BS EN 14540:2014

BSI Standards Publication

Fire-fighting hoses — Non-percolating layflat hoses for fixed systems

bsi.

...making excellence a habit.™

National foreword

This British Standard is the UK implementation of EN 14540:2014. It supersedes BS EN 14540:2004 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee FSH/17/8, Hydrants, hoses and associated water delivery equipment.

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

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

ISBN 978 0 580 78802 4

ICS 13.220.10; 23.040.70

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 July 2014.

Amendments issued since publication

Date	Text affected

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 14540

July 2014

ICS 13.220.10; 23.040.70

Supersedes EN 14540:2004+A1:2007

English Version

Fire-fighting hoses - Non-percolating layflat hoses for fixed systems

Tuyaux de lutte contre l'incendie - Tuyaux aplatissables étanches pour systèmes fixes

Feuerlöschläuche - Flachschläuche für Wandhydranten

This European Standard was approved by CEN on 28 May 2014.

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 CEN-CENELEC 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 CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.

EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

Contents

Page

Foreword

This document (EN 14540:2014) has been prepared by Technical Committee CEN/TC 192 “Fire and Rescue Service Equipment”, the secretariat of which is held by BSI.

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 January 2015 and conflicting national standards shall be withdrawn at the latest by January 2015.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 14540:2004+A1:2007.

This revised standard now references EN 15889:2011, *Fire-fighting hoses - Test methods*, which includes the test methods formerly in annexes within EN 14540.

This standard is based on liaison with CEN/TC 191 “Fixed fire-fighting systems” and should be read in conjunction with EN 671-2.

Requirements for semi-rigid hoses for use with fire-fighting pumps and vehicles are given in EN 1947; those semi-rigid hoses for fixed systems are given in EN 694.

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Introduction

A fixed system is a manually operated unit installed in a building in order to make it possible for the occupants to control and extinguish a small fire. The system consists of fixed units mounted on walls or in cabinets permanently connected to a water supply. The fixed units are composed of a coupling, a valve with a pressure indicator, a layflat hose with its support and a nozzle.

The fixed systems are specified in EN 671-2, *Fixed firefighting systems — Hose systems — Part 2: Hose systems with lay-flat hose*.

1 Scope

This European Standard specifies the requirements and test methods for non-percolating layflat hoses for fixed systems. The hoses are intended for use at a maximum working pressure of 1,5 MPa over a range of inside diameters from 25 mm to 52 mm.

This European Standard applies exclusively to hoses for fire-fighting purposes intended for use at a minimum ambient temperature of −20 °C in normal conditions, and a minimum temperature of −30 °C in colder climatic conditions and a maximum ambient temperature of +60 °C. Hoses conforming to this standard should be used with fire hose couplings conforming to the relevant national standards for couplings.

NOTE 1 Hoses for use at ambient temperatures below −20 °C can be supplied if they have been tested at the specified lower temperature in accordance with 6.4 and identified by their marking in Clause 8 f).

Hoses in marine applications and/or aggressive environments to be used with wall hydrants as specified in EN 671-2 can conform to the requirements of this standard.

NOTE 2 All pressures are gauge pressures and are expressed in megapascals[1].

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 15889:2011, *Fire-fighting hoses - Test methods*

EN ISO 1307, *Rubber and plastics hoses - Hose sizes, minimum and maximum inside diameters, and tolerances on cut-to-length hoses (ISO 1307)*

EN ISO 1402, *Rubber and plastics hoses and hose assemblies - Hydrostatic testing (ISO 1402)*

EN ISO 4671, *Rubber and plastics hoses and hose assemblies - Methods of measurement of the dimensions of hoses and the lengths of hose assemblies (ISO 4671)*

EN ISO 8033, *Rubber and plastics hoses - Determination of adhesion between components (ISO 8033)*

EN ISO 8330, *Rubber and plastics hoses and hose assemblies - Vocabulary (ISO 8330)*

[1] 1 MPa = 10 bar

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN ISO 8330 and the following apply.

3.1
layflat hose
hose with a soft wall which, when unpressurized internally, collapses to such an extent that the inner faces of the inside diameter make contact and the hose takes up a flat cross-sectional appearance

3.2
jacket
circular woven seamless reinforcement

4 Materials and construction of hose

The hose shall be uncovered. It shall consist of the following:

a) a water impermeable rubber or plastics lining;

b) a synthetic fibre jacket.

1) The hose jacket can be dyed or pigmented.

2) The hose manufacturer should weave the jacket and assemble the jacket and lining.

The lining should be as smooth as possible so as to minimize friction.

5 Dimensions, tolerances and maximum mass

5.1 Inside diameter and maximum mass

The inside diameter of the hose and tolerances when measured in accordance with EN ISO 4671 shall conform to the requirements given in Table 1. The mass per metre length for a length of hose of at least 2 m, without couplings fitted, shall not exceed the value given in Table 1.

Table 1 — Inside diameter, tolerances on inside diameter and maximum mass per unit length

Inside diameter mm	Tolerances for inside diameter mm	Maximum mass per unit length kg/m
25	−0,5 to +1,0	0,18
38	−0,5 to +1,5	0,24
40/42/45		0,29
50/51/52		0,35

5.2 Length and tolerances on length

The total length of hose supplied shall be stated in metres.

Tolerance on length shall be in accordance with EN ISO 1307.

NOTE The coil or flake size, and the test procedures to determine these can, if considered necessary, be stated by the purchaser.

6 Performance requirements of finished hose

6.1 Hydrostatic requirements

6.1.1 Deformation under normal working pressure

The dimensional stability of the hose when tested in accordance with EN ISO 1402, shall conform to the requirements of Table 2 and Table 3.

The initial test pressure shall be 0,07 MPa, and the final test pressure shall be 1,0 MPa.

The twisting line shall be clockwise.

Table 2 — Change in length and external diameter

	Tolerances %
Change in length	0,0 to +5,0
Change in external diameter	0,0 to +5,0

Table 3 — Twisting line

Inside diameter mm	**Maximum twist** °/m
25	120
38 to 52 inclusive	100

6.1.2 Deformation under proof pressure

A proof pressure hold test shall be carried out on three hose lengths each of 1 m in accordance with EN ISO 1402. The proof pressure shall be as given in Table 4 and on examination during the test, the test pieces shall not show any evidence of leakage, cracking, abrupt distortion or other signs of failure.

Table 4 — Working pressures, proof pressure and minimum burst pressure

	Pressure MPa
Normal working pressure	1,0
Maximum working pressure [a]	1,5
Proof pressure [b]	2,25
Minimum burst pressure	4,5
[a] To accommodate pump close down pressures, the maximum working pressure may be exceeded by a maximum of 0,2 MPa for short periods only. [b] A statistically based sampling plan may be used to provide evidence that hoses in a given batch conform to the proof pressure requirement.	

6.1.3 Minimum burst pressure

Three test pieces of length 1 m shall be subjected to the burst pressure test as specified in EN ISO 1402.

No individual test piece shall burst at less than the burst pressure given in Table 4.

It is not necessary to increase the pressure above the minimum burst value to burst the hose. It is sufficient to increase the pressure to the required minimum burst pressure stated in Table 4 in order to pass this test requirement. This should be stated in the Test Report.

6.1.4 Kink pressure

When tested in accordance with EN 15889:2011, Annex C, the test piece shall neither burst nor show any signs of leakage or damage when examined visually before or after being subjected to the proof pressure given in Table 4.

6.2 Adhesion

When tested in accordance with type 1 of EN ISO 8033 the adhesion between the lining and jacket shall be not less than 1,0 kN/m.

The test piece shall be of length (25 ± 0,5) mm cut at right angles to the longitudinal axis of the hose. The ring shall be cut transversely and opened out to form a strip and the adhesion determined with the rate of travel of the power driven grips such that a rate of ply separation of (50 ± 5) mm/min is obtained.

If an adhesion result is not possible because of tearing due to high adhesion, this shall be accepted as a pass. All adhesions shall be attempted and the results recorded.

6.3 Accelerated ageing

The hose shall be tested in accordance with EN 15889:2011, D.1.

After ageing, subject three test pieces to the burst pressure test as specified in 6.1.3.

The mean of the burst pressure test results shall not decrease by more than 25 % from the initial mean burst pressure value determined from the results obtained in 6.1.3.

Subject the remaining test piece to the adhesion test as given in 6.2.

The adhesion between lining and jacket of the coiled test piece shall be not less than 0,9 kN/m.

6.4 Low temperature flexibility

When tested in accordance with EN 15889:2011, G.1, the inner lining of the hose shall not crack or become loose from the jacket after 15 cycles. The test temperatures shall be as specified below:

Standard test temperature	(−20 ± 2) °C
Special test temperature	(−30 ± 2) °C

NOTE The special test temperature requirement is for hoses for use in the colder climatic conditions of Northern Europe.

6.5 Hot surface resistance

When tested in accordance with EN 15889:2011, Annex H at a test temperature of (200 ± 10) °C, the test piece shall not show signs of leakage within 120 s from the application of the filament rod or on removal of the filament rod after this period, in none of the four tests.

6.6 Resistance to kinking

When tested in accordance with EN 15889:2011, Annex Q and using a bending radius 10 times its inside diameter, the hose shall not show any kinks when examined visually.

7 Frequency of testing

Type tests and Production tests shall be carried out as detailed in Annex A.

Batch tests as given in Annex B shall be carried to control the quality of the product. They are for guidance only.

8 Marking

Each length of hose shall be legibly and permanently marked with the following minimum information, at least twice per length, at both ends:

a) the manufacturer's name or trade mark

b) the number and date of this European Standard;

c) the inside diameter;

d) the maximum working pressure in MPa (bar);

e) the quarter and year of manufacture;

f) the test temperature if lower than −20 °C (see 6.4);

g) the approval number and the certifying body or its reference, where applicable.

EXAMPLE Man - EN 14540:2014 - 20 - 45 - 1,5(15) - 2Q/2014

Annex A
(normative)
Frequencies of testing (type test and production test)

Table A.1 gives the frequencies for the tests specified in this standard.

Type tests are those tests carried out to determine that the hose design and methods of manufacture meet the full requirements of the standard. They shall be repeated whenever the hose construction or the materials are modified. Repeat type tests shall be carried out every five years unless it can be confirmed by the manufacturer that no changes have been made during this period.

Production tests are those tests to be carried out on every manufactured length of hose.

Table A.1 – Frequencies of testing

Dimension/property under test (with reference to relevant clause)	**Type test**	**Production test**
Inside diameter (5.1)	**X**	**X**
Maximum mass (5.1)	**X**	**X**
Change in length at normal working pressure (6.1.1)	**X**	-
Change in external diameter at normal working pressure (6.1.1)	**X**	-
Twist at normal working pressure (6.1.1)	**X**	-
Proof pressure (6.1.2)	**X**	-
Minimum burst pressure (6.1.3)	**X**	-
Kink pressure (6.1.4)	**X**	-
Adhesion (6.2)	**X**	-
Accelerated ageing (6.3)	**X**	-
Low temperature flexibility (6.4)	**X**	-
Hot surface resistance (6.5)	**X**	-
Non-kink properties (6.6)	**X**	-
NOTE X to be tested.		

Annex B
(informative)
Frequencies of testing (batch test)

Batch tests are those tests to be carried out on a hose or sample of hose from every batch manufactured.

Table B.1 – Frequencies of testing

Dimension/property under test (with reference to relevant clause)	**Batch test**
Inside diameter (5.1)	**X**
Maximum mass (5.1)	**X**
Change in length at normal working pressure (6.1.1)	**X**
Change in external diameter at normal working pressure (6.1.1)	**X**
Twist at normal working pressure (6.1.1)	**X**
Proof pressure (6.1.2)	**X**
Minimum burst pressure (6.1.3)	**X**
Kink pressure (6.1.4)	**X**
Adhesion (6.2)	**X**
Accelerated ageing (6.3)	-
Low temperature flexibility (6.4)	-
Hot surface resistance (6.5)	-
Non-kink properties (6.6)	-
NOTE X to be tested.	

Bibliography

[1] EN 671-2, *Fixed firefighting systems - Hose systems - Part 2: Hose systems with lay-flat hose*

[2] EN ISO 9001, *Quality management systems - Requirements (ISO 9001)*

[3] EN 1947, *Fire-fighting hoses — Semi-rigid delivery hoses and hose assemblies for pumps and vehicles*

[4] EN 694, *Fire-fighting hoses — Semi-rigid hoses for fixed systems*

This page deliberately left blank

British Standards Institution (BSI)

BSI is the national body responsible for preparing British Standards and other standards-related publications, information and services.

BSI is incorporated by Royal Charter. British Standards and other standardization products are published by BSI Standards Limited.

About us

We bring together business, industry, government, consumers, innovators and others to shape their combined experience and expertise into standards -based solutions.

The knowledge embodied in our standards has been carefully assembled in a dependable format and refined through our open consultation process. Organizations of all sizes and across all sectors choose standards to help them achieve their goals.

Information on standards

We can provide you with the knowledge that your organization needs to succeed. Find out more about British Standards by visiting our website at bsigroup.com/standards or contacting our Customer Services team or Knowledge Centre.

Buying standards

You can buy and download PDF versions of BSI publications, including British and adopted European and international standards, through our website at bsigroup.com/shop, where hard copies can also be purchased.

If you need international and foreign standards from other Standards Development Organizations, hard copies can be ordered from our Customer Services team.

Subscriptions

Our range of subscription services are designed to make using standards easier for you. For further information on our subscription products go to bsigroup.com/subscriptions.

With **British Standards Online (BSOL)** you'll have instant access to over 55,000 British and adopted European and international standards from your desktop. It's available 24/7 and is refreshed daily so you'll always be up to date.

You can keep in touch with standards developments and receive substantial discounts on the purchase price of standards, both in single copy and subscription format, by becoming a **BSI Subscribing Member**.

PLUS is an updating service exclusive to BSI Subscribing Members. You will automatically receive the latest hard copy of your standards when they're revised or replaced.

To find out more about becoming a BSI Subscribing Member and the benefits of membership, please visit bsigroup.com/shop.

With a **Multi-User Network Licence (MUNL)** you are able to host standards publications on your intranet. Licences can cover as few or as many users as you wish. With updates supplied as soon as they're available, you can be sure your documentation is current. For further information, email bsmusales@bsigroup.com.

BSI Group Headquarters

389 Chiswick High Road London W4 4AL UK

Revisions

Our British Standards and other publications are updated by amendment or revision.

We continually improve the quality of our products and services to benefit your business. If you find an inaccuracy or ambiguity within a British Standard or other BSI publication please inform the Knowledge Centre.

Copyright

Useful Contacts:

Customer Services
Tel: +44 845 086 9001
Email (orders): orders@bsigroup.com
Email (enquiries): cservices@bsigroup.com

Subscriptions
Tel: +44 845 086 9001
Email: subscriptions@bsigroup.com

Knowledge Centre
Tel: +44 20 8996 7004
Email: knowledgecentre@bsigroup.com

Copyright & Licensing
Tel: +44 20 8996 7070
Email: copyright@bsigroup.com

bsi.

...making excellence a habit.™