Means of examination.	Man-way / inspection port fitted?	No	Not feasible on vacuum insulated cryogenic vessels.
2.5	Means of draining and venting.	Vent valve fitted?	Yes	
2.6	Corrosion or other chemical attack.	Corrosion allowance in design?	Yes	Corrosion resistant materials on piping. No corrosion mechanism on inner vessel.
2.7	Wear.	N/A		N/A
2.8	Assemblies.	Components to approved standard and correctly integrated / assembled?	Yes	Piping test and NDT where appropriate.
2.9	Provisions for filling and discharge.	Fill / off-take valves fitted?	Yes	
2.10	Protection against exceeding the allowable limits of pressure equipment.	Overpressure protective devices fitted?	Yes	Relief valves / burst discs on vessel, thermal RV's on blocked-in valves.
2.11	Safety accessories.	Relief devices to approved specification and in-test?	Yes	See vessel assessment Section 4.
2.12	External fire.	Fire condition in over-pressure protection safety design?	Yes	Inner vessel safety systems sized for external fire without loss of outer jacket integrity or siting in accordance with BCGA publications.
3.1	Manufacturing procedures.	Approved / witnessed by inspection authority?	Yes	To design code requirements
3.2	Final assessment.			
	3.2.1 – Final inspection.	Witnessed by inspection authority / user inspectorate and stamped on nameplate?	Yes	See vessel assessment Section 1 & 3.
	3.2.2 – Proof test.	Pressure test certification?	Yes	
	& 7.4 – Hydrostatic test pressure.	Vessel proof tested to 1.43 x PS?	No	Test pressure to design code requirement.
	3.2.3 – Inspection of safety devices.	Relief devices have correct lift pressure, are properly installed and in-test?	Yes	See vessel assessment Section 4.
3.3	Marking and labelling.	Is nameplate legible and permanently affixed to vessel? Markings as follows:	Yes	See vessel assessment Section 4.
	3.3a – For all pressure vessels.	Serial No, manufacturer, year of manufacture, safe operating limits.	Yes	See vessel assessment Section 4.
	3.3b – Depending on the type of pressure equipment	Test pressure, volume, vessel code, product service?	Yes	See vessel assessment Section 4.
4.1	Materials for pressurised parts.	Materials to approved national standard referenced in design code?	Yes	Verified by original inspections
7.1	Allowable stresses.	Appropriate stress values used?	Yes	To design code requirements

TABLE 1: Demonstration of compliance of vessel >1000 litre capacity with applicable essential safety requirements.

Individual assessment will still be required to satisfy compliance with PSSR (10) criteria and establish ‘fitness for purpose’.

9.3.2 Vaporisers

Using assessment checklist in Appendix 7.

- Confirm original design pressure and operating parameters.
- Confirm unit is fit for intended purpose.
- Validate pressure integrity as part of the overall piping system pressure test.
- Carry out an ageing pressure equipment assessment in accordance with BCGA CP 39 (22).

9.3.3 Ancillary equipment

Using assessment checklist in Appendix 8.

- Confirm original design pressure and operating parameters.
- Confirm unit is fit for intended purpose.
- Validate pressure integrity as part of the overall piping system pressure test.
- Carry out an ageing pressure equipment assessment in accordance with BCGA CP 39 (22).

9.4 Statement of compliance for the pressure system

In order to demonstrate that a system design review has been conducted on the complete pressure system, a ‘Statement of Compliance’ shall be issued which clearly defines the items of equipment and assemblies and states the method of assessment for both new and used equipment. Any exclusions must also be specified.

An example form which may be used to show a typical ‘Statement of Compliance’ for the system shown in Figure 1 is detailed at Appendix 3. Table 2 summarises the combinations of equipment used.

9.4.1 Combination of used and new equipment

In the example shown (as detailed in Appendix 3) the tank, vaporiser and control panel have been confirmed as ‘fit for service’, with one section of the interconnecting pipework assessed as Category 1 and one section as SEP.

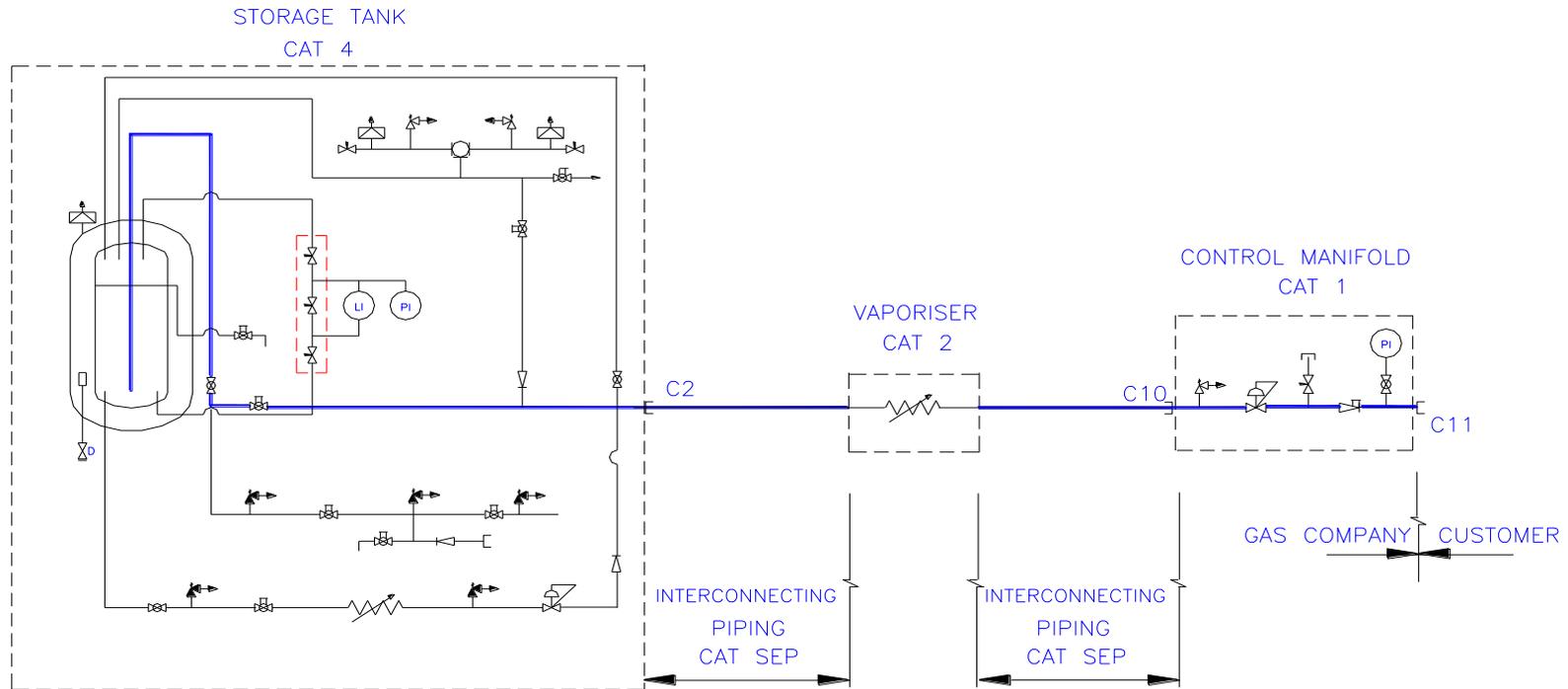


FIGURE 1: Interpretation of the PED for installations at user premises

Item	1) Tank	2) Tank to Vaporiser Piping	3) Vaporiser	4) Vaporiser to Control Panel Pipe	5) Control manifold
Used and New Equipment	To be assessed by the supplier as defined in Section 9.3.1	Designed to SEP by the supplier	To be assessed by the supplier as defined in Section 9.3.2	To be CE marked by the supplier	Assessed by the supplier as defined in Section 9.3.3
Entire pressure system to undergo a system design review. i.e. at each interface between the component parts the pressure, flow, temperature defaults to be reviewed to ensure operating limits are not exceeded and safety devices suitably sized. An example form for a Statement of Compliance is given in Appendix 3.					

TABLE 2: Summary of the combination of equipment used

9.4.2 Equipment to other Directives

A pressure system may contain pressurised equipment, which is marked to conform to a directive other than the PED (1), e.g. filter chambers to the Simple Pressure Vessel Directive (SPVD) (3), transportable vessels to the Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations (11), and even items covered by the Machinery Directive (5). They will need to be included in the system design review but the statement of compliance would reflect this.

NOTE: Appendix 4 shows an example form for a typical ‘Declaration of Conformity’ which can be used as a template for items manufactured and CE marked by the gas company. In the example above it could be used for the pipework.

9.5 Piping design

For the piping element of the pressure system the supplier will be the manufacturer, and it will be either SEP or Category I (no notified body involvement). Higher categories may on occasions be required which would necessitate the involvement of a notified body. The text below addresses the key points of SEP and Category I.

9.5.1 Sound engineering practice

Piping is designed and manufactured in accordance with SEP.

- It must be accompanied by adequate instructions for use;
- Must identify the manufacturer;
- Must be safe;
- Must not be CE marked.

NOTE: SEP piping may be designed and installed either using national codes or standards or those produced by individual companies.

9.5.2 Category I

The requirements for this piping system are:

- The relevant essential safety requirements have been satisfied by applying appropriate industrial and / or in-house standards. Wherever possible a transposed harmonised standard should be used;
- Technical documentation has been produced, details of which are given in Section 9.5.4;
- The appropriate conformity assessment procedure (Module A as detailed in the PER (9)) has been carried out;

- The CE marking has been affixed to the pipework system by the manufacturer;
- A ‘Declaration of Conformity’ has been drawn up (example shown in Appendix 4);
- It is safe.

9.5.3 Pressure testing

Pressure testing of piping is not specifically mentioned within the PER (9). In the absence of requirements within the PED (1) or harmonised standards, the requirements of traditionally applied codes such as ANSI B31.3 (17), *Process piping*, (which generally requires 1.5 times design pressure, but allows 1.1 times design pressure or the working pressure, under some circumstances) may be followed. Pneumatic testing will continue to be applied where it can be demonstrated that the equipment is not designed to be hydraulically full or where the presence of any remaining water might be detrimental to the process.

9.5.4 Technical documentation (File)

The supplier shall compile the technical documentation, and hold it for a period of ten years, or for the life of the system which ever is the greater.

The technical documentation shall enable an assessment to be made of the conformity of the pressure equipment with the requirements of the PER (9) which apply to it. It shall, as far as is relevant for such assessment, cover the design, manufacture and operation of the pressure equipment and contain:

- A general description of the pressure equipment;
- Conceptual design and drawings such as a piping and instrumentation drawing (P&ID), equipment layout and parts lists;
- Analysis of hazards and assessment against the essential safety requirements;
- A list of the standards used and methods adopted to meet the essential safety requirements;
- Design calculations;
- Material and equipment approvals, jointing technique used and operator qualifications where applicable;
- Examinations carried out and test reports;

- Instructions and manuals;
- Declaration of conformity or statement of compliance.

The supplier must take all measures necessary to ensure that the manufacturing process adopted meets all the requirements of the PER (9). Appendix 2 provides an example of a technical documentation file contents sheet.

10. MATERIAL APPROVALS

There are three methods that can be used for material approvals:

- 1) By using materials that comply with harmonised standards.
- 2) By using materials that are covered by European Approval of pressure equipment Materials (EAM).
- 3) Particular Material Appraisal (PMA).

For pressure equipment in Category I and Category II the manufacturer may produce a PMA, for Category III and IV equipment a Notified Body must generate / approve the PMA.

A PMA declares that a material is suitable for the intended application and use in pressure equipment. A PMA applies to an individual piece of pressure equipment or assembly, though different designs may be covered in some cases by a generic PMA.

Where a notified body is used to generate the PMA they may use their own format.

Appendix 5 details a PMA format that may be used.

11. JOINING

For pressure equipment, permanent joining of components must be carried out by suitably qualified personnel using suitable procedures.

11.1 Permanent joining between different categories

Consider a piping connection which is being used to join a cryogenic vessel to a piping system which could be SEP or Category I. The piping could be joined to a Category IV vessel at one end and possibly a Category II vaporiser at the other.

The joining technique must be appropriate to the hazard, the higher the hazard the more onerous are the requirements. Whilst the hazard for the pipe will remain constant along its length, its joint with the item of a higher category must default to the highest

category. In this example the joint with the vessel would be assessed to Category IV and the joint with the vaporiser would be to Category II.

Mechanical joints are not subjected to the same level of approval and therefore the use of a mechanical joint to join pressure equipment of differing categories is an acceptable method, and is indeed current industry practice.

Refer to BCGA CP 4 (18), *Industrial gas cylinder manifolds and gas distribution pipework (excluding acetylene)*, for approved jointing methods for gas distribution pipework.

12. CUSTOMER INTERFACE

It is typical of the industrial gases industry that equipment is leased and connected to either new or existing pressure equipment at a customer site.

The supplier of the pressure system (usually the gas company) should agree where his scope of supply ends and the customer responsibility starts. All demarcation points shall be physically marked on the system, clearly identified on the supply contract, the PSSR (10) Written Scheme of Examination and the customer operating manual. It is good practice to identify the normal system operating limits which occur at the demarcation point.

The gas supplier should also provide the following information to enable the customer to formally assess the suitability of his system for the connection of the supply system.

- 1) Fluid type.
- 2) PER (9) fluid group.
- 3) Fluid pressure i.e. maximum allowable pressure (PS).
- 4) Fluid temperature i.e. at the PS value.
- 5) Fluid flow i.e. at the PS value.
- 6) Termination supply point size i.e. DN size and joint type.
- 7) Termination supply point conformity assessment category.
- 8) Termination supply point material classification.
- 9) Down stream safety accessory recommendation.
- 10) Declaration of conformity (if applicable).
- 11) Identification of associated hazards.
- 12) Safe operating and maintenance instructions.

13) Recommendation of BCGA respective publications.

13. REFERENCES

Document Number	Title
1. 97/23/EC	Pressure Equipment Directive (PED).
2. 1996/36/EC	Transportable Pressure Equipment Directive (TPED).
3. 87/404/EEC	Simple Pressure Vessel Directive (SPVD).
4. 2004/108/EC	EMC Directive.
5. 2006/42/EC	Machinery Directive.
6. 2006/95/EC	Low voltage Directive.
7. 93/42/EEC	Medical Devices Directive (as amended).
8. 94/9/EC	Potentially explosive atmospheres (ATEX) Directive.
9. SI 1999 No. 2001	Pressure Equipment Regulations 1999 (PER) (as amended).
10. SI 2000 No 128	Pressure Systems Safety Regulations 2000 (PSSR).
11. SI 2009 No. 1348	The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2009 (as amended).
12. DTI Guidance Note URN 99/1147	Department for Trade and Industry Guidance Note URN 99/1147 on Pressure Equipment. NOTE: DTI is obsolete – relevant functions are now carried out by the Department for Business, Innovation and Skills (BIS).
13. HSE L122	Safety of Pressure Systems. Pressure Systems Safety Regulations 2000. Approved Code Of Practice.
14. BS EN 1057	Copper and copper alloys. Seamless, round copper tubes for water and gas in sanitary and heating applications.
15. BS EN 1515	Flanges and their joints.
16. PD 5500	Specification for unfired fusion welded pressure vessels.
17. USA ASME B31.3	Process Piping.

Document Number	Title
18. BCGA Code of Practice 4	Industrial gas cylinder manifolds and gas distribution pipework (excluding acetylene).
19. BCGA Code of Practice 23	Application of the Pressure Systems Safety Regulations 2000 to industrial and medical pressure systems installed at user premises.
20. BCGA Code of Practice 24	Application of the Pressure Systems Safety Regulations 2000 to operational process plant.
21. BCGA Code of Practice 25	Revalidation of cryogenic static storage tanks.
22. BCGA Code of Practice 39	In-service requirements of pressure equipment installed at user premises.

Further information can be obtained from:

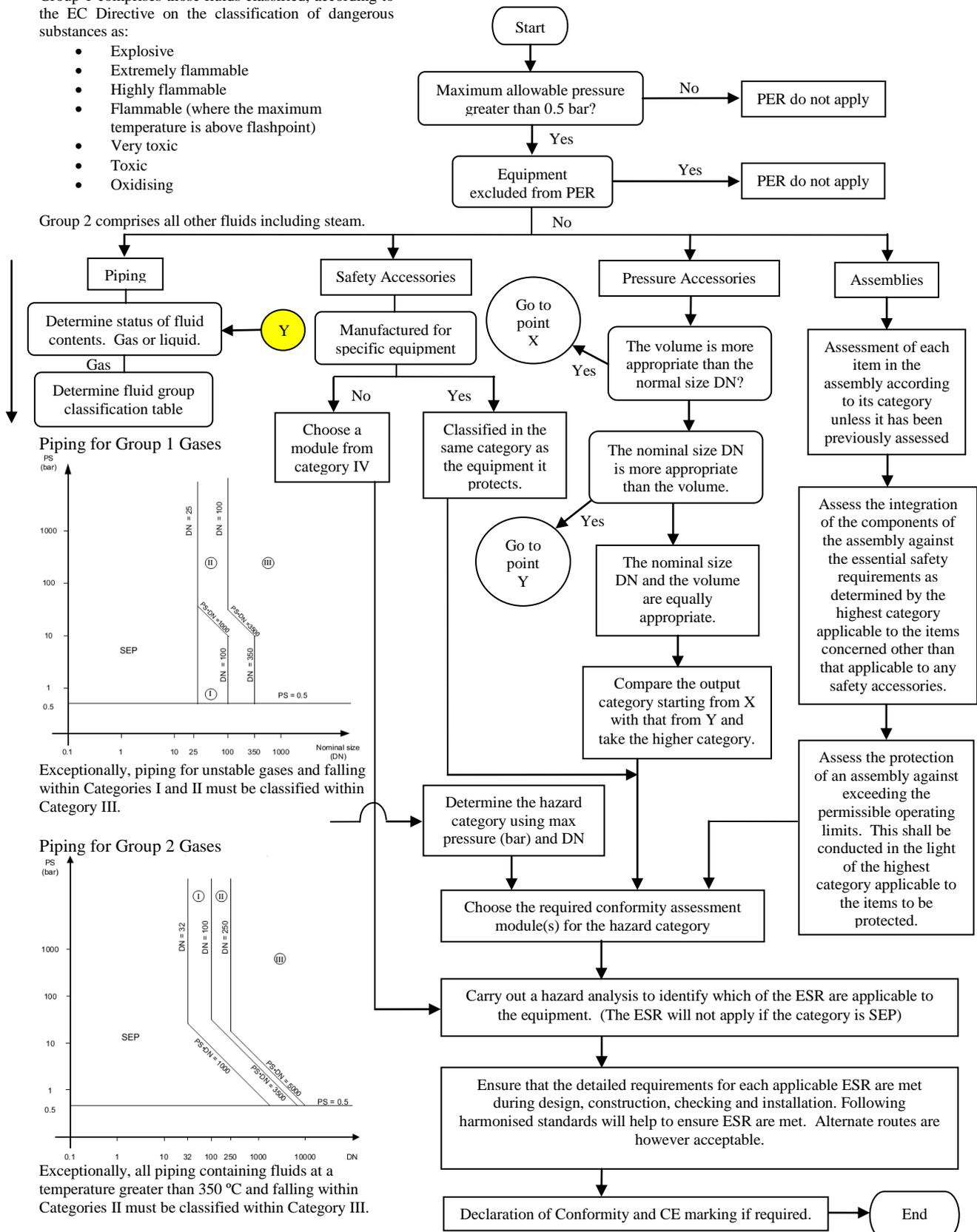
Department for Business, Innovation and Skills (BIS)	www.bis.gov.uk
Health and Safety Executive (HSE)	www.hse.gov.uk
UK Legislation	www.legislation.gov.uk
British Standards Institute (BSI)	www.bsigroup.co.uk
British Compressed Gases Association (BCGA)	www.bcgaco.uk
American Society of Mechanical Engineers (ASME)	www.asme.org

PRESSURE EQUIPMENT REGULATIONS FLOWCHART

Group 1 comprises those fluids classified, according to the EC Directive on the classification of dangerous substances as:

- Explosive
- Extremely flammable
- Highly flammable
- Flammable (where the maximum temperature is above flashpoint)
- Very toxic
- Toxic
- Oxidising

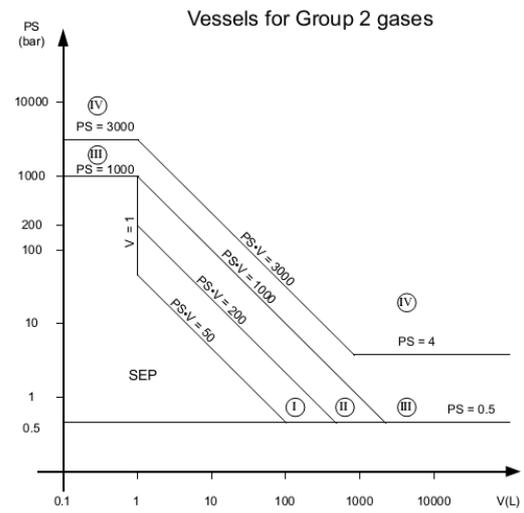
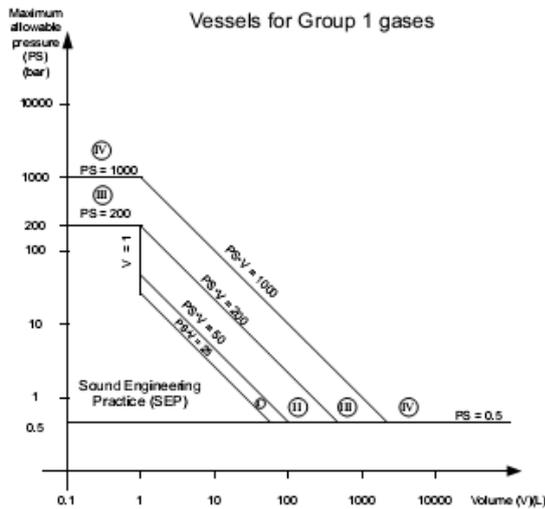
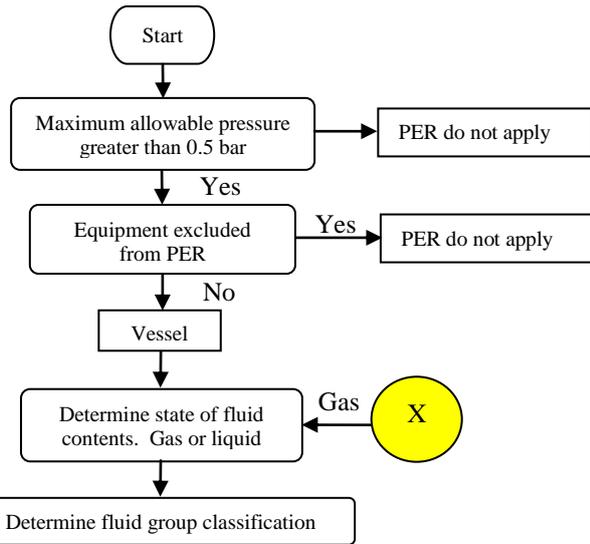
Group 2 comprises all other fluids including steam.



Group 1 comprises those fluids classified, according to the EC Directive on the classification of dangerous substances as:

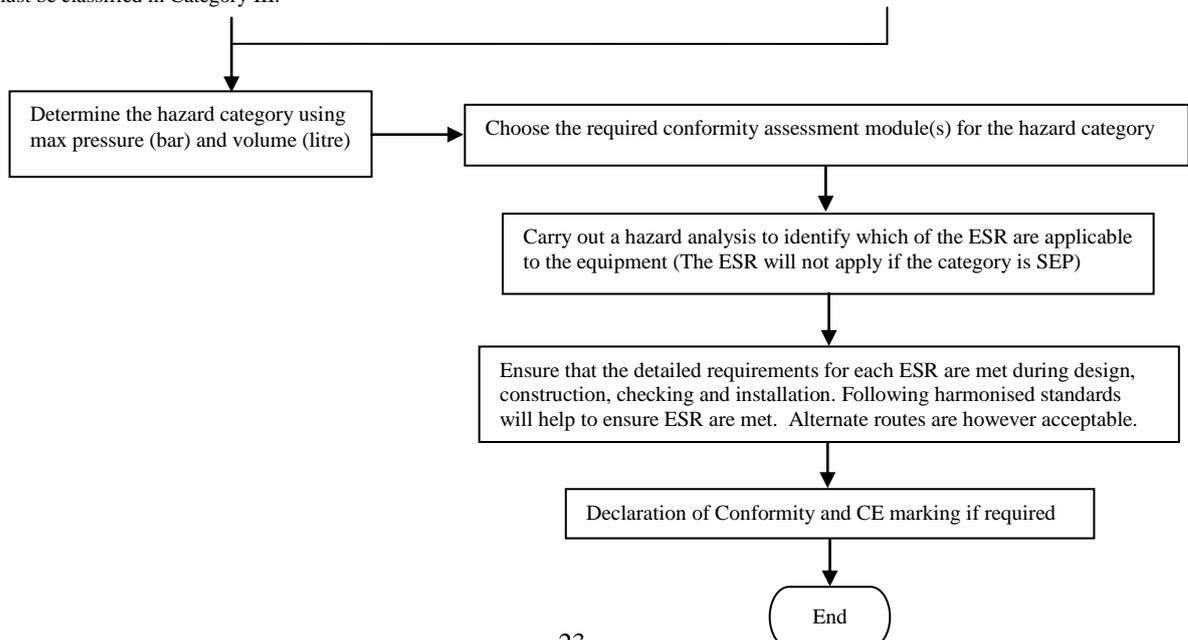
- Explosive
- Extremely flammable
- Highly flammable
- Flammable (where the maximum temperature is above flashpoint)
- Very toxic
- Toxic
- Oxidising

Group 2 comprises all other fluids including steam.



Exceptionally, vessels intended to contain an unstable gas and falling within Categories I & II on the basis of this chart must be classified in Category III.

Exceptionally, portable extinguishers and bottles for breathing equipment must be classified at least in Category III.



PRESSURE EQUIPMENT REGULATIONS

TECHNICAL DOCUMENTATION FILE

General Description

Project Name:

Project Number:

Equipment Name:

Equipment Identification Number:

Manufacturer

Manufacturer's Address:

Manufacturer's Authorised Representative:

Manufacturer's Authorised Representative's
Address:

INDEX

1. Conceptual Design
2. Hazard Analysis / ESR Assessment
3. Standards / Specifications / Procedures
4. Design Parameters / Calculations
5. Material / Equipment Approvals
6. Manufacturing / Examination
Technical Reports
7. Instructions / Manuals
8. Declaration of Conformity /
Statement of Compliance

**EXAMPLE FORM
DECLARATION OF CONFORMITY**

<i>COMPANY LOGO</i>	Declaration of Conformity with the Pressure Equipment Regulations SI 1999 No 2001
Name and address of the Manufacturer and location of Assembly * if applicable:	
Description of overall Pressure Equipment or Assembly:	
Conformity assessment procedure followed:	
Pressure equipment constituting the Assembly and conformity assessment used, if applicable: *	
Name and address of the Notified Body if applicable: #	
Reference of the: EC type examination certificate # EC design examination certificate # EC certificate of conformity #	
Harmonised standards used if applicable: #	
Other technical standards and specifications used if applicable: #	
References to other European Directives if applicable: #	
Authorised Person for the Manufacturer * or Authorised Representative within the EC * making this legally binding declaration:	
Name:	Title:
Signature:	Date:

* Delete where not appropriate

State “*Not applicable*” or “*None*” where not appropriate

PARTICULAR MATERIAL APPRAISAL

Pressure equipment manufacturer:

Pressure equipment:

Maximum allowable pressure (bar):

Maximum allowable
temperature (°C):

Minimum allowable
temperature (°C):

Material manufacturer:

Material specification:

Grade:

Heat number:

Compliance with ESRs:

Property	Requirement	Compliance
Sufficiently ductile		
Sufficiently tough		
Weld including HAZ		
Not significantly affected by aging.		
Suitable for intended processing		
Mechanical properties		
Marking		
Type of certificate		
Manufacturers approval		

Additional testing results are given in Report No.:

The named pressure equipment manufacturer may use this material specification for the construction of pressure equipment designed for use within the stated limits and subject to the following restrictions:

Additional testing:

Restrictions:

This PMA must be reviewed for continued acceptance on or before:

Name:

Title:

Signature:

Date:

ASSESSMENT OF NON CE-MARKED PRE-PED PRESSURE VESSELS

Vessel Serial No.

APPROVAL	
<i>The attached assessment has demonstrated that the aforementioned pressure vessel that was placed on the market prior to 29th May 2002 is compliant with the key applicable essential safety requirements of the Pressure Equipment Directive (97/23/EC). It is endorsed for use within an Assembly but cannot be CE-marked.</i>	
Authorised 'Competent Person' on behalf of <i>GAS COMPANY</i>	
Name:	Title:
Signature:	Date:

1. VESSEL DETAILS

Confirm the following details for the pressure vessel.

Vessel Type & I/D No. (Company)		
Manufacturer		
Manufacturer Serial No.		
Year of Manufacture		
Design Code(s)		
Volume - Geometric – Litre		
Design Pressure - bar(g)		
Design Temperature - °C		
Pressure Test	Date:	Test Pressure:
Independent Inspection Authority		

2. VESSEL DOCUMENTATION

From what source has the above technical data for the vessel been obtained?

Documentation Source	Tick source	Source type	Copy of document attached
Vessel Dossier (Original manufacturer)			Desirable requirement
Vessel Certificate (e.g. CEOC)			Desirable requirement
Vessel Nameplate (Photo / Rubbing)			Supplementary data
Vessel Refurbishment Dossier			Supplementary data
Verified Vessel Database			Supplementary data
Verified Installation & Maintenance Database			Supplementary data
Vessel Revalidation Report			Supplementary data
By Association (from batch manufacture records)			Supplementary data

3. VESSEL HISTORY

Confirm the following details to determine whether the vessel is fit for continued service.

Was design code acceptable in the country of use when vessel first placed on the market? Refer to Table below.	
Was design/manufacture approved and certificated by an independent authority? If NOT vessel assessment shall be referred to Competent Person for further investigation.	
Is the vessel within its original validation period (20 years for cryogenic tanks)? If NOT has it been Revalidated, and is revalidation still current? Append report.	
Is the vessel within its permissible 'in-service inspection' period?	
Is the original vessel nameplate intact, permanently affixed, legible and contains required information? If NOT conduct vessel identity verification, and if successful, affix replacement nameplate	
Is the vessel designed for the intended product?	

NOTE: It is mandatory to answer YES to all the above questions if the vessel is to be PED (1) compliant.

Recognised design codes acceptable before PED (1) in the UK

Design Code	
ASME VIII (USA)	
BS 1515 (15) / PD 5500 (16)	
CODAP (France)	
REGELS / STOOMWEZEN (Holland)	
AD MERKBLATTER / DRUCK V. (Germany)	
CODE DE CRYOGENIQUE (Belgium)	
ISPESL (Italy)	
TKN (Sweden)	

4. INITIAL IN-SERVICE INSPECTION

Carry out an initial inspection before taking into use to verify:

Pressure vessel nameplate is intact, with the design / working pressure, manufacture code and date of manufacture, clearly legible.
Nameplate data corresponds to the vessel certification reviewed and consistent with system P&ID.
Tank outer jacket and integral pipework are free from mechanical damage.
Vessel overpressure protection devices have been replaced with new or refurbished units to correct specification, i.e. <ul style="list-style-type: none"> • Main vessel relief valves do not exceed design pressure. • Burst discs do not exceed test pressure. • Thermal relief valves have set pressure greater than vessel relief valves.

ASSESSMENT OF NON CE-MARKED PRE-PED VAPORISERS

APPROVAL	
<i>The attached assessment has demonstrated that the aforementioned pressure equipment that was placed on the market prior to 29th May 2002 is compliant with the key applicable essential safety requirements of the Pressure Equipment Directive (97/23/EC). It is endorsed for use within an Assembly but cannot be CE-marked.</i>	
Authorised 'Competent Person' on behalf of <i>GAS COMPANY</i>	
Name:	Title:
Signature:	Date:

Project No.:

Customer Name:

Location:

1. VAPORISER DETAILS

Verify vaporiser details using model / manufacturer from the matrix below if nameplate not fitted.

Vaporiser P&ID Tag No.				
Vaporiser functional type				
Company type reference				
Vaporiser I/D No. (Company)				
Manufacturer				
Manufacturer Serial No. (if available)				
Design code				
Design pressure				
Was design acceptable in the country of use when vessel first placed on the market?				
Is the vaporiser designed for the intended product?				

2. INITIAL IN-SERVICE INSPECTION

Carry out an initial inspection before taking into use to verify:

Vaporiser Rating is consistent with system P&ID.
Vaporiser is free from mechanical damage and is adequately supported.
Vaporiser is of the appropriate cleanliness for the intended product service.
Vaporiser is validated as part of the overall system.
Pressure test.

ASSESSMENT OF NON CE-MARKED PRE-PED PRESSURE EQUIPMENT

APPROVAL	
<i>The attached assessment has demonstrated that the aforementioned pressure equipment that was placed on the market prior to 29th May 2002 is compliant with the key applicable essential safety requirements of the Pressure Equipment Directive (97/23/EC). It is endorsed for use within an Assembly but cannot be CE-marked.</i>	
Authorised 'Competent Person' on behalf of <i>GAS COMPANY</i>	
Name:	Title:
Signature:	Date:

Project No.:

Customer Name:

Location:

1. EQUIPMENT DETAILS

Confirm the following details to determine whether the equipment is fit for continued service:

Equipment functional type	
Type reference	
Equipment I/D No. (company)	
Manufacturer	
Manufacturers Serial No.	
Date of manufacture	
Design code	
Design pressure – bar(g)	
Was design acceptable in the country of use when equipment first placed on the market?	
Is the original equipment nameplate intact, permanently affixed and legible?	
Is the equipment designed for the intended product?	

2. INITIAL IN-SERVICE INSPECTION

Carry out an initial inspection before taking into use to verify:

Equipment nameplate is intact, with the Design / Working Pressure, Manufacture Code and Date of manufacture clearly legible.
Equipment Rating is consistent with system P&ID.
Equipment is free from mechanical damage and is adequately supported.
Equipment is of the appropriate cleanliness for the intended product service.
Validate by means of pressure test.
Overpressure protection devices replaced with new or refurbished units to correct specification.

CLASSIFICATION OF PRESSURE SYSTEM CHANGES

Refurbishment of pressure equipment is only carried out when assemblies are removed from customer sites and broken down into their constituent parts prior to re-use. Refurbishment back to an equipment’s original state is classed as maintenance and therefore excluded from the PER (9). Minor modifications are similarly excluded.

Major modifications that are classified as a significant change to the " Pressure Equipment", even on pre-PER (9) equipment, shall be subject to the PER (9).

Table A9-1 defines how typical modifications to assemblies/combinations of pressure equipment may affect the ‘relocated assembly’ classification when equipment is next installed.

DESCRIPTION OF CHANGE	MODIFICATION	
	MINOR	MAJOR
Pressure system configuration		
Change size / type of individual “used” pressure equipment items to suit the space available and specific site / customer conditions. *	X	
Change number of “used” pressure equipment items to suit new customer process conditions. *	X	
Pressure system of “new” / “major modified” pressure equipment.		
Assemble with all “new” pressure equipment with “new” interconnecting piping. #		X
Re-assemble all “new” pressure equipment with “used” piping. #		X
Re-assemble “new” and “major mod” pressure equipment with “new” piping. #		X
Re-assemble “new” and “major mod” pressure equipment with “used” piping. #		X
Pressure system of “used” pressure equipment.		
Re-assemble all “used” pressure equipment with “new” piping. #	X	
Re-assemble all “used” pressure equipment with “used” piping. #	X	
Pressure system of “new” / “major modified” and “used” pressure equipment.		
Re-assemble “used” and “new” / “major mod” pressure equipment with “new” piping. #	X	
Re-assemble “used” and “new” / “major mod” pressure equipment with “used” piping. #	X	

* Pressure system design review required.

Global conformity assessment required

TABLE A9-1: CLASSIFICATION OF ASSEMBLIES / PRESSURE SYSTEMS

Table A9-2 defines how typical modifications / refurbishment to discrete items of pressure equipment shall be classified after removal from service and before relocation / re-use.

DESCRIPTION OF CHANGE	MODIFICATION	
	MINOR	MAJOR
Vacuum insulated storage vessel		
Change of product service:		
• To a product for which the tank was originally manufactured / coded.	X	
• To a product not covered in the original approval documentation / design.		X
Change or repair to the external piping and piping components / valves.	X	
Repair to outer jacket.	X	
Repair to the inner pressure vessel. *	X	
Change to the inner pressure vessel. *		X
Change to interspace piping.		X
Change to the stated design parameters. *	X	
Replace relief valves with different size / type / set pressure within design parameters.	X	
Vaporisers		
Change of product service:		
• To a product for which the vaporiser was originally manufactured.	X	
• To a product not covered in the original approval documentation / design.		X
Change or replacement of vaporiser headers on line sizes in excess of DN50.		X
Control panels and pressure control manifolds		
Modification unless the scope or range has been changed.	X	
Non-vacuum insulated vessel		
Change of product service:		
• To a product for which the vessel was originally manufactured / coded.	X	
• To a product not covered in the original approval documentation / design.		X
Change or repair to the external piping and piping components / valves.	X	
Repair to the pressure vessel. *	X	
Change to the pressure vessel. *		X
Change to the stated design parameters. *		X
Replace relief valves with different size / type / set pressure within design parameters.	X	
Interconnecting piping.		
Change or repair to reusable piping from previous assembly / system.	X	

* With appropriate third party independent authority / Notified Body involvement.

TABLE A9-2: MODIFICATION / REFURBISHMENT TO PRESSURE EQUIPMENT

British Compressed Gases Association
www.bcga.co.uk