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Summary of pages

This document comprises a front cover, an inside front cover, pages i to xx, pages 1/1 to 5/34, pages A/1 to Z/10, pages Al/1 to Ti/10, pages I to XIV, an inside back cover and a back cover.

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Foreword

Publishing information

This Published Document is published by BSI Standards Limited, under licence from The British Standards Institution, and came into effect on 30 April 2015. It provides a specification for the design, manufacture, inspection and testing of pressure vessels manufactured from carbon, ferritic alloy and austenitic steels, aluminium and aluminium alloys, copper and copper alloys, nickel and nickel alloys, and titanium and titanium alloys.

Supersession

PD 5500:2015+A1:2015 supersedes PD 5500:2015, which is withdrawn.

Information about this document

The start and finish of text introduced or altered by Amendment No. 1 is indicated in the text by tags 〉A1 〈A1. Minor editorial changes are not tagged but are provided as replacement pages. Details of the changes can be found in the Summary of Changes.

PD 5500 is updated annually and the DPC (draft for public comment) is normally issued in January each year. Users of the specification are encouraged to review and comment on the proposed amendments in the DPC. This can be done by registering on the BSI draft review website at http://drafts.bsigroup.com or by obtaining a hard copy from BSI Customer Services.

The form and content of the original issue of PD 5500 was derived, without technical amendment, from the 1997 edition of BS 5500, *Specification for unfired fusion welded pressure vessels*, and all amendments issued thereto, up to and including No. 6 (September 1999). At the time PD 5500 differed from BS 5500 only insofar as it did not retain the latter's status as a national standard. This specification is thus, founded on the experience derived from the application of BS 5500 and the first edition of PD 5500, providing an integrated set of rules which have been shown to provide vessels of suitable integrity for a wide range of duties and risk environments.

BS 5500:1997 was withdrawn because its status as a national standard was incompatible with BSI's obligations to CEN consequent to the development of the European Standard EN 13445, *Unfired pressure vessels*. That European Standard was first published in May 2002. A new edition of EN 13445 was published in July 2009.

The process of development of EN 13445 by CEN and its reference in the Official Journal of the European Communities creates, for equipment which conforms to that standard, a presumption of conformity with the essential safety requirements of the EU's pressure equipment directive, 97/23/EC (see article 5 of that directive). This Published Document does not provide that presumption of conformity. However, this Published Document can be used, for vessels within the scope of directives, subject to:

– adherence of the directive's conformity assessment requirements;

– the manufacturer satisfying himself that this PD covers all the technical requirements of the Directive relevant to the vessel in question.

This use may be to cover the full range of applicable vessel requirements or to cover an issue not, at the time, appropriately supported in EN 13345.

The normative form of wording is used in this Published Document, even though this does not have the status of a national standard, in order to ensure clarity in the definition of its requirements and recommendations.

Reference is made in the text to a number of standards which have been withdrawn. Such standards are identified in the list of references (see page V). Consideration is currently being given as to whether replacement standards are available or are being developed, for example, in the European programme, and to the implications for PD 5500 of such replacement standards. When a decision is made about any replacements standards, these will be identified by the issue of an amendment.

The British Standards Institution will be pleased to receive constructive proposals based on experience or research that may lead to improvements in this Published Document. PVE/1 intends to keep the content and technical status of this specification under review along with the need to publish appropriate supplements covering other types of pressure vessels. If there is sufficient demand from industry, this Published Document will be extended to cover other non-ferrous materials.

The requirements for materials not listed in Section 2. Materials, are given in supplements to the main text, which are to be read in conjunction with the main text so as to provide comprehensive requirements for pressure vessels produced in the relevant material. Annexes to the main text are provided which can be either normative (i.e. requirements) or informative (i.e. recommendations). These annexes can include additional requirements to the main text or informative guidance or recommendations, or can provide worked examples. Enquiry cases are published primarily to give guidance and clarification of possible ambiguities in the main text and will be incorporated into the main text or into an annex at an appropriate stage. Some Enquiry cases are published to provide new information and are identified as "preliminary rules".

It should be noted that the effective date of amendments to this Published Document will be later than the publication date to allow users time to amend their own working procedures and documentation. See the introduction to the summary of pages table.

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Figure G.2.5-1 was originally published as Figure 2 on page 21 of WRC Bulletin 90 September 1963.

Figure G.2.5-2 was originally published as Figure 3 on page 21 of WRC Bulletin 90 September 1963.

Figure G.2.5-3 was originally published as Figure 7 on page 24 of WRC Bulletin 90 September 1963.

Figure G.2.5-4 was originally published as Figure 8 on page 24 of WRC Bulletin 90 September 1963.

Figure G.2.5-5 was originally published as Figure 9 on page 25 of WRC Bulletin 90 September 1963.

Figure G.2.5-6 was originally published as Figure 10 on page 25 of WRC Bulletin 90 September 1963.

Figure G.2.5-7 was originally published as Figure 11 on page 26 of WRC Bulletin 90 September 1963.

Figure G.2.5-8 was originally published as Figure 12 on page 26 of WRC Bulletin 90 September 1963.

Figure G.2.6-1 to Figure G.2.6-8 are reproduced by courtesy of the *International Journal of Solids and Structures*, 1967.

This document may be referred to by the UK Health and Safety Executive (HSE) when giving guidance.

Contractual and legal considerations

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a Published Document cannot confer immunity from legal obligations.

Summary of Changes

This specification is kept up to date by the issue, from time to time, of replacement pages.

Tags (〈A1〉 〈A1〉) on replacement pages will indicate that changes of technical reference significance have been made at that point. The tags applied for any particular amendment or corrigendum carry the same designation number, commencing with 1 for the first amendment, then 2 for the second amendment, and 1 for the first corrigendum, then 2 for the second corrigendum, and so on. Minor editorial changes are not tagged.

The following table identifies for each page of the specification whether or not an amendment or corrigendum has been made to that page and the designation number of the amendment or corrigendum made. Each amended page becomes part of the authorized version at the effective date given for each amendment or corrigendum on the inside front cover.

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iii to xx	Amendment 1
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2/1 to 2/26	No amendment
2/27 to 2/28	Amendment 1
2/29 to 2/30	No amendment
Section 3	
3/1 to 3/46	No amendment
3/47 to 3/50	Amendment 1
3/51 to 3/122	No amendment
3/123 to 3/124	Amendment 1
3/125 to 3/138	No amendment
3/139 to 3/140	Amendment 1
3/141 to 3/190	No amendment
3/191 to 3/192	Amendment 1
3/193 to 3/198	No amendment
3/199 to 3/200	Amendment 1
3/201 to 3/234	No amendment
Section 4	
4/1 to 4/10	No amendment
4/11 to 4/12	Amendment 1
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Section 5	
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C/1 to C/8	No amendment
C/9 to C/10	Amendment 1
C/11 to C/14	No amendment
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D/5 to D/8	Amendment 1
D/9 to D/22	No amendment
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D/25 to D/28	No amendment
Annex E	
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Annex G	
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W/83 to W/84	Amendment 1
Annex X	
X/1 to X/2	Amendment 1
Aluminium supplement	
Al/1 to Al/14	No amendment
Al/15 to Al/16	Amendment 1
Al/17 to Al/26	No amendment

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List of references	
V to XIV	Amendment 1
Enquiry Case 127	
EC/1 to EC/2	No amendment
EC/3 to EC/6	Amendment 1
EC/7 to EC/12	No amendment
Enquiry Case 134	
EC/1 to EC/2	Amendment 1
Enquiry Case 139	
EC/1 to EC/22	Amendment 1

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Section 1. General

1.1 Scope

1.1.1 This Published Document specifies requirements for the design, construction, inspection, testing and verification of compliance of new unfired fusion welded pressure vessels. The materials of construction are specified in Section 2. The term "pressure vessel" as used in this specification includes branches up to the point of connection to the connecting piping by bolting, screwing or welding, and supports, brackets or other attachments directly welded to the pressure containing shell. The term "unfired" excludes vessels that are subject to direct generated heat or flame impingement from a fired process. It does not exclude vessels subject to electrical heating or heated process streams.

NOTE Whilst this specification is limited to the construction of new vessels, with the agreement of the relevant parties it can be used to guide the maintenance or any modification of existing vessels. Where these existing vessels were designed and constructed using an earlier edition of PD 5500, with the agreement of the relevant parties, that earlier edition can be used to guide the maintenance or any modification.

1.1.2 In addition to the definitive requirements this specification also requires the items detailed in **1.5** to be documented. For compliance with this specification, both the definitive requirements and the documented items have to be satisfied.

1.1.3 This specification applies only to pressure vessels manufactured under the survey of a competent engineering Inspecting Authority or Organization. The competent engineering Inspection Authority or Organization shall either be:

a) a notified body appointed by a member state of the European Union for the Pressure Equipment Directive 97/23/EC for the range of activities covered by this specification; or

NOTE Within the UK the United Kingdom Accreditation Service (UKAS) acts on behalf of the regulating authority in accrediting inspection bodies.

b) accredited to BS EN 45004, to Type A independence criteria, for inspection in the subject matter of this specification; or

c) accredited by an organization authorized by the local Regulatory Authority in countries outside the EU and in circumstances where the Pressure Equipment Directive 97/23/EC does not apply.

The intent of this requirement is regarded as satisfied where inspection is carried out by competent personnel of a separate engineering inspection department maintained by the purchaser of the vessel (in which case Type B independence criteria shall be met). An inspection department maintained by the manufacturer does not satisfy this requirement except:

a) that specific responsibilities may be delegated at the discretion of the Inspecting Authority or Organization; or

b) in the case of vessels for the manufacturer's own use and not for resale.

This specification applies only to vessels made by manufacturers who can satisfy the Inspecting Authority or Organization that they are competent and suitably equipped to fulfil the appropriate requirements of this specification.

The requirements for testing and inspecting serially manufactured pressure vessels are given in Annex V. In all other respects the appropriate requirements in the specification apply.

Glass lined steel vessels require special design considerations subject to the limits imposed by the method of construction which should have the agreement of the Inspecting Authority.

1.1.4 This specification does not cover the following.

a) Storage tanks designed for the storage of liquids at near atmospheric pressures, i.e. where the pressure additional to that due to the hydrostatic head does not exceed 140 mbar[1)] above or 6 mbar below atmospheric pressure.

b) Low pressure, above ground storage tanks which have a single vertical axis of revolution designed for the storage of liquids at a pressure not exceeding 1 bar[1)] .

c) Vessels in which the stresses calculated in accordance with the Equations given in Section 3 are less than 10 % of the design stress permitted by Section 3.

d) Multilayered, autofrettaged, prestressed vessels or other special designs of vessels which may be appropriate for very high pressures.

e) Transport vessels, i.e. vessels used for transport of contents under pressure.

f) Vessels for specific applications which are covered by standards listed in the *BSI Catalogue*.

NOTE 1 PD 5500 may be used for the design and manufacture of liquid and bulk powder road tankers, provided consideration is given to the following:

– *chapter 6.8.2 of ADR (European Agreement concerning International Carriage of Dangerous Goods by Road); in particular relating to static and dynamic stresses in motion, protection of the shell and supports and fittings, minimum thickness and the provision of anti-surge plates;*

– *chapter 9.7.5.1 of ADR relating to stability.*

BS 3441 gives guidance on the design and construction of tanks for the transport of milk and liquid milk products.

Road tankers used to transport non-hazardous substances in the UK and which operate at a pressure above 0.5 bar are subject to the Pressure Systems Safety Regulations, 2000 (SI 128).

NOTE 2 See Note 1 of 3.2.2 regarding the applicability of PD 5500 Section 3 to thick walled vessels.

NOTE 3 The titles of the publications referred to in this specification are listed at the end of the document.

1.1.5 This specification does not address the nature or consequences of a fire in the vicinity of a pressure vessel. Any consideration of the effect of a fire hazard in the design of a pressure vessel would have to be under the direction of the plant owner or his responsible agent such as the plant architect/engineer, with analysis of the consequences of a fire adjacent to a pressure vessel being undertaken in accordance with a comprehensive specification of the fire conditions, impingement parameters, analytical methods and assessment criteria.

1.1.6 This specification addresses materials in various ways.

a) The main text gives requirements for steels.

[1)] 1 mbar = 10^2 N/m^2 = 100 Pa.
1 bar = 10^5 N/m^2 = 0.1 N/mm^2 = 100 kPa.

b) Certain other materials are covered by supplements which identify either where the main text is applicable or where specific requirements of the supplement apply.

1.1.7 When another standard or specification calls for the provisions of PD 5500 to be applied, the responsibility for defining the manner in which the provisions are applied and their appropriateness for the intended duty, is defined in that other document.

1.1.8 Guidance on the application of PD 5500 to pressure vessels that fall within the scope of the European Pressure Equipment Directive is given in Annex Z.

1.2 Interpretation

If any ambiguity be found or doubt arise as to the meaning or effect of any part of this specification or as to whether anything ought to be done or omitted to be done in order that this specification should be complied with in full, the question shall be referred to the Pressure Vessels Technical Committee (PVE/1) of the British Standards Institution, whose interpretation of the requirements of this specification upon the matter at issue shall be given free of charge and shall be final and conclusive. Parties adopting this specification for the purposes of any contract shall be deemed to adopt this provision unless they expressly exclude it or else import an arbitration provision in terms extending to interpretation of this specification. However, this provision is limited to questions of interpretation and does not confer upon the committee any power, duty or authority to adjudicate upon the contractual rights or duties of any person under a contract except in so far as they may necessarily be affected by the interpretation arrived at by the committee.

Findings or rulings of the committee upon all enquiries, including matters of interpretation, which are of sufficient importance that both enquiries and replies be made public as soon as possible will be published in an enquiry reply form for inclusion in the PD 5500 ring binder as Enquiry Cases. Their availability will be notified in *Update Standards.*

After taking into account any public comment thereon, Enquiry Cases may be incorporated, as appropriate, into this specification as amendments which will form part of the next convenient annual updating.

1.3 Definitions

For the purposes of this specification the following definitions apply.

1.3.1 purchaser

the organization or individual who buys the finished pressure vessel for its own use or as an agent for the owner

1.3.2 manufacturer

the organization that designs, constructs and tests the pressure vessel in accordance with the purchaser's order. The design function may be carried out by the purchaser or his agent, independently from the organization that constructs and tests the vessel (see **1.4.2**)

1.3.3 Inspecting Authority

the body or organization that verifies that the vessel has been designed, constructed and tested in accordance with this specification