BS EN 694:2014

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Fire-fighting hoses — Semi-rigid hoses for fixed systems

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National foreword

This British Standard is the UK implementation of EN 694:2014. It supersedes BS EN 694:2001 which is withdrawn.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.

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Fire-fighting hoses - Semi-rigid hoses for fixed systems

Tuyaux de lutte contre l'incendie - Tuyaux semi-rigides pour systèmes fixes

Feuerlöschschläuche - Formstabile Schläuche für Wandhydranten

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Foreword

This document (EN 694:2014) 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of an identical text or by endorsement, at the latest by January 2015 and conflicting national standards shall be withdrawn at the latest by January 2015.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 694:2001+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 694.

The standard is based on liaison with CEN/TC 191 “Fixed fire-fighting systems” and should be read in conjunction with EN 671-1.

Requirements for semi-rigid hoses for use with fire-fighting pumps and vehicles are given in EN 1947; those for non-percolating layflat hoses for fixed systems are given in EN 14540.

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, a semi-rigid hose which is water filled or empty fitted on a reel with its support and a nozzle.

The fixed system is specified in EN 671-1, *Fixed firefighting systems - Hose systems - Part 1: Hose reels with semi-rigid hose.*

1 Scope

This European Standard specifies the requirements and test methods for semi-rigid hoses for fire-fighting purposes for use with fixed systems. The hoses are intended for use at a maximum working pressure of 1,2 MPa for hoses of 19 mm and 25 mm inside diameter and 0,7 MPa for hoses of 33 mm inside diameter.

Hoses conforming to this European Standard are intended for applications where long intervals can occur between the occasions of use, for example on fixed fire hose reels in buildings and other construction works.

This European Standard applies exclusively to hoses for fire-fighting purposes intended for use at ambient conditions in non-aggressive or non-corrosive atmospheres within the temperature range −20 °C to +60 °C.

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).

NOTE 2 All pressures are expressed in megapascals. 1 MPa = 10 bar

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 176:2005, *Plastics - Determination of loss of plasticizers - Activated carbon method (ISO 176:2005)*

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 7326:2008, *Rubber and plastics hoses - Assessment of ozone resistance under static conditions (ISO 7326:2006)*

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)*

EN ISO 10619-2:2011, *Rubber and plastics hoses and tubing - Measurement of flexibility and stiffness - Part 2: Bending tests at sub-ambient temperatures (ISO 10619-2:2011)*

3 Terms and Definitions

For the purposes of this standard the following definition applies, together with those for working pressure, proof pressure and burst pressure given in EN ISO 8330.

3.1
semi-rigid hose
hose which maintains its round cross-section even when unpressurized

4 Classification

4.1 General

All types and classes of hoses shall be so flexible that they can be rolled and kept on a drum of minimum diameter 200 mm for 19 mm and 25 mm inside diameter hose and of minimum diameter 280 mm for 33 mm inside diameter hose.

Hoses shall be one of two types distinguished by their construction. Each hose type shall be further divided into classes distinguished by the materials used for lining and cover.

4.2 Classification by types (hose construction)

Type A hoses shall consist of:

a) a seamless rubber or plastics lining;

b) a textile reinforcement with or without a rigid spiral helix;

c) a rubber or plastics cover.

Type B hoses shall consist of:

d) a seamless rubber or plastics lining;

e) a circular woven textile reinforcement with a rigid spiral helix;

f) an uncovered or rubber or plastics cover.

4.3 Classification by class (materials for lining and cover)

The hose types shall be further subdivided into six classes dependent on the materials used in the construction in accordance with Table 1.

Table 1 — Classes and materials

Class	Lining material	Cover material
1	rubber	rubber
2	plastics	plastics
3	rubber	plastics
4	plastics	rubber
5	rubber	no cover
6	plastics	no cover

5 Dimensions, tolerances and maximum mass

5.1 Inside diameter and maximum mass

The inside diameter of the hose, when measured in accordance with EN ISO 4671, shall conform to the requirements given in Table 2. The mass per metre length of the hose shall be in accordance with Table 2.

Table 2 — 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	
		Type A	Type B
		max.	max.
19	−0,5 to +1,0	0,75	0,25
25	±1,0	0,90	0,35
33	−1,0 to +1,5	1,00	0,50

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.

6 Performance requirements of finished hose

6.1 Hydrostatic requirements

6.1.1 Deformation under maximum working pressure

The dimensional stability of the hose, when tested in accordance with EN ISO 1402, shall conform to the requirements given in Table 3. The length of the test piece shall be 1 m.

For 19 mm and 25 mm inside diameter hoses the initial test pressure shall be 0,07 MPa and the final test pressure shall be 1,2 MPa. For 33 mm inside diameter hose the initial test pressure shall be 0,07 MPa and the final test pressure shall be 0,7 MPa.

The twist shall be not greater than 30°/m for type A. For type B the twist may be greater than 30°/m but in this case it shall only be in a direction which closes the coupling and shall be stated in the test report.

Table 3 — Change in length and external diameter

	Tolerances for type A %	Tolerances for type B %
Change in length	0 to +7,5	0 to +5,0
Change in external diameter	0 to +7,5	0 to +5,0

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 — Maximum working pressure, proof pressure and minimum burst pressure

Pressure MPa	**Inside diameter**	
	19 mm and 25 mm	**33 mm**
Maximum working pressure	1,2	0,7
Proof pressure	2,4	1,4
Minimum burst pressure	4,2	2,45

6.1.3 Minimum burst pressure

A burst pressure test shall be carried out in accordance with EN ISO 1402 on the three test pieces used for the deformation under proof pressure test.

Each of the test pieces shall not burst at a pressure less than that 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 be pressurised to 1,2 MPa for 19 mm and 25 mm inside diameter hoses and at 0,7 MPa for 33 mm inside diameter hose.

There shall be no leakage or damage prior to releasing the pressure.

6.2 Adhesion

When tested in accordance with EN ISO 8033 the adhesion between all components shall be not less than 1,5 kN/m for type A hoses and 1,0 kN/m for type B hoses.

The test method shall be dependant on the construction of the hose

6.3 Accelerated ageing

The hose shall be tested in accordance with EN 15889:2011, D.2.

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 resultant adhesion of the fourth test piece shall be in accordance with the requirements of 6.2.

6.4 Low temperature flexibility

The test shall be carried out in accordance with Clause 5, Method B of EN ISO 10619-2:2011 using a mandrel of outside diameter equal to 12 times the inside diameter of the hose. After bending the hose round the mandrel through 180° for (10 ± 2) s at a temperature of (−20 ± 2) °C or lower if requested, it shall not show any signs of breaking or cracking and shall meet the proof pressure requirement given in Table 4.

6.5 Hot surface resistance

For all types and classes, when tested in accordance with EN 15889:2011, Annex H at a test temperature of (200 ± 2) °C. In none of the four tests shall leakage occur less than 60 s from the application of the filament rod or on removal of this filament rod after the specified period.

6.6 Ozone resistance

For all diameter and types of hoses when tested in accordance with EN ISO 7326:2008, 7.1, method 1, neither the inside or the cover of the hose shall show any signs of visible cracks. The lining shall be examined by slitting the hose wall.

6.7 Bending and crush resistance

When tested in accordance with EN 15889:2011, Annex K at a temperature of (23 ± 2) °C, the ratio *T*/*D* shall not exceed 1,20 and there shall be no visible signs of kinking.

6.8 UV-resistance (xenon arc lamp)

NOTE A test for resistance to UV and requirements based on EN ISO 30013 will be added at the revision of this standard, when more experience has been acquired.

6.9 Loss in mass on heating

When tested in accordance with 6.2, Method B of ISO 176:2005 the lining and cover materials shall not show a loss in mass greater than 4 %.

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 for type B hoses and along the whole length at minimum intervals of 2 m for type A hoses:

a) manufacturer's name or trademark;

b) number and date of this European Standard;

c) hose type, class and inside diameter in mm;

d) maximum working pressure in MPa (bar);

e) quarter and year of manufacture;

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

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

EXAMPLE: Man - EN 694: 2014 - A - 2 – 19 −1,2(12) - 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**	-
Change in length at maximum working pressure (6.1.1)	**X**	-
Change in external diameter at maximum working pressure (6.1.1)	**X**	-
Twist at maximum 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**	**-**
Ozone resistance (6.6)	**X**	-
Bending and crush resistance (6.7)	**X**	-
Loss in mass on heating (6.9)	**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 maximum working pressure (6.1.1)	**X**
Change in external diameter at maximum working pressure (6.1.1)	**X**
Twist at maximum 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)	-
Ozone resistance (6.6)	-
Bending and crush resistance (6.7)	-
Loss in mass on heating (6.9)	-
NOTE X to be tested.	

Bibliography

[1] EN 671-1, *Fixed firefighting systems - Hose systems - Part 1: Hose reels with semi-rigid hose*

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

[3] EN ISO 30013, *Rubber and plastics hoses - Methods of exposure to laboratory light sources - Determination of changes in colour, appearance and other physical properties (ISO 30013)*

[4] EN 14540, *Fire-fighting hoses — Non-percolating layflat hoses for fixed systems*

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

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