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Edition 3

SOUTH AFRICAN NATIONAL STANDARD

Categorization and conformity assessment criteria for all pressure equipment

WARNING
This document references other documents normatively.

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SANS 347:2019
Edition 3

Table of changes

Change No.	Date	Scope

Foreword

This South African standard was prepared by National Committee SABS/TC 058, *Vessels and systems under pressure,* in accordance with procedures of the South African Bureau of Standards, in compliance with annex 3 of the WTO/TBT agreement.

This document was approved for publication in December 2019.

This document supersedes SANS 347:2012 (edition 2).

This document is referenced in the Occupational Health and Safety Act, 1993 (Act No. 85 of 1993).

Compliance with this document cannot confer immunity from legal obligations.

Reference is made in the introduction,1.2, 3.1.4, 3.1.15, 4.1.2, 5.1.8, 5.1.8(e), 5.2.4.1, 5.2.4.2, 5.2.4.3, 5.2.4.4, 5.6.6, 5.6.6(d), 5.6.8(a), 5.6.9, 5.6.13, 5.13.4(d), 5.15.1(b), 7.1.6, 7.1.10(b), 7.1.10(f) clause 8, B.2.1, B.3.2, C.2.1, C.2.1(b), D.2.1, D.3.1 and D.10.2 to the "relevant national legislation". In South Africa this means the Pressure Equipment Regulations (PER) in the Occupational Health and Safety Act, 1993 (Act No. 85 of 1993).

Reference is made in clause 3 to the "relevant national legislation". In South Africa this means the Pressure Equipment Regulations and Major Hazard Installation Regulations in the Occupational Health and Safety Act, 1993 (Act No. 85 of 1993).

Reference is made in 3.1.1, 3.1.2, 6.7.1.3.5(b) and 7.1.1 to the "relevant national body". In South Africa this means the South African National Accreditation System (SANAS).

Reference is made in 3.1.14, C.2.3 and C.2.6(b), to the "relevant national body". In South Africa this means the National Nuclear Regulator (NNR).

Reference is made in 3.1.16 to the "relevant national legislation". In South Africa this means the Occupational Health and Safety Act, 1993 (Act No. 85 of 1993) or the Mine Health and Safety Act, 1996 (Act No. 29 of 1996) (or both), as applicable.

Reference is made in note 3 to table 2, table 3, D.5.1, D.7.1, D.7.3, D.8.4, D.8.5(i), D.10.1 and D.10.1(e) to the "relevant national legislation". In South Africa this means the Pressure Equipment Regulations (PER) with reference to the Pressure Equipment Regulations (PER) General Requirements Regulation 3(3), as applicable.

Reference is made in 5.2.4.1, 5.2.4.2, and 5.2.4.4 to the "relevant national body". In South Africa this means the Liquefied Petroleum Gas Safety Association of Southern Africa (LPGSASA).

Reference is made in B.2.1(b) to the "relevant national legislation". In South Africa this means Regulation 7.3(b) of the Pressure Equipment Regulations in the Occupational Health and Safety Act, 1993 (Act No. 85 of 1993).

Foreword *(concluded)*

Reference is made in C.3.2 to the "relevant national legislation". In South Africa this means Regulation 7.4 of the Pressure Equipment Regulations in the Occupational Health and Safety Act, 1993 (Act No. 85 of 1993).

Reference is made in C.2.5 to the ″relevant national legislation″. In South Africa this means the Engineering Profession Act, 2000 (Act No. 46 of 2000).

Reference is made in D.10.4 to the ″relevant national legislation″. In South African this means the General Machinery Regulation (GMR 2.1).

Annexes A, B, C and D form an integral part of this document.

Introduction

The risk of injury arising from defects in the construction of pressure equipment and non-pressure equipment is related to the consequences should failure occur during use. These consequences are primarily dependent on the hazard level. An increased hazard level requires an increased degree of independent conformity assessment or verification. Should a certified management system be controlled by the manufacturer, the involvement of the approved inspection authority (AIA) will be decreased.

Although this document is based on the European Pressure Equipment Directive, Transportable Pressure Equipment Directive and the Simple Pressure Equipment Directive changes have been made to accommodate specific requirements specified in the relevant national legislation (see foreword). Every effort has been made to ensure that the manufacture of pressure equipment is carried out in a safe manner so as to prevent injury to the user as well as to the public.

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Categorization and conformity assessment criteria for all pressure equipment

1 Scope

1.1 This standard specifies the criteria to be used for the categorization and conformity assessment of pressure equipment (metallic and non-metallic) for use by but not limited to the manufacturer, users, certification bodies, approved inspection authorities, importers and assemblers.

1.2 This standard is also applicable to the certification, re-instatement, modification or repair of pressure equipment (metallic and non-metallic) manufactured under the relevant national legislation (see foreword), as defined by the relevant statutory regulations for pressure equipment.

2 Normative references

The following referenced documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies. Information on currently valid national and international standards can be obtained from the South African Bureau of Standards.

2.1 Standards

ANSI NB 23 *National Board Inspection Code*

ASME III Division 1 *Component design and construction*

ASME VIII Division 1 Appendix 10, *Quality control system.*

ASME QA1-1, *Qualifications for Authorized Inspection.*

SANS 3834-1/ISO 3834-1, *Quality requirements for fusion welding of metallic materials – Part 1: Criteria for the selection of the appropriate level of quality requirements.*

SANS 3834-2/ISO 3834-2, *Quality requirements for fusion welding of metallic materials – Part 2: Comprehensive quality requirements.*

SANS 9001/ISO 9001, *Quality management systems – Requirements.*

SANS 10019, *Transportable containers for compressed, dissolved and liquefied gases – Basic design, manufacture, use and maintenance*.

SANS 10227, *Criteria for the operation of inspection authorities performing inspection in terms of the Pressure Equipment Regulations*.

SANS 13485/ISO 13485, *Medical devices – Quality management systems – Requirements for regulatory purposes.*

SANS 17020/ISO/IEC 17020, *Conformity assessment – Requirements for the operation of various types of bodies performing inspection*.

SANS 17021/ISO/IEC 17021, *Conformity assessment – Requirements for bodies providing audit and certification of management systems*.

2.2 Other publications

Pressure equipment directive of the European Union (PED).

RD-0034*, Quality and Safety Management Requirements for Nuclear Installations – Quality Management System (Level 1 and 2).*

Simple pressure equipment directive of the European Union (SPED).

Transportable pressure equipment directive of the European Union (TPED).

USA Department of transportation (DoT) mark scheme directive.

3 Definitions and abbreviations

For the purposes of this document, the definitions and abbreviations in the relevant statutory regulations for pressure equipment (for example, the relevant national legislation (see foreword)) and the following apply.

3.1 Definitions

3.1.1
approved certification body
body for management system certification in accordance with SANS 17021 and approved by the relevant regulatory authority and accredited by the relevant national body (see foreword) for the specific conformity assessment modules within their scope of accreditation or relevant health and safety standards

3.1.2
approved inspection authority
organization that is approved by the relevant regulatory authority and accredited by the relevant national body (see foreword) in accordance with SANS 17020 and SANS 10227 (as applicable)

3.1.3
assembly
group of components put together by an assembler or a manufacturer to form an integral and functional whole

NOTE The assembly of pressure equipment on the site and under the responsibility of the user, as in the case of industrial installations is not considered to be an assembly.

3.1.4
certificate of manufacture
written declaration of conformance to the relevant health and safety standard(s) and to the relevant national legislation (see foreword)

3.1.5
certified quality system
quality system for production, final inspection and testing, that is certified by an approved certification body (CB) (see clause 7)

3.1.6
conformity assessment
process undertaken by the manufacturer and when applicable, by the approved inspection authority (AIA) in order to demonstrate that the statutory requirements are satisfied

3.1.7
conformity assessment modules
modular approach to conformity assessment, thereby subdividing it into a number of independent activities

3.1.8
declaration of conformity
written declaration of conformance to either an applicable health and safety standard, applicable code symbol marking or relevant European Directive

3.1.9
defect
imperfections by nature or accumulated effect that render a part or product unable to comply with minimum applicable acceptance standards or specifications

NOTE Defects are pertinent to design, materials, fabrication, inspection, testing, qualification and certification.

3.1.10
hazard category
classification of pressure equipment according to risk

3.1.11
health and safety standard
code of construction
standard that is approved in terms of the relevant national legislation (see foreword) by the relevant regulatory authority, and that contains requirements for the design, manufacture, repair, modification, inspection and testing of pressure equipment

3.1.12
inspection
examination or measurement that verifies whether an item or activity complies with the specified requirements

3.1.13
nominal size
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

NOTE 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.

3.1.14
nuclear use
equipment manufactured to a nuclear health and safety standard and nuclear quality system ASME NQA-1 or any other nuclear quality system approved by the relevant national body (see foreword)

3.1.15
pressure equipment regulations
PERs
pressure equipment regulations in the relevant national legislation (see foreword) for use in South Africa and enforced by the relevant regulatory authority

3.1.16
regulatory authority
authority which is legally charged with the enforcement of the relevant national legislation (see foreword) that relates to pressure equipment in South Africa

3.1.17
surveillance
act of monitoring or observing to verify whether an item or activity complies with specified requirements

3.1.18
third party
organization performing inspection and test activities independently of the parties involved

3.1.19
type approval
once-off approval of the design, inspection and testing of pressure equipment

3.1.20
unstable gas
gas or a vapour liable to transform itself, spontaneously and suddenly, producing a pressure variation, when this transformation happens in a confined volume under the only effect of a low variation of an operating parameter, for example, acetylene, methyl acetylene, vinyl fluoride

3.1.21
verification
act of reviewing, inspecting, testing, checking, auditing or otherwise determining and documenting whether items, processes, services or documents comply with specified requirements

3.2 Abbreviations

AIA	approved inspection authority
CB	approved certification body
CE	Conformité Européenne, meaning "European Conformity"
CP	competent person for in service inspection
MT/PT	magnetic particle testing or liquid penetrant testing
PERs	pressure equipment regulations
PS	design pressure
SRMCR	safety related measurement control and regulation
SEP	sound engineering practice

4 Criteria for determining hazard categories

4.1 Hazard categories

4.1.1 In order to determine how the statutory regulations will apply to specific items of pressure equipment, a manufacturer shall classify the equipment into one of the following five hazard categories:

a) sound engineering practice (SEP);

b) category I;

c) category II;

d) category III; or

e) category IV.

4.1.2 Sound engineering practice (SEP) applies to equipment that is not subjected to conformity assessment but that shall be designed and manufactured in accordance with sound engineering practice (best practice) for safe use. In the case of this equipment the manufacturer shall ensure that design and manufacture take into account all the relevant factors that influence safety during its intended lifetime (see clause 6). The equipment shall have instructions for use and shall bear the identification of the manufacturer. SEP equipment is not required to meet any other of the statutory requirements listed in the relevant national legislation (see foreword).

4.1.3 For equipment categorized as category I equipment, the manufacturer shall ensure that such equipment complies with the requirements of the applicable health and safety standard(s). The manufacturer shall issue a certificate of manufacture confirming that the equipment is manufactured in accordance with the applicable health and safety standard(s). The design requirements of such equipment shall be in accordance with the applicable health and safety standard(s).

4.1.4 The design of pressure equipment for category II and higher needs to be approved for compliance with a scheduled health and safety standard listed in pressure equipment regulation by an appropriately registered professional person (for example, registered Pr. Eng. Pr. Technologist or Pr. Cert. Eng. competent in the field of pressure equipment design and with knowledge and experience of the relevant health and safety standards). The qualifications of the professional person shall be verified by the approved inspection authority or certification body, as applicable. Design requirements for piping shall be as given in annex A.

4.1.5 Engineers performing design activities for pressure equipment from countries outside of the Republic of South Africa for manufacture in the Republic of South Africa shall be accepted on the basis of mutual recognition agreements (for example, Washington Accord). Where no such agreements exist, the acceptance of the engineer shall be done by the appointed approved inspection authority's design verification engineer (as referenced in SANS 10227) based on equivalent qualifications and experience as stated in 4.1.4.

4.1.6 Imported pressure equipment in accordance with 5.2.4.1, 5.2.4.2, 5.2.4.3 or 5.2.4.4 does not have to meet the requirements of 4.1.4.

4.2 Criteria for categorization

4.2.1 In order to determine which category an item of equipment falls into; the manufacturer shall identify the following:

a) the type of pressure equipment, for example,

   1) pressure vessels,

2) steam generators,

3) piping,

4) pressure accessories,

5) safety accessories; or

6) transportable gas containers;

b) the state of the fluid contents – gas or liquid;(see note) and

c) the fluid group of the contents – group 1 or group 2 (see table 1).

4.2.2 When containment is lost and the fluid changes from liquid to gas (flashes), then the fluid state shall be deemed to be a gas.

Table 1 — Categorization figures

1	2	3	4	5	6	7	8	9	10	11
Equipment type	**Pressure vessels**				**Steam generator**	**Piping**				**Transportable gas containers**
State of contents	**Gas**		**Liquid**[b]			**Gas**		**Liquid**[b]		
Fluid group[c]	1	2	1	2		1	2	1	2	1
Refer to figure	1	2	3	4	5	6	7	8	9	[a]
NOTE For two-phase flow, the equipment should be categorized to the higher risk.										
[a] Transportable gas container and their safety and pressure accessories shall be assessed using table 3.										
[b] No pockets of gas may form above the liquid in the equipment, including steam.										
[c] Fluid group 1 = dangerous; fluid group 2 = not dangerous (see 4.3.1).										

4.3 Categorization

4.3.1 Fluid groups

4.3.1.1 Fluid group 1

4.3.1.1.1 For transportable gas containers, this group comprises fluids classified as dangerous substances in accordance with SANS 10019 .

4.3.1.1.2 For all other pressure equipment, classification shall be done in accordance with the following:

a) unstable explosives or explosives;

b) flammable gases;

c) oxidizing gases;

d) flammable liquids;

e) flammable liquids, where the maximum allowable temperature is above the flashpoint;

f) flammable solids;

g) self-reactive substances and mixtures;

h) pyrophoric liquids;

i) pyrophoric solids;

j) substances and mixtures which in contact with water emit flammable gases;

k) oxidizing liquids;

l) oxidizing solids;

m) organic peroxides;

n) acute oral toxicity;

o) acute dermal toxicity;

p) acute inhalation toxicity; and

q) radioactive substances.

NOTE Group 1 also comprises substances and mixtures contained in pressure equipment with a maximum allowable temperature TS which exceeds the flashpoint of the fluid.

4.3.1.2 Fluid group 2

4.3.1.2.1 This group comprises fluids other than those in fluid group 1, including steam.

4.3.1.2.2 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.

4.3.1.2.3 All inert gases are classified under fluid group 2 unless otherwise specified within the applicable health and safety standard.

4.3.2 Pressure accessories

Figures 1 to 4 for vessels or figures 6 to 9 for piping are applicable depending on whether the volume (V) or the nominal size (DN) is appropriate for classification of the pressure accessory. Where both the volume and the nominal size are appropriate, the pressure accessory shall be classified in the higher category.

4.3.3 Safety accessories

4.3.3.1 These are generally classified as category IV. Safety accessories manufactured for specific equipment shall at least be classified as the same category as the equipment that they protect. Safety accessories shall

a) 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,

b) be independent of other functions, unless their safety function cannot be affected by such other functions, and

c) 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.

4.3.3.2 When safety related measurement control and regulation (SRMCR) devices are used as a safety accessory, it is not necessarily required to be categorized as category IV but may be categorized according to 4.2.

4.4 Categorization graphs

4.4.1 General

4.4.1.1 Depending on the requirements of 4.2, the relevant figure of figures 1 to 9 shall be used to determine the applicable hazard category (SEP, I, II, III or IV) for pressure equipment, excluding transportable gas containers.

4.4.1.2 The manufacturer shall calculate and plot on the relevant graph, the design pressure (PS) and volume or nominal size for the equipment that is manufactured in order to identify which category such equipment falls into. For components whose design is based on a pressure rating system, the limiting pressure used to design the component shall be used as the design pressure (PS). Where equipment could be subjected to multiple cases, including differing pressures, fluids or fluid groups, the equipment shall be categorized according to the most stringent concurrent combination. In general, the lower the design pressure and volume, the lower the category for the equipment.

4.4.1.3 Each category shown in the graphs starts above the lower line and ends on the upper line.

4.4.2 Vessels

4.4.2.1 Dangerous gas

Vessels that fall within categories I or II and that are intended to contain an unstable gas, shall be classified as category III (see figure 1).

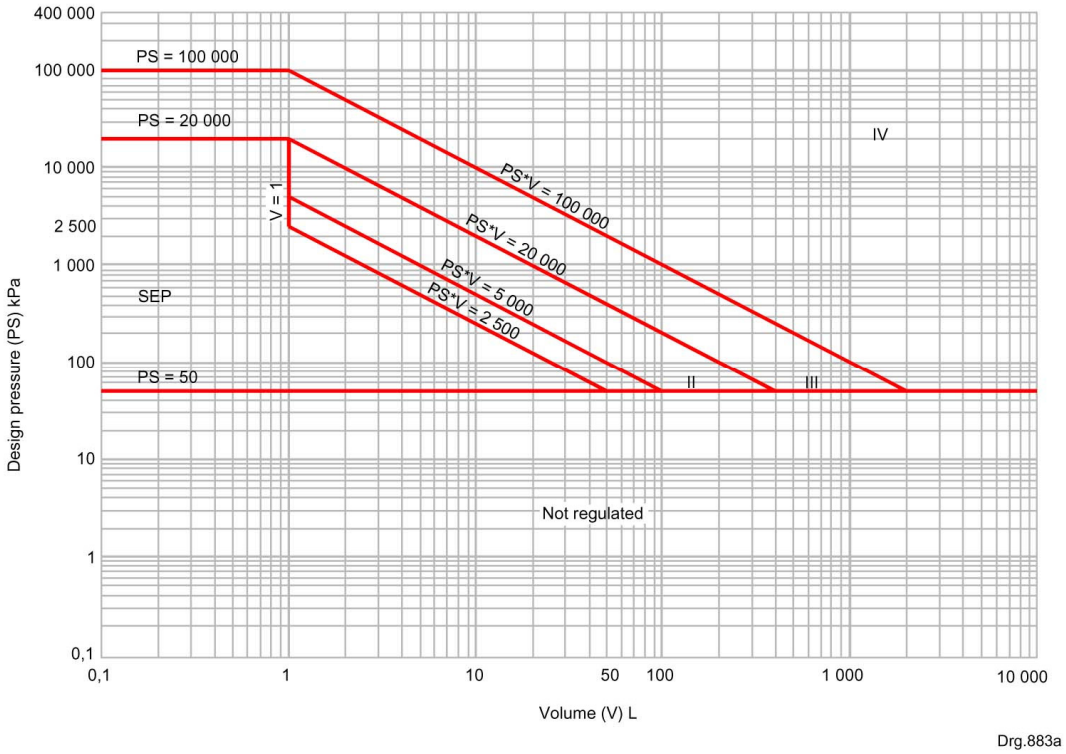

Figure 1 — Graph for vessels — Dangerous gas

4.4.2.2 Non-dangerous gas

Portable fire extinguishers up to 3 000 kPa shall be classified as at least category III (see figure 2).

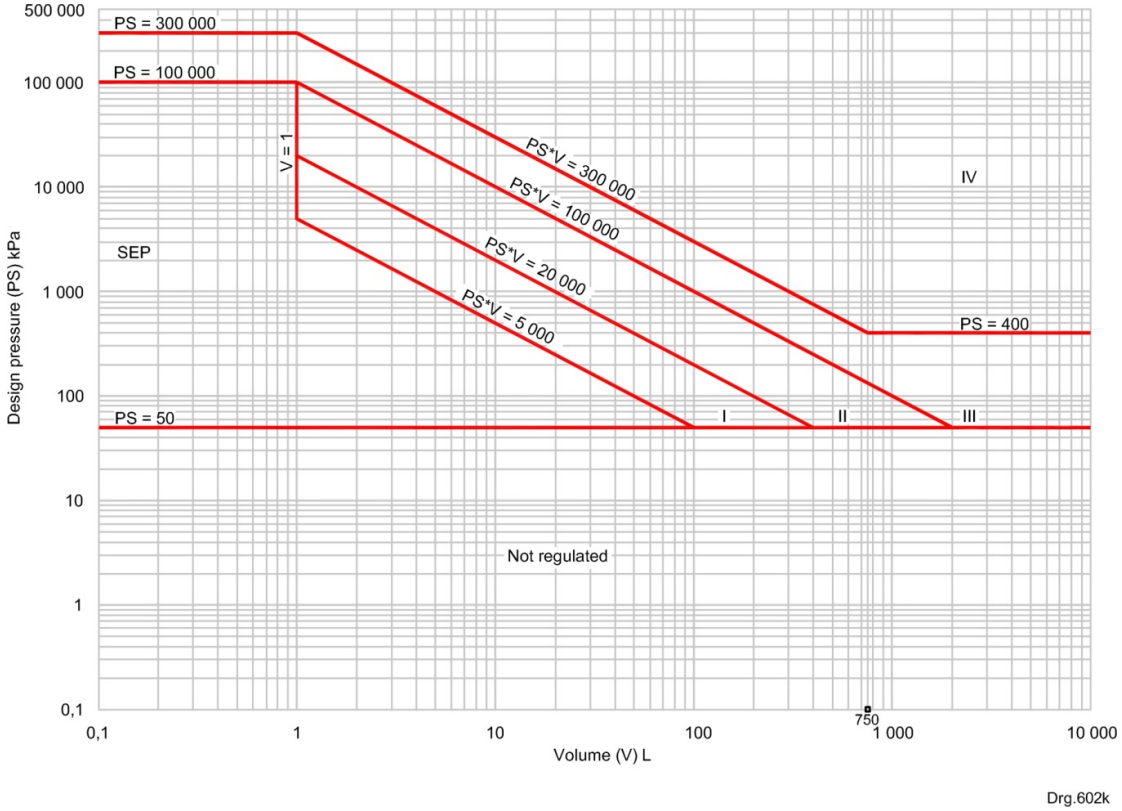

Figure 2 — Graph for vessels — Non-dangerous gas

4.4.2.3 Dangerous liquids

Figure 3 shows the various categories for dangerous liquids contained in vessels.

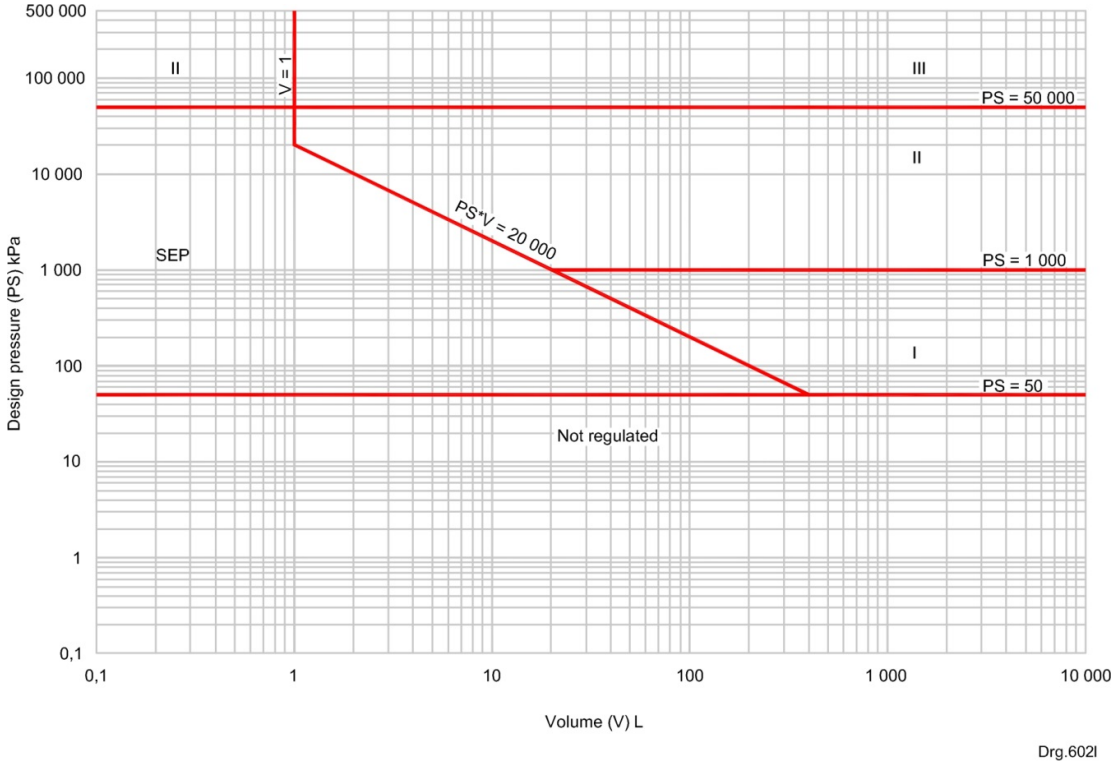

Figure 3 — Graph for vessels — Dangerous liquids

4.4.2.4 Non-dangerous liquids

Assemblies intended for generating warm water shall be subjected to a type approval. See table 2 category 3 for warm water.

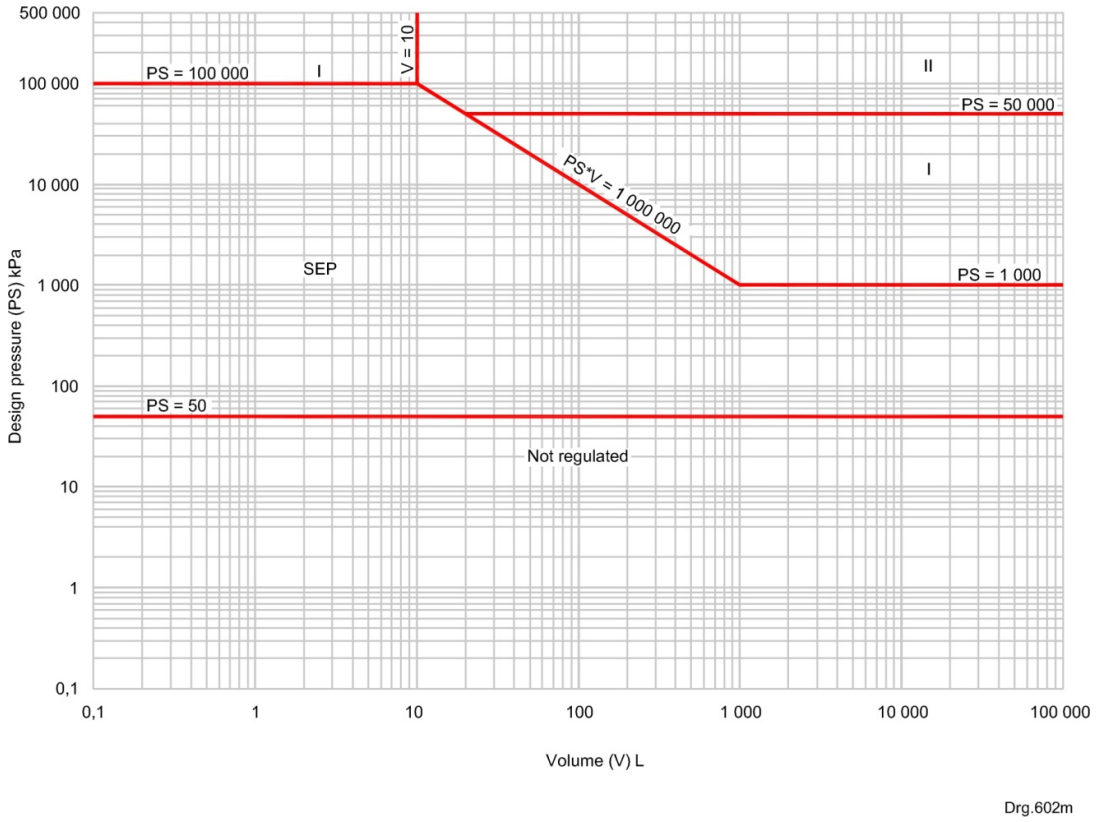

Figure 4 — Graph for vessels — Non-dangerous liquids

4.4.3 Steam generators

The design of jacketed pressure cookers shall be subjected to a conformity assessment procedure equivalent to at least one of the category III modules (see figure 5).

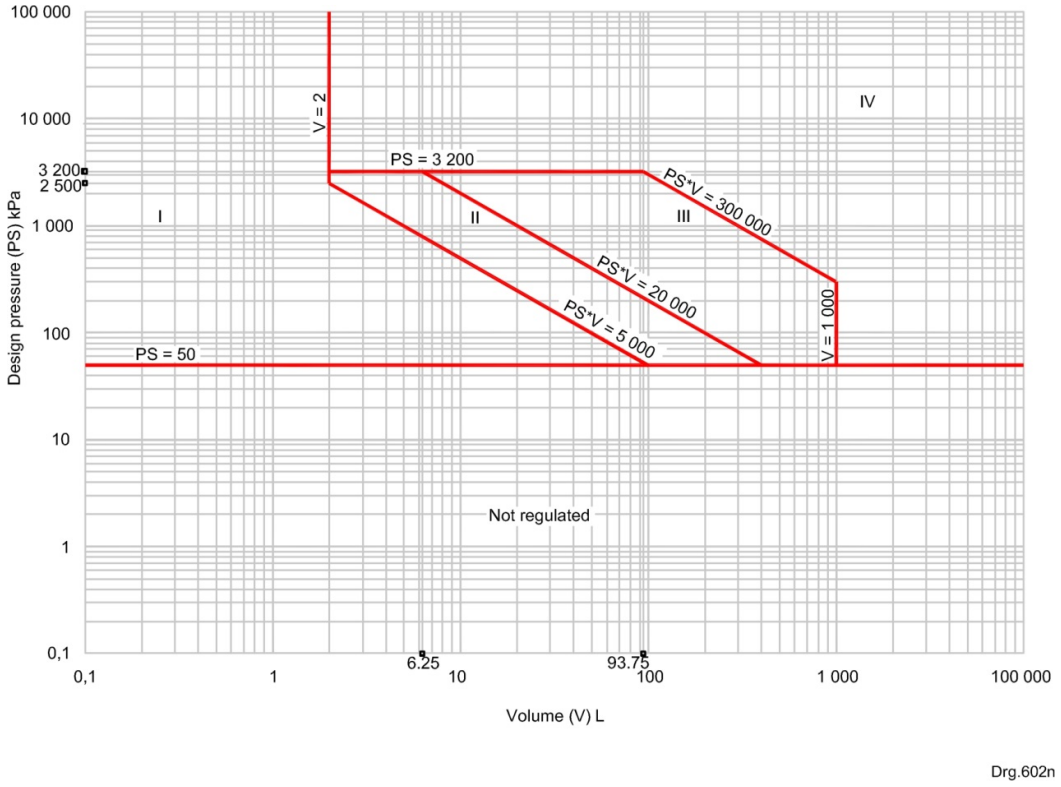

Figure 5 — Graph for steam generators

4.4.4 Piping

4.4.4.1 Dangerous gas

Piping that is intended for unstable gases that fall within categories I or II shall be classified as category III (see figure 6).

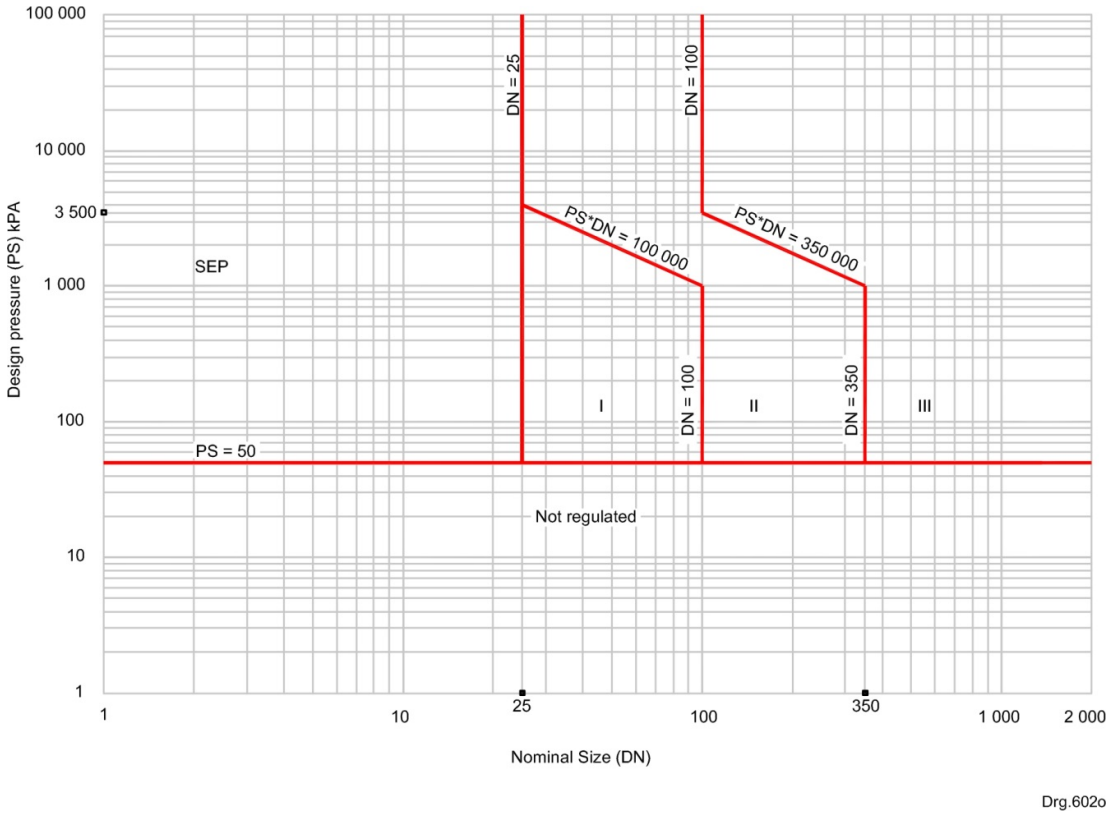

Figure 6 — Graph for piping — Dangerous gas

4.4.4.2 Non-dangerous gas

All piping that contains fluids at a temperature greater than 350 °C (not applicable to non-metallic piping) and that falls into category II shall be classified as category III (see figure 7).

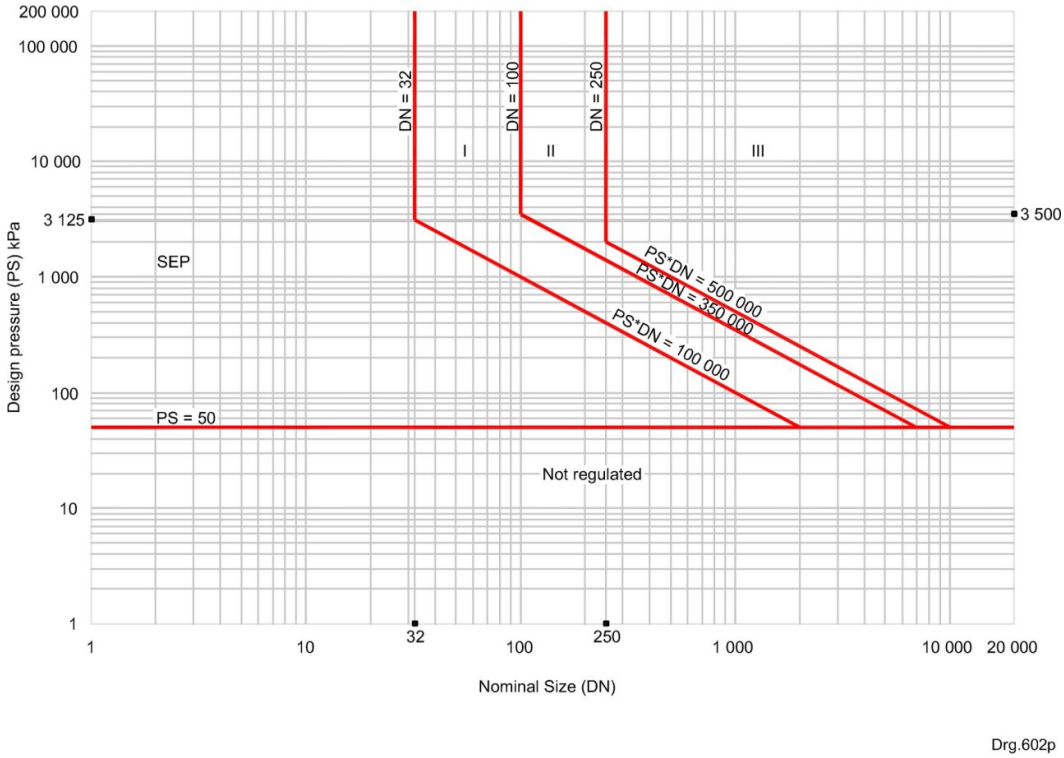

Figure 7 — Graph for piping — Non-dangerous gas

4.4.4.3 Dangerous liquids

Figure 8 shows the various categories for dangerous liquids contained in piping.

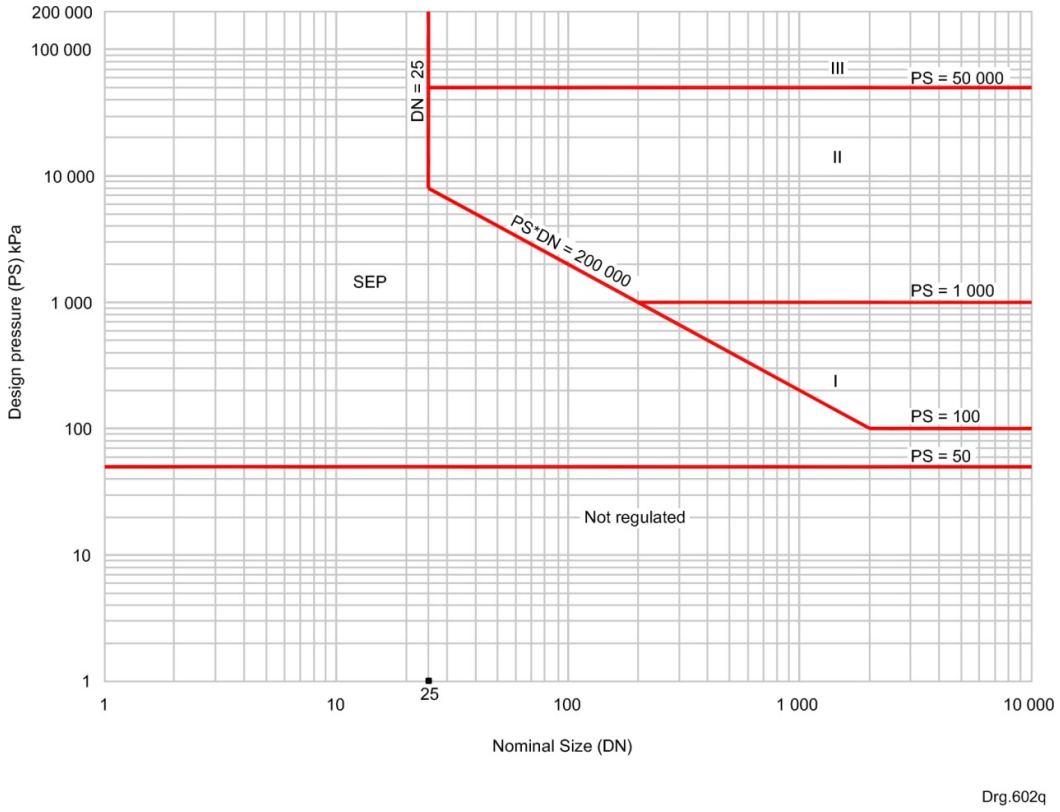

Figure 8 — Graph for piping — Dangerous liquids

4.4.4.4 Non-dangerous liquids

Figure 9 shows the various categories for non-dangerous liquids contained in piping.

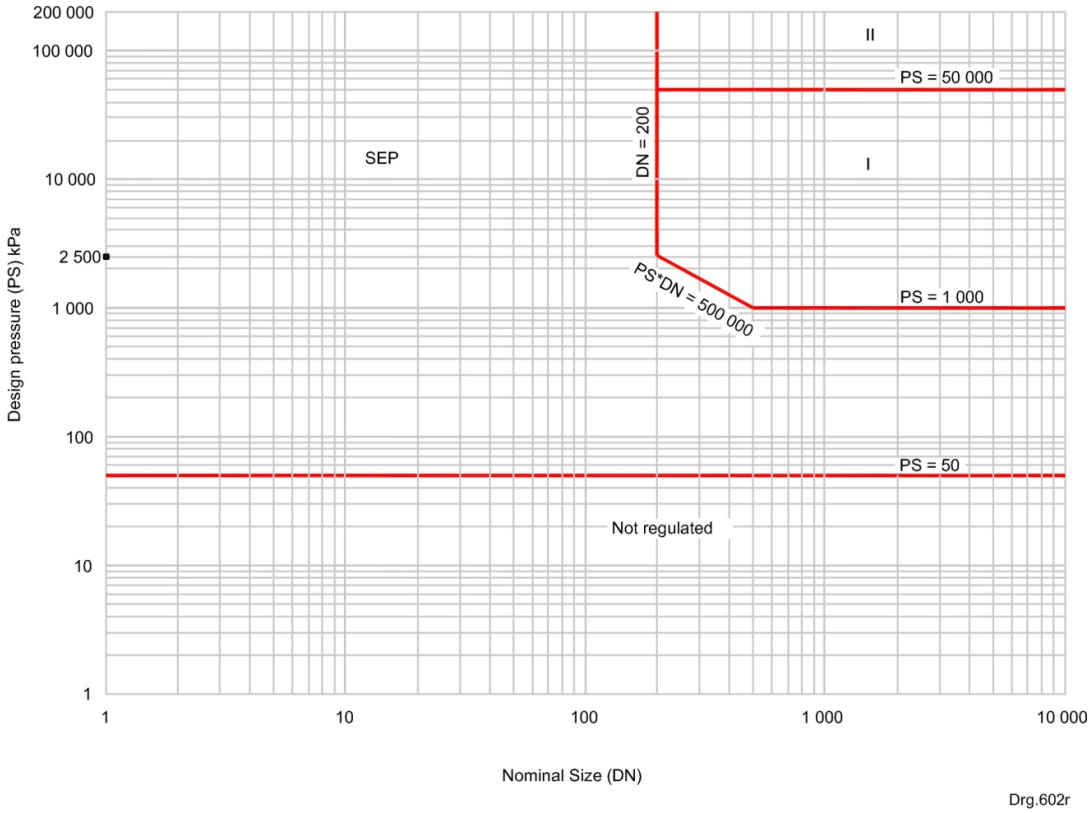

Figure 9 — Graph for piping — Non-dangerous liquids

5 Conformity assessment criteria

5.1 General

5.1.1 Before putting pressure equipment classified as either hazard category I, II, III or IV on the market, such equipment shall be subjected to the procedures in the appropriate conformity assessment modules in accordance with either table 2 or 3, or annex B or C as applicable.

5.1.2 The modules for products in categories II, III and IV require the involvement of a certification body, approved inspection authority or third-party organization either in the approval and monitoring of the manufacturer's quality system, or in direct product inspection.

5.1.3 Third-party organizations, when approved by the regulatory authority, may also carry out the approval of welding procedures and personnel, including non-destructive examination personnel, as required for pressure equipment classified as category II, III and IV.

5.1.4 Modules differ according to the type of assessment (for example, documentary checks, type approval, design approval, quality assurance) and the organization carrying out the assessment (for example, the manufacturer, approved inspection authority or certification body).

5.1.5 See annexes B and C for specific conformity assessment requirements pertaining to RSA/CI/OHSA marked pressure equipment.

5.1.6 The manufacturer shall appoint the approved inspection authority if not appointed by the buyer or user of the equipment as required by the applicable conformity assessment module or annex B or C.

NOTE The modules attributed to a higher hazard category may also be used in the lower categories.

5.1.7 Pressure equipment in Assemblies shall be conformity assessed as follows:

a) the assessment of each item of pressure equipment making up the assembly shall be in accordance with the hazard Category and the applicable Conformity Assessment Module;

b) the assessment of the integration of the various components of the assembly are suitable for the intended duty such as material compatibility, vibration, loads and stresses;

c) the assessment of the protection of an assembly against exceeding the permissible operating limits shall be conducted in the light of the highest category applicable to the items of equipment to be protected; and

d) Assemblies intended for generating warm water shall be subjected to a type approval (see figure 4).

5.1.8 Once conformity assessment has been completed, and if the equipment or assembly complies with the provisions of the relevant national legislation (see foreword), the manufacturer shall be required to affix the marking to each item of pressure equipment and issue a certificate of manufacture with the minimum information as follows:

a) pressure equipment or assembly (product, type, batch or serial number);

b) name and address of the manufacturer and, where applicable, his authorized representative;

c) this declaration of conformity is issued under the sole responsibility of the manufacturer;

d) objective of the declaration (identification of pressure equipment or assembly allowing traceability; it may, where necessary for the identification of the pressure equipment or assembly, include an image) as follows:

   1) description of the pressure equipment or assembly;

   2) technical data sheet reference or general arrangement drawing reference;

   3) hazard category and conformity assessment module followed; and

   4) in the case of assemblies, description of the pressure equipment constituting the assembly, and the conformity assessment modules followed.

e) declaration of conformity with the relevant national legislation (see foreword);

f) references to the relevant health and safety standards used or references to the other technical specifications in relation to which conformity is declared;

g) the name, address and number of the approved inspection authority which carried out the conformity assessment and the number of the certificate issued, and a reference to the type examination certificate – production type, type examination certificate – design type design examination certificate;

h) additional information:

   1) signed for and on behalf of;

   2) place and date of issue;

   3) name, function, signature; and

   4) where appropriate, particulars of the signatory authorised to sign the legally binding declaration for the manufacturer or his authorised representative

i) countersignature of the approved inspection authority as applicable.

5.1.9 Where pressure equipment has to be re-instated, it shall be performed in accordance with annex D.

Table 2 — Conformity assessment modules for each category of pressure equipment manufactured locally excluding transportable gas containers

1	2	3
Hazard category	**Conformity assessment modules**	
	Manufacturer without certified quality system	**Manufacturer with certified quality system**
I	A	A
II	A2	A2 or D1 or E1
III	B (design type) + F or B (production type) + C2	H or B (production type) + E or B (design type) +D
IV	G or B (production type) + F	H1 or B (production type) + D

A = internal production control

A2 = internal production control plus supervised pressure equipment checks at random intervals

B = type examination-production type plus type examination-design type

C2 = conformity to type based on internal production control plus supervised pressure equipment checks at random intervals

D = conformity to type based on quality assurance of the production process

D1 = quality assurance of the production process

E = conformity to type based on pressure equipment quality assurance

E1 = product quality assurance for final pressure equipment inspection and testing

F = conformity to type based on pressure equipment verification

G = conformity based unit verification

H = conformity based on full quality assurance

H1 = conformity based on full quality assurance plus design examination

NOTE 1 For RSA/CI/OHSA/…….marked equipment for non-nuclear use refer to annex B.

NOTE 2 For RSA/CI/OHSA/…….marked equipment for nuclear use refer to annex C.

NOTE 3 For non-RSA/CI/OHSA/……marked equipment for nuclear use the requirements of the Nuclear Facility's Inservice Inspection Programme, as approved by the relevant national legislation (see foreword), should apply.

Table 3 — Conformity modules for transportable gas containers and related pressure and safety accessories for all fluids

NOTE Table 3 covers test pressures 0 kPa to 300 000 kPa and volume 0,5 L to 3 000 L (water capacity).

1	2
Hazard category	**Conformity assessment modules**[a]
III	B + F
B = type examination – design type F = conformity to type based on pressure equipment verification	
The relevant national legislation (see foreword) requires all pressure equipment for use in South Africa to be categorized and submitted to the applicable conformity assessments contained in this standard. NOTE Transportable gas containers should be manufactured to a relevant health and safety standard incorporated into the relevant national legislation (see foreword).	
[a] Where imported transportable gas containers and related pressure and safety accessories are sourced from the European Union, compliance to the *Transportable Pressure Equipment Directive of the European Union* (TPED) is applicable.	

5.2 Final assessment

5.2.1 General

Pressure equipment shall be subjected to a final assessment by the manufacturer as described in 5.2.2 to 5.2.3 (inclusive). The approved inspection authority shall also carry out final assessment in accordance with conformity assessment modules C 2 (monitoring), E1, F, G and H1.

5.2.2 Final inspection

Pressure equipment shall undergo a final inspection to assess visually and by examination of the accompanying documents compliance with the requirements of the applicable health and safety standard(s). Tests carried out during manufacture may be taken into account. In order to comply with the safety requirements, the final inspection shall be carried out internally and externally on every part of the equipment, where appropriate, in the course of manufacture (for example, where examination during the final inspection is no longer possible).

5.2.3 Pressure test

5.2.3.1 Final assessment of pressure equipment shall 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 specified in the applicable health and safety standard(s).

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

5.2.3.3 Where the hydrostatic pressure test is deemed to be harmful or impractical, alternative test methods as permitted in the applicable Health and Safety standard may be applied.

5.2.4 Imported pressure equipment

5.2.4.1 General

Pressure equipment imported into the Republic of South Africa (with all the documentation and marking, as required by the statutory regulations), shall be subjected to a conformity assessment review by the importer to ensure compliance with the relevant national legislation (see foreword). All reviews of pressure vessels, steam generators, assemblies and transportable gas containers that are not Pi (π) or *USA Department of transportation* (DoT) marked shall be verified by an approved inspection authority (appointed by the importer) except where manufactured under SEP and category I requirements, as applicable. Gas cylinders for liquefied petroleum gas (LPG) service only require a cylinder verification certificate issued by the relevant national body (see foreword).

5.2.4.2 Pi marked equipment

Pi (π) marked pressure equipment in accordance with the TPED and manufactured to the applicable health and safety standard(s) incorporated shall be acceptable for importation into the Republic of South Africa provided the pressure equipment is verified for compliance with the relevant national legislation (see foreword) by the importer. Gas cylinders for LPG service only require a cylinder verification certificate issued by the relevant national body (see foreword).

5.2.4.3 ASME, API and CE marked equipment

ASME and API marked pressure equipment fully complying to the applicable standard and CE marked pressure equipment in accordance with the *Pressure equipment directive of the European Union (*PED) or the *Simple pressure equipment directive of the European Union* (SPED) shall be acceptable for importation into Republic of South Africa provided the equipment is verified for compliance with the relevant national legislation (see foreword) by the importer and the approved inspection authority for pressure vessels, steam generators and assemblies category II and higher.

5.2.4.4 DoT marked equipment

DoT marked pressure equipment complying with DoT regulations and marked with DoT manufacturer's Registration Number) shall be acceptable for importation into Republic of South Africa provided the pressure equipment is verified for compliance with the relevant national legislation (see foreword) by the importer. Gas cylinders for LPG service only require a cylinder verification certificate issued by the relevant national body (see foreword).

5.3 Module A — Internal production control

5.3.1 This module describes the procedure whereby the manufacturer, or his authorized representative in the Republic of South Africa, shall comply with the requirements in 5.3.2 and shall declare that the pressure equipment complies with the requirements of the applicable statutory regulations for pressure equipment. The manufacturer, or his authorized representative in the Republic of South Africa, shall affix to each item of pressure equipment the permanent marking or data plate, as relevant, required by the pressure equipment regulations, and draw up a certificate of manufacture which shall identify the pressure equipment for which it was drawn up.

5.3.2 The manufacturer shall draw up the technical documentation described in 5.3.4 and, either the manufacturer or his authorized representative in the Republic of South Africa, shall make it available to the relevant regulatory authority for inspection purposes for a period of 12 years after the last of the pressure equipment has been manufactured.

5.3.3 Where neither the manufacturer nor his authorized representative is in the Republic of South Africa, the obligation to keep the technical documentation available is the responsibility of the person who places the pressure equipment on the local market.

5.3.4 The technical documentation shall enable an assessment to be made of the conformity of the pressure equipment with the requirements of the applicable statutory regulations for pressure equipment. It shall, as far as is relevant for such assessment, cover the design, manufacture and operation of the pressure equipment, and contain the following:

a) a general description of the pressure equipment;

b) conceptual design and manufacturing drawings and diagrams of components, subassemblies, circuits, etc.;

c) descriptions and explanations necessary for an understanding of the said drawings and diagrams and the operation of the pressure equipment;

d) the applicable approved health and safety standard(s);

e) results of design calculations made, verifications carried out, etc.

f) inspection results and test reports.

5.3.5 The manufacturer, or his authorized representative in the Republic of South Africa, shall keep a copy of the certificate of manufacture with the technical documentation.

5.3.6 The manufacturer shall take all measures necessary to ensure that the manufactured pressure equipment complies with the technical documentation referred to in 5.3.4 and with the applicable statutory regulations for pressure equipment.

5.4 Module A2 — Internal production control plus supervised pressure equipment checks at random intervals

In addition to the requirements of module A (see 5.3), the following shall apply:

a) Final assessment shall be performed by the manufacturer and it shall be monitored by means of unexpected visits by an approved inspection authority.

b) During such visits, the approved inspection authority shall

   1) Establish that the manufacturer has performed the final assessment in accordance with the requirements of 5.2 and the applicable health and safety standard, and

   2) Take samples of pressure equipment at the manufacturing or storage premises in order to conduct checks. The approved inspection authority shall assess the number of items of equipment to be sampled and shall perform, or have performed, all or part of the final assessment of the pressure equipment samples.

c) Should one or more of the items of pressure equipment not conform, the approved inspection authority shall take appropriate measures.

d) With the agreement of the approved inspection authority, the manufacturer shall affix the unique mark of the approved inspection authority to each item of pressure equipment

5.5 Module B —Type examination — Production type

5.5.1 Type examination (production type) is the part of a conformity assessment procedure in which an approved inspection authority examines the technical design of the pressure equipment and verifies and attests that the technical design meets the requirements of the applicable statutory regulations for pressure equipment.

5.5.2 Type examination (production type) shall consist of an assessment of the adequacy of the technical design of the pressure equipment through examination of the technical documentation and supporting evidence referred to in 5.5.6, plus examination of a specimen, representative of the production envisaged, of the complete pressure equipment.

5.5.3 The application for type examination production type shall be lodged by the manufacturer, or by his authorized representative in the Republic of South Africa, with a single approved inspection authority of his choice provided that the scope of accreditation of the approved inspection authority allows it to do this type of work.

5.5.4 The application shall contain

a) the name and address of the manufacturer and, if the application is lodged by the manufacturer's authorized representative in the Republic of South Africa, his name and address as well,

b) a written declaration that a similar application has not been lodged with another approved inspection authority, and

c) the technical documentation described in 5.5.6.

5.5.5 The applicant shall make available to the approved inspection authority a representative sample of the product concerned, hereinafter called "type examination". The approved inspection authority may request further samples should the test programme so require. A type examination may cover several versions of pressure equipment provided that the differences between the versions do not affect the level of safety.

5.5.6 The technical documentation shall enable an assessment to be made of the conformity of the pressure equipment with the requirements of the applicable statutory regulations for pressure equipment. It shall, as far as is relevant for such assessment, cover the design, manufacture and operation of the pressure equipment, and contain at least the following:

a) a general description of the pressure equipment;

b) conceptual design, manufacturing drawings and diagrams of components, subassemblies, circuits, etc.;

c) descriptions and explanations necessary for an understanding of the said drawings and diagrams and the operation of the pressure equipment;

d) the applicable approved health and safety standard(s);

e) results of design calculations made, verifications carried out, etc.;

f) test reports;

g) information concerning the tests carried out during manufacture; and

h) information concerning the qualifications and approvals required in 6.7.1.3.4 and 6.7.1.3.5.

5.5.7 The approved inspection authority shall

a) examine the technical documentation, verify that the type has been manufactured in conformity therewith and identify the components designed in accordance with the relevant requirements of the applicable health and safety standards, as well as those designed without complying with the requirements of those standards;

b) in particular, the approved inspection authority shall

1) examine the technical documentation and supporting evidence to assess the adequacy of the technical design and manufacturing procedures,

2) verify the certificate issued by the materials manufacturer in accordance with the applicable health and safety standard,

3) approve the procedures for the permanent joining of pressure equipment parts; or check that they have been previously approved in accordance with 6.7.1.3.4 and 6.7.1.3.5, and

4) verify that the personnel undertaking the permanent joining of pressure equipment parts and the non-destructive examinations are qualified or have been approved in accordance with the applicable statutory regulations for pressure equipment and 6.7.1.3.4 and 6.7.1.3.5 as applicable.

c) perform, or have performed, the appropriate verifications and necessary tests to establish whether the solutions adopted by the manufacturer comply with the requirements of the applicable statutory regulations for pressure equipment,

d) perform or have performed the appropriate verifications and necessary tests to establish whether, where the manufacturer has chosen to apply the applicable health and safety standard(s), these have actually been applied, and

e) agree with the applicant as to the location where the verifications and necessary tests shall be carried out.

5.5.8 Where the type complies with the applicable statutory regulations for pressure equipment, the approved inspection authority shall issue a type examination certificate-production type to the manufacturer. The certificate, which shall be valid for 10 years and be renewable, shall contain the name and address of the manufacturer, the results of the verification, the conditions (if any) for its validity and the necessary data for identification of the approved type.

5.5.9 A list of the relevant parts of the technical documentation shall be annexed to the type-examination certificate-production type and a copy shall be kept by the approved inspection authority. The certificate and its annexes shall contain all relevant information to allow the conformity of manufactured pressure equipment with the examined type to be evaluated and to allow for in-service control.

5.5.10 If the approved inspection authority refuses to issue a type examination certificate – production type to the manufacturer, or to his authorized representative in the Republic of South Africa, that body shall provide detailed reasons for such refusal. Appeals can be lodged with the relevant regulatory authority.

5.5.11 The applicant shall inform the approved inspection authority that holds the technical documentation concerning the type examination certificate – production type, of all modifications to the approved pressure equipment. These modifications are subjected to additional approval where they might affect compliance with the essential requirements or the prescribed conditions for use of the pressure equipment. This additional approval shall be given in the form of an annex to the original type – examination certificate – production type.

5.5.12 Each approved inspection authority shall communicate to the relevant regulatory authority the relevant information concerning type examination certificates – production type which it has withdrawn, and, on request, those it has issued. Each approved inspection authority shall also communicate to other approved inspection authority's the relevant information concerning the type examination certificates – production type, it has withdrawn or refused.

5.5.13 Other approved inspection authorities may receive copies of the type examination certificates – production type or their annexes (or both).The annexes to the type examination certificates – production type shall also be made available to them.

5.5.14 The manufacturer, or his authorized representative in the Republic of South Africa, shall keep together with the technical documentation, copies of type examination certificates – production type and their annexes for a period of 12 years after the last of the pressure equipment has been manufactured.

5.6 Module B — Type examination — Design type

5.6.1 Type examination – design type is the part of a conformity assessment procedure in which an approved inspection authority examines the technical design of the pressure equipment and verifies and attests that the technical design meets the requirements of the applicable statutory regulations for pressure equipment.

5.6.2 Type examination (design type) shall consist of an assessment of the adequacy of the technical design of the pressure equipment through examination of the technical documentation and supporting evidence referred to in 5.6.6, without examination of a specimen.

5.6.3 The manufacturer, or his authorized representative within the Republic of South Africa, shall lodge an application for design type examination – design type with a single approved inspection authority.

5.6.4 The application shall include

a) the name and address of the manufacturer and, if the application is lodged by the authorized representative, his name and address as well,

b) a written declaration that the same application has not been lodged with any other approved inspection authority, and

c) the technical documentation described in 5.6.6.

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

5.6.6 The technical documentation shall enable an assessment to be made of the conformity of the pressure equipment with the requirements of the relevant national legislation (see foreword) which apply to it. It shall, as far as is relevant for such assessment, cover the design, manufacture and operation of the pressure equipment and contain at least.

a) a general description of the pressure equipment,

b) conceptual design and manufacturing drawings and diagrams of components, subssemblies, circuits, etc.,

c) descriptions and explanations necessary for an understanding of the said drawings and diagrams and the operation of the pressure equipment,

d) a list of the approved health and safety standards referred to in the pressure equipment regulations applied in full or in part, and descriptions of solutions adopted to meet the essential requirements of the relevant national legislation (see foreword) where the standards referred to in pressure equipment regulations have not been applied,

e) the necessary supporting evidence for the adequacy of the technical design solution. This supporting evidence shall include the results of tests carried out by the appropriate laboratory of the manufacturer or on his behalf and under his responsibility,

f) results of design calculations made, examinations carried out, etc.; and

g) information regarding the qualifications or approvals required for manufacturing.

5.6.7 The approved inspection authority shall examine the technical documentation and supporting evidence to assess the adequacy of the technical design of the product with the relevant provisions of the standards referred to in the pressure equipment regulation.

5.6.8 In particular, the approved inspection authority shall

a) perform the necessary examinations to establish whether the solutions adopted by the manufacturer meet the essential requirements of the relevant national legislation (see foreword),

b) verify the certificate issued by the materials manufacturer in accordance with the applicable health and safety standard, and

c) approve procedures for permanent joining of pressure equipment parts or verify that they have been previously approved in accordance with 6.7.1.3.4 or 6.7.1.3.5.

5.6.9 Where the design meets the provisions of the relevant national legislation (see foreword) which apply to it, the approved inspection authority shall issue a type examination certificate – design type to the applicant. The report shall contain the name and address of the applicant, conclusions of the verification, conditions for its validity and the necessary data for identification of the approved design.

5.6.10 A list of the relevant parts of the technical documentation shall be annexed to the report and a copy kept by the approved inspection authority.

5.6.11 If the approved inspection authority refuses to issue a type examination certificate (design type) to the manufacturer or to his authorized representative within the Republic of South Africa, that approved inspection authority shall provide detailed reasons for such refusal.

5.6.12 Provision shall be made for an appeals procedure.

5.6.13 The applicant shall inform the approved inspection authority that holds the technical documentation concerning the type examination certificate (design type) of all modifications to the approved design; these are subject to additional approval where such changes may affect the conformity of the pressure equipment with the essential requirements of the relevant national legislation (see foreword) or the prescribed conditions for use of the equipment. This additional approval shall be given in the form of an addition to the original type examination certificate (design type).

5.6.14 General

5.6.14.1 Each approved inspection authority shall communicate to the other approved inspection authorities the relevant information concerning the type examination certificate (design type) it has withdrawn or refused.

5.6.14.2 The other approved inspection authority may on request obtain the relevant information concerning

a) the type examination certificate – design type and additions granted and

b) the type examination certificate – design type and additions withdrawn.

5.6.15 The manufacturer, or his authorized representative within the Republic of South Africa, shall keep with the technical documentation referred to in 5.6.6 copies of the design-verification report and their additions for a period of 12 years after the last of the pressure equipment has been manufactured.

5.6.16 Where neither the manufacturer nor his authorized representative is within the Republic of South Africa, the obligation to keep the technical documentation available is the responsibility of the person who places the product on the market (the importer).

5.7 Module C2 — Conformity to type (and verification of final assessment) based on internal production control plus supervised pressure equipment checks at random intervals

5.7.1 This module describes the procedure whereby the manufacturer, or his authorized representative in the Republic of South Africa, shall ensure and declare that the pressure equipment concerned complies with the type as described in the type-verification certificate and complies with the requirements of the applicable statutory regulations for pressure equipment. The manufacturer, or his authorized representative in the Republic of South Africa, shall affix his own manufacturing mark to each item of pressure equipment and draw up a certificate of manufacture.

5.7.2 The manufacturer shall take all measures necessary to ensure that pressure equipment complies with the type described in the type-verification certificate and with the requirements of the applicable statutory regulations for pressure equipment.

5.7.3 The manufacturer, or his authorized representative in the Republic of South Africa, shall keep a copy of the certificate of manufacture for a period of twelve years after the last of the pressure equipment has been manufactured.

5.7.4 Where neither the manufacturer nor his authorized representative is in the Republic of South Africa, the obligation to keep the technical documentation available is the responsibility of the person who places the pressure equipment on the local market.

5.7.5 Final assessment shall be subjected to monitoring in the form of unexpected visits by an approved inspection authority chosen by the manufacturer.

5.7.6 During such visits, the approved inspection authority shall

a) Establish that the manufacturer has performed the final assessment in accordance with the applicable health and safety standard.

b) Take samples of the pressure equipment at the manufacturing or storage premises in order to conduct checks. The approved inspection authority shall assess the number of items of equipment to be sampled and shall decide whether it is necessary to perform, or have performed, all or part of the final assessment on the pressure equipment samples.

5.7.7 Should one or more of the items of pressure equipment not conform to the module, the approved inspection authority shall take appropriate measures.

5.7.8 With the agreement of the approved inspection authority, the manufacturer shall affix the unique mark of the approved inspection authority to each item of pressure equipment.

5.8 Module D — Conformity to type based on quality assurance of the production process

5.8.1 General

This module describes the procedure whereby the manufacturer, who complies with the requirements of 5.8.2.1, shall ensure and declare that the pressure equipment concerned complies with the type described in the type – examination certificate and complies with the requirements of the applicable statutory regulations for pressure equipment. The manufacturer, or his authorized representative in the Republic of South Africa, shall affix the manufacturer's mark to each item of pressure equipment and draw up a certificate of manufacture. The manufacturer's mark shall be accompanied by the identification number of the approved inspection authority responsible for surveillance, as specified in 5.8.3.

5.8.2 Certified quality system

5.8.2.1 The manufacturer shall operate a certified quality system for production, final inspection and testing as specified in 7.1 and be subject to surveillance by an approved certification body as specified in 7.2.

5.8.2.2 The quality system shall ensure compliance of the pressure equipment with the type described in the type examination certificate and with the requirements of the applicable statutory regulations for pressure equipment.

5.8.2.3 The manufacturer shall lodge an application for an approved certification body to assess his quality system for the pressure equipment concerned.

5.8.3 Type examination

5.8.3.1 The manufacturer shall draw up a written certificate of manufacture for each pressure equipment model and identify each model on the certificate.

5.8.3.2 The manufacturer's mark shall be accompanied by the identification number of the approved inspection authority responsible for surveillance.

5.9 Module D1 — Quality assurance of the production process

5.9.1 This module describes the procedure whereby the manufacturer, who complies with the requirements of 5.9.3, ensures and declares that the items of pressure equipment concerned satisfy the requirements of the applicable statutory regulations for pressure equipment. The manufacturer, or his authorized representative in the Republic of South Africa, shall affix the manufacturer's mark to each item of pressure equipment and draw up a written certificate of manufacture. The manufacturer's marking shall be accompanied by the identification number of the approved inspection authority responsible for surveillance.

5.9.2 The manufacturer shall draw up the technical documentation. The technical documentation shall enable an assessment to be made of the conformity of the pressure equipment with the requirements of the applicable statutory regulations for pressure equipment. It shall, as far as is relevant for such assessment, cover the design, manufacture and operation of the pressure equipment and contain:

a) a general description of the pressure equipment;

b) conceptual design and manufacturing drawings and diagrams of components, subassemblies, circuits, etc.;

c) descriptions and explanations necessary for an understanding of the said drawings and diagrams and the operation of the pressure equipment;

d) a list of the standards referred to in the pressure equipment regulation and descriptions of the solutions adopted to meet the essential requirements of the applicable statutory regulations for pressure equipment;

e) results of design calculations made, examinations carried out, etc.; and

f) test reports.

5.9.3 The manufacturer shall operate a certified quality system for production, final inspection and testing as specified in 7.1 and be subject to surveillance by an approved certification body as specified in 7.2.

5.9.4 The quality system shall ensure compliance of the pressure equipment with the requirements of the applicable statutory regulations for pressure equipment.

5.10 Module E — Conformity to type based on pressure equipment quality assurance

5.10.1 The manufacturer shall operate a certified quality system for the final pressure equipment inspection and testing, as specified in 7.1 and be subjected to surveillance as specified in 7.2.

5.10.2 Under the quality system, each item of the pressure equipment shall be verified and appropriate tests, as set out in the applicable health and safety standard(s), or equivalent tests, particularly for final assessment as referred to in the applicable health and safety standard, shall be carried out in order to ensure its compliance with the requirements of the applicable statutory regulations for pressure equipment.

5.11 Module E1 — Quality assurance for final pressure equipment inspection and testing

5.11.1 This module describes the procedure whereby the manufacturer, who complies with the requirements of 5.11.3, shall ensure and declare that the pressure equipment concerned complies with the requirements of the applicable statutory regulations for pressure equipment. The manufacturer, or his authorized representative in the Republic of South Africa, shall affix the manufacturer's mark to each item of pressure equipment and draw up a certificate of manufacture. The mark shall be accompanied by the identification number of the approved inspection authority responsible for surveillance.

5.11.2 The manufacturer shall draw up the technical documentation. The technical documentation shall enable an assessment to be made of the conformity of the pressure equipment with the requirements of the applicable statutory regulations for pressure equipment. It shall, as far as is applicable for such assessment, cover the design, manufacture and operation of the pressure equipment and contain the following:

a) a general description of the pressure equipment;

b) conceptual design and manufacturing drawings and diagrams of components, subassemblies, circuits, etc.;

c) descriptions and explanations necessary for an understanding of the said drawings and diagrams and the operation of the pressure equipment;

d) a list of the health and safety standards, applied in full or in part, and descriptions of the solutions adopted to meet the essential requirements of the applicable statutory regulations for pressure equipment where the standards referred to in pressure equipment regulation have not been applied;

e) results of design calculations made, verifications carried out, etc.; and

f) test reports.

5.11.3 The manufacturer shall operate a certified quality system in accordance with 7.1 and for the final pressure equipment inspection and testing and be subjected to surveillance by an approved certification body in accordance with 7.2.

5.12 Module F — Conformity to type, based on pressure equipment verification

5.12.1 This module describes the procedure whereby the manufacturer, or his authorized representative in the Republic of South Africa, shall ensure and declare that the pressure equipment subjected to the requirements in 5.12.3 complies with the type as described in the type examination-production certificate, or in the type examination (design certificate), and that it complies with the requirements of the applicable statutory regulations for pressure equipment.

5.12.2 The manufacturer, or his authorized representative in the Republic of South Africa, shall affix the manufacturer's mark to all the pressure equipment concerned and draw up a certificate of manufacture. The manufacturer, or his authorized representative in the Republic of South Africa, shall keep a copy of the certificate of manufacture for a period of 12 years after the last of the pressure equipment has been manufactured.

5.12.3 The approved inspection authority shall perform the appropriate verifications and tests in order to check the conformity of the pressure equipment with the applicable requirements of the statutory regulations for pressure equipment by examining and testing every product in accordance with 5.12.4 to 5.12.7 (inclusive).

5.12.4 Each item of pressure equipment shall be individually examined and shall undergo appropriate verifications and tests as set out in the applicable health and safety standards, or equivalent verifications and tests in order to verify that it conforms to the type and the requirements of the applicable statutory regulations for pressure equipment.

5.12.5 In particular, the approved inspection authority shall

a) verify that the personnel undertaking the permanent joining of parts and the non-destructive examinations are qualified or have been approved in accordance with the applicable health and safety standard,

b) verify the certificate issued by the materials manufacturer in accordance with the applicable health and safety standard, and

c) carry out the final inspection and witness the proof test referred to in the applicable health and safety standard and examine the safety devices, if applicable.

5.12.6 The approved inspection authority shall affix its unique mark to each item of pressure equipment and countersign the certificate of manufacture that relates to the tests carried out.

5.12.7 The manufacturer, or his authorized representative in the Republic of South Africa, shall ensure that the certificate of manufacture countersigned by the approved inspection authority is made available on request.

5.13 Module G — Conformity based on unit verification

5.13.1 This module describes the procedure whereby the manufacturer shall ensure and declare that the pressure equipment, which has been issued with the certificate referred to in 5.13.6(f), complies with the requirements of the applicable statutory regulations for pressure equipment. The manufacturer shall affix the manufacturer's mark to the pressure equipment and draw up a certificate of manufacture.

5.13.2 The manufacturer shall apply to an approved inspection authority of his choice for pressure equipment verification if the approved inspection authority was not appointed by the buyer or user.

NOTE It is the duty of the manufacturer to ensure the timely participation of the approved inspection authority on all pressure equipment verification irrespective of who appointed the approved inspection authority.

5.13.3 The technical documentation shall enable an assessment to be made of the conformity of the pressure equipment with the requirements of the applicable statutory regulations for pressure equipment. It shall cover the design, manufacture and operation of the pressure equipment.

5.13.4 The technical documentation shall contain the following:

a) a general description of the pressure equipment;

b) conceptual design and manufacturing drawings and diagrams of components, subassemblies, circuits, etc.;

c) descriptions and explanations necessary for an understanding of the said drawings and diagrams and the operation of the pressure equipment;

d) a list of the health and safety standards, applied in full or in part, and descriptions of the solutions adopted to meet the essential requirements for pressure equipment where the standards referred to in the relevant national legislation (see foreword) have not been applied;

e) results of design calculations made, verifications carried out, etc.;

f) test reports; and

g) appropriate details relating to the approval of the manufacturing and test procedures and of the qualifications or approval of the personnel concerned (see SANS 10227 and SANS 17020) in accordance with the applicable health and safety standard.

5.13.5 The approved inspection authority shall examine the design and construction of each item of pressure equipment during manufacture and perform appropriate tests as set out in the applicable health and safety standards, or equivalent verifications and tests, to ensure its compliance with the requirements of the applicable health and safety standard.

5.13.6 In particular the approved inspection authority shall:

a) examine the technical documentation with respect to the design and manufacturing procedures,

b) verify the certificate issued by the materials manufacturer in accordance with the applicable health and safety standard,

c) approve the procedures for the permanent joining of parts or check that they have been previously approved in accordance with the applicable health and safety standard,

d) verify the qualifications or approval of the personnel required under the applicable health and safety standard in accordance with SANS 10227 and SANS 17020,

e) carry out the final inspection referred to in the applicable health and safety standard, perform or have performed the tests referred to in the applicable health and safety standard, and examine the safety devices, if applicable, and

f) affix unique mark to the pressure equipment and countersign the certificate of manufacture for the tests carried out.

5.13.7 The manufacturer, or his authorized representative in the Republic of South Africa, shall ensure that this certificate of manufacture can be made available on request.

5.14 Module H — Conformity based on full quality assurance

5.14.1 General

5.14.1.1 This module describes the procedure whereby the manufacturer who complies with the requirements in 5.14.2 shall ensure and declare that the pressure equipment concerned complies with the requirements of the applicable statutory regulations for pressure equipment. The manufacturer, or his authorized representative in the Republic of South Africa, shall affix the manufacturer's mark to each item of pressure equipment and draw up a certificate of manufacture.

5.14.1.2 The manufacturer's mark shall be accompanied by the identification number of the approved inspection authority responsible for surveillance.

5.14.2 Quality system

The manufacturer shall operate a certified quality system for design, manufacture, final inspection and testing as specified in 7.1, and be subjected to surveillance as specified in 7.2.

5.15 Module H1 — Conformity based on full quality assurance plus design examination

5.15.1 In addition to the requirements of module H, the following shall apply:

a) The manufacturer shall lodge an application for each unit of the pressure equipment for verification of the design with the approved inspection authority.

b) The application shall enable the design, manufacture and operation of the pressure equipment to be understood and enable conformity with the relevant requirements of the relevant national legislation (see foreword) to be assessed.

   The application shall include

   1) the technical design specifications, including standards, which have been applied, and

   2) the necessary supporting evidence for their adequacy, in line with the particular health and safety standard(s). This supporting evidence shall include the results of tests carried out by the appropriate laboratory of the manufacturer or by the approved inspection authority as required by the particular health and safety standard(s).

c) The approved inspection authority shall examine the application and, where the design complies with the requirements of the applicable statutory regulations for pressure equipment, shall issue a design-verification certificate to the applicant. The certificate shall contain the results of the verification, 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 shall inform the approved inspection authority that has issued the design-verification certificate of all the modifications to the approved design. Where the modifications to the approved design might affect compliance with the essential requirements of the applicable statutory regulations for pressure equipment or the prescribed conditions for use of the pressure equipment, these modifications shall receive additional verification from the approved inspection authority that issued the design-verification certificate. This additional verification shall be given in the form of an annex to the original design-verification certificate.

e) Each approved inspection authority shall also communicate to other approved inspection authority the relevant information concerning the design-verification certificates it has withdrawn or refused.

5.15.2 Final assessment shall be subjected to increased surveillance in the form of unexpected visits by the approved certification body. During such visits, the approved certification body shall conduct verifications on the pressure equipment.

6 Essential requirements for construction

6.1 Pressure equipment shall 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 instructions of the manufacturer, or in reasonably foreseeable conditions. The design of category II, III and IV pressure equipment shall be approved by a professionally registered person in this field, prior to submission to the approved inspection authority for verification when required by the applicable conformity assessment module or when conformity assessed according to annex B and annex C (see also 4.1.4).

6.2 The pressure equipment shall be properly designed taking all relevant factors into account in order to ensure that the equipment will be safe throughout its intended life. The pressure equipment shall be designed for loadings appropriate to its intended use and other reasonably foreseeable operating conditions.

6.3 Design stability aspects

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

6.4 Assemblies

Assemblies shall be so designed that

a) the components to be assembled together are suitable and reliable for their duty, and

b) all the components are properly integrated and assembled in an appropriate manner.

6.5 Means of examination

6.5.1 Pressure equipment shall be designed and constructed so that all necessary examinations to ensure safety can be carried out.

6.5.2 Means of determining the internal condition of the equipment shall 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.

6.5.3 Other means of ensuring the safe condition of the pressure equipment may be applied

a) where it is too small for physical internal access, or

b) where opening the pressure equipment would adversely affect the inside, or

c) 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.

6.6 Safety accessories

6.6.1 Safety accessories shall

a) 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,

b) be independent of other functions, unless their safety function cannot be affected by such other functions, and

c) comply with appropriate design principles in order to obtain suitable and reliable protection.

6.6.2 These principles include, in particular, fail-safe modes, redundancy, diversity and self-diagnosis.

6.7 Manufacturing

6.7.1 Manufacturing procedures

6.7.1.1 General

The manufacturer shall 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.

6.7.1.2 Preparation of the component parts

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

6.7.1.3 Permanent joining

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

6.7.1.3.2 The properties of permanent joints shall 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.

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

6.7.1.3.4 For pressure equipment in categories II, III and IV, joining procedures and personnel shall be approved by a competent third party which, at the discretion of the manufacturer, may be

a) an approved inspection authority, or

b) a third-party organization recognized by the relevant regulatory authority.

6.7.1.3.5 Where procedures and personnel have not been approved previously by a competent third-party organization, the approvals, examinations and tests shall be performed as set out in the appropriate health and safety standard(s) and where required shall be witnessed by a competent third-party organization. If the health and safety standard does not require witnessing of activities to approve the procedure qualification records or welder qualifications, the following procedures are applicable:

a in the case of manufacturers with a certified quality system (see 7.1.10) the following documentation, if applicable, shall be presented for endorsement by the competent third-party organization:

1) mechanical test results;

2) non-destructive examination (NDE) results;

3) material and consumable certificates;

4) post-weld heat treatment records; and

5) parameter records;

b) where a manufacturer does not have a certified quality system, witnessing of the performance of test plates is mandatory for approval of the procedures and personnel. Witnessing of mechanical tests for procedure qualification records is mandatory unless the manufacturer uses a test laboratory accredited by the relevant national body (see foreword) to SANS 17025 with the appropriate test standard included in the scope of accreditation.

6.7.1.4 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 shall be applied at the appropriate stage of manufacture.

6.7.1.5 Traceability

Suitable procedures shall 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.

6.7.1.6 Control of manufacturing process

The manufacturer may use finished products, ready-made parts or components, or may subcontract these tasks. However, the manufacturer shall always retain the overall control and have the necessary competence to take the responsibility for the product. The manufacturer constructs the pressure equipment with a view of placing it on the South African market on his behalf or to sell it to a buyer for installation in industrial sites.

6.8 Operating instructions

6.8.1 When pressure equipment is placed on the market, it shall be accompanied, as far as relevant, with instructions for the user, containing all the necessary safety information relating to

a) mounting including assembling of different pieces of pressure equipment,

b) putting into service, and

c) use and maintenance including checks by the user.

6.8.2 Instructions shall cover information affixed to the pressure equipment and shall be accompanied, where appropriate, by the technical documents, drawings and diagrams necessary for a full understanding of these instructions.

6.8.3 If appropriate, these instructions shall also refer to hazards arising from misuse and particular features of the design.

6.8.4 For transportable gas containers operating instructions shall be in accordance with SANS 10019.

7 Quality system requirements

7.1 Quality system

7.1.1 The manufacturer shall operate a quality system for the manufacture, repair, modification and installation of pressure equipment to ensure compliance with the applicable health and safety standard(s). For certain conformity assessment modules, the manufacturer's quality system shall be approved by a certification body accredited by the relevant national body (see foreword) for the applicable conformity assessment module.

7.1.2 When required by the applicable conformity assessment module, the manufacturer shall lodge an application for assessment of his quality system with a certification body of his choice.

7.1.3 The application shall include:

a) all the relevant information on the pressure equipment concerned;

b) the documentation concerning the quality system; and

c) the technical documentation for the approved type and a copy of the type-verification certificate or design verification certificate, where and as applicable.

7.1.4 The quality system shall ensure compliance of the pressure equipment with the requirements of the applicable statutory regulations for pressure equipment in general, the applicable health and safety standard(s) in particular, the selected conformity assessment module and this standard. All the elements, requirements and provisions adopted by the manufacturer shall be documented in a systematic and orderly manner in the form of written policies, procedures and instructions. This quality system documentation shall permit a consistent interpretation of the procedures and quality measures such as programmes, plans, manuals and records.

7.1.5 The quality system documentation shall contain, in particular, a description of:

a) the quality objectives and the organizational structure, responsibilities and powers of management with regards to the quality of the design and to product quality,

b) the technical design specifications, including standards, that will be applied and, means that will be used to ensure that the requirements of the applicable statutory regulations for pressure equipment will be complied with,

c) the design control and design verification techniques, processes and systematic measures that will be used when designing the pressure equipment, particularly with regards to materials, in accordance with the applicable health and safety standard,

d) 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 the applicable health and safety standard,

e) the verifications and tests that will be carried out before, during, and after manufacture, and the frequency with which they will be carried out,

f) the quality records, such as inspection reports and test data, calibration data, reports on the qualifications or approval of the personnel concerned (see SANS 10227 and SANS 17020), particularly those of the personnel undertaking the permanent joining of parts and the non-destructive examinations in accordance with the applicable health and safety standard, and

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

7.1.6 The certification body shall assess the quality system to determine whether it complies with the requirements in the applicable health and safety standard(s) and the relevant national legislation (see foreword).

7.1.7 The auditing team shall have competent personnel to undertake the scope of the audit which shall be defined in the requirements of the scheme in conformance to SANS 17021. The assessment procedure shall conform to the requirements of SANS 17021.

7.1.8 The manufacturer shall undertake to fulfil the obligations that arise from the certified quality system and to ensure that the system remains satisfactory and efficient.

7.1.9 The manufacturer shall inform the certification body that has approved the quality system of any intended modifications to the quality system. The certification body shall assess the proposed changes and decide whether the amended quality system will still comply with the requirements in the applicable health and safety standard(s) or whether a re-assessment is required. The certification body shall notify its decision to the manufacturer. The notification shall contain the results of the verification and the assessment decision.

7.1.10 Accepted certified quality systems are as follows:

a) for equipment which is manufactured with metallic fusion welding as a primary production process, a system in compliance with SANS 3834-2 and which incorporates the elements of a quality management systems described in SANS 3834-1;

b) RSA/CI/OHSA equipment marked for non-nuclear use in accordance with the relevant national legislation (see foreword), using a system meeting the requirements of (a) and any additional requirements of ASME VIII Division 1 Appendix 10;

c) European certificate (CE) certified systems (for example, manufacturing to PED Modules D; E; H; H1);

d) where welding is not a primary production process for manufacture of the equipment, a system based on the SANS 9001 series adapted to address all the requirements of the applicable health and safety standard(s);

e) for medical devices, a system complying to SANS 13485; and

f) RSA/CI/OHSA equipment marked for nuclear use in accordance with the relevant national legislation (see foreword), using a system meeting the requirements of annex C and certified by a recognized certification body.

g) ASME Certificate Holders under the Boiler and Pressure Vessel Code.

NOTE Welding is a primary production process when the quality of welded joints is a cornerstone of the integrity of the pressure equipment.

7.2 Surveillance

7.2.1 The purpose of surveillance is to ensure that the manufacturer duly fulfils the obligations that arise from the approved quality system.

7.2.2 The manufacturer shall allow the certification body access, for inspection purposes, to the locations of manufacture, inspection, testing and storage, and provide it with all the necessary information, in particular

a) the quality system documentation,

b) the technical documentation, and

c) the quality records, such as inspection reports and test data, calibration data, and reports on the qualifications of the personnel concerned.

7.2.3 The certification body shall carry out periodic audits to ensure that the manufacturer maintains and applies the quality system and shall provide the manufacturer with an audit report. The frequency of periodic audits shall be such that a full re-assessment is carried out every three years.

7.2.4 In addition, the certification body may pay unexpected visits to the manufacturer. The need for such additional visits, and the frequency thereof, shall be determined by a visit-control system operated by the certification body. The following factors, in particular, shall be considered in the visit-control system:

a) the category of the equipment;

b) the results of the previous surveillance visits;

c) the need to follow-up on corrective action;

d) special conditions linked to the approval of the system, where applicable; and

e) significant changes in manufacturing organization, policy or techniques.

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

7.2.6 The manufacturer shall, for a period of 12 years after the last of the pressure equipment has been manufactured, make available to the national authorities:

a) the documentation referred to in 7.1.3(b);

b) the modifications referred to in 7.1.9; and

c) the decisions and reports from the certification body referred to in 7.1.5, 7.1.6, 7.1.8, 7.2.3 and 7.2.5.

7.2.7 When certification of a manufacturing company is transferred from one certification body to another, the requirements of SANS 17021 shall be met.

NOTE The manufacturer only needs to put a quality management system in place as required by the relevant module, for example,

a) in module D, the manufacturer only needs a quality system that complies with 5.8.2 for production, final inspection and testing,

b) in module E, the manufacturer only needs a quality system that complies with 5.10.2 for final inspection and testing, and

c) in module H, the manufacturer only needs a quality system that complies with 5.14.2 for design, production, final inspection and testing.

8 Marking

Where the pressure equipment is too small, for example, accessories, the information referred to in the relevant national legislation (see foreword) may be given on a label attached to that pressure equipment provided a unique number is used to provide traceability to the label and any certificate.

Annex A
(normative)

Design and construction requirements for piping

A.1 Piping designer

A.1.1 General

A piping designer is the person(s) in charge of the engineering design of piping and shall be experienced in the use of the health and safety standard(s).

A.1.2 Roles, accountability and qualifications of the piping designer

A.1.2.1 For category I, the piping designer shall meet the qualification and experience requirements of the applicable health and safety standard(s).

A.1.2.2 For category II and higher, the piping designer shall be an appropriately registered professional person (for example, registered Pr. Eng. Pr. Technologist or Pr. Cert. Eng.) with at least four years of relevant experience in the design of related pressure piping in compliance with the applicable health and safety standard(s).

A.1.2.3 Engineers performing design activities for pressure equipment from countries outside of the Republic of South Africa for manufacture in the Republic of South Africa shall be accepted on the basis of mutual recognition agreements (for example, Washington Accord). Where no such agreements exist, the acceptance of the engineer shall be done by the appointed approved inspection authority's design verification engineer (as referenced in SANS 10227) based on equivalent qualifications and experience as stated in 4.1.4.

A.1.2.4 Piping design experience includes design calculations for pressure, sustained and occasional loads, and piping flexibility.

A.1.2.5 The piping designer need not personally perform the drawings and calculations, but shall perform all the necessary checks required for him to acknowledge full responsibility for the design by signing drawings and calculations as complying with the applicable health and safety standard(s). The piping designer shall review the need for a piping flexibility analysis and if required, sign-off the correctness of this analysis.

A.2 The piping design package

The piping design package shall contain, as a minimum, the following information:

a) the medium and hazard category in accordance with this standard;

b) the health and safety standard(s) used for the design;

c) the design and operating conditions;

d) the fabrication, inspection and testing requirements;

e) the pipe routing and support information; and

f) a stress isometric, approved by the piping designer as applicable.

A.3 Roles and accountability of the user

The user shall keep the piping design and manufacture package for the life of the piping system.

Annex B
(normative)

Declaration of conformity requirements for RSA/CI/OHSA marked pressure equipment (non-nuclear use)

B.1 General

Equipment designed, manufactured, inspected, tested and declared conformant in accordance with this annex shall be categorized in accordance with table 1 for post-construction purposes. This annex applies to all category I through IV equipment.

B.2 RSA/CI/OHSA marked equipment – Non-nuclear use

B.2.1 The relevant national legislation (see foreword) states that where equipment meets all the requirements of a relevant ASME code or ANSI NB 23 except for marking and certification requirements, it shall be marked with RSA/CI/OHSA. In this case, one of the following options shall be used:

a) the manufacturer has a certified quality control system in accordance with 7.1.10(b) or (g) and the authorized inspector role is taken over by an approved inspection authority that inspects, verifies and also declares the equipment conformant, or

b) same as (a) but the authorized inspector role is taken over by a foreign inspection body approved by the regulatory authority in accordance with the relevant national legislation (see foreword).

B.2.2 In all cases, the verification activities by the approved inspection authority shall meet the minimum requirements of the applicable health and safety standard(s).

B.3 Marking and records

B.3.1 Format to be applied on the data plate and Declaration of Conformity

Format to be applied on the data plate and Declaration of Conformity shall be as follows:

a) RSA/CI/OHSA – AA – BB – CC;

b) RSA/CI/OHSA = ASME or ANSI NB-23 (repair and modification);

c) AA = Name/Section (VIII Division1 = 8.1 or ANSI NB 23 = 23);

d) BB = Date of issue/addenda (2014 = 14); and

e) CC = Any additional markings required by ASME or ANSI NB 23.

B.3.2 Equipment designed, manufactured, repaired, modified, inspected, tested and declared conformant in accordance with this annex shall meet the applicable requirements of the relevant national legislation (see foreword) pertaining to marking of the data plate and manufacturing records, regardless of the pressure vessel category.

Annex C
(normative)

Declaration of conformity requirements for RSA/CI/OHSA marked pressure equipment (nuclear use)

C.1 General

Equipment designed, manufactured, inspected, tested and declared conformant in accordance with this annex shall be categorized as Category III for piping and Category IV for pressure vessels and steam generators for post construction purposes.

C.2 RSA/CI/OHSA marked equipment — Nuclear

C.2.1 The relevant national legislation (see foreword) states that where equipment meets all the requirements of the ASME code except for marking and certification requirements, it shall be marked with RSA/CI/OHSA. In this case one of the following options shall be used:

a) the manufacturer that has a certified quality control system in accordance with 7.1.10 (b) or (g) and the authorized inspector role is taken over by the approved inspection authority that inspects, verifies and also declares the equipment conformant; or

b) same as (a) but the authorized inspection role is taken over by a foreign inspection body approved by the relevant regulatory authority in accordance with the relevant national legislation (see foreword).

C.2.2 In all cases, the verification activities by the approved inspection authority shall meet the minimum requirements of the applicable health and safety standard(s).

C.2.3 In addition, the manufacturer's quality management system shall meet the requirements of RD-0034. Further guidance is provided in the following Position Papers of the relevant national body (see foreword):

a) PP-0012 – Manufacturing of Components for Nuclear Installations; and

b) PP-0016 – Conformity Assessment of Pressure Equipment in Nuclear Service.

C.2.4 Local approved inspection authority shall comply with the following:

a) the relevant nuclear ASME health and safety standard shall be listed on their Scope of Accreditation (Manufacturing Inspection);

b) employ Authorized Nuclear Inspectors and Authorized Nuclear Inspector Supervisors qualified according to ASME QAI-1;

c) implement and maintain a documented Quality Program which satisfies ASME QAI-1; and

d) Perform the duties as specified in ASME QAI-1 and ASME III Division 1 Subsection NCA Article 5 000.

C.2.5 The local personnel engaged in design certification activities shall be registered in terms of the relevant national legislation (see foreword) as Professional Engineer(s) and shall meet the technical requirements of ASME III Division 1 Mandatory Appendix XXIII.

C.2.6 The local material suppliers shall be

a) SANS 9001 certified , and

b) implement and maintain a documented Quality Program which satisfies the requirements of the relevant national legislation (see foreword) as required in document RD-0034 section 6.3 – quality management system (levels 1 and 2).

C.2.7 In addition, the material shall meet all the technical requirements of the Material Specification (including any additional ASME III Division 1 Subsection NX-2000 examination and testing requirements) and the Material Test Report shall be certified by the relevant party stating conformance to the technical aspects of the ASME Code.

C.3 Marking and records

C.3.1 Format to be applied on the data plate and Declaration of Conformity

Format to be applied on the data plate and Declaration of Conformity shall be as follows:

a) RSA/CI/OHSA-AAA-BB-CC;

b) RSA/CA/OHSA = ASME;

c) AAA = Name/Section/Subsection:

(III Division 1 NB = 3.1.NB; III Division 1 NC = 3.1.NC; III Division 1 ND = 3.1.ND).

d) BB = Date of issue/addenda:

(e.g. 2017 = 17).

e) CC = Any additional markings required by ASME.

C.3.2 Equipment designed, manufactured, inspected, tested and declared conformant in accordance with this annex shall meet the applicable requirements of the relevant national legislation (see foreword) pertaining to marking of the data plate and manufacturing records, regardless of the pressure vessel category.

Annex D
(normative)

Requirements for re-instatement of conformance for pressure equipment

D.1 General

Re-instatement of conformance refers to activities undertaken to determine appropriate design parameters for pressure equipment where such data is unknown or unavailable. Satisfactory proof of previous certification shall be made available prior to the Re-instatement of conformance of the equipment. Thus, only equipment which has been previously declared conformant to a health and safety standard can be re-instated.

D.2 Types of equipment subject to re-instatement of conformance

D.2.1 New equipment being imported into the country which do not comply with the relevant national legislation (see foreword) and with the minimum requirements of this standard includes the following:

a) serial and batch type production;

b) single produced equipment; and

c) castings (for example, filter vessels).

D.2.2 Existing in-service equipment (pre- and post- 1992) includes

a) equipment that has been in service on a continuous basis, and

b) equipment that has been out of service for some time and the user wants to return it to service.

D.3 Process to be followed

D.3.1 All pressure equipment shall be categorized and submitted to the applicable conformance assessments of this standard in addition to the requirements of the relevant approved health and safety standard in accordance with the relevant national legislation (see foreword).

D.3.2 New and imported equipment which shall be viable for re-instatement of conformance shall be limited to the following types of equipment only:

a) pressure vessels;

b) steam generators; and

c) transportable gas containers (to be done in conjunction with SANS 10019).

D.4 Equipment not to be evaluated

The following equipment shall not be evaluated for re-instatement of conformance:

a) safety accessories; and

b) pressure accessories.

D.5 New and imported batch-type equipment

D.5.1 Imported equipment which does not conform to the general requirements as set out in the relevant national legislation (see foreword) and this standard in order to be subjected to normal conformity assessments shall be treated as follows:

a) Categorize the equipment in accordance with this standard and follow the stipulated process for all category I and higher equipment;

b) Identify a representative sample from the batch equipment (minimum of 20 % per batch) which can be subjected to ultimately destructive testing;

c) Conduct mechanical testing on both the parent materials, as well as the weld materials;

d) Draw up a design of the equipment. This can even be a hand sketch with key dimensions identified and indicated;

e) Select a suitable approved health and safety standard to which the Re-instatement of conformance calculations shall conform to. Take note that the materials selected to complete the calculations based on the mechanical and chemical testing of the original material tested shall be compliant with the selected health and safety standard;

f) Complete the relevant NDE examination based on the selected joint efficiency. Under no circumstance shall the selected joint efficiency be less than 0,85 or 10% radiography where joint efficiency is not defined; and

g) Compile a complete set of reverse engineering design and re-instatement of conformance calculations based on the actual completed as-built design of the equipment. Take note that for equipment categorized as category II or higher in accordance with this standard, such calculations shall be approved by the importer's representative professionally registered person (such as Pr. Eng., Pr. Tech. or Pr. Tech. Eng.), and verified by the approved inspection authority.

D.5.2 In instances where a batch sample was not subjected to complete destruction in order to conduct the relevant testing in C.5.1 and is to be reinstated, such equipment shall then be 100 % visually inspected both externally and internally where accessible, as well as subjected to the relevant non-destructive inspection (NDE) set out in the adopted health and safety standard. Specific attention shall be given to both critical welds, as well as nozzle to shell welds.

D.5.3 The units shall then be subjected to a shop pressure test in conjunction with the adopted health and safety standard and fitted with a plate that complies with the relevant national legislation (see foreword).

D.5.4 The remainder of the equipment in the original batch received shall be subjected to the following processes:

a) a complete 100 % visual inspection, as well as any NDE stipulated by the adopted health and safety standard, both externally and internally, if accessible;

b) the units shall be pressure tested in accordance with the adopted health and safety standard requirements; and

c) each unit shall be fitted with a data plate in compliance with the requirements of the relevant national legislation (see foreword).

D.6 New and imported single fabricated units

D.6.1 New and imported single fabricated units shall be treated in accordance with the following:

a) Categorize the equipment in accordance with this standard and follow the stipulated process for all category I and higher equipment.

b) Cut material sample or test pieces from the equipment and conduct mechanical testing on both the parent materials, as well as the weld materials.

c) Draw up a design of the equipment. This can even be a hand sketch with key dimensions identified and indicated.

d) Select a suitable health and safety standard to which the re-instatement calculations shall conform to. Take note that the materials selected to complete the re-instatement calculations based on the mechanical and chemical testing of the original material tested shall be compliant with the selected health and safety standard.

e) Complete the relevant NDE examination based on the selected joint efficiency. Under no circumstance shall the selected joint efficiency be less than 0,85 or 10% radiography where joint efficiency is not defined.

f) Compile a complete set of reverse engineering design and re-instatement calculations based on the actual completed as-built design of the equipment. Take note that for equipment categorized as category II or higher in accordance with this standard such calculations shall be approved by the importer's representative professionally registered entity (for example, Pr. Eng., Pr. Tech. or Pr. Tech. Eng.), and verified by the approved inspection authority.

D.6.2 The equipment shall then be 100 % visually inspected both externally and internally where accessible, as well as subjected to the relevant NDE set out in the adopted health and safety standard. Specific attention shall be given to both critical welds, as well as nozzle to shell welds.

D.6.3 The unit shall then be subjected to a shop pressure test in conjunction with the adopted health and safety standard and fitted with a data plate that complies with the requirements of the relevant national legislation (see foreword).

NOTE If the relevant tests cannot be undertaken, or the equipment is proven to be non-compliant, the unit should not be re-instated.

D.7 Castings

D.7.1 Regarding castings, for example, filter vessels, reference shall be made both to the PED and the relevant national legislation (see foreword) interpretations.

D.7.2 The PED classifies filter vessels as pressure accessories.

D.7.3 The relevant national legislation (see foreword) classifies filter vessels depending on the equipment location as follows:

a) Stand-alone – Pressure vessel; and

b) In-line – Pressure accessory.

D.8 In-service equipment

D.8.1 This clause makes specific reference to equipment which has been in service on a continuous basis but of which the statutory inspection schedule has not been kept up-to-date or followed.

D.8.2 For locally fabricated equipment one needs to pay special attention to the year of fabrication, as this will have an impact on the requirements for Re-instatement of conformance.

D.8.3 For the pre-1992 timespan; the only requirement was for the vessel to be fitted with a dataplate. Should the equipment have a dataplate bracket, but no dataplate, it can be assumed that the vessel had a dataplate fitted at some stage and was certified. If the equipment has no indication of previous certification, consensus should be reached whether the equipment is eligible for re-instatement of conformance.

D.8.4 For the post-1992 timespan, refer to the requirements of the relevant national legislation (see foreword). At least one of the following shall be required for pressure equipment conformance:

a) equipment documents (such as design and drawings);

b) equipment dataplate;

c) certificate of manufacture; and

d) inspection history.

D.8.5 The following process should be followed in order to re-instate the equipment:

a) Conduct a full statutory inspection on the equipment, including full dimensional checks. Verify the set pressure of the relieve valve (RV) of the equipment.

b) Review equipment inspection history, if available. If this is available, evaluate the option of rather conducting a fitness for service evaluation than a re-instatement.

c) Conduct positive material identification (PMI) and hardness testing on materials in order to determine equivalent tensile strength. It is important to verify the carbon content of the material and confirm whether materials are alloyed or not.

d) Test a representative sample (10 %) of the internal surfaces of the equipment (Specifically T-welds and nozzle welds) with a suitable NDE method. Radiography shall be carried out where practical for sub-surface defects on welds and magnetic particle testing or liquid penetrant testing (MT/PT) for surface breaking defects. If the internal surface is not accessible, other techniques, for example, ultrasonic testing (UT) can be applied.

e) Identify a suitable health and safety standard based on the outcome of the PMI testing, as well as the relevant materials in full compliance with the chosen standard. Should the mechanical properties of the materials be unknown or unavailable; the lowest grade material specified in the health and safety standard meeting that specific chemical composition shall be used.

f) Confirm the required design conditions such as pressure and temperature, as well as service medium. Verify the set pressure of the relieve valve (RV) of the equipment.

g) Complete an as-built design of the equipment. This can be either a sketch or a computer-aided drawing (CAD), as long as all of the critical dimensions and proposed design data is given.

h) Conduct the relevant NDE in conjunction with the selected health and safety standard, based on the joint efficiency. Note that the joint efficiency shall under no circumstances be less than 0,85 or 10% radiography where joint efficiency is not defined.

NOTE The NDE completed should be such that any degradation of both internal and external surfaces due to service type (both old and new) can be identified.

i) Complete a full set of Re-instatement of conformance calculations. Note that the relevant national legislation (see foreword) and this standard approach shall be followed. For all category II or higher equipment, the design shall be approved by the user's appointed professionally registered entity (for example, Pr. Eng., Pr. Tech. or Pr. Tech. Eng.), and verified by the approved inspection authority. The user presents the design to the approved inspection authority. This can be a drawing, calculations (or both). The approved inspection authority verifies the submitted design by means of a set of control calculations.

D.9 Locally fabricated equipment which have been out of service for an unknown amount of time

D.9.1 When pressure equipment is sold, the manufacturer shall ensure that it is accompanied, where relevant, with instructions for the user, containing all the necessary safety information relating to mounting, including the assembling of different pieces of pressure equipment; putting into service; and maintenance, including checks by the user.

D.9.2 The following approach to Re-instatement of conformance is applicable in the instance where locally fabricated equipment which have been out of service for an unknown amount of time:

a) complete a full statutory inspection on the equipment; including full dimensional checks;

b) confirm the intended design conditions and service. Then categorize the equipment accordingly;

c) confirm the availability of the equipment history and previous certification including

1) the dataplate, and

2) the equipment records such as design and drawings, certificate of manufacture,

d) Follow the route of re-instatement of conformance stipulated in (c) for in-service equipment should the equipment history be available. Take note that evidence of the service history, as well as design for the intended service is extremely important for the material selection.

D.9.3 If nothing listed in (a) to (d) is available; no re-instatement of conformance shall be done.

D.10 Documentation required as part of the re-instatement of conformance data package

D.10.1 In this instance, the user adopts the responsibility of the manufacturer as defined in the relevant national legislation (see foreword), the following documents shall be included into the data package as a minimum requirement:

a) the general arrangement drawing, giving all critical as-built dimensions, as well as proposed design conditions;

b) a complete set of calculations, approved by the user appointed professionally registered person, and verified by the approved inspection authority;

c) proof of hazard categorization in accordance with this standard, based on the intended service;

d) the certificate of manufacture, countersigned by the approved inspection authority;

e) a facsimile of the data plate or marking which shall conform to the requirements set out in the relevant national legislation (see foreword) and SANS 10019, as applicable;

f) the results of all non-destructive, as well as destructive examinations carried out on the equipment;

g) the baseline inspection report, including the visual inspection report, wall thickness report, and statutory inspection report. Baseline inspection shall be completed by the competent person (CP) inspector of the approved inspection authority; and

h) the pressure test report. Note that the pressure test shall be conducted in accordance with the relevant health and safety standard adopted and witnessed by the approved inspection authority.

D.10.2 Approved inspection authority shall confirm the equipment is satisfactorily protected against over-pressurization in accordance with the requirements of the relevant national legislation (see foreword).

D.10.3 Upon completion of the Re-instatement of conformance activities, the equipment shall be subjected to a complete pre-commissioning inspection and test prior to being commissioned into service.

D.10.4 The certificate of manufacture shall be issued by the user on its letterhead and signed by a person appointed in terms of the relevant national legislation (see foreword) or a supervisor of the premises where machinery is operated.

D.10.5 The certificate of manufacture shall be countersigned by the responsible approved inspection authority representative.

D.10.6 It is irrelevant whether equipment was fabricated locally or has been imported.

D.10.7 The approved inspection authority should at all times be aware of the intended service before commencing with any re-instatement of conformance activities. Special care should be taken where the intended service includes any one of the following:

a) lethal service;

b) cryogenic service;

c) hydrogen service; or

d) any other deteriorating services.

D.10.8 If a vessel that is re-instated requires any modification or repair during the re-instatement of conformance process, two certificates shall be issued:

a) the repair and modification manufacturer shall issue a certificate of repair and modification for those activities only; and

b) the user of the vessel, who is ultimately responsible for the re-instatement of conformance activities, shall issue the declaration of conformance.

Bibliography

Standards

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