BRITISH STANDARD

BS 5342:1985

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Specification for

Rubber hoses for high-pressure saturated steam

UDC 621.643.3-036.4:621.6.023

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Rubber Standards Committee (RUM/-) to Technical Committee RUM/9, upon which the following bodies were represented:

British Gas Corporation
British Rubber Manufacturers' Association
Chief and Assistant Chief Fire Officers' Association
Department of the Environment (Property Services Agency)
Fire Extinguishing Trades Association
Health and Safety Executive
Home Office
Institution of Fire Engineers
Institution of Mechanical Engineers
Liquified Petroleum Gas Industry Technical Association (UK)
London Fire Brigade
London Transport Executive
Malaysian Rubber Producers' Research Association
Ministry of Defence
National Coal Board
Society of Motor Manufacturers and Traders Limited

The following bodies were also represented in the drafting of the standard, through subcommittees and panels:

Association of Hydraulic Equipment Manufacturers
British Plastics Federation
British Railways' Board
Engineering Equipment and Materials Users' Association

This British Standard, having been prepared under the direction of the Rubber Standards Committee, was published under the authority of the Board of BSI and comes into effect on
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The following BSI references relate to the work on this standard:
Committee reference RUM/9
Draft for comment 82/55697 DC

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Amendments issued since publication

Amd. No.	Date of issue	Comments

Contents

Foreword

This revision of this British Standard has been prepared under the direction of the Rubber Standards Committee, and supersedes BS 5342:1977 which is withdrawn.

It specifies two types of rubber hoses for use at different working pressures each with two classes of resistant cover.

The principal changes from the 1977 edition are as follows:

a) each hose type has been specified with and without an oil resistant cover and a requirement has been included for the oil resistance;

b) a requirement for uniformity of the lining and cover thickness has been added;

c) a requirement for the resistance to ozone and the perforation of the cover has been added;

d) a requirement for the concentricity of hoses has been added.

The standard principally specifies performance and construction requirements. In order to take account of modern technological developments, no requirements are included for specific materials, constructions and manufacturing methods.

Attention is drawn to BS 5122 which covers the requirements for low-pressure and medium-pressure steam hoses.

In the absence of a suitable method of test no requirement is specified for abrasion resistance of the cover or resistance to chemicals which may be contained in carry over.

Correspondence with International Standards. This British Standard is related to ISO 6134:1981 "*Rubber hoses for steam — Specification*" published by the International Organization for Standardization (ISO), but differs from ISO 6134 in the following respects:

a) there is no type equivalent to type 1 with a working pressure of 6.0 bar (0.6 MPa);

b) the use of textile reinforcement is not specified;

c) a nominal bore of 44.5 mm is specified whilst 40, 50, 63 and 80 mm are not specified;

d) the method of exposure to steam for assessment of resistance to steam is more precise;

e) marking requirements are specified.

Attention is also drawn to the Health and Safety at Work etc., Act 1974 and the need to ensure that hoses specified in this standard are installed in such a way that personnel are adequately protected.

Certification. Attention is drawn to the certification facilities described on the inside back cover of this standard.

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 4, 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 British Standard specifies the requirements for the construction, physical properties and performance of two types of rubber hoses for high-pressure saturated steam. Each type is further divided into two classes having either an oil resistant or non-oil resistant cover.

NOTE The titles of the publications referred to in this standard are listed on page 4.

2 Definitions

For the purposes of this British Standard, the definitions given in BS 3558 apply.

3 Classification

Rubber hoses specified in this standard shall be classified as follows.

Type 1: semi-high-pressure steam hose with maximum working pressure 10 bar [1)].

Type 2: high-pressure steam hose with maximum working pressure 16 bar.

Each type of hose shall be further divided into

Class A: a non-oil resistant cover, or

Class B: an oil resistant cover.

4 Construction

4.1 The hoses shall consist of:

a) seamless rubber lining;

b) wire reinforcing layer or layers, complying with the requirements of BS 3592-2;

NOTE Wire reinforcing layers may be applied by any suitable technique.

c) rubber cover.

The lining and cover shall be free from holes, except as called for in **4.3**, porosity and other defects. All rubber components shall be of heat-resistant rubber.

4.2 The hoses shall be mandrel made and the finish shall be smooth or fabric marked.

4.3 The rubber cover shall be perforated with a minimum of 280 holes per metre, in four rows equally spaced around the periphery, to relieve possible pressure build-up between the plies.

4.4 The end fittings used with the hose shall be of a type that provides for tightening up during service, such as the bolted clamp type, to compensate for creep of the rubber compounds.

NOTE The end fittings used with the hose should be those recommended by the hose manufacturer.

5 Dimensions and permissible deviations

5.1 Bore

When measured as described in clause **3** BS 5173-1:1976, the bore of the hose shall be in accordance with the nominal bores and permissible deviations given in Table 1.

Table 1 — Nominal bores and permissible deviations

Nominal bore	Permissible deviations
mm	mm
12.5 16 19 25 31.5 38 44.5 51	± 0.75

5.2 Lining and cover thickness

When measured in accordance with the method described in BS 5173-1, the minimum thickness of the lining shall be 2.5 mm and the minimum thickness of the cover shall be 1.5 mm.

The variation in thickness of lining or cover shall not exceed 15 % of the measured mean thickness, excluding cover overlaps.

5.3 Concentricity

When measured in accordance with the method described in BS 5173-1, the variation from concentricity measured between inside and outside diameters shall not exceed 2.0 mm.

5.4 Permissible deviations on cut lengths of hoses

The permissible deviations on cut lengths of hoses shall be as shown in Table 2.

Table 2 — Permissible deviations on cut lengths

Nominal length of hose	Permissible deviations
mm	
Up to and including 300	± 3 mm
Over 300 and up to and including 600	± 4.5 mm
Over 600 and up to and including 900	± 6 mm
Over 900 and up to and including 1 200	± 9 mm
Over 1 200 and up to and including 1 800	± 12 mm
Over 1 800	± 1 % of nominal length

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

6 Physical properties of the cover

6.1 Resistance to liquids (class B hoses)

When tested in accordance with the volumetric method described in BS 903-A16, using oil No. 3 and immersing for 70^{+2}_{-0} h at 100 ± 1 °C, the cover shall have a volume change not greater than 100 %.

6.2 Resistance to ozone

When tested in accordance with the method described in BS 5173-6, using an elongation of 20 % at 40 ± 2 °C for 168 ± 1 h, no cracking shall be visible under × 2 magnification.

7 Performance requirements

7.1 Adhesion

When tested in accordance with the method described in BS 5173-3, the adhesion between lining and reinforcement, and between cover and reinforcement shall be not less than 2.0 N/mm.

7.2 Pressure requirements

7.2.1 When tested in accordance with the method described in BS 5173-2, the hoses shall comply with the requirements of Table 3 and shall show no cracks or leaks at proof pressure.

7.2.2 All manufactured lengths of hose shall be tested at proof pressure.

7.3 Steam resistance

7.3.1 168 h *test*. When tested in accordance with the method described in Appendix A, the hose shall comply with the requirements of Table 4, the lining shall not be cracked or pop-corned (an eruption evident on the surface of a hose lining after exposure to pressurized steam) and the cover shall not be cracked or blistered.

Table 3 — Hydrostatic pressure requirements

Property	Type 1	Type 2
Design working pressure	10 bar	16 bar
Proof pressure	50 bar	80 bar
Change in diameter at proof pressure	+ 15 %, – 5 %	+ 15 %, – 5 %
Change in length at proof pressure	± 12 %	± 12 %
Maximum twist at proof pressure	30°/m	30°/m
Minimum burst pressure	100 bar	160 bar

Table 4 — Steam resistance requirements

Property	Minimum requirements
Mean burst pressure	90 % of mean value for hoses not exposed to steam
Hardness of lining after steaming	Not more than 10 IRHD above value for non-steamed test piece
Mean elongation at break of lining after steaming	Not less than 50 % of mean non-steamed value with a minimum figure of 150 %

7.3.2 750 h *test*. When tested in accordance with the method described in Appendix A, the lining shall not be cracked or pop-corned and the cover shall not be cracked or blistered. There shall be no leakage of steam through the walls of the hose.

NOTE Any leakage at the coupling shall be ignored.

8 Marking

Each manufactured length of hose shall be continuously marked and also labelled with a tag tied at each end of the hose with the following information:

a) the hose manufacturer's name or identification;

b) the number of this British Standard [2)], with the type and class number as suffixes;

c) the nominal bore;

d) the month and year of manufacture;

e) the design working pressure.

This information shall be stated in the following form:

MR/BS 5342/1A/19 mm/January 1985/10 bar.

[2)] Marking BS 5342 on or in relation to a product is a claim by the manufacturer that the product has been manufactured to the requirements of the standard. The accuracy of such a claim is therefore solely the manufacturer's responsibility. Enquiries as to the availability of third party certification to support such claims should be addressed to the Director, Quality Assurance Division, BSI, PO Box 375, Milton Keynes MK 14 6LO for certification marks administered by BSI or to the appropriate authority for other certification marks.

Appendix A Test for resistance to steam

A.1 Test pieces

Cut six lengths of hose each with fittings to give minimum lengths of 1 m between the end fittings.

A.2 Procedure

A.2.1 168 h *test*. Select any two test pieces and subject them for 168 ± 2 h to flowing saturated steam using method B described in clause **11** of BS 5173-3:1977, at a pressure of 10 ± 0.5 bar for type 1 hose and 16 ± 0.5 bar for type 2 hose. Allow the test pieces to cool and then, at room temperature, bend them four times through 180° for nominal bore sizes up to and including 31.5 mm and through 90° for larger bore sizes, over a mandrel of appropriate radius given in Table 5, rotating the test piece through 90° between each bending. After bending, mark these test pieces "steamed hose".

Table 5 — Mandrel sizes

Nominal bore	Mandrel radius
mm	mm
12.5	150
16	190
19	230
25	300
31.5	375
38	455
44	540
51	600

A.2.1.1 Mark two test pieces through which steam has not flowed "non-steamed hose".

A.2.1.2 Determine the burst pressure of all four test pieces as described in BS 5173-2.

A.2.1.3 Cut open the four test pieces and determine the hardness by the micro-test method described in BS 903-A26 and the elongation at break of the lining rubber as described in BS 903-A2 using the type 2 dumb-bell. Record the hardness and elongation at break of the lining for the four test pieces.

A.2.2 750 h *test*. Subject two further samples of hose to flowing saturated steam at the appropriate pressure described in **A.2.1** for 750 ± 5 h and report the condition of the hose and any failure.

A.3 Calculation and report

Calculate and report the following information:

a) date of test;

b) individual burst pressures;

c) mean burst pressure of "steamed hose";

d) mean burst pressure of "non-steamed hose";

e) individual values for elongation at break of hose lining;

f) mean elongation at break of "non-steamed hose" lining;

g) mean elongation at break of "steamed hose" lining;

h) hardness of non-steamed and steamed hose lining;

i) condition of hose after 750 ± 5 h steaming, including stiffening, cover cracking, leaks (not due to fittings), condition of lining and hose bursts.

Publications referred to

BS 903, *Methods of testing vulcanized rubber.*
BS 903-A2, *Determination of tensile stress-strain properties.*
BS 903-A16, *The resistance of vulcanized rubber to liquids.*
BS 903-A26, *Determination of hardness.*
BS 3558, *Glossary of rubber terms.*
BS 3592, *Steel wire for rubber hose reinforcement.*
BS 3592-2, *Coated patented steel wire.*
BS 5122, *Rubber hose for saturated steam.*
BS 5173, *Methods of test for hoses.*
BS 5173-1, *Measurement of dimensions.*
BS 5173-2, *Hydraulic pressure tests.*
BS 5173-3, *General physical tests.*
BS 5173-6, *Environmental tests.*
ISO 6134, *Rubber hoses for steam — Specification*[3)].

[3)] Referred to in the foreword only.

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