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Specification for unfired pressure vessels

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- Copper supplement: Requirements for copper and copper alloys in the design and construction of unfired pressure vessels *Cu/1*
- Duplex supplement: Requirements for duplex and super duplex steels (austenitic-ferritic stainless steels) in the design and construction of unfired pressure vessels *Du/1*
- Nickel supplement: Requirements for nickel and nickel alloys in the design and construction of unfired pressure vessels *Ni/1*
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Summary of pages

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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 31 January 2021. 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, titanium and titanium alloys, and duplex and super duplex steels.

Supersession

PD 5500:2021+A1:2021 supersedes PD 5500:2021, which is withdrawn.

Information about this document

As part of the changes made at Amendment 3 of PD 5500:2018, the title of this standard changed from "Specification for unfired fusion welded pressure vessels" to "Specification for unfired pressure vessels".

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 standards development portal at <https://standardsdevelopment.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 ^[A1] was published in ^[A1] 2021.

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, 2014/68/EU (see article 12 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.

^[A1] Following the UK's withdrawal from the EU, the PED 2014/68/EU, as implemented by the Pressure Equipment (Safety) Regulations 2016, is no longer applicable for vessels placed on the market in Great Britain (England, Scotland and Wales). For pressure vessels placed on the market in Northern Ireland, the PED, as implemented by the Pressure Equipment (Safety) Regulations 2016, as

modified by Schedule 2 of The Pressure Vessels (Amendment) (Northern Ireland) (EU Exit) Regulations 2020 is still applicable – see 1.1.3, 1.4 and Annex Z. 

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.

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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) and (A11) 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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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 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 ^{A1} (see 1.3.3 and 1.4.3) ^{A1}. The competent engineering Inspection Authority or Organization shall ^{A1} be one of the following ^{A1}:

^{A1}

- a) an organization accredited to BS EN ISO/IEC 17020:2012, to Type A independence criteria, for inspection in the subject matter of this specification, for pressure vessels placed on the market; or
- b) competent personnel of a separate engineering inspection department maintained by the purchaser of the vessel and accredited to BS EN ISO/IEC 17020:2012, to Type B independence criteria, for inspection in the subject matter of this specification, for pressure vessels for the purchaser’s own use and not for resale. An inspection department maintained by the manufacturer does not satisfy this requirement except:
 - 1) that specific responsibilities may be delegated at the discretion of the Inspecting Authority or Organization; or
 - 2) in the case of vessels for the manufacturer’s own use and not for resale; or
- c) an organization accredited by the local Regulating Authority in countries outside the UK and the EU and in circumstances where the Pressure Equipment (Safety) Regulations 2016 (PER) and the Pressure Equipment Directive 2014/68/EU (PED) do not apply. ^{A1}

^{A1} Text deleted ^{A1}