BRITISH STANDARD

BS 6130-1: 1993

CONFIRMED
DECEMBER 2007

Hose and hose assemblies for asphalt and bitumen —

Part 1: Specification for flexible metallic hose and hose assemblies

UDC 621.643.3.034:665.637.8

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Piping Systems Components Standards Policy Committee (PSE/-) to Technical Committee PSE/12, upon which the following bodies were represented:

British Compressed Gases Association
British Gas plc
British Rubber Manufacturers' Association Ltd.
Electricity Association
Energy Industries Council
Engineering Equipment and Materials Users' Association
LP Gas Association
Ministry of Defence
Petrol Pump Manufacturer's Association
United Kingdom Petroleum Industry Association Ltd.

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Contents

Foreword

This Part of BS 6130 has been prepared under the direction of the Piping Systems Components Standards Policy Committee. It supersedes BS 6130:1981, which is withdrawn. It is one of a series concerned with hose and hose assemblies for conveying petroleum products. It specifies requirements for ensuring the integrity and standardization of two types of metallic hose and hose assembly for conveying asphalt and bitumen, which are hazardous materials at temperatures where they can flow readily.

Corrugated hose with a temperature limit of 400 °C has been introduced with details on construction, manufacture and testing.

It is envisaged that rubber hose and hose assemblies will be specified in BS 6130-2.

Asbestos has been specified for the strip wound hose constructions covered by this Part of BS 6130 as the only packing material that can meet the duty required although other alternative materials are being considered.

The manufacture of all asbestos-based products is covered by the requirements of the control of Asbestos at Work Regulations 1987, introduced on 1 March 1988. These set out comprehensive provisions covering work activities involving exposure to asbestos. Advice on how to comply with these regulations can be obtained from the manufacturers of the material, from the Asbestos Information Centre, Derby Road, Widnes, Cheshire WH8 9ND, from the local area office of the Health and Safety Executive or from the Environmental Health Department of the Local Authority.

Particular note has to be taken of the Asbestos Products (Safety) Regulations 1985, made under the Consumer Safety Act 1978 and of the Asbestos (Prohibitions) Regulations 1988 made under the Health and Safety at Work etc. Act 1974, which prohibit the supply of products containing amosite or crocidolite and set out requirements for the labelling of all products containing asbestos.

All the above legislation implements European Directives.

Product certification. Users of this British Standard are advised to consider the desirability of third party certification of product conformity with this British Standard based on testing and continuing product surveillance which may be coupled with assessment of a supplier's quality systems against the appropriate Part of BS 5750.

Enquiries as to the availability of third party certification schemes are forwarded by BSI to the Association of Certification Bodies. If a third party certification scheme does not already exist, users should consider approaching an appropriate body from the list of Association members.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

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

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 8, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

1 Scope

This Part of BS 6130 specifies requirements for the design, manufacture, performance, testing and marking of two basic types of metallic hose and hose assembly for dockside, road and rail loading and unloading of asphalt and bitumen. The standard covers nominal sizes DN 80 to DN 250 with working pressures of 5 bar and 12 bar.[1)]

NOTE This standard allows a number of options. Therefore, to assist the purchaser, a checklist of the options, together with the other information to be supplied in the enquiry and order is given in Annex A.

2 References

2.1 Normative references

This Part of BS 6130 incorporates, by reference, provisions from specific editions of other publications. These normative references are cited at the appropriate points in the text and the publications are listed on the inside back cover. Subsequent amendments to, or revisions of, any of these publications apply to this Part of BS 6130 only when incorporated in it by updating or revision.

2.2 Informative references

This Part of BS 6130 refers to other publications that provide information or guidance. Editions of these publications current at the time of issue of this standard are listed on the inside back cover, but reference should be made to the latest editions.

3 Definitions

For the purposes of this Part of BS 6130, the following definitions apply.

3.1
tube

plain cylindrical uncorrugated material which may be processed during manufacture to become hose

3.2
hose

flexible leak-tight metal element of an assembly without fittings or covering

3.3
braid

layer (or layers) of cylindrically woven wires covering the hose and attached to the hose ends and fittings, restraining the hose against elongation

3.4
hose assembly

hose with end fittings attached, complete with braid and/or other covering, if required, ready for service

3.5
corrugated flexible metallic hose

pressure-tight hose made from tube with annular corrugations made by deforming the metal

3.6
strip wound flexible metallic hose

pressure-tight hose made from helically wound preformed strip generally with right-hand lead, whose turns, incorporating a packing, are connected together by double overlapping

3.7
ferrule

metal sleeve used on corrugated hose assemblies to restrict the bending of the corrugations affected by heat during the attachment of end fittings

3.8
external sleeve/protection coil

device used to provide protection to the external surface of the hose against mechanical damage and/or against corrosion from the external environment

3.9
packed fitting

leak-proof end fitting that is screwed on to the tube and packed, then locked by means of a back nut

3.10
design pressure

maximum pressure at which a hose assembly is designed to be serviceable

3.11
maximum operating temperature

highest temperature to which the hose will be subjected

NOTE The maximum operating temperature includes adequate margins to cover uncertainties in service conditions.

3.12
burst pressure

pressure at which any part of the hose assembly fails

3.13
cyclic life

minimum number of complete cycles which, at the test conditions, the hose is designed to withstand without failure

3.14
bend radius

radius of a bend measured to the hose centre line

[1)] 10 bar = 1 MPa = 1×10^6 N/m^2.

4 Construction and temperature limits

4.1 The types of hose and hose assembly and their upper temperature limits shall be as follows.

Type A. Strip wound, for use up to 300 °C;

Type B. Corrugated, covered by stainless steel braid with carbon steel or stainless steel end fittings for use up to 400 °C.

4.2 Where ambient temperatures fall below – 20 °C a stainless steel hose assembly shall be used.

5 Pressure ratings at working temperature

The pressure ratings shall conform to those given in Table 1.

The types of hose and hose assembly specified shall be classified in accordance with Table 1.

Table 1 — Pressure ratings and classification

Class and duty	Maximum[a] working pressure
	Bar[b]
Class 1 (dockside)	12
Class 2 (road and rail)	5

[a] The working pressures specified in this table include an allowance for surge pressure.
[b] 10 bar = 1 MPa = 1×10^6 N/m^2.

6 Nominal sizes

The nominal sizes of hose and hose assemblies shall conform to those given in Table 2.

Table 2 — Nominal sizes

Class	Nominal size DN				
1	80	100	150	200	250
2	80	100	150		

NOTE DN is defined in ISO 6708.

7 Length

7.1 Measurement of length

Hose assembly lengths shall be measured from face to face of the flanges.

NOTE Normal maximum hose lengths are 15 m for sizes up to and including DN 200 and 11 m for size DN 250.

7.2 Tolerance on length

7.2.1 Type A hose assemblies shall have a tolerance on length of + 5 %, – 1 % when measured in mid-extension i.e. halfway between the fully compressed and fully extended positions.

7.2.2 Type B shall have a tolerance on length of + 3 %, – 0 %.

8 Materials

8.1 Type A hose

Type A hose shall be made from deep drawn carbon steel strip conforming to BS 1449-1, grade 3, condition CS and subsequently galvanized or from stainless steel conforming to BS 1449-2:1983, grade 304S16 or 316S11.

8.2 End fittings for type A hose assemblies

Type A hose assemblies shall have flanged end fittings made from one or more of the following materials:

a) carbon steel conforming to BS EN 10083-1:1991, 2 C 22;

b) stainless steel conforming to BS 1449-2:1983, grade 304S15;

c) copper alloy conforming to BS 1400:1985, designation G1 or LG4.

The end fitting shall incorporate an asbestos packing.

WARNING. Materials containing asbestos are subject to legislation that requires precautions to be taken when handling them to ensure that they do not constitute a hazard to health (see foreword).

8.3 Type B hose

8.3.1 *Hose material*

Type B hose shall be made from austenitic stainless steel to BS 1449-2:1983, grade 304S11, 321S31 or 316S11.

8.3.2 *Braid material*

Braid shall be made from fully annealed austenitic stainless steel wire conforming to BS 1554:1990, designation 316S19, 321S31 or 304S31 (0.045 % carbon max.)

8.3.3 *External protection*

The hose braid shall be protected by a stainless steel coil along the full length of the assembly and welded to the fitting. When the hose is bent to the minimum bend radius given in Table 3 the coil dimensions and pitch length of the coil shall be such that the hose is protected against abrasion when laying on a flat surface.

Table 3 — Minimum bend radii

Nominal size of hose DN	Type A		Type B
	Class 1 mm	Class 2 mm	Class 1 and 2 mm
80	650	590	450
100	820	660	560
150	1 250	1 070	815
200	1 600	—	1 015
250	2 000	—	1 220

8.4 End fittings for Type B hose assemblies

Type B hose assemblies shall have carbon steel or stainless steel flanged end fittings.

The grade of material to be used shall be:

a) carbon steel conforming to BS EN 10083-1:1991, 2 C 22; or

b) stainless steel conforming to BS 970-1:1991, 316S11 or 321S31.

8.5 External insulation

When specified by the purchaser, external insulation shall be fitted to assist operator handling (see Annex A).

9 Construction

9.1 Type A hose manufacturing method

Type A hose shall be of a double overlap, interlocking packed construction (see Figure 1).

Figure 1 — Construction details for type A hose

Hose shall be packed with asbestos.

WARNING. Materials containing asbestos are subject to legislation that requires precautions to be taken when handling them to ensure that they do not constitute a hazard to health (see foreword).

NOTE Type A hose assemblies may have their ends reinforced by the fitting of a larger size of interlocking hose.

9.2 Type B hose manufacturing method

9.2.1 *Hose*

Type B hose shall be of single ply construction and shall be manufactured from:

a) seamless tube; or

b) single longitudinally butt-welded tube.

Transverse joining of strip or circumferential joining of tube prior to corrugating shall not be permitted.

The corrugations shall be annular and of uniform height and pitch and continuous along the length of the hose.

9.2.2 *Joints*

Where a manufacturer joins lengths of hose prior to braiding, such joints shall be either butt-welded or edge-welded as shown in Figure 2. All the tests described in clauses **12** and **13** shall be carried out on hose incorporating such a joint.

9.2.3 *Braid*

The hose shall be closely covered by wire either machine woven around the hose or fitted by hand as a stocking.

Braid wires shall be continuous. Joints in braid wires shall only be made in individual wires and shall be welded or brazed. The jointing operation shall not result in sharp edges or projections.

9.2.4 *Ferrules*

Ferrules shall be fitted to support the length of hose affected by the welding of the end fitting.

The minimum ferrule length shall be 40 mm or the length of three corrugations, whichever is the greater.

10 Method of assembly

10.1 Type A hose assemblies

Type A hose shall have the end fitting screwed to the outside of the hose packed and locked without the application of torque to the hose (see Figure 3).

NOTE A typical screwed, packed and locked fitting is shown in Figure 3.

a) Butt-welded b) Edge-welded

Figure 2 — Details of butt-welded and edge-welded hose joints for type B hose

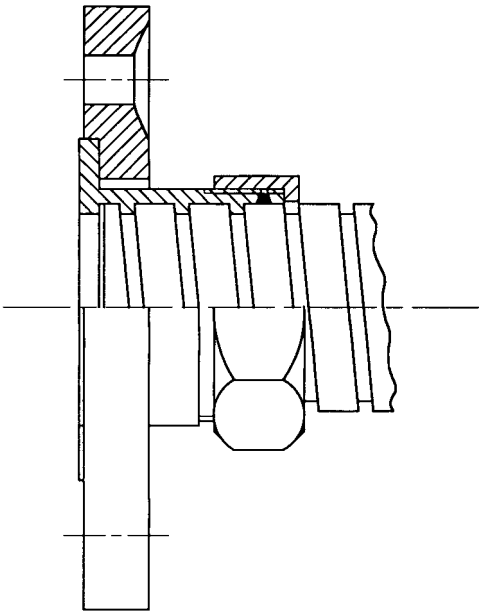


Figure 3 — Typical screwed, packed and locked end fitting for type A hose

10.2 Type B hose assemblies

Type B hose shall be assembled by one of the following methods:

Method 1. The braid shall be passed through a ferrule and shall be welded to the end of the corrugated hose and to the ferrule so that the braid wires are bonded securely. The end fitting shall then be introduced and welded to the hose by a second weld. Surface oxidation of the first weld shall be removed prior to commencement of the second weld [see Figure 4 (a)].

Method 2. The end fitting shall be welded to the end of the corrugated hose and the braid added to this assembly. A ferrule shall then be placed around the braid at the end fitting. The braid and ferrule shall then be welded to the end fitting, this second weld being spaced at a distance from the first weld, so that the braid wires are bonded securely [see Figure 4 (b)].

The end fitting, hose, braid and ferrule shall not be welded together using a single weld.

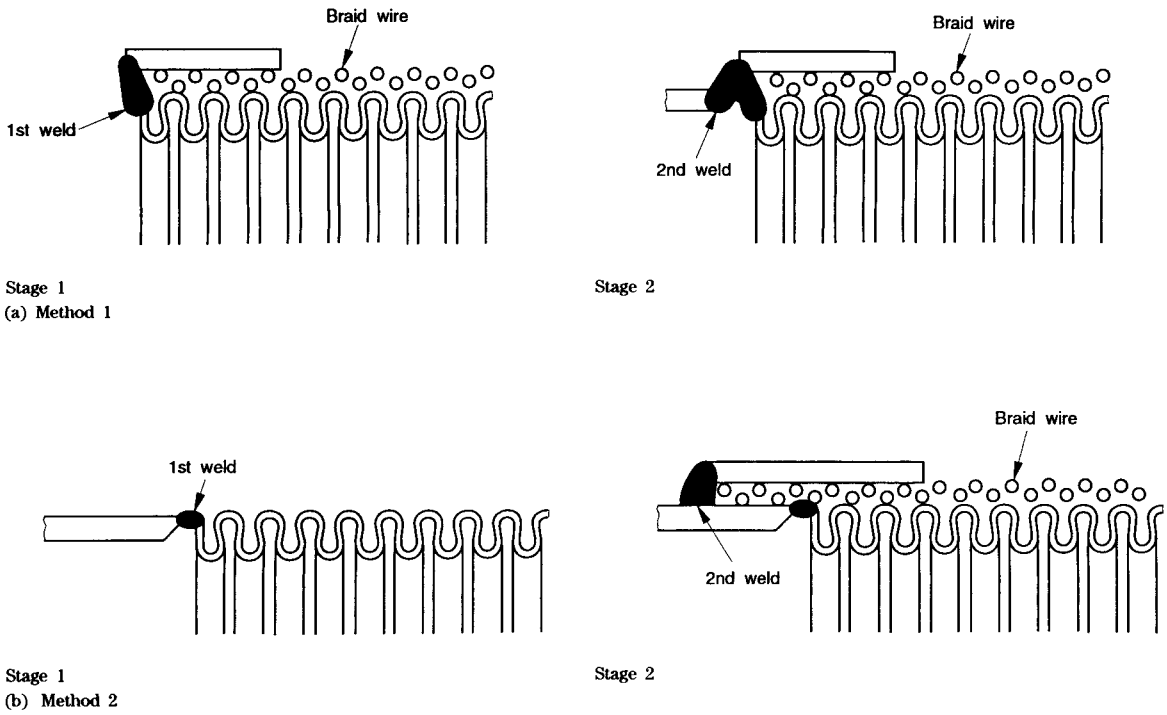


Figure 4 — Welding of end fitting, ferrule and braid to type B hose

11 Welding of type B hose assemblies

Welding procedures shall conform to BS EN 288-3:1992. Welders shall be qualified in accordance with BS EN 287-1:1992. Welding consumables shall conform to BS 2901-1:1983, BS 2901-2:1990 and BS 2901-3:1990.

12 Type approval tests

12.1 General

The manufacturer shall carry out the following tests on each new design or design of modified hose assembly and shall supply a copy of the certificate to the purchaser, if required (see Annex A).

The test results, including the burst pressure, shall be stated on the certificate.

12.2 Bend test for type A hose assemblies

12.2.1 A hose assembly, having a minimum length of 1 m excluding fittings, shall be bent to the appropriate minimum bend radius given in Table 3. When returned to a straight position the hose shall show no sign of permanent deformation.

12.2.2 A straight-edge shall be placed against the strip section. Any deformation of the hose exceeding 1 mm shall be considered a failure.

12.3 Pressure tests for type A hose assemblies

12.3.1 For a type A hose assembly the hose used for the bend test (see **12.2**) shall be used for the pressure tests.

12.3.2 The hose assembly shall be unrestrained torsionally and axially when subjected to the pressure tests.

The tests shall be carried out at ambient temperature.

12.3.3 The hydraulic test pressure given in Table 4 shall be applied to the hose assembly for 5 min and then released. After the release of pressure there shall be no permanent change of shape of the strip section.

A straight-edge shall be placed against the strip section. Any deformation of the hose exceeding 1 mm shall be considered a failure.

12.3.4 The hose shall be subjected to an increase in pressure over a period of approximately 15 min until failure of the assembly occurs. The pressure at which failure occurs shall be not less than the minimum burst pressure given in Table 4.

Table 4 — Test pressures

Class and duty	Hydraulic test pressure	Minimum burst pressure	
		Type A	Type B
	Bar[a]	Bar[a]	Bar[a]
Class 1 (dockside)	18	50	72
Class 2 (road and rail)	7.5	20	29

[a] 10 bar = 1 MPa = 10^6 N/m^2.

12.4 Pressure tests for type B hose assemblies

12.4.1 A straight sample of hose having a length of at least 1 m excluding fittings shall be subjected to an hydraulic pressure test. The pressure shall be applied gradually in increments until the hose fails. Each increment shall be one-tenth of the minimum burst pressure given in Table 4. The rate of increase in pressure shall be between 0.75 bar/s and 1.75 bar/s. The increase in volume and increase in overall length shall be recorded for each pressure increment.

12.4.2 Graphs of pressure against overall length and increase in volume shall be plotted from the values obtained from **12.4.1**.

12.4.3 At the hydraulic test pressure given in Table 4, the increase in overall length shall be not greater than 3 % of the original length between the ferrules.

12.4.4 The pressure at which there is a marked permanent increase in overall length shall be found from a change of slope of the graph of pressure against overall length (see **12.4.2**). This pressure shall be at least twice the maximum working pressure given in Table 1.

NOTE This is the braid yield pressure.

12.4.5 The pressure at which there is a marked permanent increase in internal volume without a corresponding increase in length shall be found from a change of slope of the graph of pressure against increase in volume (see **12.4.2**). This pressure shall be at least twice the maximum working pressure given in Table 1.

NOTE This is corrugation deformation pressure.

12.4.6 The minimum burst pressure of the hose assembly shall be as given in Table 4.

12.5 Fatigue test for type B hose assemblies

12.5.1 Six samples of each size shall be subjected to a rolling bend test (see Table 5 and Figure 5). The hose shall first be subjected to the hydraulic test given in Table 4; the test shall then be conducted with the hose at the maximum working pressure given in Table 1 and with the distance between centres equal to twice the maximum test bend radius given in Table 5.

Table 5 — Fatigue test for type B hose assemblies

Nominal size DN	Test bend radius mm	Hose length between ferrules mm
80	450	1 890
100	560	2 435
150	815	3 485

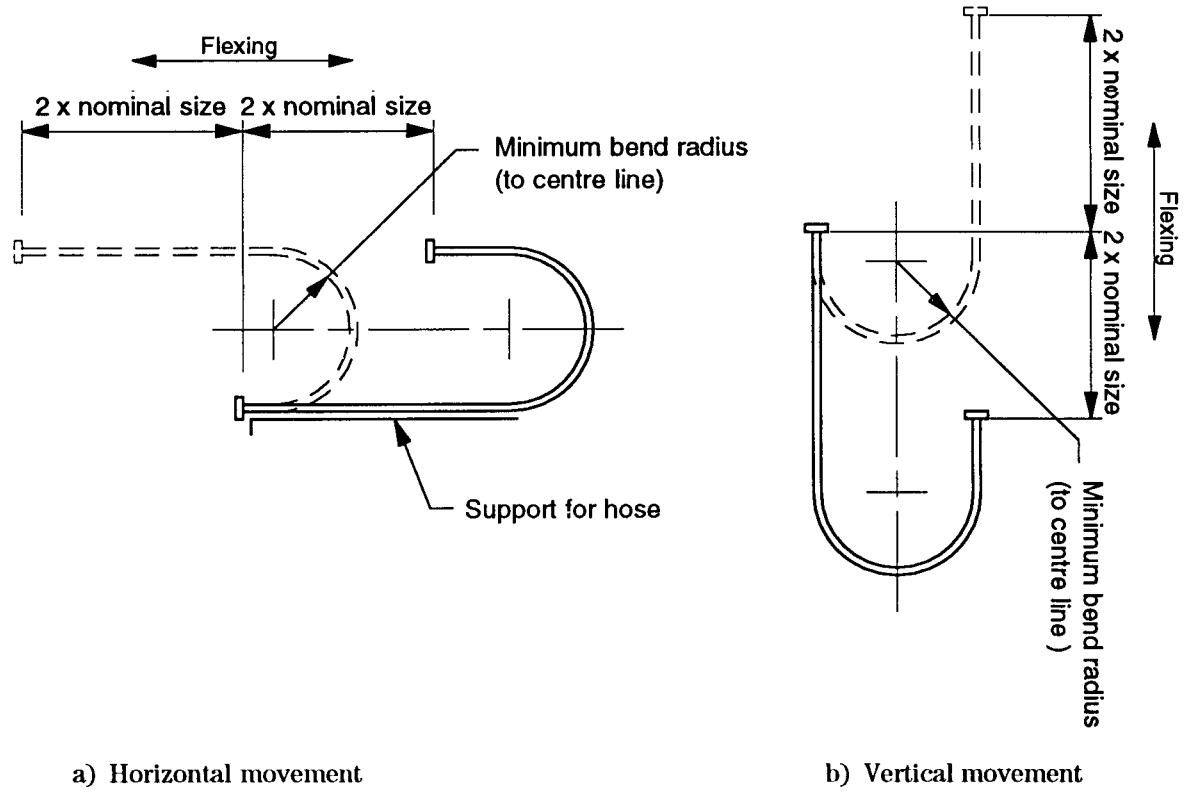
12.5.2 The hose shall be subjected to repeated flexing at a rate of from 40 cycles/min to 120 cycles/min in a direction parallel with the axis of the hose through a movement of 4 × nominal size.

12.5.3 The average number of cycles before failure for a type B hose assembly of size DN 80 to DN 150 shall be not less than 5 000 and the minimum number of cycles for any one hose assembly before failure shall be not less than 4 000.

NOTE The cyclic life of hose assemblies sizes DN 200 and DN 250 should be agreed between the purchaser and manufacturer (see Annex A).

12.5.4 Failure shall be determined by the hose leaking or showing any permanent change in shape beyond the natural set of the hose whilst the test is in progress.

12.5.5 The test shall be conducted using complete hose assemblies and each assembly shall be mounted for the test as shown in either Figure 5 a) or Figure 5 b). A bottom plate shall be fixed to support the lower limb of the hose at all times during the test when it is mounted as shown in Figure 5 a).



a) Horizontal movement

b) Vertical movement

All dimensions are in millimetres.

Figure 5 — Fatigue test for type B hose assemblies

13 Production pressure test

13.1 General

After manufacture every hose assembly shall be subjected to a hydraulic pressure test during which there shall be no sign of leakage or of any other mode of failure. The test pressure shall be as given in Table 4. The test pressure shall be applied and maintained for a sufficient length of time to permit a visual examination of all surfaces and joints but in any case for not less than 3 min.

13.2 Stainless steel hose assemblies

The test medium used for stainless steel hose assemblies shall be water.

NOTE Attention is drawn to the need to control the chloride content of water used for hydraulic tests on austenitic stainless steel assemblies to below 30 mg/L.

13.3 Galvanized steel hose assemblies

The test medium used for galvanized steel hose assemblies shall be light hydraulic oil.

14 Test certificate

The manufacturer shall provide a production test certificate for each completed hose assembly or batch of assemblies.

The certificate shall contain the following information:

a) declaration by the manufacturer that the assemblies conform to this standard;

b) the material specification for each component of the assembly;

c) the production test pressure (see clause **13** and Table 4);

d) the hose serial number(s).

15 Marking

Hose assemblies shall be permanently and legibly marked with the following information:

a) the number of this British Standard and type, e.g. BS 6130-1[2)], type A;

b) manufacturer's name or trade mark;

c) manufacturer's type code;

d) manufacturer's serial number;

e) month and year of manufacture, e.g. 3/92;

f) maximum working pressure and maximum operating temperature, e.g. WP12/400 °C.

NOTE The information may be stamped on a metal label permanently attached to each hose assembly.

[2)] Marking BS 6130-1:1993 on or in relation to a product represents a manufacturer's declaration of conformity, i.e. a claim by or on behalf of the manufacturer that the product meets the requirements of the standard. The accuracy of the claim is solely the claimant's responsibility. Such a declaration is not to be confused with third party certification of conformity, which may also be desirable.

Annex A (informative) Information to be supplied by the purchaser

The purchaser should supply the following information in his order.

a) type and class of hose (see clauses **4** and **5**);

b) hose length;

c) whether thermal insulation is required;

d) end fitting material;

e) whether a copy of the type approval test certificate is required (see **12.1**);

f) for type B hose assemblies of size DN 200 or DN 250, the cyclic life (see **12.5.3**).

List of references (see 1.2)

Normative references

BSI standards publications

BRITISH STANDARDS INSTITUTION, London

BS 1400:1985, *Specification for copper alloy ingots and copper alloy and high conductivity copper castings.*

BS 1449, *Steel plate, sheet and strip.*

BS 1449-1, *Carbon and carbon-manganese plate, sheet and strip.*

BS 1449-2:1983, *Specification for stainless and heat-resisting steel plate, sheet and strip.*

BS 1554:1990, *Specification for stainless and heat-resisting steel round wire.*

BS 2901, *Specification for filler rods and wires for gas-shielded arc welding.*

BS 2901-1:1983, *Ferritic steels.*

BS 2901-2:1990, *Specification for stainless steels.*

BS 2901-3:1990, *Specification for copper and copper alloys.*

BS EN 287, *Approval testing of welders for fusion welding.*

BS EN 287-1:1992, *Steels.*

BS EN 288, *Specification and approval of welding procedures for metallic materials.*

BS EN 288-3:1992, *Welding procedure tests for the arc welding of steels.*

BS EN 10083, *Specification for quenched and tempered steels.*

BS EN 10083-1:1991, *Technical delivery conditions for special steels.*

Informative references

BSI standards publications

BRITISH STANDARDS INSTITUTION, London

BS 5750, *Quality systems*[3)].

BS 6130, *Specification for hose and hose assemblies for asphalt and bitumen*[3)].

BS 6130-2:1993, *Specification for rubber hose and hose assemblies.*

ISO standards publication

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO), Geneva. (Publication is available from BSI Customer Services.)

ISO 6708:1980, *Pipe components — Definition of nominal size.*

[3)] Referred to in the foreword only.

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