Specification for design and construction of ferrous piping installations for and in connection with land boilers

Calcul et construction des installations de conduites en métaux ferreux pour chaudières — Spécifications

Bauart und Konstruktion von Eisenrohrleitungssystemen für ortsfeste Heizkessel

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Committees responsible for this British Standard

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British Compressed Gases Association
British Fire Protection Systems Association Ltd.
British Gas plc
British Steel Industry
Copper Development Association
Electricity Association
Energy Industries Council
Engineering Equipment and Materials Users Association
Health and Safety Executive
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Summary of pages

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Contents

Foreword

This British Standard, first published in 1938 and subsequently revised in 1942, 1954, 1967, 1975, 1986 and 1990, has been prepared under the direction of the Pressure Vessel Standards Policy Committee. It supersedes the 1990 edition which is withdrawn.

This British Standard forms one of a series for boiler installations, the others in the series being:

BS 1113 Specification for design and manufacture of water-tube steam generating plant (including superheaters, reheaters and steel tube economizers)

BS 2790 Specification for design and manufacture of shell boilers of welded construction

For information on the materials and the standard sizes of steel pipes applicable to this standard, reference should be made to the following standards.

BS 1387 Specification for screwed and socketed steel tubes and tubulars and for plain end steel tubes suitable for welding or for screwing to BS 21 pipe threads

BS 3600 Specification for dimensions and masses per unit length of welded and seamless steel pipes and tubes for pressure purposes

BS 3601 Specification for carbon steel pipes and tubes with specified room temperature properties for pressure purposes

BS 3602 Specification for steel pipes and tubes for pressure purposes: carbon and carbon manganese steel with specified elevated temperature properties

Part 1 Specification for seamless and electric resistance welded including induction welded tubes

Part 2 Specification for longitudinally arc welded tubes

BS 3604 Steel pipes and tubes for pressure purposes: ferritic alloy steel with specified elevated temperature properties

Part 1 Specification for seamless and electric resistance welded tubes

Part 2 Specification for longitudinally arc welded tubes

BS 3605 Austenitic stainless steel pipes and tubes for pressure purposes

Part 1 Specification for seamless tubes

Integral pipework for water-tube boilers as determined in the scope and definition clauses of BS 1113 is excluded from this standard and is dealt with in BS 1113.

The 1993 edition incorporates all technical changes up to and including Amendment No. 4 (15 Dec 1992) associated with the 1990 edition. Changes of significance in these amendments have included the development of the following:

(a) matching of pipe bores and outside diameters for butt welding;

(b) changes to the hydrostatic test;

(c) issue of appendices for flexibility, evaluation of stresses in branches subject to moment load, and design by analysis;

(d) issue of enquiry cases for the use of butt welding pipe fittings, and testing of pipe bends.

In this standard pressures are expressed as 'gauge' unless otherwise stated.

Fluid pressure is expressed in bar except in the case of calculations where N/mm^2 is used. 1 bar = 0.1 N/mm^2 = 100 kPa.

A format has been adopted that will facilitate amendment. It is intended to keep this standard up to date by the issue of replacement or additional pages when necessary. Each replacement or added page will carry an issue number (with date) indicating its relationship to the original issue of this standard, the pages of which are marked 'Issue 1'. For example:

Issue 1 will indicate an original page of, or one that has been added to, the original issue of this standard and has not been amended since insertion;

Issue 2 will indicate a first amendment of either an original page or an added page;

Issue 3 will indicate a second amendment of either an original page or an added page.

Side lining on replacement pages will indicate that changes of technical or reference significance have been made at that point.

This British Standard sets forth engineering requirements deemed necessary for the design and construction of ferrous pipework for and in conjunction with land boilers.

Because of the wide range of pipes and piping installations that may be designed and manufactured in accordance with this standard, general guidance has been given on some aspects with specific requirements being for agreement between the parties concerned according to the particular design and manufacturing details. The purpose of this standard, however, is unchanged from previous editions.

It has been assumed in the drafting of this British Standard that the execution of its provisions is entrusted to appropriately qualified and experienced people.

The purchaser is recommended as an aid to demonstrating the pipework supplier's capability of achieving the required quality level, to specify in his contract, that the manufacturer operates a quality system in compliance with the appropriate Parts of BS 5750.

This standard is included in the list of 'Standards significant to Health and Safety at Work' published by the UK Health and Safety Executive (HSE)* and is also referred to by HSE in giving guidance.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

* Health and Safety Executive, Baynards House, 1 Chepstow Place, London, W2 4TF.

Section one. General

1.1 Scope

This British Standard specifies requirements for the design and construction, including materials and design parameters, workmanship, inspection and testing, for ferrous pipes and piping installations for and in connection with land boilers.

This standard applies to the following.

(a) The ferrous pipework connecting steam generating plant to engine, turbine or industrial plant and all ancillary steam and water pipework in connection therewith.

(b) The pipes and pipe fittings forming parts of the installations described in (a) for:

(1) pipes of any bore, where the pressure exceeds 3.5 bar; and

(2) pipes over 250 mm bore for steam at pressures up to and including 3.5 bar.

NOTE 1. The term 'pipe fitting' used in this standard includes tees, elbows and special components, but excludes valves and everything covered by BS 759 and BS 6759.

(c) Ferrous pipes and piping installations constructed in materials used up to the design temperature limits given in table 3.2.

This standard does not apply to the component parts of the boiler unit or to integral piping which are dealt with in BS 1113.

NOTE 2. Attention is drawn to the safety requirements specified in section seven of BS 1113 : 1992 for certain valves and fittings which may require installation in piping systems beyond the scope of BS 1113.

NOTE 3. The titles of the publications referred to in this standard are listed on the last page.

1.2 Interpretation

If any ambiguity is found or doubt arises as to the meaning or effect of any part of this standard or as to whether anything ought to be done or omitted in order to comply with this standard in full, the question shall be referred to the Piping Systems Technical Committee (PVE/10) of the British Standards Institution, whose interpretation of the requirements of this standard upon the matter at issue will be given free of charge and shall be accepted as final and conclusive. Parties adopting this standard for the purposes of any contract shall be deemed to have accepted this provision unless by their contract they either expressly exclude it or else include an arbitration provision extending the interpretation of this standard; however, this provision shall be limited to interpretation and shall not confer upon the committee any power or jurisdiction 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 interpretations arrived at by the committee.

Findings or rulings of the committee upon all enquiries, including matters of interpretation, that are of sufficient importance for both enquiries and replies to be made public as soon as possible will be published in an enquiry-reply form for inclusion in the BS 806 ring-binder as Enquiry Cases. Their availability will be notified in *BSI News*.

After taking into account any public comment thereon, Enquiry Cases will be incorporated, if appropriate, into the standard either by amendment or in the course of the next convenient annual updating.

1.3 Definitions and prime symbols

1.3.1 Definitions

For the purposes of this British Standard the following definitions apply.

1.3.1.1 purchaser. The organization or individual who buys the finished piping installation for its own use or as an agent for the owner.

1.3.1.2 manufacturer. The organization that designs, fabricates and erects the piping installation in accordance with the purchaser's order. The design, fabrication and erection functions may be carried out by separate organizations.

1.3.2 Prime symbols

The prime symbols used in the equations in this British Standard are defined as follows.

D mean outside diameter* of the pipe (in mm)

d mean inside diameter* of the pipe (in mm). This should not be confused with nominal size, which is an accepted designation associated with outside diameters of standard rolling sizes.

t_f minimum thickness of the pipe calculated by the appropriate equation (in mm)

t_b minimum thickness of the pipe before bending, i.e. t_f + bending allowance (in mm)

t_m minimum thickness of the branch or main at the branch position (in mm)

t mean thickness based on limiting thickness tolerances of the ordered pipe (in mm)

T design temperature (in °C)

p design pressure (in N/mm^2)

f maximum permissible design stress (in N/mm^2)

P_t hydraulic test pressure (in N/mm^2)

1.4 Information and requirements to be agreed and to be documented

1.4.1 Information to be supplied by the purchaser

The following information shall be supplied by the purchaser and shall be fully documented. Both the definitive requirements specified throughout this standard and the documented items shall be satisfied before a claim of compliance with the standard can be made and verified.

* The mean diameter for the purposes of calculation is the diameter midway between the maximum and minimum diameters possible using tolerances specified in the tube manufacturing specifications.