

NIST GCR 04-870

A Guide to the EU Pressure Equipment Directive

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A Guide to the Pressure Equipment Directive

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The Pressure Equipment Directive (PED)

(97/23/EC)

In force on November 29, 1999 and mandatory from May 30, 2002

To Be Considered:

The CE Marking is aptly called the passport to Europe for products. It is required by law if the product is within the scope of one of the European Union (EU) Directives under the "New Approach to Technical Harmonization and Standards" (See NIST SP 951 Page 1). It is not a quality mark, nor is it a mark for consumers. All manufacturers are required to affix the CE Marking to products that are governed by New Approach Directives. CE Marking on a product indicates to all authorities that the product is in compliance with the Essential Safety Requirements (see page 8) of all Directives that apply to the product.

For a listing of EU Member States and signatories of the European Economic Area (EEA), see NIST SP 951 Page 1.

There is more than one New Approach Directive to regulate the design and placing on the market of equipment that create risk due to pressure. In addition to the Pressure Equipment Directive (97/23/EC), there is the Simple Pressure Vessel Directive (87/404/EC, for vessels containing air and nitrogen), the Transportable Pressure Equipment Directive (99/36/EC), and the Aerosol Dispensers Directive (75/324/EEC). This publication provides an outline of the Pressure Equipment Directive only.

Purpose of the Pressure Equipment Directive (PED)

The purpose of the Pressure Equipment Directive (PED) is to harmonize the national laws of Member States in the EEA regarding the design, manufacture, testing and compliance requirements of pressure equipment and assemblies of pressure equipment.

Harmonization of national laws ensures that pressure equipment can be manufactured and sold through the European Union without having to go through national approvals in every member state. The PED requires that all pressure equipment and assemblies within its scope must be safe when placed on the market and put into service.

Scope

The PED applies to the design, manufacture and conformity assessment of pressure equipment and assemblies of pressure equipment with maximum allowable pressure greater than 0.5 bar above atmospheric pressure (i.e. 1.5 bar of absolute pressure). "Allowable pressure" is a reference to the assembly's (or device's) rating (*See Article 1 of the PED, page 27 below*).

Definitions

The following are definitions of key terms used throughout the PED:

pressure equipment: includes vessels, piping, safety accessories and pressure accessories. Where applicable, pressure equipment includes elements attached to pressurized parts, such as flanges, nozzles, couplings, supports, lifting lugs, etc.

vessels: are defined as a housing designed and built to contain fluids under pressure.

piping: means piping components intended for the transport of fluids, when connected together for integration into a pressure system.

safety accessories: means devices designed to protect pressure equipment against the allowable limits being exceeded.

pressure accessories: means devices with an operational function and having pressure bearing housings.

assemblies: mean several pieces of pressure equipment assembled by a manufacturer to constitute an integrated and functional whole.

I. Determining whether equipment is within the scope

A. Products Covered

- Pressure Vessels
- Steam Generators
- Installation Piping
- Safety accessories and other accessories which are under pressure and intended for pressure vessels, steam generators and installation piping

Typical examples of pressure equipment covered include:

- shell and water tube boilers
- heat exchangers
- plant vessels
- pressurized storage containers
- industrial pipework

Typical examples of safety accessories include:

- safety valves
- bursting disc safety devices
- buckling rods,
- controlled safety pressure relief systems

- pressure switches
- temperature switches
- fluid level switches

B. Products Excluded

The PED does not apply to equipment and assemblies which are:

- listed in Article 1, clause 3 of the PED (*see below*)
- placed on the EEA before November 29, 1999
- for use outside the EEA without the CE Marking
- in use, or their repair or modification (unless significant)

Article 1, clause 3 (see page 28) lists the equipment outside the scope of the PED as follows:

- pipelines comprising piping or a system of piping designed for the conveyance of any fluid or substance to or from an installation (onshore or offshore) starting from and including the last isolation device located within the confines of the installation, including all the annexed equipment designed specifically for pipelines. This exclusion does not apply to standard pressure equipment such as may be found in pressure reduction stations or compression stations;
- networks for the supply, distribution and discharge of water and associated equipment and headraces such as penstocks, pressure tunnels, pressure shafts for hydroelectric installations and their related specific accessories;
- equipment covered by Directive 87/404/EEC on simple pressure vessels;
- equipment covered by Directive 75/324/EEC of 20 May 1975 on aerosol dispensers;
- motor vehicle equipment defined by the following Directives and their Annexes:
 - Directive 70/156/EEC of 6 February 1970 on type-approval of motor vehicles and their trailers
 - Directive 74/150/EEC of 4 March 1974 on type-approval of wheeled agricultural or forestry tractors
 - Directive 92/61/EEC of 30 June 1992 on type-approval of two or three-wheel motor vehicles
- equipment classified as no higher than Category I under Article 9 (See page 33) of the PED and covered by one of the following Directives:
 - Directive 98/37/EC of June 22, 1998 relating to machinery

NOTE: The text of the PED indicates Directive 89/392/EEC of 14 June 1989. This Directive has been replaced by 98/37/EC.

- Directive 95/16/EC of 29 June 1995 relating to lifts
- Directive 73/23/EEC of 19 February 1973 relating to electrical equipment designed for use within certain voltage limits
- Directive 93/42/EEC of 14 June 1993 concerning medical devices
- Directive 90/396/EEC of 29 June 1990 relating to appliances burning gaseous fuels
- Directive 94/9/EC of 23 March 1994 concerning equipment and protective systems intended for use in potentially explosive atmospheres
- equipment covered by Article 223 (1) (b) of the Treaty;
- items specifically designed for nuclear use, failure of which may cause an emission of radioactivity;
- well-control equipment used in the petroleum, gas or geothermal exploration and extraction industry and in underground storage which is intended to contain and/or control well pressure. This comprises the wellhead (Christmas tree), the blow out preventers (BOP), the piping manifolds and all their equipment upstream;
- equipment comprising casings or machinery where the dimensioning, choice of material and manufacturing rules are based primarily on requirements for sufficient strength, rigidity and stability to meet the static and dynamic operational effects or other operational characteristics and for which pressure is not a significant design factor. Such equipment may include:
 - engines including turbines and internal combustion engines;
 - steam engines, gas/steam turbines, turbo-generators, compressors, pumps and actuating devices;
- blast furnaces including the furnace cooling system, hot-blast recuperators, dust extractors and blast-furnace exhaust-gas scrubbers and direct reducing cupolas, including the furnace cooling, gas converters and pans for melting, re-melting, de-gassing and casting of steel and non-ferrous metals;
- enclosures for high-voltage electrical equipment such as switchgear, control gear, transformers, and rotating machines;

- pressurized pipes for the containment of transmission systems, e.g. for electrical power and telephone cables;
- ships, rockets, aircraft and mobile off-shore units, as well as equipment specifically intended for installation on board or the propulsion thereof;
- pressure equipment consisting of a flexible casing, e.g. tires, air cushions, balls used for play, inflatable craft, and other similar pressure equipment;
- exhaust and inlet silencers;
- bottles or cans for carbonated drinks for final consumption;
- vessels designed for the transport and distribution of drinks having a PS.V of not more than 500 bar.L and a maximum allowable pressure not exceeding 7 bar;
- equipment covered by the following conventions:
 - ADR: European Agreement concerning the International Carriage of Dangerous Goods by Road
 - RID: Regulations concerning the International Carriage of Dangerous Goods by Rail
 - IMDG: International Maritime Dangerous Goods Code
 - ICAO: International Civil Aviation Organization
- radiators and pipes in warm water heating systems;
- vessels designed to contain liquids with a gas pressure above the liquid of not more than 0.5 bar.

II. Product Classification

Once the manufacturer has confirmed that its equipment is within the scope of the PED, the next step is to determine the classification of the equipment. There are four Categories: I to IV. Category I relates to the lowest and Category IV relates to the highest hazard Category (*Article 10, clause 1.3, page 34*).

Equipment below Category I fall under a separate fifth “category” for which "Sound Engineering Practice" (SEP) is applicable. For equipment falling under SEP, the Essential Safety Requirements and the certification procedures are not applicable (*Article 3, clause 3, page 31*). However, the manufacturer of such equipment must ensure that design and manufacture take into account all relevant factors influencing safety during the intended lifetime. The equipment must be accompanied by adequate instructions for use and must bear the identification of the manufacturer.

In order to determine which Category an item of equipment falls into, the manufacturer needs to identify:

- the type of equipment - **vessel / steam generators / piping**
- the state of the intended fluid contents - **gaseous** or **liquid**
- the fluid group of the intended contents - **Group 1** or **Group 2**

Group 1 comprises those fluids classified according to the Directive on the Classification of Dangerous Substances (67/548/EC) as:

- explosive
- extremely flammable
- highly flammable
- easily flammable (where the maximum allowable temperature is above flashpoint)
- extremely toxic
- toxic
- oxidizing

Group 2 comprises all other fluids including water/steam.

Depending on the above, one of the nine charts in *Annex II* (See page 53) (Table 1 below) determines the applicable conformity assessment Category (SEP, I, II, III or IV).

Table 1. Product Classifications and relevant charts

	VESSELS				STEAM GENERATORS	PIPING			
State of Contents	Gas		Liquid			Gas		Liquid	
Fluid Group	Dangerous	Other	Dangerous	Other		Dangerous	Other	Dangerous	Other
Refer to Tables (Annex II of PED)	1	2	3	4	5	6	7	8	9

On each of these charts (1-9), maximum allowable pressure (PS) (bar) is plotted against, for vessels, the volume in liters, V(L), and for piping, the nominal size (DN). These

charts have up to five bands relating to the different Categories (SEP, I, II, III or IV). Demarcation lines on each chart indicate the upper limit of maximum allowable pressure and volume or nominal size for each Category. The manufacturer has to plot the maximum allowable pressure and volume or nominal size for their piece of equipment on the relevant chart to identify which Category the item of equipment falls into. In general, the lower the pressure and volume, the lower the Category for the equipment. (*Table taken from the European Commission Website: www.newapproach.org*).

Pressure accessories: Charts 1 to 4 for vessels or Charts 6 to 9 for piping in *Annex II* (*See page 53*) are applicable depending on whether the volume V or the nominal size DN is considered appropriate for classification of the pressure accessory. Where both the volume and the nominal size are considered appropriate, the pressure accessory must be classified in the highest Category.

Safety accessories: These are generally classified under Category IV. Safety accessories manufactured for specific equipment may be classified in the same Category as the equipment they protect.

Assemblies: Specific provisions (*Article 10, clause.2, page 34*) are applicable which are based on the classification of the individual parts of pressure equipment of which the assembly is composed.

III. Compliance to the Essential Safety Requirements

An important principle in preparing for the CE Marking process is compliance with the Essential Safety Requirements (ESRs). Pressure equipment under Categories I, II, III and IV must meet the ESRs given in *Annex I, page 39*.

ESRs include:

Sections 1 to 4 of Annex I (*See pages 39-49*)

General Requirements

Design Requirements

Manufacturing Requirements

Material Requirements

Sections 5 to 6 of Annex I (*See pages 49-50*)

Requirements for Steam Raising Equipment

Requirements for Piping

Section 7 of Annex I (*See pages 50-52*)

Specific Requirements

Risk Analysis

The PED requires manufacturers to produce and document a hazard analysis. The manufacturer must design, manufacture and check his equipment to ensure its safety with respect to its use under reasonably foreseeable conditions. In addition, the manufacturer

must interpret and apply the ESRs in such a way as to take account of the state-of-the-art at the time of design. Examples of risks are over-pressurization; incompatibility of contents with materials; and brittle fracture.

Materials

With respect to materials, the manufacturer of pressure equipment must adhere to the ESRs by using appropriate materials:

- which comply with **European Harmonized Standards** (*See page 18*). Materials which comply with available Harmonized Standard(s) are presumed to be in conformity with the PED.
- covered by **European Approval of Materials** - European Approval of Materials is a technical document defining the characteristics of materials intended for repeated use in the manufacture of pressure equipment not covered by a harmonized standard. Notified Bodies (*See NIST SP 951 Page 20*) issue these documents. The Notified Body determines and performs the appropriate inspections and tests to certify the conformity of the types of material with the corresponding requirements of the PED (*See Article 11, page 35*).
- evaluated by a **particular material appraisal** – which is available for use of materials having a thickness or product form which fall outside a certain standard. For equipment in Categories III or IV, the material assessment must be carried out by the Notified Body which conducts the conformity assessment. Note: the approval for materials is not valid for repeated use and is only granted **(one time?)** per manufacturer.

Operating Instructions

Essential Safety Requirement 3.4 (*See Annex I, page 39*) requires the manufacturer to provide operating instructions.

The operating instructions should specify the following:

- residual hazards from the hazard analysis
- transportation and installation instructions
- commissioning requirements, including safety accessories
- draining and venting requirements
- maintenance detail and how the equipment is to be inspected
- safe operating limits
- what contents the equipment has been designed for.

Special Requirements

There are special requirements in addition to the essential requirements for fired or otherwise heated pressure equipment (*See Sections 1 to 4 of Annex I, pages 39-49 (General, Design, Manufacturing and Materials)*). Special requirements related to overheating would apply, for example, to steam and hot-water generators and piping (*See Section 5 and Section 6 of Annex I pages 49-50*).

Specific quantitative requirements for certain pressure equipment materials are given as general rules in *Section 7 of Annex I, pages 51-52*. The provisions laid down in this section supplement the Essential Safety Requirements of Sections 1 to 6 for the pressure equipment to which they apply.

IV. Conformity Assessment

In order to demonstrate that the Essential Safety Requirements are met, *Article 10, page 34* lays down various conformity assessment procedures applicable to the design, production quality control measures, and the testing of the equipment.

Assessment and conformity procedures are different for each Category, ranging from self-declaration for the lowest (Category I) hazard up to full ISO 9001 quality management and/or Notified Body type examination for Category IV equipment. Self-declaration implies that no Notified Body intervention is required

Based on the Category of the equipment, manufacturers will be given a choice of the 'modules' shown in Tables 2 and 3 (*See NIST Special Publication 951 Page 6*). A requirement for *Notified Body or Recognized Third Party (See page 17)* involvement can appear at the design stage, the production stage, and/or final proof testing stage. The nature and extent of involvement depends on the equipment design (Category) and on the manufacturer's existing quality control systems. Note that the modules applicable to a higher hazard Category may be used in lower Categories.

Article 10, clause 2 (see page 34) addresses the conformity assessment provisions for assemblies. Pressure equipment which is part of an assembly will be assessed according to the tables in *Annex II (see page 53)*, and an assessment is carried out on the integration of each item. The modules for products in Categories II, III and IV require the involvement of Notified Bodies (Article 12, page 35), either in the approval and monitoring of the manufacturers' quality system or in direct product inspection.

Table 2. Modules for each Category

Safety Hazard Category	Conformity Assessment Modules
I	A
II	A1 D1 E1
III	B1 + D B1 + F B + E B + C1 H
IV	B + D B + F G H1

(Table taken from the European Commission Website: www.newapproach.org).

Table 3. Conformity Assessment Procedure for each module

Module	Conformity Assessment Procedure	Description
A	Internal production control	<p>Manufacturer:</p> <ul style="list-style-type: none"> - declares that pressure equipment satisfies the requirements of the Directive which apply to it - affixes the CE Marking to the pressure equipment - compiles a Technical File and must be kept available for a period of ten years after the last of the pressure equipment has been manufactured - ensures that the manufacturing process requires the manufactured pressure equipment to comply with the Technical File

		<ul style="list-style-type: none"> - prepares and keep available a Declaration of Conformity
A1	Internal production control with monitoring of final assessment.	<p>Manufacturer:</p> <ul style="list-style-type: none"> - As above <p>Notified Body:</p> <ul style="list-style-type: none"> - monitoring of final assessment by Notified Body
B	EC type – examination.	<p>Manufacturer:</p> <ul style="list-style-type: none"> - compiles a Technical File which must be kept available for a period of ten years after the last of the pressure equipment has been manufactured <p>Notified Body:</p> <ul style="list-style-type: none"> - ascertains and attests that a representative example of the production meets the provisions of the Directive which apply to it - examines the Technical File - issues a EC-type examination certificate
B1	EC design – examination.	<p>Manufacturer:</p> <ul style="list-style-type: none"> - compiles a Technical File which must be kept available for a period of ten years after the last of the pressure equipment has been manufactured <p>Notified Body:</p> <ul style="list-style-type: none"> - ascertains and attests that the <i>design</i> of an item meets the provisions of the Directive which apply to it - examines the Technical File - issues a EC-type examination certificate
C1	Monitoring of final	<p>Manufacturer:</p>

	assessment.	<ul style="list-style-type: none"> - compiles a Technical File which must be kept available for a period of ten years after the last of the pressure equipment has been manufactured - ensures that the pressure equipment is in conformity with the type as described in the EC-type examination certificate and satisfies the requirements of the Directive which apply to it - ensures that the manufacturing process requires the manufactured pressure equipment to comply with the Technical File - prepares and keep available a Declaration of Conformity <p>Notified Body:</p> <ul style="list-style-type: none"> - monitoring of final assessment in the form of unexpected visits by the Notified Body
D	Quality assurance for production, final inspection and testing.	<p>Manufacturer:</p> <ul style="list-style-type: none"> - compiles a Technical File which must be kept available for a period of ten years after the last of the pressure equipment has been manufactured - ensures and declares that the pressure equipment conforms with the type described in the EC-type examination certificate or the EC-design certificate and satisfies the requirements of the Directive which apply to it - must operate an approved quality system for production, final inspection and testing and be subject to Notified Body surveillance <p>Notified Body:</p> <ul style="list-style-type: none"> - assess the quality system and conduct periodic (and unexpected) audits

<p>D1</p>	<p>Quality assurance for production, final inspection and testing.</p>	<p>Manufacturer:</p> <ul style="list-style-type: none"> - compiles a Technical File which must be kept available for a period of ten years after the last of the pressure equipment has been manufactured - ensures and declares that pressure equipment satisfies the requirements of the Directive which apply to it. - must operate an approved quality system for production, final inspection and testing and be subject to Notified Body surveillance <p>Notified Body:</p> <ul style="list-style-type: none"> -assess the quality system and conduct periodic (and unexpected) audits
<p>E</p>	<p>Quality assurance for final inspection and testing.</p>	<p>Manufacturer:</p> <ul style="list-style-type: none"> - compiles a Technical File which must be kept available for a period of ten years after the last of the pressure equipment has been manufactured - ensures and declares that the equipment is in conformity with the type described in the EC type examination certificate and satisfies the requirements of the Directive which apply to it - must operate an approved quality system for the final inspection and testing and be subject to Notified Body surveillance <p>Notified Body:</p> <ul style="list-style-type: none"> -assess the quality system and conduct periodic (and unexpected) audits

E1	Quality assurance for final inspection and testing.	<p>Manufacturer:</p> <ul style="list-style-type: none"> - compiles a Technical File which must be kept available for a period of ten years after the last of the pressure equipment has been manufactured - ensures and declares that the equipment satisfies the requirements of the Directive that apply to it - must operate an approved quality system for the final inspection and testing and be subject to Notified Body surveillance <p>Notified Body:</p> <ul style="list-style-type: none"> - assess the quality system and conduct periodic (and unexpected) audits
F	Product verification.	<p>Manufacturer:</p> <ul style="list-style-type: none"> - compiles a Technical File which must be kept available for a period of ten years after the last of the pressure equipment has been manufactured - ensures and declares the pressure equipment is in conformity with the type as described in the EC type examination certificate or the EC design certificate and satisfies the requirements of the Directive - affixes the CE Marking to the pressure equipment - prepares and keeps available a Declaration of Conformity <p>Notified Body:</p> <ul style="list-style-type: none"> - examines and test each item of pressure equipment individually
G	EC Unit verification.	<p>Manufacturer:</p> <ul style="list-style-type: none"> - compiles a Technical File which must be kept available for a period of ten years after the last of the pressure equipment has been manufactured

		<ul style="list-style-type: none"> - ensures and declares the pressure equipment which has been issued with a certificate of conformity for tests carried out satisfies the requirements of the Directive - affixes the CE Marking to the pressure equipment - prepares and keeps available a Declaration of Conformity <p>Notified Body:</p> <ul style="list-style-type: none"> - examines the design and construction of each item of pressure equipment and performs tests during manufacture
H	Full quality assurance.	<p>Manufacturer:</p> <ul style="list-style-type: none"> - compiles a Technical File which must be kept available for a period of ten years after the last of the pressure equipment has been manufactured - ensures and declares the pressure equipment satisfies the requirements of the Directive - affixes the CE Marking to the pressure equipment - prepares and keep available a Declaration of Conformity - must operate an approved quality system for design, manufacture, final inspection and testing and be subject to Notified Body surveillance <p>Notified Body:</p> <ul style="list-style-type: none"> - assess the quality system and conduct periodic (and unexpected) audits
H1	Full quality assurance with design examination and monitoring of final assessment.	As above, plus the Notified Body will examine the design and issue an EC-design certificate

A summary of each module requirement is given in *Annex III, page 59*.

Based on the options in the above table, the manufacturer can determine which conformity assessment route he or she will apply. In addition to the Category, this determination is also based on whether or not the manufacturer has a *quality system in place (See below)* and whether the product is a single or a series production.

V. Role of the Notified Body and Recognized Third Party Organization

Except for equipment in Category I and for equipment under “Sound Engineering Practice” (SEP), the Notified Body will always be involved in determining compliance with the Essential Safety Requirements of the PED.

Notified Bodies have been appointed by the EU Member States for the:

- assessment of the conformity to the PED including Quality Assurance assessment, EC type-examination and EC design-examination (*Article 10, page 34*)
- granting of European approvals for materials (*Article 11, page 35*).
- approval of non-destructive testing personnel for Categories II, III, and IV (*Annex I – 3.1.2 and 3.1.3, pages 45-46*)

A. Quality System Assessment

Depending on the Category, a product, production or complete quality assurance system is required, whether or not combined with an EC type-examination, an EC design-examination or design verification.

In most cases, quality management systems are certified (or registered, as is more commonly referred to the U.S.) to the ISO 9000 series. The scope of the ISO 9000 series specifies quality system requirements for design, development, production, installation and servicing. All elements, requirements, and provisions adopted by the manufacturer for the quality system must be documented in a systematic and orderly manner. This is done in the form of written measures, procedures and instructions. This documentation must make possible a uniform interpretation of the quality programs, quality plans, quality manuals and quality records.

For Category II, the PED requirement is limited to the supervision of the quality system. For Categories II and IV the quality system must also guarantee that the pressure equipment conforms to the type or to the design that was separately laid down in an EC type-examination or EC design-examination. The initial quality assurance assessment and periodic supervision are the responsibility of the Notified Body.

If the manufacturer already has an existing quality system in accordance with the ISO 9000 and approved by another accreditation body, this system would form the basis for

an assessment in accordance with the PED. The Notified Body will only be required to focus its review on those special elements which are normally not addressed in the ISO quality system, including Technical File, applied standards, and inspection techniques.

B. Approval of non-Destructive Testing (NDT) Personnel

Article 3.1.3 (see page 46) states that for pressure equipment, non-destructive tests of permanent joints components, which contribute to the pressure resistance of the equipment and components which are directly attached to them, must be carried out by suitable qualified personnel which are verified by a Notified Body. For pressure equipment in Categories II, III and IV, operating procedures and personnel must be approved by a competent third party – i.e. a Notified Body or a Third Party organization which has been recognized by a European Member State to conduct approvals of NDT personnel. To carry out these approvals, the Notified Body or Recognized Third Party must perform examinations and tests as set out in the appropriate Harmonized European standards (see below) or equivalent examinations or tests.

VI. Harmonized Standards

Since the PED lays down Essential Safety Requirements in general terms, standards can be important guides for the manufacturer. Standards interpret the Essential Safety Requirements and also provide a technical route to compliance.

Harmonized European Standards, which have been developed specifically to deal with the Essential Safety Requirements of the PED, provide the presumption of conformity (*See NIST SP 951 Page 11*). In the absence of or as an alternate to using Harmonized European Standards, the manufacturer is entitled to comply by using any appropriate specifications that may demonstrate conformity with the Essential Safety Requirements of the PED. However, the manufacturer must bear the burden of proof and provide suitable evidence to the Notified Body that the use of specifications other than Harmonized European Standards brings the equipment into conformance.

The European Committee for Standardization (CEN) is producing a series of **Harmonized European Standards** in support of the PED. See *page 85* for a listing of Harmonized European Standards that have been published to date.

International Standards

Where no Harmonized European Standards exist, manufacturers are instructed to use standards that emanate from international standards developing organizations such as the International Standards Organization (ISO) (*See NIST SP 951 Page 16*).

National Standards

The third best choice of the PED is the use of European national standards, to be used when no Harmonized Standards or International Standards exist.

Guidelines

Guidelines to assist the manufacturer have been established by a European Commission working group. These guidelines serve as reference documents for the application of the Directive. Although not legally binding, the guidelines provide European expert opinions and are very helpful in obtaining a better understanding of the PED.

The guidelines cover the following areas:

- Scope and exclusions of the directive
- Classification and categories
- Assemblies
- Evaluation assessment procedures
- Interpretation of the essential requirements on design
- Interpretation of the essential requirements on manufacturing
- Interpretation of the essential requirements on materials
- Interpretation of other essential requirements
- Miscellaneous
- General/Horizontal issues

The guidelines can be found on the European Commission website for the PED:

<http://ped.eurodyn.com>

VII. Technical File

Regardless of the Category, the manufacturer must compile a Technical File (*See NIST SP 951 Page 24*). This file contains all the relevant information that is needed to demonstrate that the product meets the Essential Safety Requirements of the PED.

The manufacturer must prepare the technical documentation and make this documentation, including the Declaration of Conformity, available to the surveillance authorities (*See NIST SP 951 Page 22-23*) for inspection purposes for a period ending at least five years after the last product has been manufactured.

The technical documentation must include:

- a general description of the equipment, including any variants planned
- design drawings, methods of manufacture envisaged and diagrams of components, sub-assemblies, circuits, etc.
- the descriptions and explanations necessary to understand the above-mentioned drawings and diagrams and the operations of the product
- the results of the risk analysis including a description of the preventive measures against identified risks of the equipment
- a list of the standards applied in full or in part, and descriptions of the solutions adopted to meet the essential requirements of the PED if *Harmonized European Standards* (*See page 18*) have not been applied in full
- the results of the design calculations
- inspections carried out and inspection reports
- material certificates

- information about approval of manufacturing and inspection procedures
- user manual
- Declaration of Conformity

VIII. Declaration of conformity and CE-marking

Once the conformity assessment has been completed and the equipment or assembly complies with the Essential Safety Requirements of the PED, the manufacturer will be required to affix the CE Marking (*see NIST SP 951 Page 17 and Annex VI of the PED, page 84 below*) to each item of pressure equipment or assembly and draw up a Declaration of Conformity.

The CE Marking must not be affixed to SEP equipment.

The manufacturer must draw up a Declaration of Conformity (*see NIST SP 951 Page 26*) and keep a copy with the Technical File. The Declaration of Conformity must contain the following (*See Annex VII, page 85*):

- Name and address of the manufacturer and/or his Authorized Representative;
- Product name of the equipment;
- Reference to the PED and other Directives (if applicable);
- Reference to applied Harmonized Standards;
- Where appropriate, references to the specifications with which conformity is declared;
- Identification of the signatory who has been empowered to enter into commitments on behalf of the manufacturer or his Authorized Representative established within the Community (*See NIST SP 951 Page 23*);

For a sample Declaration of Conformity, see *NIST SP 951 Page 28*.

IX. Placing Equipment on the Market (*See NIST SP 951 Page 19*)

Equipment should be placed on the market only if it complies with the appropriate Essential Safety Requirements of the PED and when it is properly installed, maintained, and used for its intended purpose,

X. Free Movement of Equipment

As long as equipment bears the CE Marking referred to in *Annex VII (See page 83)*, it will not be subject to restrictions or be prohibited from being placed on the market by any Member State.

If the equipment is subject to other Directives that also provide for the affixing of the CE Marking, it should be indicated that the apparatus fulfils the provisions of those other

Directives, too. References to these directives must be given in accompanying documents, such as the Declaration of Conformity (*See NIST SP 951 Pages 17 and 26*).

Note: Equipment on display at trade fairs, exhibitions, or demonstration, does not have to comply with the directive or bear the CE Marking. There must be a visible sign, however, that the equipment cannot be marketed or put into service until it complies with the Directive.

XI. Safeguards

If any equipment within the scope of the PED does not comply with the Essential Safety Requirements, Member States are allowed to challenge and withdraw such equipment from the market or from service (*See NIST SP 951 Page 2*).

Text of the Directive on Pressure Equipment Directive (97/23/EC)

The following text of the Pressure Equipment Directive has been taken from the digital version of the legislation issued in the Official Journal of the European Communities. Web Site: <http://www.newapproach.org>

Only European Community's legislation printed in the Official Journal of the European Communities is deemed to be authentic.

The Pressure Equipment Directive (Council Directive 97/23/EC)

Council Directive 97/23/EC of May 1997 on the approximation of laws, of the Member States concerning pressure equipment

THE EUROPEAN PARLIAMENT AND THE
COUNCIL OF THE EUROPEAN UNION,

Having regard to the Treaty establishing the
European Community, and in particular
Article 100a thereof,

Having regard to the proposals from the
Commission (1),

Having regard to the Opinion of the
Economic and Social Committee (2),

Acting in accordance with the procedure laid
down in Article 189b of the Treaty (3), in the
light of the joint text approved by the
Conciliation Committee on 4 February 1997,

1. Whereas the internal market is an area without internal frontiers in which the free movement of goods, persons, services and capital is ensured;
2. Whereas there are differences in the content and scope of the laws, regulations and administrative provisions in force in the Member States with regard to the safety and protection of health of persons and, where appropriate, domestic animals or property, where pressure equipment not covered by present Community legislation is concerned; whereas the certification and inspection procedures for such equipment differ from one Member State to another; whereas such disparities may well constitute

barriers to trade within the
Community;

3. Whereas the harmonization of national legislation is the only means of removing these barriers to free trade; whereas this objective cannot be achieved satisfactorily by the individual Member States; whereas this Directive only lays down indispensable requirements for the free circulation of the equipment to which it is applicable;
4. Whereas equipment subject to a pressure of not more than 0,5 bar does not pose a significant hazard due to pressure; whereas there should not therefore be any obstacle to its free movement within the Community; whereas this Directive applies to equipment subject to a maximum allowable pressure PS exceeding 0,5 bar;
5. Whereas this Directive relates also to assemblies composed of several pieces of pressure equipment assembled to constitute an integrated and functional whole; whereas these assemblies may range from simple assemblies such as pressure cookers to complex assemblies such as watertube boilers; whereas, if the manufacturer of an assembly intends it to be placed on the market and put into service as an assembly - and not in the form of its constituent non-assembled elements - that assembly must conform to this

- Directive; whereas, on the other hand, this Directive does not cover the assembly of pressure equipment on the site and under the responsibility of the user, as in the case of industrial installations;
6. Whereas this Directive harmonizes national provisions on hazards due to pressure; whereas the other hazards which this equipment may present accordingly may fall within the scope of other Directives dealing with such hazards; whereas, however, pressure equipment may be included among products covered by other Directives based on Article 100a of the Treaty; whereas the provisions laid down in some of those Directives deal with the hazard due to pressure; whereas those provisions are considered adequate to provide appropriate protection where the hazard due to pressure associated with such equipment remains small; whereas, therefore, there are grounds for excluding such equipment from the scope of this Directive;
 7. Whereas, for pressure equipment covered by international Conventions, transport and pressure hazards are due to be dealt with as soon as possible by forthcoming Community Directives based on such Conventions or by supplements to existing Directives; whereas such equipment is accordingly excluded from the scope of this Directive;
 8. Whereas certain types of pressure equipment, although subject to a maximum allowable pressure PS higher than 0,5 bar, do not present any significant hazard due to pressure, and therefore the freedom of movement of such equipment in the Community should not be hindered if it has been legally manufactured or placed on the market in a Member State; whereas it is not necessary in order to ensure free movement of such equipment to include it in the scope of this Directive; whereas consequently it is expressly excluded from its scope;
 9. Whereas other pressure equipment subject to a maximum allowable pressure higher than 0,5 bar and presenting a significant hazard due to pressure, but in respect of which free movement and an appropriate level of safety are guaranteed, is excluded from the scope of this Directive; whereas such exclusions should, however, be regularly reviewed in order to ascertain whether it is necessary to take action at Union level;
 10. Whereas regulations to remove technical barriers to trade must follow the new approach provided for in the Council Resolution of 7 May 1985 on a new approach to technical harmonization and standards (4), which requires a definition of the essential requirements regarding safety and other requirements of society without reducing existing, justified levels of protection within the Member States; whereas that Resolution provides that a very large number of products be covered by a single Directive in order to avoid frequent amendments and the proliferation of Directives;
 11. Whereas the existing Community Directives on the approximation of the laws of the Member States relating to pressure equipment have made positive steps towards removing barriers to trade in this area; whereas those Directives cover that sector only to a minor extent; whereas Council Directive 87/404/EEC of 25 June 1987 on the harmonization of the laws of the Member States relating to simple pressure vessels (5) is the first case of application of the new approach to the sector of pressure equipment; whereas the present Directive will not apply to the area covered by Directive 87/404/EEC; whereas, no later than three years after the

- present Directive enters into force, a review will be carried out of the application of Directive 87/404/EEC in order to ascertain the need for the integration thereof into the present Directive;
12. Whereas the framework Directive, Council Directive 76/767/EEC of 27 July 1976 on the approximation of the laws of the Member States relating to common provisions for pressure vessels and methods for inspecting them (6) is optional; whereas it provides for a procedure for the bilateral recognition of testing and certification of pressure equipment which did not operate satisfactorily and which therefore must be replaced by effective Community measures;
 13. Whereas the scope of this Directive must be based on a general definition of the term 'pressure equipment' so as to allow for the technical development of products;
 14. Whereas compliance with the essential safety requirements is necessary in order to ensure the safety of pressure equipment; whereas those requirements have been subdivided into general and specific requirements which must be met by pressure equipment; whereas in particular the specific requirements are intended to take account of particular types of pressure equipment; whereas certain types of pressure equipment in Categories III and IV must be subject to a final assessment comprising final inspection and proof tests;
 15. Whereas Member States should be in a position to allow the showing at trade fairs of pressure equipment which is not yet in conformity with the requirements of this Directive; whereas, during demonstrations, appropriate safety measures must be taken in accordance with the general safety rules of the Member State concerned to ensure the safety of persons;
 16. Whereas in order to ease the task of demonstrating compliance with the essential requirements, standards harmonized at European level are useful, especially with regard to the design, manufacture and testing of pressure equipment, compliance with which enables a product to be presumed to meet the said essential requirements; whereas standards harmonized at European level are drawn up by private bodies and must retain their non-mandatory status; whereas, for this purpose, the European Committee for Standardization (CEN) and the European Committee for Electrotechnical Standardization (Cenelec) are recognized as being the bodies that are competent to adopt harmonized standards that follow the general guidelines for cooperation between the Commission and those two bodies signed on 13 November 1984;
 17. Whereas, for the purposes of this Directive, a harmonized standard is a technical specification (European standard or harmonization document) adopted by one or other of those bodies, or by both, at the request of the Commission pursuant to Council Directive 83/189/EEC of 28 March 1983 laying down a procedure for the provision of information in the field of technical standards and regulations (7) and in accordance with the general guidelines referred to above; whereas, in relation to standardization, it would be advisable for the Commission to be assisted by the Committee set up pursuant to Directive 83/189/EEC; whereas the Committee will, if necessary, consult technical experts;
 18. Whereas manufacturing of pressure equipment calls for the utilization of safe materials; whereas in the absence of harmonized standards it

- is useful to define the characteristics of the materials intended for repeated use; whereas this definition is established by European approvals for materials, such approvals being issued by one of the notified bodies specifically designated for that task; whereas the materials conforming to the European approvals shall be presumed to satisfy the essential requirements of this Directive;
19. Whereas, in view of the nature of the hazards involved in the use of pressure equipment it is necessary to establish procedures for assessing compliance with the basic requirements of the Directives; whereas these procedures must be devised in the light of the level of danger which is inherent in the pressure equipment; whereas, therefore, for each Category of pressure equipment there must be an adequate procedure or a choice between different procedures of equivalent stringency; whereas the procedures adopted are as required by Council Decision 93/465/EEC of 22 July 1993 concerning the modules for the various phases of the conformity assessment procedures and the rules for the affixing and use of the CE conformity marking, which are intended to be used in the technical harmonization Directives (8); whereas the details added to these procedures are justified by the nature of the verification required for pressure equipment;
20. Whereas Member States should be in a position to authorize user inspectorates to carry out certain tasks for conformity assessment in the framework of this Directive; whereas for that purpose this Directive sets out criteria for the authorization of user inspectorates by Member States;
21. Whereas, under the conditions laid down by this Directive, certain procedures for conformity assessment may require each item to be inspected and tested by a notified body or a user inspectorate as part of the final assessment of the pressure equipment; whereas in other cases provision should be made to ensure that the final assessment may be monitored by a notified body by means of unexpected visits;
22. Whereas pressure equipment will, as a general rule, bear the CE marking affixed either by the manufacturer or by his authorized representative established within the Community; whereas the CE marking means that the pressure equipment complies with the provisions of this Directive and those of other applicable Community directives on CE marking; whereas for pressure equipment defined in this Directive which presents only a minor pressure hazard and for which certification procedures are therefore not justified, the CE marking will not be affixed;
23. Whereas it is appropriate that the Member States, as provided for by Article 100a of the Treaty, may take provisional measures to limit or prohibit the placing on the market, putting into service and use of pressure equipment in cases where it presents a particular risk to the safety of persons and, where appropriate, domestic animals or property, provided that the measures are subject to a Community control procedure;
24. Whereas the addressees of any decision taken under this Directive must be aware of the reasons behind that decision and the means of appeal open to them;
25. Whereas it is necessary to lay down a transitional arrangement enabling pressure equipment manufactured in compliance with the national regulations in force on the date of

entry into force of this Directive to be marketed and put into service;

26. Whereas the requirements laid down in the Annexes should be made as clear as possible so as to allow all users, including small and medium-sized enterprises (SMEs), to comply with them easily;
27. Whereas an agreement on a *modus vivendi* between the European Parliament, the Council and the Commission concerning the implementing measures for acts adopted in accordance with the procedure laid down in Article 189b of the Treaty was reached on 20 December 1994 (9).

- (1) OJ No C 246, 9. 9. 1993, p. 1 and OJ No C 207, 27. 7. 1994, p. 5.
- (2) OJ No C 52, 19. 2. 1994, p. 10.
- (3) Opinion of the European Parliament of 19 April 1994 (OJ No C 128, 9. 5. 1994, p. 61), common position of the Council of 29 March 1996 (OJ No C 147, 21. 5. 1996, p. 1), Decision of the European Parliament of 17 July 1996 (OJ No C 261, 9. 9. 1996, p. 68). Council Decision of 17 April 1997.
- (4) OJ No C 136, 4. 6. 1985, p. 1.
- (5) OJ No L 220, 8. 8. 1987, p. 48. Directive as last amended by Directive 93/68/EEC (OJ No L 220, 30. 8. 1993, p. 1).
- (6) OJ No L 262, 27. 9. 1976, p. 153. Directive as last amended by the 1994 Act of Accession.
- (7) OJ No L 109, 26. 4. 1983, p. 8. Directive at last amended by the 1994 Act of Accession.
- (8) OJ No L 220, 30. 8. 1993, p. 23.
- (9) OJ No C 102, 4. 4. 1996, p. 1.

HAVE ADOPTED THIS DIRECTIVE:

Article 1

Scope and definitions

1. This Directive applies to the design, manufacture and conformity assessment of pressure equipment and assemblies with a maximum allowable pressure PS greater than 0,5 bar.

2. For the purposes of this Directive:

2.1 'Pressure equipment' means vessels, piping, safety accessories and pressure accessories.

Where applicable, pressure equipment includes elements attached to pressurized parts, such as flanges, nozzles, couplings, supports, lifting lugs, etc.

2.1.1 'Vessel' means a housing designed and built to contain fluids under pressure including its direct attachments up to the coupling point connecting it to other equipment. A vessel may be composed of more than one chamber.

2.1.2. 'Piping' means piping components intended for the transport of fluids, when connected together for integration into a pressure system. Piping includes in particular a pipe or system of pipes, tubing, fittings, expansion joints, hoses, or other pressure-bearing components as appropriate. Heat exchangers consisting of pipes for the purpose of cooling or heating air shall be considered as piping.

2.1.3. 'Safety accessories' means devices designed to

- protect pressure equipment against the allowable limits being exceeded. Such devices include:
- devices for direct pressure limitation, such as safety valves, bursting disc safety devices, buckling rods, controlled safety pressure relief systems (CSPRS), and
- limiting devices, which either activate the means for correction or provide for

shutdown or shutdown and lockout, such as pressure switches or temperature switches or fluid level switches and 'safety related measurement control and regulation (SRMCR)' devices.

2.1.4. 'Pressure accessories' means devices with an operational function and having pressure-bearing housings.

2.1.5. 'Assemblies' means several pieces of pressure equipment assembled by a manufacturer to constitute an integrated and functional whole.

2.2. 'Pressure' means pressure relative to atmospheric pressure, i.e. gauge pressure. As a consequence, vacuum is designated by a negative value.

2.3. 'Maximum allowable pressure PS' means the maximum pressure for which the equipment is designed, as specified by the manufacturer.

It is defined at a location specified by the manufacturer. This must be the location of connection of protective and/or limiting devices or the top of equipment or if not appropriate any point specified.

2.4. 'Maximum/minimum allowable temperature TS' means the maximum/minimum temperatures for which the equipment is designed, as specified by the manufacturer.

2.5. 'Volume (V)' means the internal volume of a chamber, including the volume of nozzles to the first connection or weld and excluding the volume of permanent internal parts.

2.6. '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.

2.7. 'Fluids' means gases, liquids and vapours in pure phase as well as mixtures thereof. A fluid may contain a suspension of solids.

2.8. 'Permanent joints` means joints which cannot be disconnected except by destructive methods.

2.9. 'European approval for materials` means a technical document defining the characteristics of materials intended for repeated use in the manufacture of pressure equipment which are not covered by any harmonized standard.

3. The following are excluded from the scope of this Directive:

3.1. pipelines comprising piping or a system of piping designed for the conveyance of any fluid or substance to or from an installation (onshore or offshore) starting from and including the last isolation device located within the confines of the installation, including all the annexed equipment designed specifically for pipelines. This exclusion does not apply to standard pressure equipment such as may be found in pressure reduction stations or compression stations;

3.2. networks for the supply, distribution and discharge of water and associated equipment and headraces such as penstocks, pressure tunnels, pressure shafts for hydroelectric installations and their related specific accessories;

3.3. equipment covered by Directive 87/404/EEC on simple pressure vessels;

3.4. equipment covered by Council Directive 75/324/EEC of 20 May 1975 on the approximation of the laws of the Member States relating to aerosol dispensers **(1)** ;

3.5. equipment intended for the functioning of vehicles defined by the following Directives and their Annexes:

- Council Directive 70/156/EEC of 6 February 1970 on the approximation of the laws of the Member States relating to the type-approval of motor vehicles and their trailers **(2)**

- Council Directive 74/150/EEC of 4 March 1974 on the approximation of the laws of the Member States relating to the type-approval of wheeled agricultural or forestry tractors **(3)**

- Council Directive 92/61/EEC of 30 June 1992 relating to the type-approval of two or three-wheel motor vehicles **(4)**

3.6. equipment classified as no higher than Category I under Article 9 of this Directive and covered by one of the following Directives:

- Council Directive 89/392/EEC of 14 June 1989 on the approximation of the laws of the Member States relating to machinery **(5)**,

- European Parliament and Council Directive 95/16/EC of 29 June 1995 on the approximation of the laws of the Member States relating to lifts **(6)**,

- Council Directive 73/23/EEC of 19 February 1973 on the harmonization of the laws of the Member States relating to electrical equipment designed for use within certain voltage limits **(7)**,

- Council Directive 93/42/EEC of 14 June 1993 concerning medical devices **(8)**,

- Council Directive 90/396/EEC of 29 June 1990 on the approximation of the laws of the Member States relating to appliances burning gaseous fuels **(9)**,

- Directive 94/9/EC of the European Parliament and the Council of 23 March 1994 on the approximation of the laws of the Member States concerning equipment and protective systems intended for use in potentially explosive atmospheres **(10)**;

3.7. equipment covered by Article 223 (1) (b) of the Treaty;

3.8. items specifically designed for nuclear use, failure of which may cause an emission of radioactivity;

3.9. well-control equipment used in the petroleum, gas or geothermal exploration and extraction industry and in underground storage which is intended to contain and/or control well pressure. This comprises the wellhead (Christmas tree), the blow out preventers (BOP), the piping manifolds and all their equipment upstream;

3.10. equipment comprising casings or machinery where the dimensioning, choice

of material and manufacturing rules are based primarily on requirements for sufficient strength, rigidity and stability to meet the static and dynamic operational effects or other operational characteristics and for which pressure is not a significant design factor. Such equipment may include:

- engines including turbines and internal combustion engines,

- steam engines, gas/steam turbines, turbo-generators, compressors, pumps and actuating devices;

3.11. blast furnaces including the furnace cooling system, hot-blast recuperators, dust extractors and blast-furnace exhaust-gas scrubbers and direct reducing cupolas, including the furnace cooling, gas converters and pans for melting, re-melting, de-gassing and casting of steel and non-ferrous metals;

3.12. enclosures for high-voltage electrical equipment such as switchgear, control gear, transformers, and rotating machines;

3.13. pressurized pipes for the containment of transmission systems, e.g. for electrical power and telephone cables;

3.14. ships, rockets, aircraft and mobile off-shore units, as well as equipment specifically intended for installation on board or the propulsion thereof;

3.15. pressure equipment consisting of a flexible casing, e.g. tyres, air cushions, balls used for play, inflatable craft, and other similar pressure equipment;

3.16. exhaust and inlet silencers;

3.17. bottles or cans for carbonated drinks for final consumption;

3.18. vessels designed for the transport and distribution of drinks having a PS.V of not more than 500 bar.L and a maximum allowable pressure not exceeding 7 bar;

3.19. equipment covered by the ADR (11), the RID (12), the IMDG (13) and the ICAO Convention (14);

3.20. radiators and pipes in warm water heating systems;

3.21. vessels designed to contain liquids with a gas pressure above the liquid of not more than 0,5 bar.

- (1) OJ No L 147, 9. 6. 1975, p. 40. Directive as last amended by Commission Directive 94/1/EC (OJ No L 23, 28. 1. 1994, p. 28).
(2) OJ No L 42, 23. 2. 1970, p. 1. Directive as last amended by Commission Directive 95/54/EC (OJ No L 266, 8. 11. 1995, p. 1).
(3) OJ No L 84, 28. 3. 1974, p. 10. Directive as last amended by the 1994 Act of Accession.
(4) OJ No L 225, 10. 8. 1992, p. 72. Directive as last amended by the 1994 Act of Accession.
(5) OJ No L 183, 29. 6. 1989, p. 9. Directive as last amended by Directive 93/68/EEC (OJ No L 220, 30. 8. 1993, p. 1).
(6) OJ No L 213, 7. 9. 1995, p. 1.
(7) OJ No L 77, 26. 3. 1973, p. 29. Directive as last amended by Directive 93/68/EEC (OJ No L 220, 30. 8. 1993, p. 1).
(8) OJ No L 169, 12. 7. 1993, p. 1.
(9) OJ No L 196, 26. 7. 1990, p. 15. Directive as last amended by Directive 93/68/EEC (OJ No L 220, 30. 8. 1993, p. 1).
(10) OJ No L 100, 19. 4. 1994, p. 1.
(11) ADR = European Agreement concerning the International Carriage of Dangerous Goods by Road.
(12) RID = Regulations concerning the International Carriage of Dangerous Goods by Rail.
(13) IMDG = International Maritime Dangerous Goods Code.
(14) ICAO = International Civil Aviation Organization.

Article 2

Market surveillance

1. Member States shall take all appropriate measures to ensure that the pressure equipment and the assemblies referred to in **Article 1** may be placed on the market and put into service only if, when properly installed and maintained and used for their intended purpose, they do not endanger the health and safety of persons and, where appropriate, domestic animals or property.

2. The provisions of this Directive shall not affect Member States' entitlement to lay down, with due regard to the provisions of the Treaty, such requirements as they may deem necessary to ensure that persons and, in particular, workers are protected during use of the pressure equipment or assemblies in question provided that this does not mean modifications to such

equipment or assemblies in a way not specified in this Directive.

3. At trade fairs, exhibitions, demonstrations, etc., Member States shall not prevent the showing of pressure equipment or assemblies as defined in Article 1 not in conformity with the provisions of this Directive, provided that a visible sign clearly indicates their non-conformity and their non-availability for sale until brought into conformity by the manufacturer or by his authorized representative established within the Community. During demonstrations, appropriate safety measures shall be taken in accordance with any requirements laid down by the competent authority of the Member State concerned in order to ensure the safety of persons.

Article 3

Technical requirements

1. The pressure equipment referred to in 1.1, 1.2, 1.3 and 1.4 must satisfy the essential requirements set out in **Annex I**:

1.1. Vessels, except those referred to in 1.2 for:

(a) gases, liquefied gases, gases dissolved under pressure, vapours and also those liquids whose vapour pressure at the maximum allowable temperature is greater than 0,5 bar above normal atmospheric pressure, (1 013 mbar) within the following limits:

- for fluids in Group 1 with a volume greater than 1 L and a product of PS and V greater than 25 bar L, or with a pressure PS greater than 200 bar (**Annex II, table 1**),
- for fluids in Group 2, with a volume greater than 1 L and a product of PS and V is greater than 50 bar L, or with a pressure PS greater than 1 000 bar, and all portable extinguishers and bottles for breathing apparatus (**Annex II, table 2**);

(b) liquids having a vapour pressure at the maximum allowable temperature of not more than 0,5 bar above normal atmospheric pressure (1 013 mbar) within the following limits:

- for fluids in Group 1 with a volume greater than 1 L and a product of PS and V greater than 200 bar L, or with a pressure PS

greater than 500 bar (**Annex II, table 3**),
- for fluids in Group 2 with a pressure PS greater than 10 bar and a product of PS and V greater than 10 000 bar L, or with a pressure PS greater than 1 000 bar (**Annex II, table 4**).

1.2. Fired or otherwise heated pressure equipment with the risk of overheating intended for generation of steam or superheated water at temperatures higher than 110 °C having a volume greater than 2L, and all pressure cookers (**Annex II, table 5**).

1.3. Piping intended for:

(a) gases, liquified gases, gases dissolved under pressure, vapours and those liquids whose vapour pressure at the maximum allowable temperature is greater than 0,5 bar above normal atmospheric pressure (1 013 mbar) within the following limits:

- for fluids in Group 1 with a DN greater than 25 (**Annex II, table 6**),
- for fluids in Group 2 with a DN greater than 32 and a product of PS and DN greater than 1 000 bar (**Annex II, table 7**);

(b) liquids having a vapour pressure at the maximum allowable temperature of not more than 0,5 bar above normal atmospheric pressure (1 013 mbar), within the following limits:

- for fluids in Group 1 with a DN greater than 25 and a product of PS and DN greater than 2 000 bar (**Annex II, table 8**),
- for fluids in Group 2 with a PS greater than 10 bar, a DN greater than 200 and a product of PS and DN greater than 5 000 bar (**Annex II, table 9**).

1.4. Safety and pressure accessories intended for equipment covered by 1.1, 1.2 and 1.3 including where such equipment is incorporated into an assembly.

2. The assemblies defined in **Article 1**, section 2.1.5, which include at least one item of pressure equipment covered by section 1 of this Article and which are listed in 2.1, 2.2 and 2.3 of this Article must satisfy the essential requirements set out in Annex I.

2.1. Assemblies intended for generating steam or superheated water at a temperature higher than 110 °C comprising

at least one item of fired or otherwise heated pressure equipment presenting a risk of overheating.

2.2. Assemblies other than those referred to in 2.1, if the manufacturer intends them to be placed on the market and put into service as assemblies.

2.3. By way of derogation from the introductory paragraph to this section, assemblies intended for generating warm water at temperatures not greater than 110 °C which are manually fed with solid fuels and have a PS.V greater than 50 bar.L must comply with the essential requirements referred to in 2.10, 2.11, 3.4, 5 (a) and 5 (d) of **Annex I**.

3. Pressure equipment and/or assemblies below or equal to the limits in sections 1.1, 1.2 and 1.3 and section 2 respectively must be designed and manufactured in accordance with the sound engineering practice of a Member State in order to ensure safe use. Pressure equipment and/or assemblies must be accompanied by adequate instructions for use and must bear markings to permit identification of the manufacturer or of his authorized representative established within the Community. Such equipment and/or assemblies must not bear the CE marking referred to in Article 15.

Article 4

Free movement

1.1. Member States shall not, on grounds of the hazards due to pressure, prohibit, restrict or impede the placing on the market or putting into service under the conditions specified by the manufacturer of pressure equipment or assemblies referred to in Article 1 which comply with this Directive and bear the CE marking indicating that they have undergone conformity assessment in accordance with **Article 10**.

1.2. Member States shall not, on grounds of the hazards due to pressure, prohibit, restrict or impede the placing on the market or putting into service of pressure equipment or assemblies which comply with **Article 3** (3).

2. Member States may require, to the extent that it is needed for safe and correct use of pressure equipment and assemblies, the information referred to in **Annex I** sections 3.3 and 3.4 to be provided in the official language(s) of the Community which may be determined in accordance with the Treaty by the Member State in which the equipment or assembly reaches the final user.

Article 5

Presumption of conformity

1. Member States shall regard pressure equipment and assemblies bearing the CE marking provided for in **Article 15** and the EC declaration of conformity provided for in **Annex VII** as conforming to all the provisions of this Directive, including the conformity assessment provided for in

Article 10.

2. Pressure equipment and assemblies which conform to the national standards transposing the harmonized standards the reference numbers of which have been published in the Official Journal of the European Communities shall be presumed to conform to the essential requirements referred to in **Article 3**. Member States shall publish the reference numbers of the national standards referred to above.

3. Member States shall ensure that appropriate measures are taken to enable both sides of industry to have an input at national level in the process of preparing and monitoring the harmonized standards.

Article 6

Committee on technical standards and regulations

Where a Member State or the Commission considers that the standards referred to in **Article 5** (2) do not entirely meet the essential requirements referred to in **Article 3**, the Member State concerned or the Commission shall inform the Standing Committee set up by Article 5 of Directive 83/189/EEC giving the reasons therefor. The

Committee shall issue an opinion as a matter of urgency.

Taking into account the Committee's opinion, the Commission shall notify the Member States as to whether or not those standards should be withdrawn from the publications referred to in **Article 5 (2)**.

Article 7

Committee on Pressure Equipment

1. The Commission may take any appropriate measure to implement the following provisions:

Where a Member State considers that, for very serious safety reasons,

- an item or family of pressure equipment referred to in **Article 3 (3)** should be subject to the requirements of Article 3 (1), or
- an assembly or family of assemblies referred to in **Article 3 (3)** should be subject to the requirements of Article 3 (2), or
- an item or family of pressure equipment should be classified, by way of derogation from the requirements of **Annex II**, in another Category,

it shall submit a duly substantiated request to the Commission and ask it to take the necessary measures. Those measures shall be adopted in accordance with the procedure laid down in paragraph 3.

2. The Commission shall be assisted by a Standing Committee, hereafter referred to as 'the Committee', composed of representatives appointed by the Member States and chaired by a representative of the Commission. The Committee shall draw up its own rules of procedure.

3. The representative of the Commission shall submit to the Committee a draft of the measures to be taken pursuant to paragraph 1. The Committee shall deliver its opinion on the draft, within a time limit which the chairman may lay down according to the urgency of the matter, if necessary by taking a vote. The opinion shall be recorded in the minutes; in addition, each Member State shall have the right to ask to have its position recorded in the minutes. The Commission shall take the utmost account of the opinion delivered by the Committee. It

shall inform the Committee of the manner in which its opinion has been taken into account.

4. The Committee may furthermore examine any other matter relating to the implementation and practical application of this Directive and raised by its chairman either on his own initiative or at the request of a Member State.

Article 8

Safeguard clause

1. Where a Member State ascertains that pressure equipment or assemblies referred to in Article 1, bearing the CE marking and used in accordance with their intended use are liable to endanger the safety of persons and, where appropriate, domestic animals or property, it shall take all appropriate measures to withdraw such equipment or assemblies from the market, prohibit the placing on the market, putting into service or use thereof, or restrict free movement thereof.

The Member State shall immediately inform the Commission of any such measure, indicating the reasons for its decision and, in particular, whether non-conformity is due to:

- (a) failure to satisfy the essential requirements referred to in **Article 3**;
- (b) incorrect application of the standards referred to in **Article 5 (2)**;
- (c) shortcomings in the standards referred to in **Article 5 (2)**;
- (d) shortcomings in the European approval of pressure equipment materials as referred to in **Article 11**.

it shall submit a duly substantiated request to the Commission and ask it to take the necessary measures. Those measures shall be adopted in accordance with the procedure laid down in paragraph 3.

2. The Commission shall enter into consultation with the parties concerned without delay. Where the Commission considers, after this consultation, that the measure is justified, it shall immediately so inform the Member State which took the initiative and the other Member States.

Where the Commission considers, after this consultation, that the measure is unjustified, it shall immediately so inform the Member State which took the initiative and the manufacturer, or his authorized representative established within the Community. Where the decision referred to in paragraph 1 is based on a shortcoming in the standards or in European approvals for materials and where the Member State at the origin of the decision maintains its position the Commission shall immediately inform the Committee referred to in **Article 6** in order to initiate the procedure referred to in the first paragraph of Article 6.

3. Where pressure equipment or an assembly which does not comply bears the CE marking, the competent Member State shall take appropriate action against the person(s) having affixed the CE marking and shall so inform the Commission and the other Member States.

4. The Commission shall ensure that the Member States are kept informed of the progress and outcome of this procedure.

Article 9

Classification of pressure equipment

1. Pressure equipment referred to in **Article 3** (1) shall be classified by Category in accordance with **Annex II**, according to ascending level of hazard.

For the purposes of such classification fluids shall be divided into two groups in accordance with 2.1 and 2.2.

2.1. Group 1 comprises dangerous fluids. A dangerous fluid is a substance or preparation covered by the definitions in Article 2 (2) of Council Directive 67/548/EEC of 27 June 1967 on the approximation of the laws, regulations and administrative provisions relating to the classification, packaging and labelling of dangerous substances (1).

Group 1 comprises fluids defined as:

- explosive,
- extremely flammable,
- highly flammable,
- flammable (where the maximum allowable temperature is above flashpoint),

- very toxic,
- toxic,
- oxidizing.

2.2. Group 2 comprises all other fluids not referred to in 2.1.

3. Where a vessel is composed of a number of chambers, it shall be classified in the highest Category applicable to the individual chambers. Where a chamber contains several fluids, classification shall be on the basis of the fluid which requires the highest Category.

Article 10

Conformity assessment

1.1. Before placing pressure equipment on the market, the manufacturer shall subject each item of equipment to one of the conformity assessment procedures described in **Annex III**, according to the conditions given in this Article.

1.2. The conformity assessment procedures to be applied to an item of pressure equipment with a view to affixing the CE marking shall be determined by the Category, as defined in **Article 9**, in which the equipment is classified.

1.3. The conformity assessment procedures to be applied for the various Categories are as follows:

- Category I
Module A
- Category II
Module A1
Module D1
Module E1
- Category III
Module B1 + D
Module B1 + F
Module B + E
Module B + C1
Module H
- Category IV
Module B + D
Module B + F

Module G
Module H1

1.4. Pressure equipment shall be subjected to one of the conformity assessment procedures which may be chosen by the manufacturer among those laid down for the Category in which it is classified. The manufacturer may also choose to apply one of the procedures which apply to a higher Category, if available.

1.5. In the framework of quality assurance procedures for equipment in Categories III and IV referred to in **Article 3**, section 1.1 (a), section 1.1 (b) first indent and section 1.2, the notified body shall, when performing unexpected visits, take a sample of equipment from the manufacturing or storage premises in order to perform, or have performed, the final assessment as referred to in **Annex I**, section 3.2.2. To this end, the manufacturer shall inform the notified body of the intended schedule of production. The notified body shall carry out at least two visits during the first year of manufacturing. The frequency of subsequent visits shall be determined by the notified body on the basis of the criteria set out in section 4.4 of the relevant modules.

1.6. In the case of one-off production of vessels and equipment in Category III referred to in **Article 3**, section 1.2 under the module H procedure, the notified body shall perform or have performed the final assessment, as referred to in **Annex I**, section 3.2.2, for each unit. To this end, the manufacturer shall communicate the intended schedule of production to the notified body.

2. Assemblies referred to in **Article 3** (2) shall be subjected to a global conformity assessment procedure comprising:

(a) assessment of each item of pressure equipment making up the assembly and referred to in **Article 3** (1) which has not been previously subjected to a conformity assessment procedure and to a separate CE marking; the assessment procedure shall be determined by the Category of each item of equipment;

(b) the assessment of the integration of the various components of the assembly as

referred to in sections 2.3, 2.8 and 2.9 of **Annex I** which shall be 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 as referred to in sections 2.10 and 3.2.3 of **Annex I** shall be conducted in the light of the highest Category applicable to the items of equipment to be protected.

3. By way of derogation from paragraphs 1 and 2, the competent authorities may, where justified, allow the placing on the market and putting into service in the territory of the Member State concerned of individual pressure equipment items and assemblies referred to in **Article 1** (2), in respect of which the procedures referred to in paragraphs 1 and 2 of this Article have not been applied and the use of which is in the interests of experimentation.

4. Records and correspondence relating to conformity assessment shall be drawn up in the official language(s) of the Community which may be determined in accordance with the Treaty by the Member State where the body responsible for carrying out these procedures is established, or in a language accepted by that body.

Article 11

European approval for materials

1. European approval for materials, as defined in **Article 1**, section 2.9, shall be issued at the request of one or more manufacturers of materials or equipment, by one of the notified bodies referred to in **Article 12** specifically designated for that task. The notified body shall determine and perform, or arrange for the performance of, the appropriate inspections and tests to certify the conformity of the types of material with the corresponding requirements of this Directive; in the case of materials recognized as being safe to use before 29 November 1999, the notified body shall take account of the existing data when certifying such conformity.

2. Before issuing European approval for materials, the notified body shall inform the Member States and the Commission by sending them the appropriate information. Within three months, a Member State or the Commission may refer the matter to the Standing Committee set up by Article 5 of Directive 83/189/EEC, giving its reasons. In that case, the Committee shall issue an opinion as a matter of urgency.

The notified body shall issue the European approval for materials taking into account, where appropriate, the opinion of the Committee and the comments submitted.

3. A copy of the European approval for pressure equipment materials shall be sent to the Member States, the notified bodies and the Commission. The Commission shall publish and keep up to date a list of European approvals for materials in the Official Journal of the European Communities.

4. The materials used for the manufacture of pressure equipment conforming with European approvals for materials, the references of which have been published in the Official Journal of the European Communities, shall be presumed to conform to the applicable essential requirements of **Annex I**.

5. The notified body which issued the European approval for pressure equipment materials shall withdraw that approval if it finds that it should not have been issued for if the type of materials is covered by a harmonized standard. It shall immediately inform the other Member States, the notified bodies and the Commission of any withdrawal of an approval.

Article 12

Notified bodies

1. Member States shall notify the Commission and the other Member States of the bodies which they have appointed to carry out the procedures referred to in **Article 10** and **Article 11**, together with the specific tasks which those bodies have been appointed to carry out and the identification numbers assigned to them beforehand by the Commission.

The Commission shall publish in the Official Journal of the European Communities a list of the notified bodies, with their identification numbers and the tasks for which they have been notified. The Commission shall ensure that this list is kept up to date.

2. Member States shall apply the criteria set out in **Annex IV** for the designation of bodies. Bodies meeting the criteria laid down in the relevant harmonized standards shall be presumed to fulfil the corresponding criteria in **Annex IV**.

3. A Member State which has notified a body must withdraw such notification if it finds that the body no longer meets the criteria referred to in paragraph 2.

It shall forthwith inform the other Member States and the Commission of any such withdrawal of a notification.

Article 13

Recognized third-party organizations

1. Member States shall notify the Commission and the other Member States of the third-party organizations which they have recognized for the purposes of the tasks referred to in **Annex I**, sections 3.2.2 and 3.1.3.

The Commission shall publish in the Official Journal of the European Communities a list of the recognized organizations with the tasks for which they have been recognized. The Commission shall ensure that this list is kept up to date.

2. Member States shall apply the criteria set out in **Annex IV** for the recognition of organizations. Organizations meeting the criteria laid down in the relevant harmonized standards shall be presumed to fulfil the corresponding criteria in **Annex IV**.

3. A Member State which has recognized an organization must withdraw such recognition if it finds that the organization no longer meets the criteria referred to in paragraph 2.

It shall forthwith inform the other Member States and the Commission of any such withdrawal of a recognition.

Article 14

User inspectorates

1. By way of derogation from the provisions relating to the tasks carried out by the notified bodies, Member States may authorize in their territory the placing on the market, and the putting into service by users, of pressure equipment or assemblies referred to in **Article 1** of which conformity with the essential requirements has been assessed by a user inspectorate designated in accordance with the criteria referred to in paragraph 8.
2. When a Member State has designated a user inspectorate in accordance with the criteria set out in this Article, it may not, on grounds of the hazards due to pressure, prohibit, restrict or impede the placing on the market or putting into service under the conditions provided for in this Article of pressure equipment or assemblies the conformity of which has been assessed by a user inspectorate designated by another Member State in accordance with the criteria set out in this Article.
3. Pressure equipment and assemblies the conformity of which has been assessed by a user inspectorate shall not bear the CE marking.
4. The pressure equipment and assemblies referred to may be used only in establishments operated by the group of which the inspectorate is part. The group shall apply a common safety policy as regards the technical specifications for the design, manufacture, inspection, maintenance and use of pressure equipment and assemblies.
5. The user inspectorates shall act exclusively for the group of which they are part.
6. The conformity assessment procedures applicable by user inspectorates shall be modules A1, C1, F and G, as described in **Annex III**.
7. Member States shall inform the other Member States and the Commission which user inspectorates they have authorized, the tasks for which they have been designated

and, for each inspectorate, a list of the establishments satisfying the provisions of paragraph 4.

8. In designating the user inspectorates, the Member States shall apply the criteria listed in **Annex V** and ensure that the group of which the inspectorate is part applies the criteria referred to in the second sentence of paragraph 4.

9. A Member State that has authorized a user inspectorate shall withdraw that authorization if it finds that the user inspectorate no longer meets the criteria referred to in paragraph 8. It shall inform the other Member States and the Commission thereof.

10. The effects of this Article shall be monitored by the Commission and evaluated three years after the date specified in Article 20 (3). To this end, Member States shall forward to the Commission any useful information on the implementation of this Article. If necessary the evaluation shall be accompanied by a proposal for amendment of the Directive.

Article 15

CE marking

1. The CE marking consists of the initials 'CE' in accordance with the model in **Annex VI**.

The CE marking shall be accompanied by the identification number, as referred to in Article 12 (1), of the notified body involved at the production control phase.

2. The CE marking shall be affixed in a visible, easily legible and indelible fashion to each

- item of pressure equipment referred to in **Article 3** (1), or

- assembly referred to in **Article 3** (2)

which is complete or is in a state permitting final assessment as described in section 3.2 of Annex I.

3. It is not necessary for the CE marking to be affixed to each individual item of pressure equipment making up an assembly as referred to in Article 3 (2). Individual items of pressure equipment already bearing the CE marking when incorporated into the assembly shall continue to bear that marking.

4. Where the pressure equipment or assembly is subject to other Directives covering other aspects which provide for the affixing of the CE marking, the latter shall indicate that the pressure equipment or assembly in question is also presumed to conform to the provisions of those other Directives.

However, should one or more of those Directives allow the manufacturer, during a transitional period, to choose which arrangements to apply, the CE marking shall indicate conformity only with the Directives applied by the manufacturer. In this case, the particulars of the said Directives, as published in the Official Journal of the European Communities, must be given in the documents, notices or instructions required by the Directives and accompanying the pressure equipment or assembly.

5. The affixing of markings on pressure equipment or assemblies which are likely to mislead third parties as to the meaning or form of the CE marking shall be prohibited. Any other marking may be affixed to pressure equipment or assemblies provided that the visibility and legibility of the CE marking is not thereby reduced.

Article 16

Unduly affixed CE marking

Without prejudice to Article 8:

(a) where a Member State establishes that the CE marking has been affixed unduly, the manufacturer, or his authorized representative established within the Community, shall be obliged to make the product conform as regards the provisions

concerning the CE marking and to end the infringement under the conditions imposed by the Member State;

(b) should non-conformity persist, the Member State must take all appropriate measures to restrict or prohibit the placing on the market of the product in question or to ensure that it is withdrawn from the market in accordance with the procedures laid down in Article 8.

Article 17

Member States shall take appropriate measures in order to encourage the authorities responsible for implementing this Directive to cooperate with each other and provide each other and the Commission with information in order to assist the functioning of this Directive.

Article 18

Decisions entailing refusal or restriction

Any decision taken pursuant to this Directive which restricts the placing on the market and the putting into service or requires the withdrawal from the market of pressure equipment or assemblies shall state the exact grounds on which it is based. Such decision shall be notified forthwith to the party concerned, who shall at the same time be informed of the legal remedies available to him under the laws in force in the Member State concerned and of the time limits to which such remedies are subject.

Article 19

Repeal

Article 22 of Directive 76/767/EEC shall cease to apply as from 29 November 1999 in respect of pressure equipment and assemblies covered by this Directive.

Article 20

Transposition and transitional provisions

1. Before 29 May 1999 Member States shall adopt and publish the laws, regulations and administrative provisions necessary to comply with this Directive. They shall

forthwith inform the Commission thereof. When Member States adopt the measures referred to in the first subparagraph, they shall contain a reference to this Directive or shall be accompanied by such reference on the occasion of their official publication. The methods of making such reference shall be laid down by Member States. Member States shall apply such provisions as from 29 November 1999.

2. Member States shall communicate to the Commission the texts of the provisions of national law which they adopt in the field governed by this Directive.

3. Member States must permit the placing on the market of pressure equipment and assemblies which comply with the regulations in force in their territory at the date of application of this Directive until 29 May 2002, and permit such equipment and assemblies to be put into service beyond that date.

Article 21

Addressees of the Directive

This Directive is addressed to the Member States. Done at Brussels, 29 May 1997. For the European Parliament For the Council

The President The President

J. M. GIL-ROBLES A. JORRITSMA
LEBBINK

Annex I

ESSENTIAL SAFETY REQUIREMENTS PRELIMINARY OBSERVATIONS

1. The obligations arising from the essential requirements listed in this Annex for pressure equipment also apply to assemblies where the corresponding hazard exists.
2. The essential requirements laid down in the Directive are compulsory. The obligations laid down in these essential requirements apply only if the corresponding hazard exists for the pressure equipment in question when it is used under conditions which are reasonably foreseeable by the manufacturer.
3. The manufacturer is under an obligation to analyse the hazards in order to identify those which apply to his equipment on account of pressure; he must then design and construct it taking account of his analysis.
4. The essential requirements are to be interpreted and applied in such a way as to take account of the state of the art and current practice at the time of design and manufacture as well as of technical and economic considerations which are consistent with a high degree of health and safety protection.

1. GENERAL

1.1 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.

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

- eliminate or reduce hazards as far as is reasonably practicable,
- apply appropriate protection measures against hazards which cannot be eliminated,
- 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.

1.3. Where the potential for misuse is known or can be clearly foreseen, the pressure equipment must be designed to prevent danger from such misuse or, if that is not possible, adequate warning given that the pressure equipment must not be used in that way.

2. DESIGN

2.1. General

The pressure equipment must be properly designed taking all relevant factors into account in order to ensure that the equipment will be safe throughout its intended life.
The design must incorporate appropriate safety coefficients using comprehensive methods which are known to incorporate adequate safety margins against all relevant failure modes in a consistent manner.

2.2. Design for adequate strength

2.2.1 The pressure equipment must be designed for loadings appropriate to its intended use and other reasonably foreseeable operating conditions. In particular, the following factors must be taken into account:

- internal/external pressure,
- ambient and operational temperatures,
- static pressure and mass of contents in operating and test conditions,
- traffic, wind, earthquake loading,
- reaction forces and moments which result from the supports, attachments, piping, etc.,
- corrosion and erosion, fatigue, etc.,
- decomposition of unstable fluids.

Various loadings which can occur at the same time must be considered, taking into account the probability of their simultaneous occurrence.

2.2.2 Design for adequate strength must be based on:

- as a general rule, a calculation method, as described in 2.2.3, and supplemented if necessary by an experimental design method as described in 2.2.4, or
- an experimental design method without calculation, as described in 2.2.4, when the product of the maximum allowable pressure PS and the volume V is less than 6 000 bar 7L or the product PS 7DN less than 3 000 bar.

2.2.3 Calculation method

(a) Pressure containment and other loading aspects

The allowable stresses for pressure equipment must be limited having regard to reasonably foreseeable failure modes under operating conditions. To this end, safety factors must be applied to eliminate fully any uncertainty arising out of manufacture, actual operational conditions, stresses, calculation models and the properties and behaviour of the material. These calculation methods must provide sufficient safety margins consistent, where applicable, with the requirements of section 7.

The requirements set out above may be met by applying one of the following methods, as appropriate, if necessary as a supplement to or in combination with another method:

- design by formula,
- design by analysis,
- design by fracture mechanics;

(b) Resistance

Appropriate design calculations must be used to establish the resistance of the pressure equipment concerned.

In particular:

- the calculation pressures must not be less than the maximum allowable pressures and take into account static head and dynamic fluid pressures and the decomposition of unstable fluids. Where a vessel is separated into individual pressure-containing chambers, the partition wall must be

designed on the basis of the highest possible chamber pressure relative to the lowest pressure possible in the adjoining chamber,

- the calculation temperatures must allow for appropriate safety margins,
- the design must take appropriate account of all possible combinations of temperature and pressure which might arise under reasonably foreseeable operating conditions for the equipment,
- the maximum stresses and peak stress concentrations must be kept within safe limits,
- the calculation for pressure containment must utilize the values appropriate to the properties of the material, based on documented data, having regard to the provisions set out in section 4 together with appropriate safety factors. Material characteristics to be considered, where applicable, include:
 - yield strength, 0,2 % or 1,0 % proof strength as appropriate at calculation temperature,
 - tensile strength,
 - time-dependent strength, i.e. creep strength,
 - fatigue data,
 - Young's modulus (modulus of elasticity),
 - appropriate amount of plastic strain,
 - impact strength,
 - fracture toughness,
- appropriate joint factors must be applied to the material properties depending, for example, on the type of non-destructive testing, the materials joined and the operating conditions envisaged,
- the design must take appropriate account of all reasonably foreseeable degradation mechanisms (e.g. corrosion, creep, fatigue) commensurate with the intended use of the equipment. Attention must be drawn, in the instructions referred to in section 3.4, to particular features of the design which are relevant to the life of the equipment, for example:
 - for creep: design hours of operation at specified temperatures,
 - for fatigue: design number of cycles at specified stress levels,
 - for corrosion: design corrosion allowance;

(c) Stability aspects

Where the calculated thickness does not allow for adequate structural stability, the necessary measures must be taken to remedy the situation taking into account the risks from transport and handling

2.2.4 Experimental design method

The design of the equipment may be validated, in all or in part, by an appropriate test programme carried out on a sample representative of the equipment or the Category of equipment. The test programme must be clearly defined prior to testing and accepted by the notified body responsible for the design conformity assessment module, where it exists. This programme must define test conditions and criteria for acceptance or refusal. The actual values of the essential dimensions and characteristics of the materials which constitute the

equipment tested shall be measured before the test.

Where appropriate, during tests, it must be possible to observe the critical zones of the pressure equipment with adequate instrumentation capable of registering strains and stresses with sufficient precision.

The test programme must include:

(a) A pressure strength test, the purpose of which is to check that, at a pressure with a defined safety margin in relation to the maximum allowable pressure, the equipment does not exhibit significant leaks or deformation exceeding a determined threshold.

The test pressure must be determined on the basis of the differences between the values of the geometrical and material characteristics measures under test conditions and the values used for design purposes; it must take into account the differences between the test and design temperatures;

(b) where the risk of creep or fatigue exists, appropriate tests determined on the basis of the service conditions laid down for the equipment, for instance hold time at specified temperatures, number of cycles at specified stress-levels, etc.;

(c) where necessary, additional tests concerning other factors referred to in 2.2.1 such as corrosion, external damage, etc.

2.3 Provisions to ensure safe handling and operation

The method of operation specified for pressure equipment must be such as to preclude any reasonably foreseeable risk in operation of the equipment. Particular attention must be paid, where appropriate, to:

- closures and openings,
- dangerous discharge of pressure relief blow-off,
- devices to prevent physical access whilst pressure or a vacuum exists,
- surface temperature taking into consideration the intended use,
- decomposition of unstable fluids.

In particular, pressure equipment fitted with an access door must be equipped with an automatic or manual device enabling the user easily to ascertain that the opening will not present any hazard. Furthermore, where the opening can be operated quickly, the pressure equipment must be fitted with a device to prevent it being opened whenever the pressure or temperature of the fluid presents a hazard.

2.4. Means of examination

(a) Pressure equipment must be designed and constructed so that all necessary examinations to ensure safety can be carried out;

(b) Means of determining the internal condition of the equipment must be available, where it is necessary to ensure the continued safety of the equipment, such as access openings allowing physical access to the inside of the pressure equipment so that appropriate examinations can be carried out safely and ergonomically;

(c) Other means of ensuring the safe condition of the pressure equipment may be applied:

- where it is too small for physical internal access, or

- where opening the pressure equipment would adversely affect the inside, or
- where the substance contained has been shown not to be harmful to the material from which the pressure equipment is made and no other internal degradation mechanisms are reasonably foreseeable.

2.5. Means of draining and venting

Adequate means must be provided for the draining and venting of pressure equipment where necessary:

- to avoid harmful effects such as water hammer, vacuum collapse, corrosion and uncontrolled chemical reactions. All stages of operation and testing, particularly pressure testing, must be considered,
- to permit cleaning, inspection and maintenance in a safe manner.

2.6. Corrosion or other chemical attack

Where necessary, adequate allowance or protection against corrosion or other chemical attack must be provided, taking due account of the intended and reasonably foreseeable use.

2.7. Wear

Where severe conditions of erosion or abrasion may arise, adequate measures must be taken to:

- minimize that effect by appropriate design, e.g. additional material thickness, or by the use of liners or cladding materials,
- permit replacement of parts which are most affected,
- draw attention, in the instructions referred to in 3.4, to measures necessary for continued safe use.

2.8. Assemblies

Assemblies must be so designed that:

- the components to be assembled together are suitable and reliable for their duty,
- all the components are properly integrated and assembled in an appropriate manner.

2.9. Provisions for filling and discharge

Where appropriate, the pressure equipment must be so designed and provided with accessories, or provision made for their fitting, as to ensure safe filling and discharge in particular with respect to hazards such as:

(a) on filling:

- overfilling or overpressurization having regard in particular to the filling ratio and to vapour pressure at the reference temperature,
- instability of the pressure equipment;

(b) on discharge: the uncontrolled release of the pressurized fluid;

(c) on filling or discharge: unsafe connection and disconnection.

2.10. Protection against exceeding the allowable limits of pressure equipment

Where, under reasonably foreseeable conditions, the allowable limits could be exceeded, the pressure equipment must be fitted with, or provision made for the fitting of, suitable protective devices, unless the equipment is intended to be protected by other protective devices within an assembly.

The suitable device or combination of such devices must be determined on the basis of the particular characteristics of the equipment or assembly.

Suitable protective devices and combinations thereof comprise:

(a) safety accessories as defined in **Article 1**, section 2.1.3,

(b) where appropriate, adequate monitoring devices such as indicators and/or alarms which enable adequate action to be taken either automatically or manually to keep the pressure equipment within the allowable limits.

2.11. Safety accessories

2.11.1. Safety accessories must:

- be so designed and constructed as to be reliable and suitable for their intended duty and take into account the maintenance and testing requirements of the devices, where applicable,
- be independent of other functions, unless their safety function cannot be affected by such other functions,
- comply with appropriate design principles in order to obtain suitable and reliable protection. These principles include, in particular, fail-safe modes, redundancy, diversity and self-diagnosis.

2.11.2. Pressure limiting devices

These devices must be so designed that the pressure will not permanently exceed the maximum allowable pressure PS; however a short duration pressure surge in keeping with the specifications laid down in 7.3 is allowable, where appropriate.

2.11.3. Temperature monitoring devices

These devices must have an adequate response time on safety grounds, consistent with the measurement function.

2.12. External fire

Where necessary, pressure equipment must be so designed and, where appropriate, fitted with suitable accessories, or provision made for their fitting, to meet damage-limitation requirements in the event of external fire, having particular regard to its intended use.

3. MANUFACTURING

3.1. Manufacturing procedures

The manufacturer must ensure the competent execution of the provisions set out at the design stage by applying the appropriate techniques and relevant procedures, especially with a view to the aspects set out below.

3.1.1. Preparation of the component parts

Preparation of the component parts (e.g. forming and chamfering) must not give rise to defects or cracks or changes in the mechanical characteristics likely to be detrimental to the safety of the pressure equipment.

3.1.2. Permanent joining

Permanent joints and adjacent zones must be free of any surface or internal defects detrimental to the safety of the equipment.

The properties of permanent joints must meet the minimum properties specified for the materials to be joined unless other relevant property values are specifically taken into account in the design calculations.

For pressure equipment, permanent joining of components which contribute to the pressure resistance of equipment and components which are directly attached to them must be carried out by suitably qualified personnel according to suitable operating procedures.

For pressure equipment in Categories II, III and IV, operating procedures and personnel must be approved by a competent third party which, at the manufacturer's discretion, may be:

- a notified body,
- a third-party organization recognized by a Member State as provided for in **Article 13**.

To carry out these approvals the third party must perform examinations and tests as set out in the appropriate harmonized standards or equivalent examinations and tests or must have them performed.

3.1.3. Non-destructive tests

For pressure equipment, non-destructive tests of permanent joints must be carried out by suitable qualified personnel. For pressure be approved by a third-party organization recognized by a Member State pursuant to **Article 13**.

3.1.4. Heat treatment

Where there is a risk that the manufacturing process will change the material properties to an extent which would impair the safety of the pressure equipment, suitable heat treatment must be applied at the appropriate stage of manufacture.

3.1.5. Traceability

Suitable procedures must be established and maintained for identifying the material making up the components of the equipment which contribute to pressure resistance by suitable means from receipt, through production, up to the final test of the manufactured pressure equipment.

3.2. Final assessment

Pressure equipment must be subjected to final assessment as described below.

3.2.1. Final inspection

Pressure equipment must undergo a final inspection to assess visually and by examination of the accompanying documents compliance with the requirements of the Directive. Test carried out during manufacture may be taken into account. As far as is necessary on safety grounds, the final inspection must be carried out internally and externally on every part of the equipment, where appropriate in the course of manufacture (e.g. where examination during the final inspection is no longer possible).

3.2.2. Proof test

Final assessment of pressure equipment must include a test for the pressure containment aspect, which will normally take the form of a hydrostatic pressure test at a pressure at least equal, where appropriate, to the value laid down in 7.4.

For Category I series-produced pressure equipment, this test may be performed on a statistical basis.

Where the hydrostatic pressure test is harmful or impractical, other tests of a recognized value may be carried out. For tests other than the hydrostatic pressure test, additional measures, such as non-destructive tests or other methods of equivalent validity, must be applied before those tests are carried out.

3.2.3. Inspection of safety devices

For assemblies, the final assessment must also include a check of the safety devices intended to check full compliance with the requirements referred to in 2.10.

3.3. Marking and labelling

In addition to the CE marking referred to in Article 15, the following information must be provided

(a) for all pressure equipment:

- the name and address or other means of identification of the manufacturer and, where appropriate, of his authorized representative established within the Community,
- the year of manufacture,
- identification of the pressure equipment according to its nature, such as type, series or batch identification and serial number,
- essential maximum/minimum allowable limits;

(b) depending on the type of pressure equipment, further information necessary for safe installation, operation or use and, where applicable, maintenance and periodic inspection such as:

- the volume V of the pressure equipment in L,
- the nominal size for piping DN,
- the test pressure PT applied in bar and date,
- safety device set pressure in bar,
- output of the pressure equipment in kW,
- supply voltage in V (volts),
- intended use,
- filling ratio kg/L,
- maximum filling mass in kg,
- tare mass in kg,

- the product group;

(c) where necessary, warnings fixed to the pressure equipment drawing attention to misuse which experience has shown might occur.

The CE marking and the required information must be given on the pressure equipment or on a dataplate firmly attached to it, with the following exceptions:

- where applicable, appropriate documentation may be used to avoid repetitive marking of individual parts such as piping components, intended for the same assembly. This applies to CE marking and other marking and labelling referred to in this Annex;

- where the pressure equipment is too small, e.g. accessories, the information referred to in (b) may be given on a label attached to that pressure equipment;

- labelling or other adequate means may be used for the mass to be filled and the warnings referred to in (c), provided it remains legible for the appropriate period of time.

3.4. Operating instructions

(a) When pressure equipment is placed on the market, it must be accompanied, as far as relevant, with instructions for the user, containing all the necessary safety information relating to:

- mounting including assembling of different pieces of pressure equipment,

- putting into service,

- use,

- maintenance including checks by the user;

(b) Instructions must cover information affixed to the pressure equipment in accordance with 3.3, with the exception of serial identification, and must be accompanied, where appropriate, by the technical documents, drawings and diagrams necessary for a full understanding of these instructions;

(c) If appropriate, these instructions must also refer to hazards arising from misuse in accordance with 1.3 and particular features of the design in accordance with 2.2.3.

4. MATERIALS

Materials used for the manufacture of pressure equipment must be suitable for such application during the scheduled lifetime unless replacement is foreseen.

Welding consumables and other joining materials need fulfil only the relevant requirements of 4.1, 4.2 (a) and the first paragraph of 4.3, in an appropriate way, both individually and in a joined structure.

4.1. Materials for pressurized parts must:

(a) have appropriate properties for all operating conditions which are reasonably foreseeable and for all test conditions, and in particular they should be sufficiently ductile and tough. Where appropriate, the characteristics of the materials must comply with the requirements of 7.5. Moreover, due care should be exercised in particular in selecting materials in order to prevent brittle-type fracture where necessary; where for specific reasons brittle material has to be used appropriate measures must be taken;

(b) be sufficiently chemically resistant to the fluid contained in the pressure equipment; the chemical and physical properties necessary for operational safety must not be significantly affected within the scheduled lifetime of the equipment;

- (c) not be significantly affected by ageing;
- (d) be suitable for the intended processing procedures;
- (e) be selected in order to avoid significant undesirable effects when the various materials are put together.

4.2.

- (a) The pressure equipment manufacturer must define in an appropriate manner the values necessary for the design calculations referred to in 2.2.3 and the essential characteristics of the materials and their treatment referred to in 4.1;
- (b) the manufacturer must provide in his technical documentation elements relating to compliance with the materials specifications of the Directive in one of the following forms:
 - by using materials which comply with harmonized standards,
 - by using materials covered by a European approval of pressure equipment materials in accordance with Article 11,
 - by a particular material appraisal;
- (c) for pressure equipment in Categories III and IV, particular appraisal as referred to in the third indent of (b) must be performed by the notified body in charge of conformity assessment procedures for the pressure equipment.

4.3.

The equipment manufacturer must take appropriate measures to ensure that the material used conforms with the required specification.

In particular, documentation prepared by the material manufacturer affirming compliance with a specification must be obtained for all materials.

For the main pressure-bearing parts of equipment in Categories II, III and IV, this must take the form of a certificate of specific product control.

Where a material manufacturer has an appropriate quality-assurance system, certified by a competent body established within the Community and having undergone a specific assessment for materials, certificates issued by the manufacturer are presumed to certify conformity with the relevant requirements of this section.

SPECIFIC PRESSURE EQUIPMENT REQUIREMENTS

In addition to the applicable requirements of sections 1 to 4, the following requirements apply to the pressure equipment covered by sections 5 and 6.

5. FIRED OR OTHERWISE HEATED PRESSURE EQUIPMENT WITH A RISK OF OVERHEATING AS REFERRED TO IN ARTICLE 3 (1)

This pressure equipment includes:

- steam and hot-water generators as referred to in **Article 3**, section 1.2, such as fired steam and hot-water boilers, superheaters and reheaters, waste-heat boilers, waste incineration boilers, electrode or immersion-type electrically heated boilers, pressure cookers, together with their accessories and where applicable their systems for treatment of feedwater and for fuel supply, and
- process-heating equipment for other than steam and hot water generation falling under **Article 3**, section 1.1, such as heaters for chemical and other similar processes and pressurized food-

processing equipment. This pressure equipment must be calculated, designed and constructed so as to avoid to minimize risks of a significant loss of containment from overheating. In particular it must be ensured, where applicable, that:

- (a) appropriate means of protection are provided to restrict operating parameters such as heat input, heat take-off and, where applicable, fluid level so as to avoid any risk of local and general overheating,
- (b) sampling points are provided where required to allow evaluation of the properties of the fluid so as to avoid risks related to deposits and/or corrosion,
- (c) adequate provisions are made to eliminate risks of damage from deposits,
- (d) means of safe removal of residual heat after shutdown are provided,
- (e) steps are taken to avoid a dangerous accumulation of ignitable mixtures of combustible substances and air, or flame blowback.

6. PIPING AS REFERRED TO IN ARTICLE 3, SECTION 1.3

Design and construction must ensure:

- (a) that the risk of overstressing from inadmissible free movement or excessive forces being produced, e.g. on flanges, connections, bellows or hoses, is adequately controlled by means such as support, constraint, anchoring, alignment and pre-tension;
- (b) that where there is a possibility of condensation occurring inside pipes for gaseous fluids, means are provided for drainage and removal of deposits from low areas to avoid damage from water hammer or corrosion;
- (c) that due consideration is given to the potential damage from turbulence and formation of vortices; the relevant parts of 2.7 are applicable;
- (d) that due consideration is given to the risk of fatigue due to vibrations in pipes;
- (e) that, where fluids of Group 1 are contained in the piping, appropriate means are provided to isolate 'take-off' pipes the size of which represents a significant risk;
- (f) that the risk of inadvertent discharge is minimized; the take-off points must be clearly marked on the permanent side, indicating the fluid contained;
- (g) that the position and route of underground piping is at least recorded in the technical documentation to facilitate safe maintenance, inspection or repair.

7. SPECIFIC QUANTITATIVE REQUIREMENTS FOR CERTAIN PRESSURE EQUIPMENT

The following provisions apply as a general rule. However, where they are not applied, including in cases where materials are not specifically referred to and no harmonized standards are applied, the manufacturer must demonstrate that appropriate measures have been taken to achieve an equivalent overall level of safety.

This section is an integral part of **Annex I**. The provisions laid down in this section supplement the essential requirements of sections 1 to 6 for the pressure equipment to which they apply.

7.1. Allowable stresses

7.1.1 Symbols

R_e/t , yield limit, indicates the value at the calculation temperature of:

- the upper flow limit for a material presenting upper and lower flow limits,
- the 1,0 % proof strength of austenitic steel and non-alloyed aluminium,
- the 0,2 % proof strength in other cases.

$R_m/20$ indicates the minimum value of the ultimate strength 20 °C.

R_m/t designates the ultimate strength at the calculation temperature.

7.1.2.

The permissible general membrane stress for predominantly static loads and for temperatures outside the range in which creep is significant must not exceed the smaller of the following values, according to the material used:

- in the case of ferritic steel including normalized (normalized rolled) steel and excluding fine-grained steel and specially heat-treated steel, $2/3$ of R_e/t and $5/12$ of $R_m/20$;
- in the case of austenitic steel:
 - if its elongation after rupture exceeds 30 %, $2/3$ of R_e/t
 - or, alternatively, and if its elongation after rupture exceeds 35 %, $5/6$ of R_e/t and $1/3$ of R_m/t ;
- in the case of non-alloy or low-alloy cast steel, $10/19$ of R_e/t and $1/3$ of $R_m/20$;
- in the case of aluminium, $2/3$ of R_e/t ;
- in the case of aluminium alloys excluding precipitation hardening alloys $2/3$ of R_e/t and $5/12$ of $R_m/20$.

7.2. Joint coefficients

For welded joints, the joint coefficient must not exceed the following values:

- for equipment subject to destructive and non-destructive tests which confirm that the whole series of joints show no significant defects: 1,
- for equipment subject to random non-destructive testing: 0,85,
- for equipment not subject to non-destructive testing other than visual inspection: 0,7.

If necessary, the type of stress and the mechanical and technological properties of the joint must also be taken into account.

7.3. Pressure limiting devices, particularly for pressure vessels

The momentary pressure surge referred to in 2.11.2 must be kept to 10 % of the maximum allowable pressure.

7.4. Hydrostatic test pressure

For pressure vessels, the hydrostatic test pressure referred to in 3.2.2 must be no less than:

- that corresponding to the maximum loading to which the pressure equipment may be subject in service taking into account its maximum allowable pressure and its maximum allowable temperature, multiplied by the coefficient 1,25, or
- the maximum allowable pressure multiplied by the coefficient 1,43, whichever is the greater.

7.5. Material characteristics

Unless other values are required in accordance with other criteria that must be taken into account, a steel is considered as sufficiently ductile to satisfy 4.1 (a) if, in a tensile test carried out by a standard procedure, its elongation after rupture is no less than 14 % and its bending rupture energy measured on an ISO V test-piece is no less than 27 J, at a temperature not greater than 20 °C but not higher than the lowest scheduled operating temperature.

Annex II

CONFORMITY ASSESSMENT TABLES

1. The references in the tables to Categories of modules are the following:

I = Module **A**

II = Module **A1, D1, E1**

III = Modules **B1 + D, B1 + F, B + E, B + C1, H**

IV = Modules **B+ D, B + F, G, H1**

2. The safety accessories defined in **Article 1**, Section 2.1.3, and referred to in **Article 3**, Section 1.4, are classified in Category IV. However, by way of exception, safety accessories manufactured for specific equipment may be classified in the same Category as the equipment they protect.

3. The pressure accessories defined in **Article 1**, Section 2.1.4, and referred to in **Article 3**, Section 1.4, are classified on the basis of:

- their maximum allowable pressure PS, and
- their volume V or their nominal size DN, as appropriate, and
- the group of fluids for which they are intended,

and the appropriate table for vessels or piping is to be used to determine the conformity assessment Category.

4. The demarcation lines in the following conformity assessment tables indicate the upper limit for each Category.

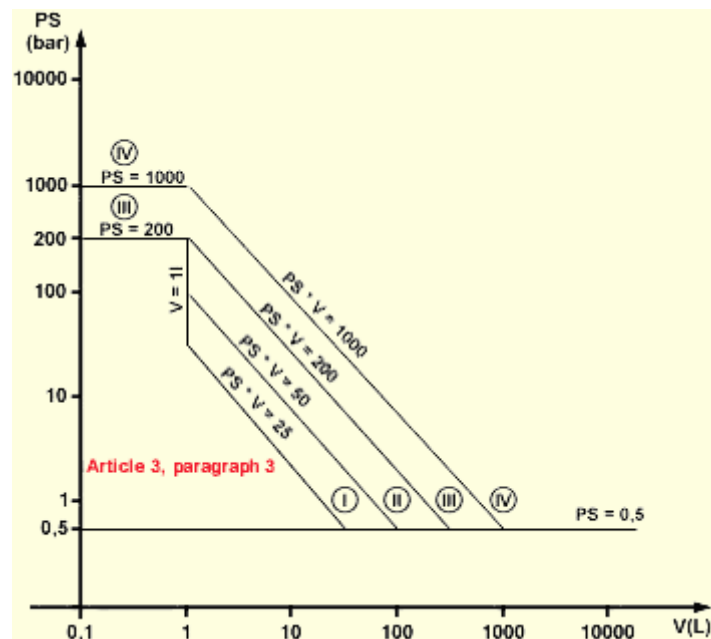


Table 1

Vessels referred to in Article 3, Section 1.1 (a), first indent.

Exceptionally, vessels intended to contain an unstable gas and falling within Categories I or II on the basis of table 1 must be classified in Category III.

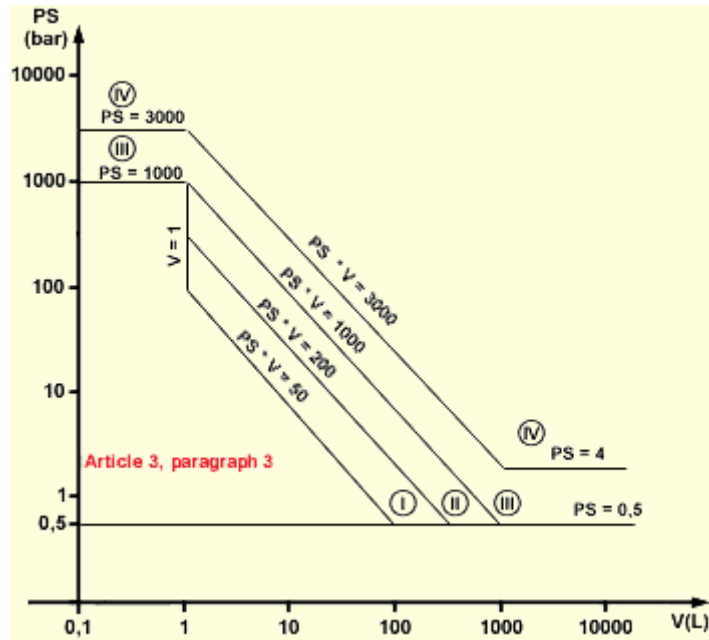


Table 2

Vessels referred to in Article 3, Section 1.1 (a), second indent.

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

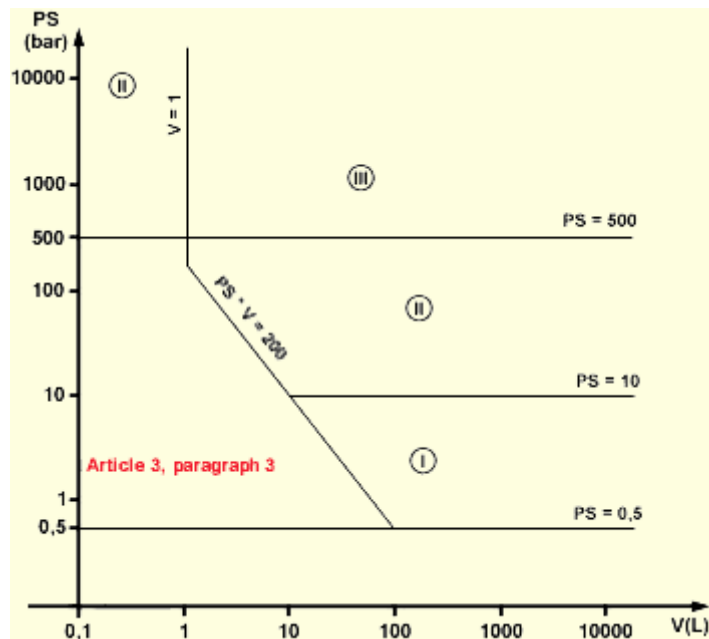


Table 3

Vessels referred to in Article 3, Section 1.1 (b), first indent.

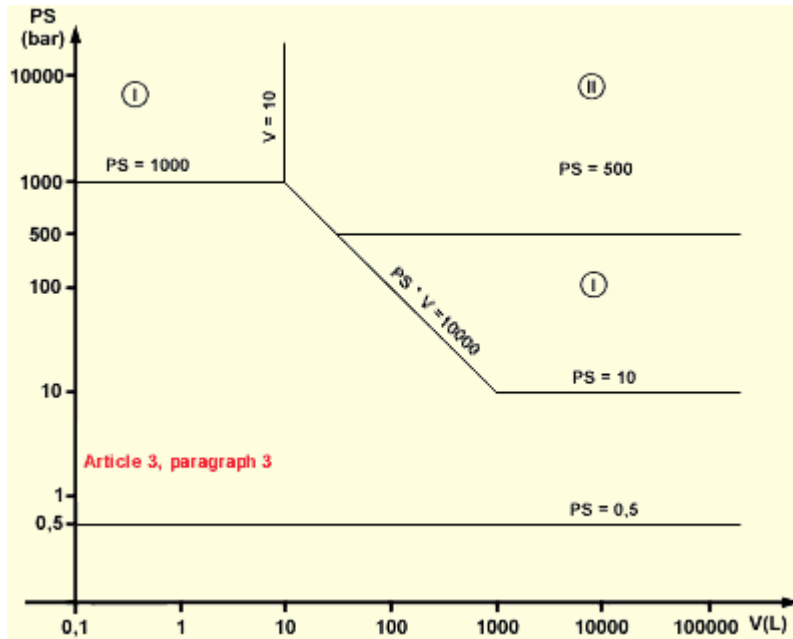


Table 4

Vessels referred to in Article 3, Section 1.1 (b), second indent.

Exceptionally, assemblies intended for generating warm water as referred to in **Article 3**, Section 2.3, must be subject either to an EC design examination (Module B1) with respect to their conformity with the essential requirements referred to in Sections 2.10, 2.11, 3.4, 5 (a) and 5 (d) of **Annex I**, or to full quality assurance (Module H).

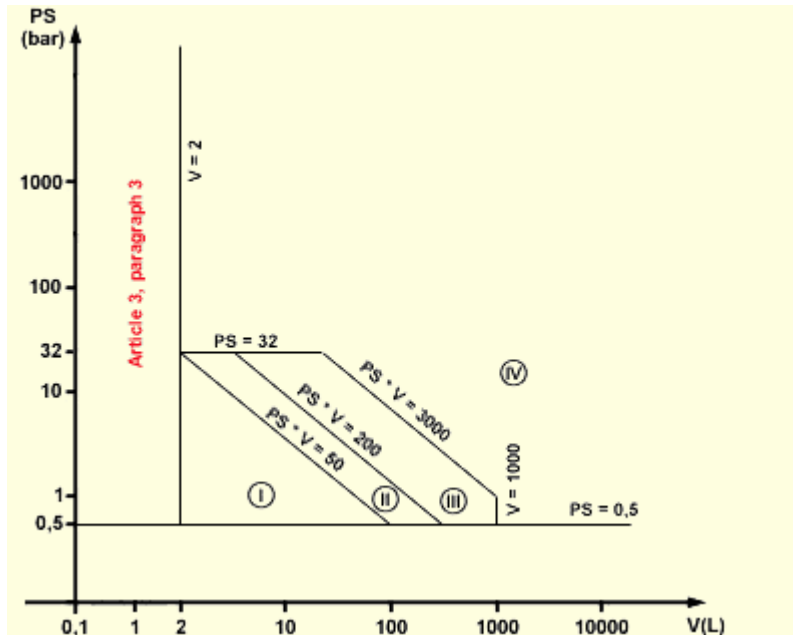


Table 5

Pressure equipment referred to in Article 3, Section 1.2.

Exceptionally, the design of pressure-cookers must be subject to a conformity assessment procedure equivalent to at least one of the Category III modules.

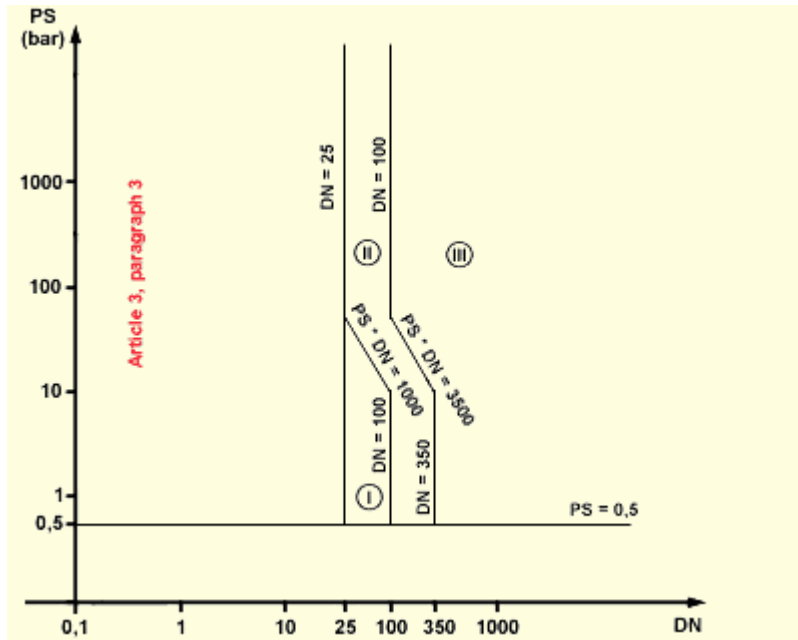


Table 6

Piping referred to in Article 3, Section 1.3 (a), first indent.

Exceptionally, piping intended for unstable gases and falling within Categories I or II on the basis of Table 6 must be classified in Category III.

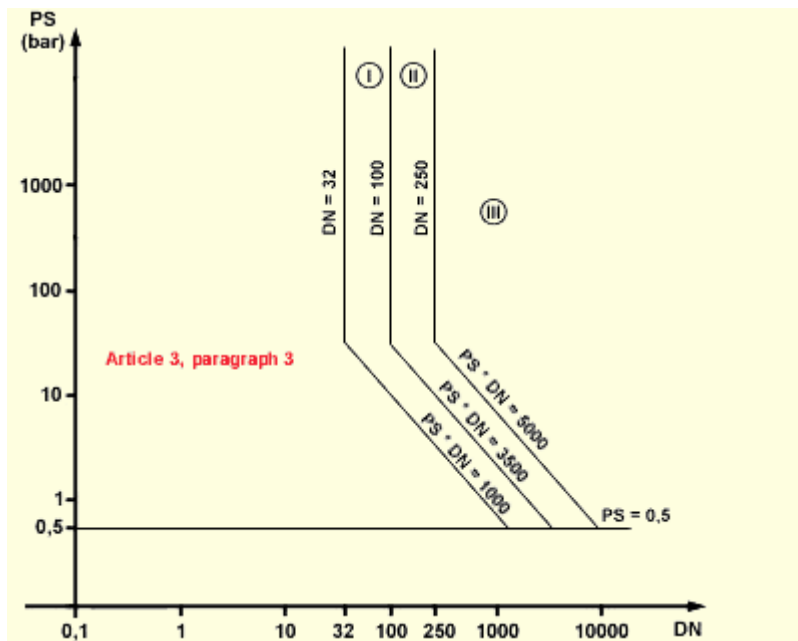


Table 7

Piping referred to in Article 3, Section 1.3 (a), second indent.

Exceptionally, all piping containing fluids at a temperature greater than 350 °C and falling within Category II on the basis of Table 7 must be classified in Category III.

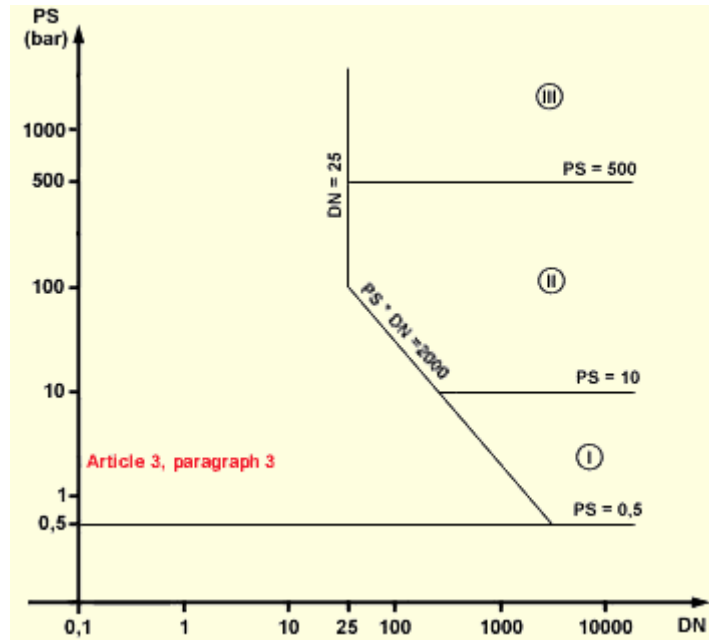


Table 8

Piping referred to in Article 3, Section 1.3 (b), first indent.

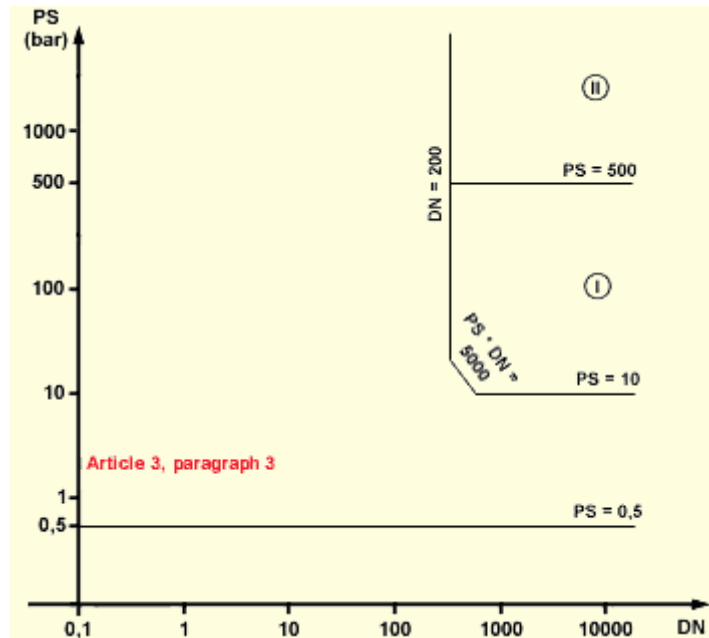


Table 9

Piping referred to in Article 3, Section 1.3 (b), second indent.

Annex III

CONFORMITY ASSESSMENT PROCEDURES

The obligations arising from the provisions on pressure equipment in this Annex also apply to assemblies.

Module A (internal production control)

1. This module describes the procedure whereby the manufacturer or his authorized representative established within the Community who carries out the obligations laid down in section 2 ensures and declares that pressure equipment satisfies the requirements of the Directive which apply to it. The manufacturer, or his authorized representative established within the Community, must affix the CE marking to each item of pressure equipment and draw up a written declaration of conformity.

2. The manufacturer must draw up the technical documentation described in section 3 and either the manufacturer or his authorized representative established within the Community must keep it at the disposal of the relevant national authorities for inspection purposes for a period of ten years after the last of the pressure equipment has been manufactured.

Where neither the manufacturer nor his authorized representative is established within the Community, the obligation to keep the technical documentation available is the responsibility of the person who places the pressure equipment on the Community market.

3. The technical documentation must enable an assessment to be made of the conformity of the pressure equipment with the requirements of the Directive which apply to it. It must, 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 manufacturing drawings and diagrams of components, sub-assemblies, circuits, etc.,
- descriptions and explanations necessary for an understanding of the said drawings and diagrams and the operation of the pressure equipment,
- a list of the standards referred to in **Article 5**, applied in full or in part, and a description of the solutions adopted to meet the essential requirements of the Directive where the standards referred to in **Article 5** have not been applied,
- results of design calculations made, examinations carried out, etc.,
- test reports.

4. The manufacturer, or his authorized representative established within the Community, must keep a copy of the declaration of conformity with the technical documentation.

5. The manufacturer must take all measures necessary to ensure that the manufacturing process requires the manufactured pressure equipment to comply with the technical documentation referred to in section 2 and with the requirements of the Directive which apply to it.

Module A1 (internal manufacturing checks with monitoring of the final assessment)

In addition to the requirements of module A, the following applies.

Final assessment must be performed by the manufacturer and monitored by means of

unexpected visits by a notified body chosen by the manufacturer.
During such visits, the notified body must:

- establish that the manufacturer actually performs final assessment in accordance with section 3.2 of **Annex I**,

- take samples of pressure equipment at the manufacturing or storage premises in order to conduct checks. The notified body assesses the number of items of equipment to sample and whether it is necessary to perform, or have performed, all or part of the final assessment of the pressure equipment samples.

Should one or more of the items of pressure equipment not conform, the notified body must take appropriate measures. On the responsibility of the notified body, the manufacturer must affix the former's identification number on each item of pressure equipment.

Module B (EC type-examination)

1. This module describes the part of the procedure by which a notified body ascertains and attests that a representative example of the production in question meets the provisions of the Directive which apply to it.

2. The application for EC type-examination must be lodged by the manufacturer or by his authorized representative established within the Community with a single notified body of his choice.

The application must include:

- the name and address of the manufacturer and, if the application is lodged by the authorized representative, his name and address as well,
- a written declaration that the same application has not been lodged with any other notified body,
- the technical documentation described in section 3.

The applicant must place at the disposal of the notified body a representative example of the production envisaged, hereinafter called 'type'.

The notified body may request further examples should the test programme so require.

A type may cover several versions of pressure equipment provided that the differences between the versions do not affect the level of safety.

3. The technical documentation must enable an assessment to be made of the conformity of the pressure equipment with the requirements of the Directive which apply to it. It must, 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 type,
- conceptual design and manufacturing drawings and diagrams of components, sub-assemblies, circuits, etc.,
- descriptions and explanations necessary for an understanding of the said drawings and diagrams and the operation of the pressure equipment,
- a list of the standards referred to in **Article 5**, applied in full or in part, and descriptions of the solutions adopted to meet the essential requirements of the Directive where the standards referred to in **Article 5** have not been applied,
- results of design calculations made, examinations carried out, etc.,

- test reports,
- information concerning the tests provided for in manufacture,
- information concerning the qualifications or approvals required under sections 3.1.2 and 3.1.3 of Annex I.

4. The notified body must:

4.1. examine the technical documentation, verify that the type has been manufactured in conformity with it and identify the components designed in accordance with the relevant provisions of the standards referred to in Article 5, as well as those designed without applying the provisions of those standards.

In particular, the notified body must:

- examine the technical documentation with respect to the design and the manufacturing procedures,
- assess the materials used where these are not in conformity with the relevant harmonized standards or with a European approval for pressure equipment materials, and check the certificate issued by the material manufacturer in accordance with section 4.3 of **Annex I**,
- approve the procedures for the permanent joining of pressure equipment parts, or check that they have been previously approved in accordance with section 3.1.2 of **Annex I**,
- verify that the personnel undertaking the permanent joining of pressure equipment parts and the non-destructive tests are qualified or approved in accordance with sections 3.1.2 or 3.1.3 of **Annex I**.

4.2. perform or have performed the appropriate examinations and necessary tests to establish whether the solutions adopted by the manufacturer meet the essential requirements of the Directive where the standards referred to in **Article 5** have not been applied.

4.3. perform or have performed the appropriate examinations and necessary tests to establish whether, where the manufacturer has chosen to apply the relevant standards, these have actually been applied.

4.4. agree with the applicant the location where the examinations and necessary tests are to be carried out.

5. Where the type satisfies the provisions of the Directive which apply to it, the notified body must issue an EC type-examination certificate to the applicant. The certificate, which should be valid for ten years and be renewable, must contain the name and address of the manufacturer, the conclusions of the examination and the necessary data for identification of the approved type. A list of the relevant parts of the technical documentation must be annexed to the certificate and a copy kept by the notified body. If the notified body refuses to issue an EC type-examination certificate to the manufacturer or to his authorized representative established within the Community, that body must provide detailed reasons for such refusal. Provision must be made for an appeals procedure.

6. The applicant must inform the notified body that holds the technical documentation concerning the EC type-examination certificate of all modifications to the approved pressure equipment; these are subject to additional approval where they may affect conformity with the essential requirements or the prescribed conditions for use of the pressure equipment. This additional approval must be given in the form of an addition to the original EC type-examination certificate.

7. Each notified body must communicate to the Member States the relevant information concerning EC type-examination certificates which it has withdrawn, and, on request, those it has

issued. Each notified body must also communicate to the other notified bodies the relevant information concerning the EC type-examination certificates it has withdrawn or refused.

8. The other notified bodies may receive copies of the EC type-examination certificates and/or their additions. The annexes to the certificates must be held at the disposal of the other notified bodies.

9. The manufacturer, or his authorized representative established within the Community, must keep with the technical documentation copies of EC type-examination certificates and their additions for a period of ten years after the last of the pressure equipment has been manufactured.

Where neither the manufacturer nor his authorized representative is established within the Community, the obligation to keep the technical documentation available is the responsibility of the person who places the product on the Community market.

Module B1 (EC design-examination)

1. This module describes the part of the procedure whereby a notified body ascertains and attests that the design of an item of pressure equipment meets the provisions of the Directive which apply to it.

The experimental design method provided for in section 2.2.4 of **Annex I** may not be used in the context of this module.

2. The manufacturer, or his authorized representative established within the Community, must lodge an application for EC design examination with a single notified body.

The application must include:

- the name and address of the manufacturer and, if the application is lodged by the authorized representative, his name and address as well,
- a written declaration that the same application has not been lodged with any other notified body,
- the technical documentation described in section 3.

The application may cover several versions of the pressure equipment provided that the differences between the versions do not affect the level of safety.

3. The technical documentation must enable an assessment to be made of the conformity of the pressure equipment with the requirements of the Directive which apply to it. It must, 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 manufacturing drawings and diagrams of components, sub-assemblies, circuits, etc.,
- descriptions and explanations necessary for an understanding of the said drawings and diagrams and the operation of the pressure equipment,
- a list of the standards referred to in **Article 5**, applied in full or in part, and descriptions of the solutions adopted to meet the essential requirements of the Directive where the standards referred to in **Article 5** have not been applied,
- the necessary supporting evidence for the adequacy of the design solution, in particular where the standards referred to in **Article 5** have not been applied in full; this supporting evidence must

include the results of tests carried out by the appropriate laboratory of the manufacturer or on his behalf,

- results of design calculations made, examinations carried out, etc.,

- information regarding the qualifications or approvals required under sections 3.1.2 and 3.1.3 of **Annex I**.

4. The notified body must:

4.1. examine the technical documentation and identify the components which have been designed in accordance with the relevant provisions of the standards referred to in **Article 5**, as well as those which have been designed without applying the relevant provisions of those standards.

In particular, the notified body must:

- assess the materials where these are not in conformity with the relevant harmonized standards or with a European approval for pressure equipment materials,

- approve the procedures for the permanent joining of pressure equipment parts, or check that they have been previously approved in accordance with section 3.1.2 of **Annex I**,

- verify that the personnel undertaking the permanent joining of pressure equipment parts and the non-destructive tests are qualified or approved in accordance with sections 3.1.2 and 3.1.3 of **Annex I**.

4.2. perform the necessary examinations to establish whether the solutions adopted by the manufacturer meet the essential requirements of the Directive where the standards referred to in **Article 5** have not been applied.

4.3. perform the necessary examinations to establish whether, where the manufacturer has chosen to apply the relevant standards, these have actually been applied.

5. Where the type satisfies the provisions of the Directive which apply to it, the notified body must issue an EC type-examination certificate to the applicant. The certificate, which should be valid for ten years and be renewable, must contain the name and address of the manufacturer, the conclusions of the examination and the necessary data for identification of the approved type. A list of the relevant parts of the technical documentation must be annexed to the certificate and a copy kept by the notified body.

If the notified body refuses to issue an EC type-examination certificate to the manufacturer or to his authorized representative established within the Community, that body must provide detailed reasons for such refusal. Provision must be made for an appeals procedure.

6. The applicant must inform the notified body that holds the technical documentation concerning the EC type-examination certificate of all modifications to the approved pressure equipment; these are subject to additional approval where they may affect conformity with the essential requirements or the prescribed conditions for use of the pressure equipment. This additional approval must be given in the form of an addition to the original EC type-examination certificate.

7. Each notified body must communicate to the Member States the relevant information concerning EC type-examination certificates which it has withdrawn, and, on request, those it has issued. Each notified body must also communicate to the other notified bodies the relevant information concerning the EC type-examination certificates it has withdrawn or refused.

8. The other notified bodies may on request obtain the relevant information concerning:

- the EC design-examination certificates and additions granted,

- the EC design-examination certificates and additions withdrawn.

9. The manufacturer, or his authorized representative established within the Community, must keep with the technical documentation referred to in section 3 copies of EC design-examination certificates and their additions for a period of ten years after the last of the pressure equipment has been manufactured.

Where neither the manufacturer nor his authorized representative is established within the Community, the obligation to keep the technical documentation available is the responsibility of the person who places the product on the Community market.

Module C1 (conformity to type)

1. This module describes that part of the procedure whereby the manufacturer, or his authorized representative established within the Community, ensures and declares that pressure equipment is in conformity with the type as described in the EC type-examination certificate and satisfies the requirements of the Directive which apply to it. The manufacturer, or his authorized representative established within the Community, must affix the CE marking to each item of pressure equipment and draw up a written declaration of conformity.

2. The manufacturer must take all measures necessary to ensure that the manufacturing process requires the manufactured pressure equipment to comply with the type as described in the EC type-examination certificate and with the requirements of the Directive which apply to it.

3. The manufacturer, or his authorized representative established within the Community, must keep a copy of the declaration of conformity for a period of ten years after the last of the pressure equipment has been manufactured.

Where neither the manufacturer nor his authorized representative is established within the Community, the obligation to keep the technical documentation available is the responsibility of the person who places the pressure equipment on the Community market.

4. Final assessment must be subject to monitoring in the form of unexpected visits by a notified body chosen by the manufacturer.

During such visits, the notified body must:

- establish that the manufacturer actually performs final assessment in accordance with section 3.2 of **Annex I**,

- take samples of pressure equipment at the manufacturing or storage premises in order to conduct checks. The notified body assesses the number of items of equipment to sample and whether it is necessary to perform, or have performed, all or part of the final assessment of the pressure equipment samples.

Should one or more of the items of pressure equipment not conform, the notified body must take appropriate measures.

On the responsibility of the notified body, the manufacturer must affix the former's identification number on each item of pressure equipment.

Module D (production quality assurance)

1. This module describes the procedure whereby the manufacturer who satisfies the obligations of section 2 ensures and declares that the pressure equipment concerned is in conformity with the type described in the EC type-examination certificate or EC design-examination certificate and satisfies the requirements of the Directive which apply to it. The manufacturer, or his authorized representative established within the Community, must affix the CE marking to each item of pressure equipment and draw up a written declaration of conformity. The CE marking must be accompanied by the identification number of the notified body responsible for surveillance as specified in section 4.

2. The manufacturer must operate an approved quality system for production, final inspection and testing as specified in section 3 and be subject to surveillance as specified in section 4.

3. Quality system

3.1. The manufacturer must lodge an application for assessment of his quality system with a notified body of his choice.

The application must include:

- all relevant information on the pressure equipment concerned,
- the documentation concerning the quality system,
- the technical documentation for the approved type and a copy of the EC type-examination certificate or EC design-examination certificate.

3.2. The quality system must ensure compliance of the pressure equipment with the type described in the EC type-examination certificate or EC design-examination certificate and with the requirements of the Directive which apply to it. All the elements, requirements and provisions adopted by the manufacturer must be documented in a systematic and orderly manner in the form of written policies, procedures and instructions. This quality system documentation must permit a consistent interpretation of the quality programmes, plans, manuals and records. It must contain in particular an adequate description of:

- the quality objectives and the organizational structure, responsibilities and powers of the management with regard to the quality of the pressure equipment,
- the manufacturing, quality control and quality assurance techniques, processes and systematic measures that will be used, particularly the procedures used for the permanent joining of parts as approved in accordance with section 3.1.2 of **Annex I**,
- the examinations and tests that will be carried out before, during and after manufacture, and the frequency with which they will be carried out,
- the quality records, such as inspection reports and test data, calibration data, reports concerning the qualifications or approvals of the personnel concerned, particularly those of the personnel undertaking the joining of parts and the non-destructive tests in accordance with sections 3.1.2 and 3.1.3 of **Annex I**,
- the means of monitoring the achievement of the required quality and the effective operation of the quality system.

3.3. The notified body must assess the quality system to determine whether it satisfies the requirements referred to in 3.2. The elements of the quality system which conform to the relevant harmonized standard are presumed to comply with the corresponding requirements referred to in 3.2.

The auditing team must have at least one member with experience of assessing the pressure equipment technology concerned. The assessment procedure must include an inspection visit to the manufacturer's premises. The decision must be notified to the manufacturer. The notification must contain the conclusions of the examination and the reasoned assessment decision. Provision must be made for an appeals procedure.

3.4. The manufacturer must undertake to fulfil the obligations arising out of the quality system as approved and to ensure that it remains satisfactory and efficient. The manufacturer, or his authorized representative established within the Community, must inform the notified body that has approved the quality system of any intended adjustment to the quality system. The notified body must assess the proposed changes and decide whether the amended quality system will still satisfy the requirements referred to in 3.2 or whether a reassessment is required. It must

notify its decision to the manufacturer. The notification must contain the conclusions of the examination and the reasoned assessment decision.

4. Surveillance under the responsibility of the notified body

4.1. The purpose of surveillance is to make sure that the manufacturer duly fulfils the obligations arising out of the approved quality system.

4.2. The manufacturer must allow the notified body access for inspection purposes to the locations of manufacture, inspection, testing and storage and provide it with all necessary information, in particular:

- the quality system documentation,
- the quality records, such as inspection reports and test data, calibration data, reports concerning the qualifications of the personnel concerned, etc.

4.3. The notified body must carry out periodic audits to make sure that the manufacturer maintains and applies the quality system and provide the manufacturer with an audit report. The frequency of periodic audits must be such that a full reassessment is carried out every three years.

4.4. In addition the notified body may pay unexpected visits to the manufacturer. The need for such additional visits, and the frequency thereof, will be determined on the basis of a visit control system operated by the notified body. In particular, the following factors must be considered in the visit control system:

- the Category of the equipment,
- the results of previous surveillance visits,
- the need to follow up corrective action,
- special conditions linked to the approval of the system, where applicable,
- significant changes in manufacturing organization, policy or techniques.

During such visits the notified body may, if necessary, carry out or have carried out tests to verify that the quality system is functioning correctly. The notified body must provide the manufacturer with a visit report and, if a test has taken place, with a test report.

5. The manufacturer must, for a period of ten years after the last of the pressure equipment has been manufactured, hold at the disposal of the national authorities:

- the documentation referred to in the second indent of 3.1;
- the adjustments referred to in the second paragraph of 3.4;
- the decisions and reports from the notified body which are referred to in the last paragraph of 3.3, the last paragraph of 3.4, and in 4.3 and 4.4.

6. Each notified body must communicate to the Member States the relevant information concerning the quality system approvals which it has withdrawn, and, on request, those it has issued. Each notified body must also communicate to the other notified bodies the relevant information concerning the quality system approvals it has withdrawn or refused.

Module D1 (production quality assurance)

1. This module describes the procedure whereby the manufacturer who satisfies the obligations of section 3 ensures and declares that the items of pressure equipment concerned satisfy the requirements of the Directive which apply to them. The manufacturer, or his authorized representative established within the Community, must affix the CE marking to each item of pressure equipment and draw up a written declaration of conformity. The CE marking must be accompanied by the identification number of the notified body responsible for surveillance as specified in section 5.

2. The manufacturer must draw up the technical documentation described below. The technical documentation must enable an assessment to be made of the conformity of the pressure equipment with the requirements of the Directive which apply to it. It must, 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 manufacturing drawings and diagrams of components, sub-assemblies, circuits, etc.,
- descriptions and explanations necessary for an understanding of the said drawings and diagrams and the operation of the pressure equipment,
- a list of the standards referred to in **Article 5**, applied in full or in part, and descriptions of the solutions adopted to meet the essential requirements of the Directive where the standards referred to in **Article 5** have not been applied,
- results of design calculations made, examinations carried out, etc.,
- test reports.

3. The manufacturer must operate an approved quality system for production, final inspection and testing as specified in section 4 and be subject to surveillance as specified in section 5.

4. Quality system

4.1. The manufacturer must lodge an application for assessment of his quality system with a notified body of his choice.

The application must include:

- all relevant information on the pressure equipment concerned,
- the documentation concerning the quality system.

4.2. The quality system must ensure compliance of the pressure equipment with the requirements of the Directive which apply to it. All the elements, requirements and provisions adopted by the manufacturer must be documented in a systematic and orderly manner in the form of written policies, procedures and instructions. This quality system documentation must permit a consistent interpretation of the quality programmes, plans, manuals and records.

It must contain in particular an adequate description of:

- the quality objectives and the organizational structure, responsibilities and powers of the management with regard to the quality of the pressure equipment,
- the manufacturing, quality control and quality assurance techniques, processes and systematic measures that will be used, particularly the procedures used for the permanent joining of parts as approved in accordance with section 3.1.2 of **Annex I**,

- the examinations and tests that will be carried out before, during and after manufacture, and the frequency with which they will be carried out,

- the quality records, such as inspection reports and test data, calibration data, reports concerning the qualifications or approvals of the personnel concerned, particularly those of the personnel undertaking the permanent joining of parts in accordance with section 3.1.2 of Annex I,

- the means of monitoring the achievement of the required quality and the effective operation of the quality system.

4.3. The notified body must assess the quality system to determine whether it satisfies the requirements referred to in 4.2. The elements of the quality system which conform to the relevant harmonized standard are presumed to comply with the corresponding requirements referred to in 4.2. The auditing team must have at least one member with experience of assessing the pressure equipment technology concerned. The assessment procedure must include an inspection visit to the manufacturer's premises. The decision must be notified to the manufacturer. The notification must contain the conclusions of the examination and the reasoned assessment decision. Provision must be made for an appeals procedure.

4.4. The manufacturer must undertake to fulfil the obligations arising out of the quality system as approved and to ensure that it remains satisfactory and efficient. The manufacturer, or his authorized representative established within the Community, must inform the notified body that has approved the quality system of any intended adjustment to the quality system. The notified body must assess the proposed changes and decide whether the amended quality system will still satisfy the requirements referred to in 4.2 or whether a reassessment is required. It must notify its decision to the manufacturer. The notification must contain the conclusions of the examination and the reasoned assessment decision.

5. Surveillance under the responsibility of the notified body

5.1. The purpose of surveillance is to make sure that the manufacturer duly fulfils the obligations arising out of the approved quality system.

5.2. The manufacturer must allow the notified body access for inspection purposes to the locations of manufacture, inspection, testing and storage and provide it with all necessary information, in particular:

- the quality system documentation,

- the quality records, such as inspection reports and test data, calibration data, reports concerning the qualifications of the personnel concerned, etc.

5.3. The notified body must carry out periodic audits to make sure that the manufacturer maintains and applies the quality system and provide the manufacturer with an audit report. The frequency of periodic audits must be such that a full reassessment is carried out every three years.

5.4. In addition the notified body may pay unexpected visits to the manufacturer. The need for such additional visits, and the frequency thereof, will be determined on the basis of a visit control system operated by the notified body. In particular, the following factors must be considered in the visit control system:

- the Category of the equipment,

- the results of previous surveillance visits,

- the need to follow up corrective action,

- the results of previous surveillance visits,
- special conditions linked to the approval of the system, where applicable,
- significant changes in manufacturing organization, policy or techniques.

During such visits the notified body may, if necessary, carry out or have carried out tests to verify that the quality system is functioning correctly. The notified body must provide the manufacturer with a visit report and, if a test has taken place, with a test report.

6. The manufacturer must, for a period of ten years after the last of the pressure equipment has been manufactured, hold at the disposal of the national authorities:

- the technical documentation referred to in section 2,
- the documentation referred to in the second indent of 4.1,
- the adjustments referred to in the second paragraph of 4.4,
- the decisions and reports from the notified body which are referred to in the last paragraph of 4.3, the last paragraph of 4.4, and in 5.3 and 5.4.

7. Each notified body must communicate to the Member States the relevant information concerning the quality system approvals which it has withdrawn, and, on request, those it has issued. Each notified body must also communicate to the other notified bodies the relevant information concerning the quality system approvals it has withdrawn or refused.

Module E (product quality assurance)

1. This module describes the procedure whereby the manufacturer who satisfies the obligations of section 2 ensures and declares that the pressure equipment is in conformity with the type as described in the EC type-examination certificate and satisfies the requirements of the Directive which apply to it. The manufacturer, or his authorized representative established within the Community, must affix the CE marking to each product and draw up a written declaration of conformity. The CE marking must be accompanied by the identification number of the notified body responsible for surveillance as specified in section 4.

2. The manufacturer must operate an approved quality system for the final pressure equipment inspection and testing as specified in section 3 and be subject to surveillance as specified in section 4.

3. Quality system

3.1. The manufacturer must lodge an application for assessment of his quality system for the pressure equipment with a notified body of his choice.

The application must include:

- all relevant information on the pressure equipment concerned,
- the documentation concerning the quality system,
- the technical documentation for the approved type and a copy of the EC type-examination certificate.

3.2. Under the quality system, each item of pressure equipment must be examined and appropriate tests as set out in the relevant standard(s) referred to in **Article 5**, or equivalent tests, particularly final assessment as referred to in section 3.2 of **Annex I**, must be carried out in order to ensure its conformity with the requirements of the Directive which apply to it. All the elements,

requirements and provisions adopted by the manufacturer must be documented in a systematic and orderly manner in the form of written policies, procedures and instructions. This quality system documentation must permit a consistent interpretation of the quality programmes, plans, manuals and records. It must contain in particular an adequate description of:

- the quality objectives and the organizational structure, responsibilities and powers of the management with regard to the quality of the pressure equipment,
- the examinations and tests to be carried out after manufacture,
- the means of monitoring the effective operation of the quality system,
- the quality records, such as inspection reports and test data, calibration data, reports concerning the qualifications or approvals of the personnel concerned, particularly those of the personnel undertaking the permanent joining of parts and the non-destructive tests in accordance with sections 3.1.2 and 3.1.3 of **Annex I**.

3.3. The notified body must assess the quality system to determine whether it satisfies the requirements referred to in 3.2. The elements of the quality system which conform to the relevant harmonized standard are presumed to comply with the corresponding requirements referred to in 3.2. The auditing team must have at least one member with experience of assessing the pressure equipment technology concerned. The assessment procedure must include an inspection visit to the manufacturer's premises. The decision must be notified to the manufacturer. The notification must contain the conclusions of the examination and the reasoned assessment decision.

3.4. The manufacturer must undertake to discharge the obligations arising from the quality system as approved and to ensure that it remains satisfactory and efficient. The manufacturer, or his authorized representative established within the Community, must inform the notified body which has approved the quality system of any intended adjustment to the quality system. The notified body must assess the proposed changes and decide whether the modified quality system will still satisfy the requirements referred to in 3.2 or whether a reassessment is required. It must notify its decision to the manufacturer. The notification must contain the conclusions of the examination and the reasoned assessment decision.

4. Surveillance under the responsibility of the notified body

4.1. The purpose of surveillance is to make sure that the manufacturer duly fulfils the obligations arising out of the approved quality system.

4.2. The manufacturer must allow the notified body access for inspection purposes to the locations of inspection, testing and storage and provide it with all necessary information, in particular:

- the quality system documentation,
- the technical documentation,
- the quality records, such as inspection reports and test data, calibration data, reports concerning the qualifications of the personnel concerned, etc.

4.3. The notified body must carry out periodic audits to make sure that the manufacturer maintains and applies the quality system and provide the manufacturer with an audit report. The frequency of periodic audits must be such that a full reassessment is carried out every three years.

4.4. In addition the notified body may pay unexpected visits to the manufacturer. The need for such additional visits, and the frequency thereof, will be determined on the basis of a visit control

system operated by the notified body. In particular, the following factors must be considered in the visit control system:

- the Category of the equipment,
- the results of previous surveillance visits,
- the need to follow up corrective action,
- special conditions linked to the approval of the system, where applicable,
- significant changes in manufacturing organization, policy or techniques.

During such visits, the notified body may, if necessary, carry out or have carried out tests to verify that the quality system is functioning correctly. The notified body must provide the manufacturer with a visit report and, if a test has taken place, with a test report.

5. The manufacturer must, for a period of ten years after the last of the pressure equipment has been manufactured, hold at the disposal of the national authorities:

- the documentation referred to in the second indent of 3.1,
- the adjustments referred to in the second paragraph of 3.4,
- the decisions and reports from the notified body which are referred to in the last paragraph of 3.3, the last paragraph of 3.4, and in 4.3 and 4.4.

6. Each notified body must communicate to the Member States the relevant information concerning the quality system approvals which it has withdrawn and, on request, those it has issued. Each notified body must also communicate to the other notified bodies the relevant information concerning the quality system approvals it has withdrawn or refused.

Module E1 (product quality assurance)

1. This module describes the procedure whereby the manufacturer who satisfies the obligations of section 3 ensures and declares that the pressure equipment satisfies the requirements of the Directive which apply to it. The manufacturer, or his authorized representative established within the Community, must affix the CE marking to each item of pressure equipment and draw up a written declaration of conformity. The CE marking must be accompanied by the identification number of the notified body responsible for surveillance as specified in section 5.

2. The manufacturer must draw up the technical documentation described below. The technical documentation must enable an assessment to be made of the conformity of the pressure equipment with the requirements of the Directive which apply to it. It must, 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 manufacturing drawings and diagrams of components, sub-assemblies, circuits, etc.,
- descriptions and explanations necessary for an understanding of the said drawings and diagrams and the operation of the pressure equipment,
- a list of the standards referred to in **Article 5**, applied in full or in part, and descriptions of the solutions adopted to meet the essential requirements of the Directive where the standards referred to in **Article 5** have not been applied,

- results of design calculations made, examinations carried out, etc.,
- test reports.

3. The manufacturer must operate an approved quality system for the final pressure equipment inspection and testing as specified in section 4 and be subject to surveillance as specified in section 5.

4. Quality system

4.1. The manufacturer must lodge an application for assessment of his quality system with a notified body of his choice. The application must include:

- all relevant information on the pressure equipment concerned,
- the documentation concerning the quality system.

4.2. Under the quality system, each item of pressure equipment must be examined and appropriate tests as set out in the relevant standard(s) referred to in **Article 5**, or equivalent tests, and particularly final assessment as referred to in section 3.2 of **Annex I**, must be carried out in order to ensure its conformity with the requirements of the Directive which apply to it. All the elements, requirements and provisions adopted by the manufacturer must be documented in a systematic and orderly manner in the form of written policies, procedures and instructions. This quality system documentation must permit a consistent interpretation of the quality programmes, plans, manuals and records.

It must contain in particular an adequate description of:

- the quality objectives and the organizational structure, responsibilities and powers of the management with regard to the quality of the pressure equipment,
- the procedures used for the permanent joining of parts as approved in accordance with section 3.1.2 of **Annex I**,
- the examinations and tests to be carried out after manufacture,
- the means of monitoring the effective operation of the quality system,
- the quality records, such as inspection reports and test data, calibration data, reports concerning the qualifications or approvals of the personnel concerned, particularly those of the personnel undertaking the permanent joining of parts in accordance with section 3.1.2 of Annex I.

4.3. The notified body must assess the quality system to determine whether it satisfies the requirements referred to in 4.2. The elements of the quality system which conform to the relevant harmonized standard are presumed to comply with the corresponding requirements referred to in 4.2. The auditing team must have at least one member with experience of assessing the pressure equipment technology concerned. The assessment procedure must include an inspection visit to the manufacturer's premises. The decision must be notified to the manufacturer. The notification must contain the conclusions of the examination and the reasoned assessment decision. Provision must be made for an appeals procedure.

4.4. The manufacturer must undertake to discharge the obligations arising from the quality system as approved and to ensure that it remains satisfactory and efficient. The manufacturer, or his authorized representative established within the Community, must inform the notified body which has approved the quality system of any intended adjustment to the quality system. The notified body must assess the proposed changes and decide whether the modified quality system will still satisfy the requirements referred to in 4.2 or whether a reassessment is required. It must notify its decision to the manufacturer. The notification must contain the conclusions of the examination and the reasoned assessment decision.

5. Surveillance under the responsibility of the notified body

5.1. The purpose of surveillance is to make sure that the manufacturer duly fulfils the obligations arising out of the approved quality system.

5.2. The manufacturer must allow the notified body access for inspection purposes to the locations of inspection, testing and storage and provide it with all necessary information, in particular:

- the quality system documentation,
- the technical documentation,
- the quality records, such as inspection reports and test data, calibration data, reports concerning the qualifications of the personnel concerned, etc.

5.3. The notified body must carry out periodic audits to make sure that the manufacturer maintains and applies the quality system and provide the manufacturer with an audit report. The frequency of periodic audits must be such that a full reassessment is carried out every three years.

5.4. In addition the notified body may pay unexpected visits to the manufacturer. The need for such additional visits, and the frequency thereof, will be determined on the basis of a visit control system operated by the notified body. In particular, the following factors must be considered in the visit control system:

- the Category of the equipment,
- the results of previous surveillance visits,
- the need to follow up corrective action,
- special conditions linked to the approval of the system, where applicable,
- significant changes in manufacturing organization, policy or techniques.

During such visits the notified body may, if necessary, carry out or have carried out tests to verify that the quality system is functioning correctly. The notified body must provide the manufacturer with a visit report and, if a test has taken place, with a test report.

6. The manufacturer must, for a period of ten years after the last of the pressure equipment has been manufactured, keep at the disposal of the national authorities:

- the technical documentation referred to in section 2,
- the documentation referred to in the second indent of 4.1,
- the adjustments referred to in the second paragraph of 4.4,
- the decisions and reports from the notified body which are referred to in the last paragraph of 4.3, the last paragraph of 4.4 and in 5.3 and 5.4.

7. Each notified body must communicate to the Member States the relevant information concerning the quality system approvals which it has withdrawn and, on request, those is has issued. Each notified body must also communicate to the other notified bodies the relevant information concerning the quality system approvals it has withdrawn or refused.

Module F (product verification)

1. This module describes the procedure whereby a manufacturer, or his authorized representative established within the Community, ensures and declares that the pressure equipment subject to the provisions of section 3 is in conformity with the type described:

- in the EC type-examination certificate, or

- in the EC design-examination certificate and with the requirements of the Directive which apply to it.

and satisfies the requirements of the Directive which apply to it.

2. The manufacturer must take all measures necessary to ensure that the manufacturing process requires the pressure equipment to comply with the type described

- in the EC type-examination certificate, or

- in the EC design-examination certificate and with the requirements of the Directive which apply to it.

The manufacturer, or his authorized representative established within the Community, must affix the CE marking to all pressure equipment and draw up a declaration of conformity.

3. The notified body must perform the appropriate examinations and tests in order to check the conformity of the pressure equipment with the relevant requirements of the Directive by examining and testing every product in accordance with section 4. The manufacturer, or his authorized representative established within the Community, must keep a copy of the declaration of conformity for a period of ten years after the last of the pressure equipment has been manufactured.

4. Verification by examination and testing of each item of pressure equipment

4.1. Each item of pressure equipment must be individually examined and must undergo appropriate examinations and tests as set out in the relevant standard(s) referred to in **Article 5** or equivalent examinations and tests in order to verify that it conforms to the type and the requirements of the Directive which apply to it.

In particular, the notified body must:

- verify that the personnel undertaking the permanent joining of parts and the non-destructive tests are qualified or approved in accordance with sections 3.1.2 and 3.1.3 of **Annex I**,

- verify the certificate issued by the materials manufacturer in accordance with section 4.3 of **Annex I**,

- carry out or have carried out the final inspection and proof test referred to in section 3.2 of Annex I and examine the safety devices, if applicable.

4.2. The notified body must affix its identification number or have it affixed to each item of pressure equipment and draw up a written certificate of conformity relating to the tests carried out.

4.3. The manufacturer, or his authorized representative established within the Community, must ensure that the certificates of conformity issued by the notified body can be made available on request.

Module G (EC unit verification)

1. This module describes the procedure whereby the manufacturer ensures and declares that pressure equipment which has been issued with the certificate referred to in section 4.1 satisfies

the requirements of the Directive which apply to it. The manufacturer must affix the CE marking to the pressure equipment and draw up a declaration of conformity.

2. The manufacturer must apply to a notified body of his choice for unit verification. The application must contain:

- the name and address of the manufacturer and the location of the pressure equipment,
- a written declaration to the effect that a similar application has not been lodged with another notified body,
- technical documentation.

3. The technical documentation must enable the conformity of the pressure equipment with the requirements of the Directive which apply to it to be assessed and the design, manufacture and operation of the pressure equipment to be understood.

The technical documentation must contain:

- a general description of the pressure equipment,
- conceptual design and manufacturing drawings and diagrams of components, sub-assemblies, circuits, etc.,
- descriptions and explanations necessary for an understanding of the said drawings and diagrams and the operation of the pressure equipment,
- a list of the standards referred to in **Article 5**, applied in full or in part, and descriptions of the solutions adopted to meet the essential requirements of the Directive where the standards referred to in **Article 5** have not been applied,
- results of design calculations made, examinations carried out, etc.,
- test reports,
- appropriate details relating to the approval of the manufacturing and test procedures and of the qualifications or approvals of the personnel concerned in accordance with sections 3.1.2 and 3.1.3 of **Annex I**.

4. The notified body must examine the design and construction of each item of pressure equipment and during manufacture perform appropriate tests as set out in the relevant standard(s) referred to in **Article 5** of the Directive, or equivalent examinations and tests, to ensure its conformity with the requirements of the Directive which apply to it.

In particular the notified body must:

- examine the technical documentation with respect to the design and the manufacturing procedures,
- assess the materials used where these are not in conformity with the relevant harmonized standards or with a European approval for pressure equipment materials, and check the certificate issued by the material manufacturer in accordance with section 4.3 of **Annex I**,
- approve the procedures for the permanent joining of parts or check that they have been previously approved in accordance with section 3.1.2 of **Annex I**,
- verify the qualifications or approvals required under sections 3.1.2 and 3.1.3 of **Annex I**,

- carry out the final inspection referred to in section 3.2.1 of **Annex I**, perform or have performed the proof test referred to in section 3.2.2 of **Annex I**, and examine the safety devices, if applicable.

4.1. The notified body must affix its identification number or have it affixed to the pressure equipment and draw up a certificate of conformity for the tests carried out. This certificate must be kept for a period of ten years.

4.2. The manufacturer, or his authorized representative established within the Community, must ensure that the declaration of conformity and certificate of conformity issued by the notified body can be made available on request.

Module H (full quality assurance)

1. This module describes the procedure whereby the manufacturer who satisfies the obligations of section 2 ensures and declares that the pressure equipment in question satisfies the requirements of the Directive which apply to it. The manufacturer, or his authorized representative established within the Community, must affix the CE marking to each item of pressure equipment and draw up a written declaration of conformity. The CE marking must be accompanied by the identification number of the notified body responsible for surveillance as specified in section 4.

2. The manufacturer must implement an approved quality system for design, manufacture, final inspection and testing as specified in section 3 and be subject to surveillance as specified in section 4.

3. Quality system

3.1. The manufacturer must lodge an application for assessment of his quality system with a notified body of his choice. The application must include:

- all relevant information concerning the pressure equipment in question,
- the documentation concerning the quality system.

3.2. The quality system must ensure compliance of the pressure equipment with the requirements of the Directive which apply to it. All the elements, requirements and provisions adopted by the manufacturer must be documented in a systematic and orderly manner in the form of written policies, procedures and instructions. This quality system documentation must permit a consistent interpretation of the procedural and quality measures such as programmes, plans, manuals and records.

- the quality objectives and the organizational structure, responsibilities and powers of the management with regard to the quality of the design and to product quality,
- the technical design specifications, including standards, that will be applied and, where the standards referred to in **Article 5** are not applied in full, the means that will be used to ensure that the essential requirements of the Directive which apply to the pressure equipment will be met,
- the design control and design verification techniques, processes and systematic measures that will be used when designing the pressure equipment, particularly with regard to materials in accordance with section 4 of **Annex I**,
- the corresponding manufacturing, quality control and quality assurance techniques, processes and systematic measures that will be used, particularly the procedures for the permanent joining of parts as approved in accordance with section 3.1.2 of **Annex I**,
- the examinations and tests to be carried out before, during, and after manufacture, and the frequency with which they will be carried out,

- the quality records, such as inspection reports and test data, calibration data, reports concerning the qualifications or approvals of the personnel concerned, particularly those of the personnel undertaking the permanent joining of parts and the non-destructive tests in accordance with sections 3.1.2 and 3.1.3 of **Annex I**,

- the means of monitoring the achievement of the required pressure equipment design and quality and the effective operation of the quality system.

3.3. The notified body must assess the quality system to determine whether it satisfies the requirements referred to in 3.2. The elements of the quality system which conform to the relevant harmonized standard are presumed to comply with the corresponding requirements referred to in 3.2. The auditing team must have at least one member with experience of assessing the pressure equipment technology concerned. The assessment procedure must include an inspection visit to the manufacturer's premises. The decision must be notified to the manufacturer. The notification must contain the conclusions of the examination and the reasoned assessment decision. Provision must be made for an appeals procedure.

3.4. The manufacturer must undertake to fulfil the obligations arising out of the quality system as approved and to ensure that it remains satisfactory and efficient. The manufacturer, or his authorized representative established within the Community, must inform the notified body that has approved the quality system of any intended adjustment to the quality system. The notified body must assess the proposed changes and decide whether the modified quality system will still satisfy the requirements referred to in 3.2 or whether a reassessment is required. It must notify its decision to the manufacturer. The notification must contain the conclusions of the examination and the reasoned assessment decision.

4. Surveillance under the responsibility of the notified body

4.1. The purpose of this surveillance is to make sure that the manufacturer duly fulfils the obligations arising out of the approved quality system.

4.2. The manufacturer must allow the notified body access for inspection purposes to the locations of design, manufacture, inspection, testing and storage and provide it with all necessary information, in particular:

- the quality system documentation,

- the quality records provided for in the design part of the quality system, such as results of analyses, calculations, tests, etc.,

- the quality records provided for in the manufacturing part of the quality system, such as inspection reports and test data, calibration data, reports concerning the qualifications of the personnel concerned, etc.

4.3. The notified body must carry out periodic audits to make sure that the manufacturer maintains and applies the quality system and provide the manufacturer with an audit report. The frequency of periodic audits must be such that a full reassessment is carried out every three years.

4.4. In addition the notified body may pay unexpected visits to the manufacturer. The need for such additional visits, and the frequency thereof, will be determined on the basis of a visit control system operated by the notified body. In particular, the following factors must be considered in the visit control system:

- the Category of the equipment,

- the results of previous surveillance visits,

- the need to follow up corrective action,
- special conditions linked to the approval of the system, where applicable,
- significant changes in manufacturing organization, policy or techniques.

During such visits the notified body may, if necessary, carry out or have carried out tests to verify that the quality system is functioning correctly. The notified body must provide the manufacturer with a visit report and, if a test has taken place, with a test report.

5. The manufacturer must, for a period of ten years after the last of the pressure equipment has been manufactured, keep at the disposal of the national authorities:

- the documentation referred to in the second indent of the second subparagraph of 3.1;
- the adjustments referred to in the second subparagraph of 3.4;
- the decisions and reports from the notified body which are referred to in the last subparagraph of 3.3, the last subparagraph of 3.4, and in 4.3 and 4.4.

6. Each notified body must communicate to the Member States the relevant information concerning the quality system approvals which it has withdrawn, and, on request, those it has issued. Each notified body must also communicate to the other notified bodies the relevant information concerning the quality system approvals it has withdrawn or refused.

Module H1 (full quality assurance with design examination and special surveillance of the final assessment)

1. In addition to the requirements of module H, the following apply:

(a) the manufacturer must lodge an application for examination of the design with the notified body;

(b) the application must enable the design, manufacture and operation of the pressure equipment to be understood, and enable conformity with the relevant requirements of the Directive to be assessed. It must include:

- the technical design specifications, including standards, which have been applied,
- the necessary supporting evidence for their adequacy, in particular where the standards referred to in **Article 5** have not been applied in full.

This supporting evidence must include the results of tests carried out by the appropriate laboratory of the manufacturer or on his behalf;

(c) the notified body must examine the application and where the design meets the provisions of the Directive which apply to it issue an EC design-examination certificate to the applicant. The certificate must contain the conclusions of the examination, the conditions for its validity, the necessary data for identification of the approved design and, if relevant, a description of the functioning of the pressure equipment or accessories;

(d) the applicant must inform the notified body that has issued the EC design-examination certificate of all modifications to the approved design. Modifications to the approved design must receive additional approval from the notified body that issued the EC design-examination certificate where they may affect conformity with the essential requirements of the Directive or the prescribed conditions for use of the pressure equipment. This additional approval must be given in the form of an addition to the original EC design-examination certificate;

(e) each notified body must also communicate to the other notified bodies the relevant information concerning the EC design-examination certificates it has withdrawn or refused.

2. Final assessment as referred to in section 3.2 of Annex I is subject to increased surveillance in the form of unexpected visits by the notified body. In the course of such visits, the notified body must conduct examinations on the pressure equipment.

Annex IV

MINIMUM CRITERIA TO BE MET WHEN DESIGNATING THE NOTIFIED BODIES REFERRED TO IN ARTICLE 12 AND THE RECOGNIZED THIRD-PARTY ORGANIZATIONS REFERRED TO IN ARTICLE 13

1. The body, its director and the personnel responsible for carrying out the assessment and verification operations may not be the designer, manufacturer, supplier, installer or user of the pressure equipment or assemblies which that body inspects, nor the authorized representative of any of those parties. They may not become directly involved in the design, construction, marketing or maintenance of the pressure equipment or assemblies, nor represent the parties engaged in these activities. This does not preclude the possibility of exchanges of technical information between the manufacturer of pressure equipment or assemblies and the notified body.
2. The body and its personnel must carry out the assessments and verifications with the highest degree of professional integrity and technical competence and must be free from all pressures and inducements, particularly financial, which might influence their judgment or the results of the inspection, especially from persons or groups of persons with an interest in the results of verifications.
3. The body must have at its disposal the necessary personnel and possess the necessary facilities to enable it to perform properly the technical and administrative tasks connected with the inspection and surveillance operations, it must also have access to the equipment required to perform special verifications.
4. The personnel responsible for inspection must have:
 - sound technical and vocational training,
 - satisfactory knowledge of the requirements of the inspections they carry out and adequate experience of such operations,
 - the ability required to draw up the certificates, records and reports to demonstrate that the inspections have been carried out.
5. The impartiality of the inspection personnel must be guaranteed. Their remuneration must not depend on the number of inspections carried out, nor on the results of such inspections.
6. The body must take out liability insurance unless its liability is assumed by the State in accordance with national law, or the Member State itself is directly responsible for the inspections.
7. The personnel of the body must observe professional secrecy with regard to all information gained in carrying out their tasks (except vis-a-vis the competent administrative authorities of the State in which their activities are carried out) under the Directive or any provision of national law giving effect to it.

Annex V

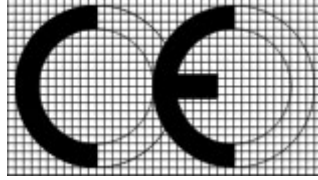
CRITERIA TO BE MET WHEN AUTHORIZING USER INSPECTORATES REFERRED TO IN ARTICLE 14

1. The user inspectorate must be organizationally identifiable and have reporting methods within the group of which it is part which ensure and demonstrate its impartiality. It must not be responsible for the design, manufacture, supply, installation, operation or maintenance of the pressure equipment or assemblies, and must not engage in any activities that might conflict with its independence of judgment and integrity in relation to its inspection activities.
2. The user inspectorate and its personnel must carry out the assessments and verifications with the highest degree of professional integrity and technical competence and must be free from all pressures and inducements, particularly financial, which might influence their judgment or the results of the inspection, especially from persons or groups of persons with an interest in the results of verifications.
3. The user inspectorate must have at its disposal the necessary personnel and possess the necessary facilities to enable it to perform properly the technical and administrative tasks connected with the inspection and surveillance operations; it must also have access to the equipment required to perform special verifications.
4. The personnel responsible for inspection must have:
 - sound technical and vocational training,
 - satisfactory knowledge of the requirements of the inspections they carry out and adequate experience of such operations,
 - the ability required to draw up the certificates, records and reports to demonstrate that the inspections have been carried out.
5. The impartiality of inspection personnel must be guaranteed. Their remuneration must not depend on the number of inspections carried out, nor on the results of such inspections.
6. The user inspectorate must have adequate liability insurance unless liability is assumed by the group of which it is part.
7. The personnel of the user inspectorate must observe professional secrecy with regard to all information gained in carrying out their tasks (except vis-a-vis the competent administrative authorities of the State in which their activities are carried out) under the Directive or any provision of national law giving effect to it.

Annex VI

CE MARKING

The CE marking consists of the initials 'CE' taking the following form:



If the CE marking is reduced or enlarged the proportions given in the above graduated drawing must be respected. The various components of the CE marking must have substantially the same vertical dimension, which may not be less than 5 mm.

Annex VII

DECLARATION OF CONFORMITY

The EC declaration of conformity must contain the following particulars:

- name and address of the manufacturer or of his authorized representative established within the Community,
- description of the pressure equipment or assembly,
- conformity assessment procedure followed,
- in the case of assemblies, description of the pressure equipment constituting the assembly, and the conformity assessment procedures followed,
- where appropriate, name and address of the notified body which carried out the inspection,
- where appropriate, a reference to the EC type-examination certificate, EC design-examination certificate or EC certificate of conformity,
- where appropriate, name and address of the notified body monitoring the manufacturer's quality assurance system,
- where appropriate, the references of the harmonized standards applied,
- where appropriate, other technical standards and specifications used,
- where appropriate, the references of the other Community Directives applied,
- particulars of the signatory authorized to sign the legally binding declaration for the manufacturer or his authorized representative established within the Community.

Harmonized Standards for Pressure Equipment

Note: This list of Pressure Equipment Harmonized Standards is from the Web Site:
<http://www.newapproach.org>

	Standard reference	Titles	Ratification date	Publication in OJ
CEN	EN 19 :2002	Industrial valves – marking of metallic valves		C 171 of 2002-07-17
CEN	EN 378-1:2000	Refrigerating systems and heat pumps – Safety and environmental requirements – Part 1: Basic requirements, definitions, classification and selection criteria		C 202 of 2001-07-18
CEN	EN 378-2	Refrigerating systems and heat pumps – Safety and environmental requirements – Part 2: Design, construction, testing, marking and documentation	2000	C 348 of 2000-12-05
CEN	EN 378-3	Refrigerating systems and heat pumps – Safety and environmental requirements – Part 3: Installation site and personal protection	2000	C 348 of 2000-12-05
CEN	EN 378-4	Refrigerating systems and heat pumps – Safety and environmental requirements – Part 4: Operation, maintenance, repair and recovery	2000	C 348 of 2000-12-05
CEN	EN 473:2000	Non-destructive testing – Qualification and certification of NDT personnel – General principles		C 202 of 2001-07-18
CEN	EN 583-1	Non-destructive testing - Ultrasonic examination - Part 1: General principles	1998	C 210 of 2000-07-22
CEN	EN 583-5:2000	Non-destructive testing - Ultrasonic examination - Part 5: Characterisation and sizing of discontinuities		C 62 of 2002-03-09
CEN	EN 1092-4:2002	Flanges and their joints - circular flanges for pipes, valves, fittings and accessories, PN designated - Part 4: Aluminium alloy flanges		C 171 of 2002-07-17
CEN	EN 1252-1	Cryogenic vessels - Materials - Part 1: Toughness requirements for temperatures below - 80°C	1998	C 348 of 2000-12-05
CEN	EN 1252-2:2001	Cryogenic vessels - Materials - Part 2: Toughness requirements for temperatures between - 80°C and - 20°C		C 62 of 2002-03-09
CEN	EN 1289	Non-destructive examination of welds - Penetrant	1998	C 348 of 2000-12-05

		testing of welds - Acceptance levels		
CEN	EN 1291	Non-destructive examination of welds - Magnetic particle testing of welds - Acceptance levels	1998	C 348 of 2000-12-05
CEN	EN 1349:2000/AC:2001	Industrial process control valves		C 62 of 2002-03-09
CEN	EN 1515-2:2001	Flanges and their joints – Bolting – Part 2: Classification of bolt materials for steel flanges, PN designated		C 171 of 2002-07-17
CEN	EN 1591-1:2001	Flanges and their joints – Design rules for gasketed circular flange connections – Part 1: Calculation method		C 62 of 2002-03-09
CEN	EN 1593	Non-destructive testing – Leak testing – Bubble emission techniques	1999	C 210 of 2000-07-22
CEN	EN 1626	Cryogenic vessels – Valves for cryogenic service	1999	C 210 of 2000-07-22
For the following harmonised supporting standard for materials, presumption of conformity to the ESRs is limited to technical data of materials in the standard and does not presume adequacy of the material to a specific equipment. Consequently the technical data stated in the material standard should be assessed against the design requirements of the specific equipment to verify that the ESRs of the PED are satisfied.				
CEN	EN 1653 :1997 A1 :2000	Copper and copper alloys – Plate, sheet and circles for boilers, pressure vessels and hot water storage units		C 202 of 2001-07-18
CEN	EN 1708-1	Welding — Basic weld joint details in steel — Part 1: Press-urised components	1999	C 227 of 1999-08-10
CEN	EN 1711:2000	Non-destructive examination of welds – Eddy current examination of welds by complex plane analysis		C 202 of 2001-07-18
CEN	EN 1713	Non-destructive examination of welds - Ultrasonic examination - Characterization of indications in welds	1998	C 348 of 2000-12-05
CEN	EN 1779	Non-destructive testing – Leak testing – Criteria for method and technique selection	1999	C 210 of 2000-07-22
CEN	EN 1797:2001	Cryogenic vessels - Gas/material compatibility		C 62 of 2002-03-09
For the following harmonised supporting standard for materials, presumption of conformity to the ESRs is limited to technical data of materials in the standard and does not presume adequacy of the material to a specific equipment. Consequently the technical data stated in the material standard should be assessed against the design requirements of the specific equipment to verify that the ESRs of the PED are satisfied."				
CEN	EN 1982	Copper and copper alloys – Ingots and castings	1998	C 348 of 2000-12-05
CEN	EN 1984	Industrial valves – Steel gate valves	2000	C 348 of 2000-12-05

CEN	EN ISO 9606-3	Approval testing of welders – Fusion welding – Part 3: Copper and copper alloys (ISO 9606-3:1999)	1999	C 210 of 2000-07-22
CEN	EN ISO 9606-4	Approval testing of welders – Fusion welding – Part 4: Nickel and nickel alloys (ISO 9606-4:1999)	1999	C 210 of 2000-07-22
CEN	EN ISO 9606-5	Approval testing of welders – Fusion welding – Part 5: Titanium and titanium alloys, zirconium and zirconium alloys (ISO 9606-5:2000)	2000	C 348 of 2000-12-05
CEN	EN ISO 9692-2	Welding and allied processes - Joint preparation - Part 2: Submerged arc welding of steel (ISO 9692-2:1998)	1998	C 210 of 2000-07-22
CEN	EN ISO 9692-3:2001	Welding and allied processes - Recommendations for joint preparation - Part 3: Metal inert gas welding and tungsten inert gas welding of aluminium and its alloys (ISO 9692-3:2000)		C 62 of 2002-03-09
For the following harmonised supporting standard for materials, presumption of conformity to the ESRs is limited to technical data of materials in the standard and does not presume adequacy of the material to a specific equipment. Consequently the technical data stated in the material standard should be assessed against the design requirements of the specific equipment to verify that the ESRs of the PED are satisfied."				
CEN	EN 10028-1	Flat products made of steels for pressure purposes – Part 1 : General requirements	2000	C 348 of 2000-12-05
For the following harmonised supporting standard for materials, presumption of conformity to the ESRs is limited to technical data of materials in the standard and does not presume adequacy of the material to a specific equipment. Consequently the technical data stated in the material standard should be assessed against the design requirements of the specific equipment to verify that the ESRs of the PED are satisfied."				
CEN	EN 10028-2	Flat products made of steels for pressure purposes – Part 2: Non-alloy and alloy steels with specified elevated temperature properties	1992	C 348 of 2000-12-05
For the following harmonised supporting standard for materials, presumption of conformity to the ESRs is limited to technical data of materials in the standard and does not presume adequacy of the material to a specific equipment. Consequently the technical data stated in the material standard should be assessed against the design requirements of the specific equipment to verify that the ESRs of the PED are satisfied."				
CEN	EN 10028-3	Flat products made of steels for pressure purposes – Part 3: Weldable fine grain steels, normalized	1992	C 348 of 2000-12-05
For the following harmonised supporting standard for materials, presumption of conformity to the ESRs is limited to technical data of materials in the standard and does not presume adequacy of the material to a specific equipment. Consequently the technical data stated in the material standard should be assessed against the design requirements of the specific equipment to verify that the ESRs of the PED are satisfied."				
CEN	EN 10028-4	Flat products made of steels for pressure purposes – Part 4: Nickel alloy steels with specified low temperature properties	1994	C 348 of 2000-12-05
For the following harmonised supporting standard for materials, presumption of conformity to the ESRs is limited to technical data of materials in the standard and does not presume adequacy of the material to a specific equipment. Consequently the technical data stated in the material standard should be assessed against the design requirements of the specific equipment to verify that				

the ESRs of the PED are satisfied."				
CEN	EN 10028-5	Flat products made of steels for pressure purposes – Part 5: Weldable fine grain steels, thermomechanically rolled	1996	C 348 of 2000-12-05
For the following harmonised supporting standard for materials, presumption of conformity to the ESRs is limited to technical data of materials in the standard and does not presume adequacy of the material to a specific equipment. Consequently the technical data stated in the material standard should be assessed against the design requirements of the specific equipment to verify that the ESRs of the PED are satisfied."				
CEN	EN 10028-6	Flat products made of steels for pressure purposes – Part 6: Weldable fine grain steels, quenched and tempered	1996	C 348 of 2000-12-05
For the following harmonised supporting standard for materials, presumption of conformity to the ESRs is limited to technical data of materials in the standard and does not presume adequacy of the material to a specific equipment. Consequently the technical data stated in the material standard should be assessed against the design requirements of the specific equipment to verify that the ESRs of the PED are satisfied."				
CEN	EN 10028-7	Flat products made of steels for pressure purposes – Part 7 : Stainless steels	2000	C 348 of 2000-12-05
For the following harmonised supporting standard for materials, presumption of conformity to the ESRs is limited to technical data of materials in the standard and does not presume adequacy of the material to a specific equipment. Consequently the technical data stated in the material standard should be assessed against the design requirements of the specific equipment to verify that the ESRs of the PED are satisfied."				
CEN	EN 10213-1	Technical delivery conditions for steel castings for pressure purposes – Part 1: General	1995	C 348 of 2000-12-05
For the following harmonised supporting standard for materials, presumption of conformity to the ESRs is limited to technical data of materials in the standard and does not presume adequacy of the material to a specific equipment. Consequently the technical data stated in the material standard should be assessed against the design requirements of the specific equipment to verify that the ESRs of the PED are satisfied."				
CEN	EN 10213-2	Technical delivery conditions for steel castings for pressure purposes – Part 2: Steel grades for use at room temperature and elevated temperatures	1995	C 348 of 2000-12-05
For the following harmonised supporting standard for materials, presumption of conformity to the ESRs is limited to technical data of materials in the standard and does not presume adequacy of the material to a specific equipment. Consequently the technical data stated in the material standard should be assessed against the design requirements of the specific equipment to verify that the ESRs of the PED are satisfied."				
CEN	EN 10213-3	Technical delivery conditions for steel castings for pressure purposes – Part 3: Steel grades for use at low temperatures	1995	C 348 of 2000-12-05
For the following harmonised supporting standard for materials, presumption of conformity to the ESRs is limited to technical data of materials in the standard and does not presume adequacy of the material to a specific equipment. Consequently the technical data stated in the material standard should be assessed against the design requirements of the specific equipment to verify that the ESRs of the PED are satisfied."				

CEN	EN 10213-4	Technical delivery conditions for steel castings for pressure purposes – Part 4: Austenitic and austenitic-ferritic steel grades	1995	C 348 of 2000-12-05
For the following harmonised supporting standard for materials, presumption of conformity to the ESRs is limited to technical data of materials in the standard and does not presume adequacy of the material to a specific equipment. Consequently the technical data stated in the material standard should be assessed against the design requirements of the specific equipment to verify that the ESRs of the PED are satisfied."				
CEN	EN 10222-1	Steel forgings for pressure purposes - Part 1: General requirements for open die forgings	1998	C 348 of 2000-12-05
CEN	EN 10222-1/1998 - A1:2001	Steel forging for pressure purposes - Part 1: General requirements for open die forging		C 171 of 2002-07-17
For the following harmonised supporting standard for materials, presumption of conformity to the ESRs is limited to technical data of materials in the standard and does not presume adequacy of the material to a specific equipment. Consequently the technical data stated in the material standard should be assessed against the design requirements of the specific equipment to verify that the ESRs of the PED are satisfied."				
CEN	EN 10222-2	Steel forgings for pressure purposes – Part 2: Ferritic and martensitic steels with specified elevated temperature properties	1999	C 348 of 2000-12-05
For the following harmonised supporting standard for materials, presumption of conformity to the ESRs is limited to technical data of materials in the standard and does not presume adequacy of the material to a specific equipment. Consequently the technical data stated in the material standard should be assessed against the design requirements of the specific equipment to verify that the ESRs of the PED are satisfied."				
CEN	EN 10222-3	Steel forgings for pressure purposes - Part 3: Nickel steels with specified low temperature properties	1998	C 348 of 2000-12-05
For the following harmonised supporting standard for materials, presumption of conformity to the ESRs is limited to technical data of materials in the standard and does not presume adequacy of the material to a specific equipment. Consequently the technical data stated in the material standard should be assessed against the design requirements of the specific equipment to verify that the ESRs of the PED are satisfied."				
CEN	EN 10222-4	Steels forgings for pressure purposes - Part 4: Weldable fine grain steels with high proof strength	1998	C 348 of 2000-12-05
For the following harmonised supporting standard for materials, presumption of conformity to the ESRs is limited to technical data of materials in the standard and does not presume adequacy of the material to a specific equipment. Consequently the technical data stated in the material standard should be assessed against the design requirements of the specific equipment to verify that the ESRs of the PED are satisfied."				
CEN	EN 10222-5	Steel forgings for pressure purposes – Part 5: Martensitic, austenitic and austenitic-ferritic stainless steels	1999	C 348 of 2000-12-05
For the following harmonised supporting standard for materials, presumption of conformity to the ESRs is limited to technical data of materials in the standard and does not presume adequacy of the material to a specific equipment. Consequently the technical data stated in the material standard should be assessed against the design requirements of the specific equipment to verify that the ESRs of the PED are satisfied."				

CEN	EN 10269	Steels and nickel alloys for fasteners with specified elevated and/or low temperature properties	1999	C 348 of 2000-12-05
For the following harmonised supporting standard for materials, presumption of conformity to the ESRs is limited to technical data of materials in the standard and does not presume adequacy of the material to a specific equipment. Consequently the technical data stated in the material standard should be assessed against the design requirements of the specific equipment to verify that the ESRs of the PED are satisfied.				
CEN	EN 10272:2000	Stainless steel bars for pressure purposes		C 202 of 2001-07-18
For the following harmonised supporting standard for materials, presumption of conformity to the ESRs is limited to technical data of materials in the standard and does not presume adequacy of the material to a specific equipment. Consequently the technical data stated in the material standard should be assessed against the design requirements of the specific equipment to verify that the ESRs of the PED are satisfied.				
CEN	EN 10273:2000	Hot rolled weldable steels bars for pressure purposes with specified elevated temperature properties		C 202 of 2001-07-18
CEN	EN 12263	Refrigerating systems and heat pumps – Safety switching devices for limiting the pressure – Requirements and tests	1998	C 210 of 2000-07-22
CEN	EN 12300	Cryogenic vessels — Cleanliness for cryogenic service 1998	1998	C 227 of 1999-08-10
For the following harmonised supporting standard for materials, presumption of conformity to the ESRs is limited to technical data of materials in the standard and does not presume adequacy of the material to a specific equipment. Consequently the technical data stated in the material standard should be assessed against the design requirements of the specific equipment to verify that the ESRs of the PED are satisfied.				
CEN	EN 12392:2000	Aluminium and aluminium alloys – Wrought products – Special requirements for products intended for the production of pressure equipment		C 202 of 2001-07-18
For the following harmonised supporting standard for materials, presumption of conformity to the ESRs is limited to technical data of materials in the standard and does not presume adequacy of the material to a specific equipment. Consequently the technical data stated in the material standard should be assessed against the design requirements of the specific equipment to verify that the ESRs of the PED are satisfied.				
CEN	EN 12420	Copper and copper alloys – Forgings	1999	C 348 of 2000-12-05
CEN	EN 12434:2000	Cryogenic vessels – Cryogenic flexible hoses		C 202 of 2001-07-18
For the following harmonised supporting standard for materials, presumption of conformity to the ESRs is limited to technical data of materials in the standard and does not presume adequacy of the material to a specific equipment. Consequently the technical data stated in the material standard should be assessed against the design requirements of the specific equipment to verify that the ESRs of the PED are satisfied.				
CEN	EN 12451	Copper and copper alloys – Seamless, round tubes for heat exchangers	1999	C 348 of 2000-12-05
CEN	EN 12452	Copper and copper alloys – Rolled, finned, seamless tubes for heat exchangers	1999	C 210 of 2000-07-22
CEN	EN 12517	Non destructive examination of welds —	1998	C 227 of

		Radiographic examination of welded joints — Acceptance levels		1999-08-10
CEN	EN 12542:2002	Static welded steel cylindrical tanks, serially produced for the storage of LPG having a volume not greater than 13 m ³ and for installation above ground – design and manufacture		C 171 of 2002-07-17
CEN	EN ISO 12797:2000	Brazing - Destructive tests of brazed joints		C 62 of 2002-03-09
CEN	EN 12952-1:2001	Water-tub boilers and auxiliary installations - Part 1: General		C 171 of 2002-07-17
CEN	EN 12952-2:2001	Water-tub boilers and auxiliary installations – Part 2: materials for pressure parts of boilers and accessories		C 171 of 2002-07-17
CEN	EN 12952-3:2001	Water-tub boilers and auxiliary installations – Part 3: Design and calculation for pressure parts		C 171 of 2002-07-17
CEN	EN 12952-5:2001	Water-tub boilers and auxiliary installations – Part 5: Workmanship and construction of pressure parts of the boiler		C 171 of 2002-07-17
CEN	EN 12952-6:2002	Water-tub boilers and auxiliary installations – Part 6: Inspection during construction, documentation and marking of pressure parts of the boiler		C 171 of 2002-07-17
CEN	EN 12952-7:2002	Water-tub boilers and auxiliary installations – Part 7: requirements for equipment for the boiler		C 171 of 2002-07-17
CEN	EN 12952-8:2002	Water-tub boilers and auxiliary installations – Part 8: requirements for firing systems for liquid and gaseous fuels for the boiler		C 171 of 2002-07-17
CEN	EN 12953-1:2002	Shell boilers – Part 1: General		C 171 of 2002-07-17
CEN	EN 12953-2:2002	Shell boilers – Part 2: Materials for pressure parts of boilers and accessories		C 171 of 2002-07-17
CEN	EN 12953-3:2002	Shell boilers – Part 3: design and calculation for pressure parts		C 171 of 2002-07-17
CEN	EN 12953-4:2002	Shell boilers – Part 4: Workmanship and construction of pressure parts of the boiler		C 171 of 2002-07-17
CEN	EN 12953-	Shell boilers - Part 5: Inspection during construction,		C 171 of 2002-07-17

	5:2002	documentation and marking of pressure parts of boiler		
CEN	EN 12953-6:2002	Shell boilers – Part 6: Requirements for equipment of the boiler		C 171 of 2002-07-17
CEN	EN 12953-7:2002	Shell boilers – Part 7: Requirement for firing systems for liquid and gaseous fuels for the boiler		C 171 of 2002-07-17
CEN	EN 13133:2000	Brazing – Brazer approval		C 202 of 2001-07-18
CEN	EN 13134:2000	Brazing – Procedure approval		C 202 of 2001-07-18
CEN	EN ISO 13136:2001	Refrigerating systems and heat pumps - Pressure relief devices and their associated piping - Methods for calculation		C 62 of 2002-03-09
CEN	EN 13371:2001	Cryogenic vessels-couplings for cryogenic service		C 171 of 2002-07-17
CEN	EN 13397:2001	Industrial valves – Diaphragm valves made of metallic materials		C 171 of 2002-07-17
CEN	EN 13445-1:2002	Unfired pressure vessels – Part 1: General		C 171 of 2002-07-17
CEN	EN 13445-2:2002	Unfired pressure vessels – Part 2: Materials		C 171 of 2002-07-17
CEN	EN 13445-3:2002	Unfired pressure vessels – Part 3: Design		C 171 of 2002-07-17
CEN	EN 13445-4: 2002	Unfired pressure vessels – Part 4: Manufacture		C 171 of 2002-07-17
CEN	EN 13445-5:2002	Unfired pressure vessels – Part 5: Inspection and testing		C 171 of 2002-07-17
CEN	EN 13445-6:2002	Unfired pressure vessels - Part 6: Requirements for design and fabrication of pressure vessels parts constructed of spheridal graphite cast iron; compliance and inspection of materials		C 171 of 2002-07-17
CEN	EN 13458-1:2002	Cryogenic vessels-Static vacuum insulated vessels – Part 1: Fundamental requirements		C 171 of 2002-07-17
CEN	EN 13480-	Metallic industrial piping - Part 1: General		C 171 of 2002-07-17

	1:2002			
CEN	EN 13480-2:2002	Metallic industrial piping - Part 2: Materials		C 171 of 2002-07-17
CEN	EN 13480-3:2002	Metallic industrial piping - Part 3: Design and calculation		C 171 of 2002-07-17
CEN	EN 13480-4:2002	Metallic industrial piping – Part 4: fabrication and installation		C 171 of 2002-07-17
CEN	EN 13480-5:2002	Metallic industrial piping - Part5: Inspection and testing		C 171 of 2002-07-17
CEN	EN 13648-1:2002	Cryogenic vessels-Safety devices for protection against excessive pressure - Part 1: Safety valves for cryogenic vessels		C 171 of 2002-07-17
CEN	EN 13648-2:2002	Cryogenic vessels-Safety devices for protection against excessive pressure - Part 2: Bursting disc safety devices for cryogenic service		C 171 of 2002-07-17