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BRITISH STANDARD

BS EN
12953-1:2002

Shell boilers —

Part 1: General

The European Standard EN 12953-1:2002 has the status of a British Standard

ICS 27.060.30; 27.100

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National foreword

This British Standard is the official English language version of EN 12953-1:2002. It partially supersedes BS 2790:1992 which will be withdrawn on publication of BS EN 12953 Parts 1, 2, 3, 4, 5, 6, 8 and 9.

When the reference to this European Standard has been published in the Official Journal of the European Communities (OJ), compliance with it will confer a presumption of conformity with the essential requirements covered by the standard in respect of the Pressure Equipment Directive.

The UK participation in its preparation was entrusted to Technical Committee PVE/16, Shell boilers, which has the responsibility to:

— aid enquirers to understand the text;

— present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;

— monitor related international and European developments and promulgate them in the UK.

A list of organizations represented on this committee can be obtained on request to its secretary.

Cross-references

The British Standards which implement international or European publications referred to in this document may be found in the *BSI Catalogue* under the section entitled "International Standards Correspondence Index", or by using the "Search" facility of the *BSI Electronic Catalogue* or of British Standards Online.

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This British Standard, having been prepared under the direction of the Engineering Sector Policy and Strategy Committee, was published under the authority of the Standards Policy and Strategy Committee on 14 June 2002

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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 12953-1

May 2002

ICS 27.060.30; 27.100

English version

Shell boilers - Part 1: General

Chaudières à tubes de fumée - Partie 1: Généralités

Großwasserraumkessel - Teil 1: Allgemeines

This European Standard was approved by CEN on 14 March 2002.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Management Centre has the same status as the official versions.

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Ref. No. EN 12953-1:2002 E

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Foreword

This document EN 12953-1:2002 has been prepared by Technical Committee CEN/TC 269 "Shell and water-tube boilers", the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by November 2002, and conflicting national standards shall be withdrawn at the latest by November 2002.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association and supports essential requirements of the Pressure Equipment Directive (PED) [1].

For the relationship with the Pressure Equipment Directive see informative annex ZA, which is an integral part of this document.

The European Standard EN 12953 concerning shell boilers consists of the following parts:

- *Part 1: General.*
- *Part 2: Materials for pressure parts of boilers and accessories.*
- *Part 3: Design and calculation for pressure parts.*
- *Part 4: Workmanship and construction of pressure parts of the boiler.*
- *Part 5: Inspection during construction, documentation and marking of pressure parts of the boiler.*
- *Part 6: Requirements for equipment for the boiler.*
- *Part 7: Requirements for firing systems for liquid and gaseous fuels for the boiler.*
- *Part 8: Requirements for safeguards against excessive pressure.*
- *Part 9: Requirements for limiting devices of the boiler and accessories.*
- *Part 10: Requirements for boiler feedwater and boiler water quality.*
- *Part 11: Acceptance tests.*
- *Part 12: Requirements for firing systems for solid fuels for the boiler.*
- *Part 13: Operating instructions.*

CR 12953-14, *Shell boilers - Guideline for the involvement of an inspection body independent of the manufacturer*.

Although these parts may be obtained separately, it should be recognized that the parts are inter-dependent. As such, the design and manufacture of shell boilers requires the application of more than one part in order for the requirements of the European Standard to be satisfactorily fulfilled.

The annexes A and B of this European Standard are informative.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

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1 Scope

1.1 General

This European Standard specifies the design, construction, equipment, operational and water treatment requirements drawn up with a view to ensuring the operating safety of new stationary shell boiler plants.

This European Standard includes the requirements for the prevention of over-heating and inadmissible over-pressurisation.

1.2 Boiler plants

A boiler plant consists of:

a) the shell boiler including all pressure parts from the feedwater inlet (including the inlet valve) to the steam and/or hot-water outlet (including the outlet valve). This includes economisers, superheaters and associated connecting pipes which are heated by flue gas and are not separated from the main system by intervening shut-off devices. Also included is any piping connecting the boiler to and including the first isolating valve;

b) isolated economisers, superheaters and associated connecting pipes;

c) expansion vessels and/or expansion tanks for plants for hot water production;

d) thermal insulation and/or refractory and cladding;

e) installations for heat supply and heating;

f) installations for processing and feeding the fuel into the boiler;

g) installations for the air supply of the boiler including the fans;

h) installations for the feedwater supply of the boiler;

i) all control and safety systems.

This European Standard specifies requirements for both directly fired and electrically heated boilers including low pressure boilers (LPB, see 3.7) as well as for waste-heat boilers with a gas-side pressure not exceeding 0,5 bar[1)] of cylindrical design, constructed from carbon or carbon manganese steels by fusion welding and a design pressure not exceeding 40 bar[1)]. The boilers covered by this European Standard are intended for land use for providing steam or hot water (typical examples are shown in Figures 1.2-1 to 1.2-5).

Where a particular boiler is a combination of shell boiler and water-tube boiler design, then the water-tube boiler standard EN 12952 is used in addition to this European Standard. One such example of this combination is shown in Figure 1.2-2.

This European Standard applies to the boiler proper, from the feed-water inlet connection to the steam outlet connection and to all other connections, including the valves and steam and water fittings. If welded ends are used, the requirements specified herein begin or end at the weld where flanges, if used, would have been fitted.

This European Standard applies to boilers having a capacity of greater than 2 l, a maximum allowable pressure greater than 0,5 bar and with a maximum design temperature in excess of 110 °C.

For Low Pressure Boilers (LPB) less stringent requirements concerning design and calculation are acceptable. Details are defined in the respective clauses.

The boiler plant comprises, besides the boiler proper as described above, all pieces of equipment necessary for the intended mode of operation, for which requirements have been laid down in the different parts of this European Standard.

[1)] For boilers operating at pressure greater than those stated the rules of this standard equally apply. However, it is generally considered that additional design analysis, inspection and testing may be necessary.

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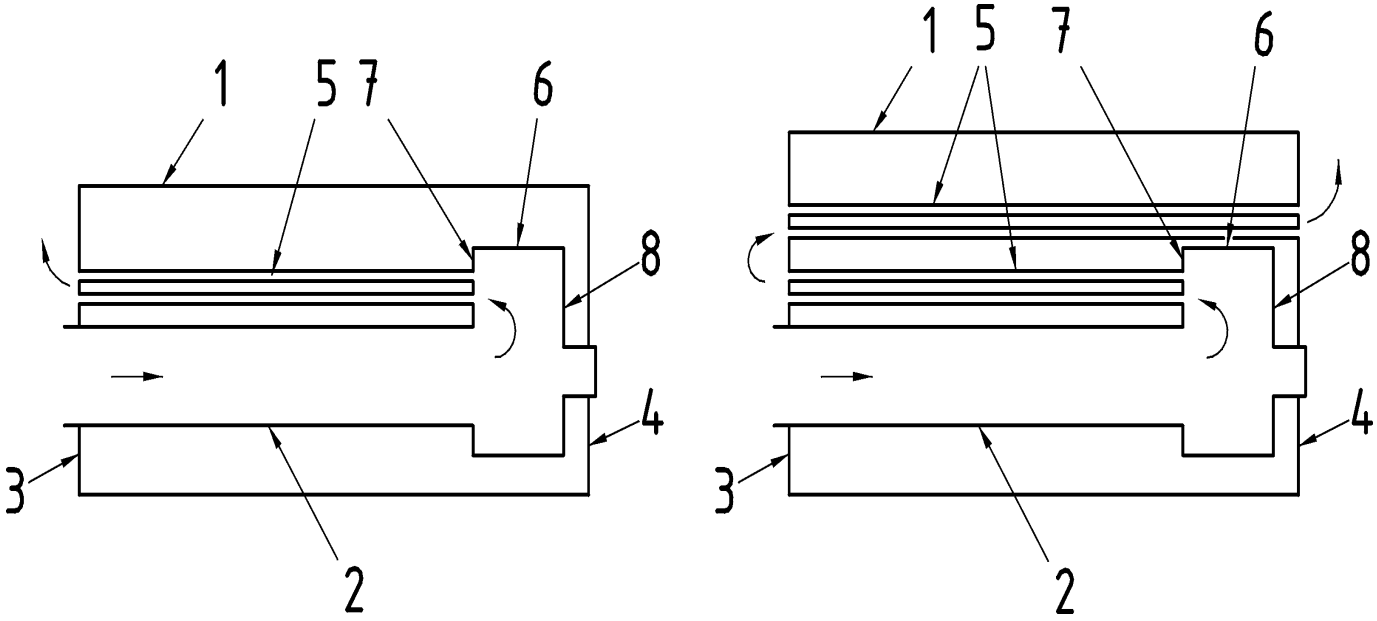


a) two pass boiler

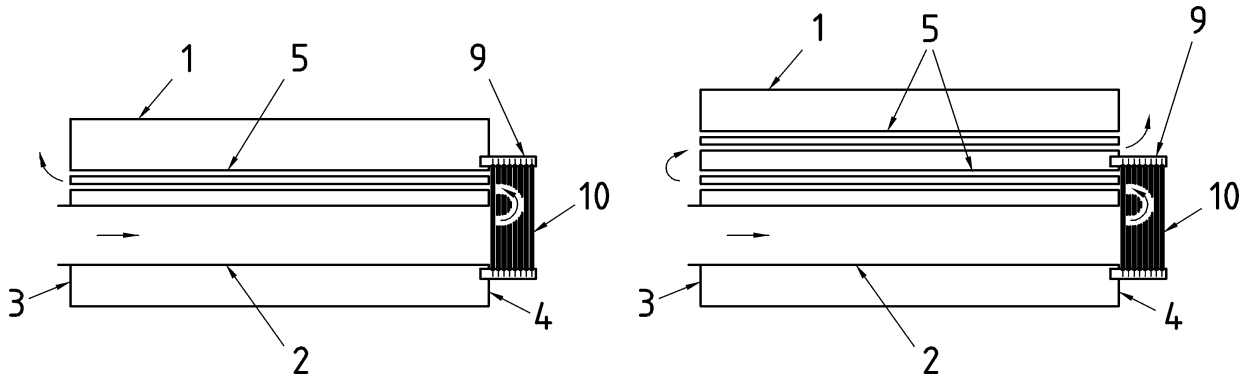
b) three pass boiler

Key

1 cylindrical shell
2 furnace tube (1st pass)
3 front tube plate
4 rear plate
5 smoke tube(s)
6 wrapper plate
7 reversal chamber tube plate
8 wet back rear plate
9 header
10 tube wall
11 refractory

NOTE The effective radiant heating surface comprises the furnace tube and the surface of the reversal chamber, where applicable.

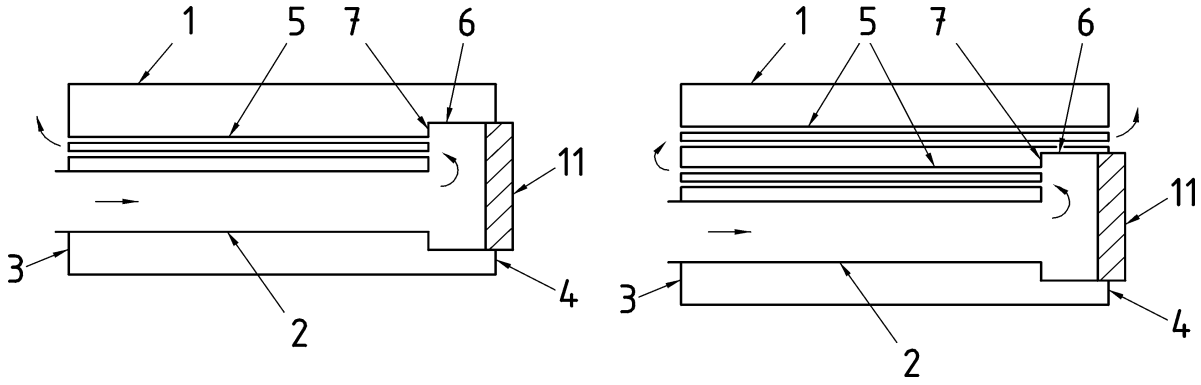
Figure 1.2-1 — Wet back boiler with internal reversal chamber



a) two pass boiler b) three pass boiler

NOTE The effective radiant heating surface comprises the furnace tube and complete surface of the reversal chamber.

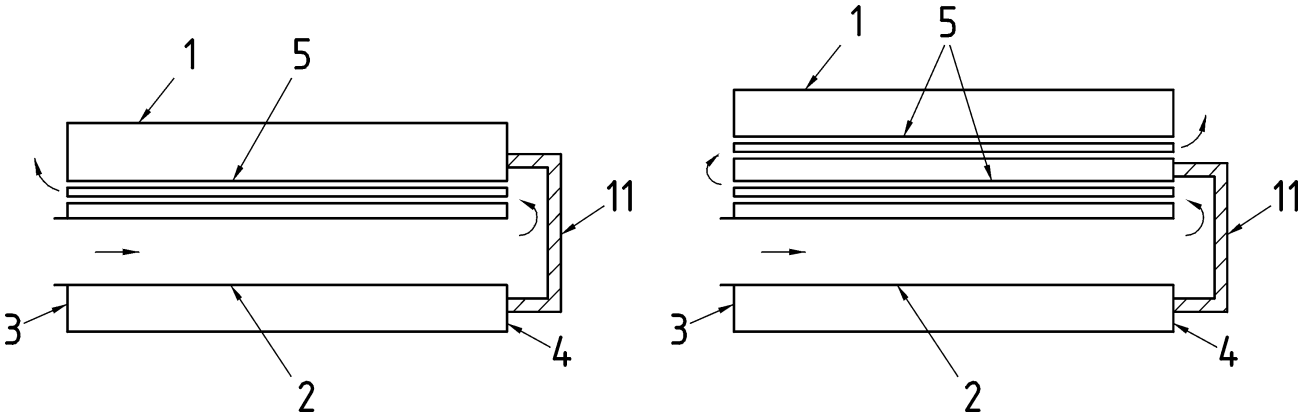
Figure 1.2-2 — Wet back boiler with external reversal chamber



a) two pass boiler b) three pass boiler

NOTE The effective radiant heating surface comprises the furnace tube wrapper plate and reversal chamber tube plate.

Figure 1.2-3 — Semi-wet back boiler



a) two pass boiler b) three pass boiler

NOTE The effective radiant heating surface comprises the furnace tube and rear tube plate.

Figure 1.2-4 — Dry back boiler

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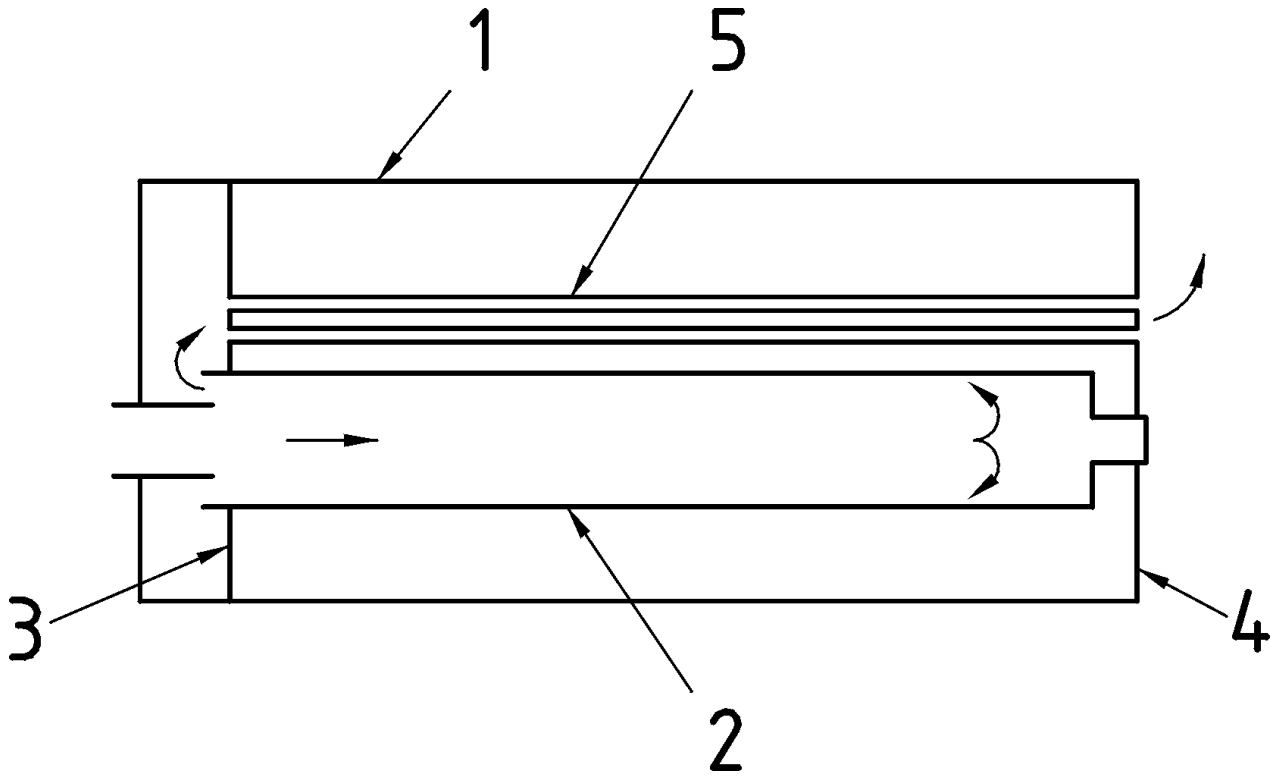

NOTE The effective radiant heating surface consists of the furnace only

Figure 1.2-5 — Reverse flame boiler

1.3 Exclusions

This European Standard does not apply to water-tube boilers, coil boilers, to boilers for railway locomotives, or to marine boilers. This standard does not cover brickwork setting and insulation.

However, no construction code can be sufficiently detailed in order to guarantee, in all cases, the necessary operational safety. It is therefore the manufacturer's responsibility, in addition to complying with the requirements of this European Standard, to take into consideration the special measures which could be necessary in order to obtain the required level of safety.

Be that as it may, the safety and reliability of a boiler complying with the requirements of this standard and with the additional precautions which may possibly be taken by the manufacturer can only be guaranteed if the feedwater and boiler water are in accordance with the requirements of prEN 12953-10 and if the boiler is correctly operated and maintained. To achieve this, the instructions given by the manufacturer in the operating and maintenance manuals are followed.

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2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text, and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references, the latest edition of the publication referred to applies (including amendments).

EN 764, *Pressure equipment — Terminology and symbols — Pressure, temperature, volume.*

prEN 764-3:1998, *Pressure equipment — Part 3: Definition and parties involved.*

EN 12952, *Water-tube boilers and auxiliary installations.*

EN 12953-3:2002, *Shell boilers — Part 3: Design and calculation.*

prEN 12953-10, *Shell boilers — Part 10: Requirements for feedwater and boiler water quality.*

CR 12953-14, S*hell boilers - Part 14: Guideline for the involvement of an inspection body independent of the manufacturer*.

3 Terms and definitions

For the purposes of this European Standard, the terms and definitions of EN 764, prEN 764-3 and the following apply.

3.1
purchaser
individual or organization that buys the completed boiler plant or part thereof from the manufacturer [EN 12952-1]

3.2
manufacturer
individual or organization responsible for the design, fabrication, testing, installation where relevant, and compliance with the requirements of this standard whether executed by him or a subcontractor, see EN 12952-1

3.3
designer
individual or organization that, on behalf of the manufacturer, carries out the design of the boiler plant and the designer determines the shape, dimensions and thicknesses of the boiler plant components, selects the materials and details the methods of construction and testing [EN 12952-1]

3.4
material supplier
individual or organization, not being a material manufacturer, that supplies material or prefabricated parts to be used in the construction of the boiler plant or any component thereof [EN 12952-1]

3.5
material manufacturer
individual or organization that produces the basic material for the fabrication of boiler plant components or prefabricated standardized parts [EN 12952-1]

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3.6
responsible authority
this standard identifies the involvement of competent organisations which are independent of the manufacturer. Such organisations may be notified bodies, recognised third-party organisations or user inspectorates. For the purpose of this standard all these organisations have been collectively termed responsible authorities (RA) (see also EN 12952-1)

NOTE 1 The definition of a notified body and the criteria controlling its operation are given respectively in article 12 and Annex IV of the Pressure Equipment Directive.

NOTE 2 The definition of a recognized third-party organisation and the criteria controlling its operation are given respectively in article 13 and Annex IV of the Pressure Equipment Directive.

NOTE 3 The definition of a user inspectorate and the criteria controlling its operation are given respectively in article 14 and annex V of the Pressure Equipment Directive.

NOTE 4 The responsibility of the manufacturer is described in 3.2.

3.7
low pressure boilers (LPB)
steam boilers with a maximum saturation temperature of 120 °C (this corresponds to a pressure of 1 bar gauge) or hot water generators with a maximum outlet temperature of 120 °C and a maximum allowable pressure of 10 bar gauge

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4 Symbols and abbreviations

For the purposes of this European Standard, the general symbols and abbreviations indicated in Table 4-1 shall apply.

Table 4-1 — Symbols and abbreviations

Symbol	Description	Unit
A	Effective radiant heating surface (see Figures 1.2-1 to 1.2-5)	m^2
A_f	Cross-sectional area effective as compensation without consideration of allowances	mm^2
A_{fb}	Cross-sectional area of branch effective as compensation	mm^2
A_{fp}	Cross-sectional area of reinforcing pad effective as compensation	mm^2
A_{fs}	Cross-sectional area of main body effective as compensation	mm^2
A_p	Pressure-loaded area without consideration of allowances	mm^2
A_{pb}	Pressure-loaded area relative to branch	mm^2
A_{ps}	Pressure-loaded area relative to main body	mm^2
A_t	Original cross-sectional area of test piece subjected to a tensile test	mm^2
a	Dimensions indicated in Figures 10.1-1, 10.2-2 to 10.2-4 of EN 12953-3:2002	mm
a_i	Inner major axis of compensation plate	mm
a_o	Outer major axis of compensating plate	mm
b	Dimensions indicated in Figures 10.1-1, 10.2-2 to -10.2-5, 13.4-1 and 13.4-2 of EN 12953-3:2002	mm
b_1	Minor axis of manhole	mm
b_i	Inner minor axis of compensating plate	mm
b_o	Outer minor axis of compensating plate	mm
C	Shape factor	—
C_1	Shape factor for unstayed walls, ends or plates as given in 9.3 of EN 12953-3:2002	—
c_1	Minus tolerance on the ordered nominal wall thickness	mm
c_2	Allowance for metal wastage	mm
D_b	Gasket mean diameter	mm
D_L	Bolt circle diameter	mm
d	Diameter of tube hole	mm
d_g	Depth of welded-on girder stay	mm
d_i	Inside diameter	mm
d_{ib}	Inside diameter of branch without allowances	mm
d_{ip}	Diameter of inner periphery of circular pad or compensating plate	mm
d_{is}	Inside diameter of main body (cylindrical shell, spherical shell or dished end) without allowances	mm

(continued)

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Table 4-1 (continued)

Symbol	Description	Unit
d_m	Mean diameter	mm
d_o	Outside diameter	mm
d_{ob}	Outside diameter of branch without allowances	mm
d_{op}	Diameter of outer periphery of circular pad of compensating plate	mm
d_{os}	Outside diameter of main body without allowances	mm
d_s	Diameter of stay	mm
E	Modulus of elasticity at design temperature	N/mm^2
e	Wall thickness	mm
e_{cb}	Required wall thickness of branch or nozzle without allowances	mm
e_{cf}	Required wall thickness of furnace without allowances	mm
e_{ch}	Required wall thickness of flat end without allowances	mm
e_{cp}	Required wall thickness of reinforcing pad	mm
e_{cs}	Required wall thickness of the main body (cylindrical or spherical shells or dished ends) without allowances	mm
e_{ct}	Required wall thickness of straight tube without allowances	mm
e_{fa}	Required wall thickness of furnace with allowances	mm
e_g	Required thickness of gusset stay	mm
e_h	Ordered thickness of flat end	mm
e_{h1}	Wall thickness in relief groove	mm
e_p	Ordered wall thickness of reinforcing pad	mm
e_{rb}	Actual wall thickness of branch or nozzle without allowances	mm
e_{rf}	Actual wall thickness of furnaces	mm
e_{rh}	Actual wall thickness of flat end without allowances	mm
e_{rp}	Actual wall thickness of reinforcing pad without allowances	mm
e_{rs}	Actual wall thickness of main body (cylindrical or spherical shell or dished end) without allowances	mm
e_{rt}	Actual tube wall thickness without allowances	mm
e_s	Ordered wall thickness of main body	mm
e_{sa}	Required wall thickness of main body with allowances	mm
e_t	Ordered tube wall thickness	mm
e_{ta}	Required wall thickness of straight tube with allowances	mm

(continued)

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Table 4-1 (continued)

Symbol	Description	Unit
F	Calculation heat flux	W/m^2
f	Nominal design stress	N/mm^2
f_a	Existing mean stress	N/mm^2
$f_{a\Phi}$	Existing mean stress between the centres of two openings	N/mm^2
f_b	Design stress for branch material	N/mm^2
f_c	Combined stress at supports	N/mm^2
f_p	Design stress for reinforcing ring material	N/mm^2
f_s	Design stress for main body material	N/mm^2
G	Gas mass flow rate in first pass tubes	$kg/(m^2 \cdot s)$
g, g_1	Clear height as shown in Figure 14.2-1 of EN 12953-3:2002	mm
h_c	Depth of curvature of dished head (with knuckle, without cylindrical skirt)	mm
h_f	Height of manhole frame	mm
h_g	Minimum width of gusset stay	mm
h_s	Height of cylindrical skirt of dished end	mm
H	Heat input (see note 3 of Figure 5.4-1 of EN 12953-3:2002)	W
I_1	Second moment of area of one complete furnace corrugation about its neutral axis excluding corrosion allowance	mm^4
I_2	Second moment of area of stiffeners	mm^4
K	Design strength value	N/mm^2
K_t	Design strength value at test (gauge) pressure	N/mm^2
K_C	Thermal conductivity	$(W \cdot mm)/(m^2 \cdot K)$
L	Distance between two effective points of furnace support	mm
L_1	Shortest distance from the edge of the access opening to the centre-line of the stay furthest away from the access opening, or, where is no access opening, half the maximum distance between the centre-lines of the stays	mm
L_2	Distance between the rear plate of the reversal chamber and the boiler back end plate	mm
L_b	Length of boiler between end plates	mm
L_{cor}	Total length of corrugation	mm
L_i	Length of leg of fillet weld around inner periphery of pad or compensating plate	mm
L_g	Length of welded-on girders	mm
L_h	Heated length of furnace	mm

(continued)

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Table 4-1 (continued)

Symbol	Description	Unit
L_o	Length of leg of fillet weld around outer periphery of pad or compensating plate	mm
L_s	Length of shell between end plates	mm
L_t	Mean pitch of adjacent tubes	mm
l_{b0}	Cylindrical length of the branch from the transition zone up to the weld	mm
l_{b1}	Measured length of external projection of branch	mm
l_{b2}	Measured length of internal projection of branch	mm
l_{rb}	Effective length of branch contributing to reinforcement	mm
l_{rbi}	Effective length of inward projection of set-through branch contributing to reinforcement	mm
l_{rp}	Effective width of reinforcing ring	mm
l_{rs}	Effective length of main body contribution to reinforcement	mm
l_{s0}	Cylindrical length of the main body from the transition zone up to the weld	mm
P_{cor}	Pitch of corrugations	mm
P_g	Pitch of welded-on girders	mm
P_Φ	Centre-to-centre distance of adjacent openings, staggered by the angle Φ referring to centre of wall without allowances	mm
PS	Maximum allowable pressure as defined by the PED	N/mm^2
p_c	Calculation pressure	N/mm^2
p_d	Design pressure	N/mm^2
p_s	Allowable (total gauge) pressure for hot-water generators	N/mm^2
p_t	Test (gauge) pressure	N/mm^2
R_m	Minimum tensile strength of the grade of material concerned at room temperature	N/mm^2
$R_{p0,2tc}$	Minimum value of yield point (0,2 % proof stress) for the grade of material concerned at temperature t_c	N/mm^2
r_{ik}	Inside radius of dishing of dished ends or of knuckle or relief groove of flat ends	mm
r_{is}	Inside corner radius of dished end or spherical shell	mm
r_{ms}	Mean radius of shell	mm
r_{ok}	Outside radius of knuckle of dished end	mm
r_{os}	Outside corner radius of dished end or spherical shell	mm
S	Safety factor	—
S_t	Safety factor for test (gauge) pressure	—
TS	Maximum/Minimum allowable temperature	°C

(continued)

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Table 4-1 (concluded)

Symbol	Description	Unit
t_c	Calculation temperature	°C
t_d	Design temperature	°C
t_m	Maximum metal temperature	°C
t_s	Saturation temperature corresponding to design pressure	°C
u	Departure from circularity (out of soundness)	%
v	Weld factor	—
v_a	Allowable ligament efficiency for branches or openings	—
v_b	Ligament efficiency for isolated branches or openings	—
v_m	Ligament efficiency for adjacent branches or openings	—
W	Force exerted by the pressure on the end plate in the zone assumed to be supported by the gusset	N
w	Overall depth of corrugation (peak to peak)	mm
w_c	Depth of corrugations	mm
X_2	Cross-sectional area of longitudinal section of furnace wall of length equal to one pitch and thickness $e_{rf} - c_2$	mm^2
x	Stress reduction factor	—
y	Factor determined from Figure 10.2-4 in EN 12953-3:2002 using the ratio b/a	—
Φ	Angle of connecting lines between the centres of two openings relative to the axis of the main body	degree
δ_5	Elongation at fracture (gauge length ratio = 5)	%
Ψ	Angle of inclination of branch relative to the normal to the circumferential line of the main body	degree
NOTE 1 N/mm^2 = 1 MN/m^2 = 1 MPa		

5 Responsibilities

5.1 Purchaser

The purchaser shall be responsible for furnishing the manufacturer with a specification of the normal working conditions of the boiler plant, together with details of any transient and/or adverse conditions under which the boiler plant is required to operate and of any special requirements to facilitate in-service inspection (see also Guides for Procurement EN 45510-3-2 where applicable). For typical minimum information to be supplied by the purchaser see annex A.

5.2 Manufacturer

The manufacturer shall be responsible for the completeness and accuracy of all design calculations, testing and inspection and for compliance with all applicable requirements of this European Standard for the whole boiler plant.

Manufacturers shall ensure that the execution of the provisions of the European Standard is entrusted to appropriately qualified and experienced personnel.

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Duties carried out by other responsible authorities shall not absolve the manufacturer from his responsibility for compliance with the applicable requirements of this European Standard. Guidance in the use of the conformity assessment procedure is given in annex B.

5.3 Responsible authority

The responsibility of the responsible authority is indicated in CR 12953-14.

6 Interpretations

If any ambiguity is found or doubt arises as to the meaning or effect of any part of this European Standard or as to whether anything ought to be done or omitted to be done in order that this standard should be complied with in full, the question shall be referred to Technical Committee CEN/TC 269.

Findings or rulings of the Committee upon all enquiries, including matters of interpretation, which are considered by the Committee to be of sufficient importance that both the enquiry and the reply be made public as soon as possible, will be published in an enquiry-reply format for inclusion in an interpretation sheet to the European Standard.

NOTE After taking into account any public comment thereon, Enquiry Cases may be incorporated, as appropriate, into the standard as amendments which will form part of the next convenient update (see document BT N 5103).

7 Design/type appraisal of pressure parts

The manufacturer is required to declare that the technical design specification and supporting documentation is in compliance with the requirements of this European Standard.

Because of the wide range of types of shell boiler plant that can be designed and manufactured in accordance with this European Standard, it has been recognized that it is not possible to cover all the combinations of situations that might arise. This might be due to the normal lag in time scale which naturally exists between standardisation and advancing technology. In order not to inhibit progress in these circumstances, general guidance has been given within this European Standard to cover such situations. The specific requirements shall be determined by the manufacturer on a case-by-case basis according to the particular design and manufacturing details involved, ensuring, in all cases, the safety of the boiler will not be impaired.

It has also been recognized that during the manufacturing stages unexpected factors might arise which require the introduction of design modifications and/or manufacturing concessions resulting in deviations from the specified requirements included at the initial design/type appraisal stage. Such deviations are permitted by this European Standard where it can be established that the safety and required function of the component are not impaired. Any such deviations shall be included in the technical documentation and recorded as part of the manufacturer's data dossier.

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Annex A
(informative)

Information to be supplied by the purchaser to the manufacturer

A.1 General

The following is typical of the minimum information which is required by the manufacturer and which should be supplied to him by the purchaser at the time of the enquiry, subject to confirmation/updating at the placement of the order.

A.2 For saturated steam boilers

a) Steam capacity, in tonnes per hour, actual.

b) Working pressure, in bar[2)] (gauge).

c) Feed-water inlet temperature, in degrees Celsius.

A.3 For superheated steam boilers

a) Steam capacity, in tonnes per hour, actual.

b) Working pressure at the superheater outlet, in bar[2)] (gauge).

c) Superheated steam temperature at actual steam capacity, in degrees Celsius.

d) Feed-water inlet temperature, in degrees Celsius.

A.4 For hot-water boilers

a) Heat capacity, in kilowatts.

b) Working pressure, in bar[2)] (gauge).

c) Hot-water return temperature, in degrees Celsius.

d) Hot-water flow temperature, in degrees Celsius.

e) Method of pressurization.

f) Switching method of the hot-water circuit.

A.5 Fuels

A.5.1 Liquid fuels

a) Type.

b) Specification and analysis.

c) Gross and net calorific values.

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2) 1 bar = 10^5 N/m^2 = 0,1 N/mm^2 = 0,1 MPa

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A.5.2 Gaseous fuels

a) Type.

b) Specification and analysis.

c) Gross and net calorific values.

d) Available gas pressure at installation.

A.5.3 Solid fuels and waste

a) Type and origin (e.g. country, district, mine, manufacturer, industrial undertaking, community).

b) Specification and analysis (e.g. state of material as supplied, gross and net calorific values, size of granule, ash-fusion point).

A.5.4 Mixed fuels

The proportion of the various fuels and the method of combustion (this requires agreement between purchaser and manufacturer).

A.5.5 Waste heat boilers

a) Mass flow of waste gas.

b) Temperature of waste gas.

c) Composition of waste gas.

A.6 General information

The limits of certain characteristic values on which the guarantees should be based (this requires agreement between purchaser and manufacturer).

Electrical power supply specification, e.g. voltage, frequency, number of phases, number of wires and any limitations for the direct starting of motors.

Site and operation conditions (e.g. erection height above sea level and climatic conditions).

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Annex B
(informative)

Guidance in the use of the conformity assessment procedures

B.1 General

B.1.1 Application of the PED

The **Pressure Equipment Directive (PED)** requires all pressure equipment falling within its scope to have its design and manufacture assessed for conformity in accordance with a series of conformity assessment modules — see Article 10 of the PED. These modules are described in detail in Annex III of the PED to which reference should be made in order to ensure compliance. The following résumé is given for guidance purposes only.

NOTE This annex deals with the conformity assessment of pressure equipment as part of the boiler assembly, with regard to essential requirements of the PED. This does not deal with the conformity assessment of other pressure equipment included in the boiler plant.

B.1.2 Résumé of the modules given in the PED

Module	Description of the main features
A	Made under the manufacturer's own responsibility
A1	The manufacturer's own responsibility but final assessment is monitored by the Notified Body.
B	The manufacturer establishes a EC Type Examination Certificate with the Notified Body.
B1	The manufacturer establishes a EC Design Examination Certificate with the Notified Body.
C1	Made to conform to a EC Type Examination Certificate with manufacture monitored by the Notified Body.
D	The manufacturer uses an approved Quality System (e.g. EN ISO 9001 type) and conforms to either a EC Design Examination or EC Type Examination Certificate.
D1	The manufacturer uses an approved Quality System (e.g. EN ISO 9001 type), and manufactures without the use of a EC Design Examination Certificate or EC Type Examination certificate.
E	The manufacturer uses an approved Quality System (e.g. EN ISO 9001 type) and conforms to a EC Type Examination Certificate.
E1	The manufacturer uses an approved Quality System (e.g. EN ISO 9001 type), without a EC Type Examination Certificate.
F	Made to either a EC Type or Design Examination Certificate with each pressurised equipment being examined by the Notified Body.
G	The manufacturer selects the Notified Body. The Notified Body carries out the examinations on each pressurised equipment.
H	The manufacturer uses an approved Quality System (e.g. EN ISO 9001 type) for each pressurised equipment.
H1	The manufacturer uses an approved Quality System (e.g. EN ISO 9001 type). The Notified Body issues a EC Design Examination Certificate and takes part in the final assessment of the pressurised equipment.

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B.1.3 Selection of modules

The choice of module depends on the hazard category in which the pressurized equipment is intended to operate. These categories are defined in Article 10 of the PED and further elaborated in Annex II of the PED.

Based on the operating parameters of the equipment, the manufacturer is required by the PED to determine the hazard category in which the equipment will operate. In choosing the module the manufacturer must ensure that his organization possesses the system of controls required by the PED for manufacture within that module.

B.2 Principles for the application of the PED

B.2.1 Status of this standard

Shell boiler components are mainly covered by Article 3 section 1.2 of the PED, with the hazard categories being defined in Annex II — Table 5. The technical text of the shell boiler standard includes all the rules necessary to ensure that shell boiler components when designed, manufactured and inspected in accordance with its provisions will, when being operated, perform safely.

B.2.2 Involvement of a Notified Body

Modules concerned with the complete manufacture of shell boiler components, as indicated in B.2.3, may require the involvement of a Notified Body. The choice of Notified Body is the responsibility of the manufacturer.

B.2.3 Module selection for shell boiler components

Considering the pressures and volumes applicable to shell boiler components, Table 1 to 9 in annex II of the PED should be consulted to determine the hazard category. The modules permitted for these hazard categories are included in annex III of the PED.

NOTE A manufacturer may choose to adopt a higher category than indicated by annex II.

B.2.4 Module selection for shell boiler assemblies

The assessment of integration of the various components of the assembly should be determined by the highest category applicable to the component concerned other than that applicable to any safety accessories.

Considering the pressure and volumes normally applicable to shell boiler assemblies, Table 5 in annex II of the PED indicates that hazard category IV is applicable.

B.2.5 Guidance on modules

Guidance on modules applicable to hazard category IV are given below. Reference should be made to annex II of the PED for precise details.

MODULE B — EC TYPE EXAMINATION

— A Notified Body confirms that a representative example of the production envisaged meets the applicable provisions of the PED.

— Technical documentation is prepared covering the design, manufacture and operation of the boiler component. In addition applicable information covering qualification and approvals must be provided for the joining and NDE procedures to be used.

— The technical documentation must be retained for a minimum of ten years.

— The Notified Body issues a EC Type Examination Certificate which is valid for ten years and is renewable.

— The manufacturer must advise the Notified Body of all modifications to the component which must be recorded in the technical documentation.

MODULE D — PRODUCTION QUALITY ASSURANCE

— The manufacturer must operate a production Quality System (e.g. EN ISO 9001) approved by a Notified Body.

— The manufacturer or his representative must confirm by written declaration that the boiler component meets the applicable requirements of the PED and conforms to the requirements of a:

EC Type Examination Certificate with respect to Module B.

— The Notified Body carries out surveillance of the Quality System by scheduled and unscheduled visits.

— The manufacturer or his representative affixes the CE mark and the identification number of the Notified Body responsible for the surveillance.

— The technical documentation and EC Type Certificate must be kept for a minimum of ten years.

MODULE F — PRODUCT VERIFICATION

— The manufacturer or his representative must ensure and declare that the boiler component meets the applicable requirements of the Directive and conforms to the requirements of a:

EC Type Examination certificate with respect to Module B.

— The Notified Body examines and tests every component including requirements for:

- Qualification and approvals
- Materials
- Final Proof Test

— The manufacturer prepares a Declaration of Conformity which must be kept for a minimum of ten years.

— The manufacturer or his representative affixes the CE mark and the identification number of the involved Notified Body.

MODULE G — EC UNIT VERIFICATION

— The manufacturer must ensure and declare that the boiler component conforms to the applicable requirements of the PED.

— The manufacturer must use a Notified Body of his choice for unit verification and submit for approval technical documentation which must include:

- Test reports
- Manufacturing and test procedures
- Qualification and approvals data for joining and NDE

— The Notified Body must verify the technical documentation and perform appropriate tests as set out in the shell boiler standard. In addition the Notified Body must carry out the final inspection of the component, including the proof testing.

— The Notified Body must prepare a Certificate of Conformity which must be kept for a minimum of ten years.

— The manufacturer or his representative affixes the CE mark to the component. The Notified Body ensures its identification number is also affixed.

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MODULE H1 — FULL QUALITY ASSURANCE WITH DESIGN EXAMINATION AND SPECIAL SURVEILLANCE OF THE FINAL TEST

— The manufacturer must operate a quality system of the type EN ISO 9001 approved by a Notified Body of his choice which covers design, manufacture, inspection and testing.

— The manufacturer must lodge an application for examination of the design with the Notified Body.

— The Notified Body issues a EC Design Examination certificate confirming that the design meets the provisions of the PED and carries out increased surveillance during the final assessment stages of the production.

— The manufacturer must confirm by written declaration that boiler component meets the applicable requirements of the PED.

— The Notified Body makes scheduled and unscheduled visits and examines the Quality System including:

- Quality System documentation
- Quality Records for design
- Quality records for manufacture

— The manufacturer or his representative affixes CE mark and the identification number of the Notified Body responsible for the surveillance.

— The manufacturer must keep all technical and quality documentation for a minimum period of ten years.

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Annex ZA
(informative)

Clauses of this European Standard addressing essential safety requirements or other provisions of the Pressure Equipment Directive

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association and supports essential safety requirements of the Pressure Equipment Directive 97/23/EC.

WARNING: Other requirements and other EU Directives **may** be applicable to the product(s) falling within the scope of this standard.

The following clauses of this standard given in Table ZA.1 are likely to support requirements of the Pressure Equipment Directive 97/23/EC.

Table ZA.1 - Comparison between the EN 12953-1 and Pressure Equipment Directive 97/23/EC

EN 12953-1 harmonised clauses	Content	Pressure Equipment Directive 97/23/EC Annex I
1.1, 1.2, 1.3	Ensurance of safety in service	1.1

Compliance with the clauses of this standard provides one means of conforming with the specific essential safety requirements of the Directive concerned and associated EFTA regulations.

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EN 12953-5, *Shell boilers — Part 5: Inspection during construction, documentation and marking.*

EN ISO 14918, *Thermal spraying — Approval testing of thermal sprayers (ISO 14918:1998).*

[1] Directive 97/23/EC of the European Parliament and of the Council of 29 May 1997 on the approximation of the laws of the Member States concerning pressure equipment; OJEC L181.

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