BRITISH STANDARD

BS 1155 : 1992

Specification for

Natural rubber compounds for extrusion

BSI STANDARDS

Committees responsible for this British Standard

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British Rubber Manufacturers' Association Ltd.
Chemical Industries' Association
Malaysian Rubber Producers' Research Association
Ministry of Defence
Rapra Technology Ltd.

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Contents

Foreword

This British Standard has been prepared under the direction of the Plastics and Rubber Standards Policy Committee. It supersedes BS 1155 : 1986 which is withdrawn.

BS 1155 : 1992 comprises an editorial revision of BS 1155 : 1986, in which the presentation has been changed to align the text with other British Standards in the group.

Other British Standards in this group for rubber compounds are as follows.

BS 1154	*Specification for natural rubber compounds*
BS 2751	*Specification for general purpose acrylonitrile-butadiene rubber compounds*
BS 2752	*Specification for chloroprene rubber compounds*
BS 3227	*Specification for butyl rubber compounds (including halobutyl compounds)*
BS 6014	*Specification for ethylene propylene rubber compounds*
BS 6996	*Specification for mineral oil resistant acrylonitrile-butadiene rubber compounds*

The following British Standards are also relevant to this standard.

BS 3558	*Glossary of rubber terms*
BS 3734	*Specification for dimensional tolerances of solid moulded and extruded rubber products*

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

Specification

1 Scope

This British Standard specifies compositional and physical property requirements for four non-black natural rubber compounds designated R40, R50, R60, R70, three non-black natural rubber/zinc oxide compounds designated S40, S50, S60 and five black natural rubber compounds designated T40, T50, T60, T70, T80.

These compounds are intended for the manufacture of items in the form of extrusions and items cut from extruded sections, e.g. washers.

NOTE 1. The compounds do not necessarily have good electrical insulating properties.

NOTE 2. The compounds may not be suitable for use when special properties are required, such as improved ozone or heat resistance, freedom from tarnishing of some metallic components (copper, silver), long term low temperature use or seals in castor oil based fluid systems.

2 References

2.1 Normative references

This British Standard 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 British Standard only when incorporated in it by updating or revision.

2.2 Informative references

This British Standard 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 Classification

Compounds shall be classified according to their vulcanized hardness in international rubber hardness degrees (IRHD), and designated by grade as shown in table 1.

Table 1. Compound classification

Grade designation			Hardness after vulcanization (IRHD)
R40	S40	T40	40^{+5}_{-4}
R50	S50	T50	50^{+5}_{-4}
R60	S60	T60	60^{+5}_{-4}
R70	—	T70	70^{+5}_{-4}
—	—	T80	80^{+5}_{-4}

4 Composition

The compounds shall be based on high quality plantation (Hevea) rubber or superior processing rubber, or on a mixture of both. The high quality plantation (Hevea) rubber shall be one or any combination of the following: pale crepe, or RSS1, or latex grade technically specified natural rubber. It shall be vulcanized with sulfur/organic accelerator(s) activated with up to 2 parts per hundred of rubber by mass (p.h.r) of stearic acid and a minimum of 5 p.h.r of zinc oxide. At least 1 p.h.r of an antioxidant shall be incorporated in the mix.

Compounds designated 'R' shall be reinforced with non-black fillers.

Compounds designated 'S' shall be reinforced with zinc oxide only and shall contain no carbon black or mineral filler other than zinc oxide.

Compounds designated 'T' shall be reinforced with carbon black(s), or with carbon black(s) and zinc oxide, and shall contain no other fillers.

If ingredients that facilitate processing, e.g. factice and/or softeners, are used in the mixes, the total amount excluding stearic acid shall not exceed 20 p.h.r. Any factice included shall only be a sulfur-vulcanized triglyceride oil type.

No reclaimed rubber or ground vulcanized rubber shall be used.

The colour of the compounds designated 'T' shall be black.

NOTE 1. The colour of the compounds designated 'R' and 'S' should be as agreed between the purchaser and the supplier.

All ingredients of the mix shall be free from grit and extraneous material.

NOTE 2. Chemical analysis may be carried out on either two-thickness sample sheets or sample items, as practicable, to verify that the composition of the mix conforms to this clause. The methods described in BS 903 : Parts B1 to B5, Parts B11 & B12, BS 4181 : Part 1, BS 5923 : Part 2 and BS 7164 : Parts 5 and 14 should be used where relevant. These British Standards are currently being revised and combined under a single BS number.

5 Preparation of test sheet

From each batch of rubber mix, a two-thickness test sheet of the following dimensions shall be prepared for testing.

The sheet shall be approximately 250 mm square with a thicker section along one side 35 mm to 50 mm wide and 6.30 ± 0.15 mm thick. The remainder of the sheet shall be 2.00 ± 0.15 mm thick. The thicker sections of the sheet shall not be additionally vulcanized.

If part of the 6.3 mm section is moulded in the form of cylindrical buttons complying with the type B test piece defined in BS 903 : Part A6 : 1992 for the purpose of compression set tests, the mould cavities shall be individually charged with pellets and not by the flow of the excess rubber from the remainder of the mould. The minimum number of buttons moulded shall be nine and they shall be in a group at one end of the 6.3 mm section.

6 Physical properties of the vulcanized test sheet

Test pieces cut from the test sheet (see clause 5) shall conform to the relevant requirements given in table 2 when tested by the methods specified in the table.

NOTE 1. Guidance for the preparation and testing of rubber products is given in annex A.

7 Marking

The compound, as sheet or items, shall be accompanied by the following information (see also BS 3574 : 1989):

a) number and date of this British Standard, i.e. BS 1155 : 1992[1)], and grade designation;

b) quarter and year of cure;

c) manufacturer's identity or trade mark;

d) manufacturer's batch number or similar means of production identity.

[1)]Marking BS 1155 : 1992 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 therefore solely the responsibility of the person making the claim. Such a declaration is not to be confused with third party certification of conformity, which may also be desirable.

Table 2. Physical properties of two-thickness test sheets

Physical property	Grade designation												Test method in BS 903 and type of test piece where appropriate
	R40	S40	T40	R50	S50	T50	R60	S60	T60	R70	T70	T80	
Hardness after vulcanization (IRHD)	40^{+5}_{-4}			50^{+5}_{-4}			60^{+5}_{-4}			70^{+5}_{-4}		80^{+5}_{-4}	Part A26 : 1969, method N, two plies, 6.30 mm and 2.00 mm, with the thicker ply on top
Density (Mg/m^3)	Agreed value ± 0.02[1)]												Part A1 : 1980, method A
Minimum tensile strength (MPa) Minimum elongation at break (%)	14 400	17 600	17 600	14 400	17 500	17 500	10 350	14 400	14 400	9 200	11 300	9 200	Part A2 : 1989, type 2 dumb-bells
Maximum compression set (%)	40			40			40			40		40	Part A6 : 1992, type B test piece, lubricated, 24^{+0}_{-2} h at 70 ± 1 °C
Resistance to accelerated ageing													Part A19 : 1986, air oven methods, 7 days $^{+0}_{-2}$ h at 70 ± 1 °C
Maximum change in tensile strength (% of original value)	− 10			− 10			− 10			− 10		− 10	Part A2 : 1989, type 2 dumb-bells
Maximum change in elongation at break (% of original value)	− 15			− 15			− 15			− 15		15	Part A2 : 1989, type 2 dumb-bells

[1)]No values are specified for density but it is recommended that a value be established for each composition.
This may provide a useful check when a series of batches of the same composition has to be tested for conformity to this British Standard.

NOTE. Line call-outs, in accordance with BS 5176, are given in annex B.

Annexes

Annex A (informative)

Guidance for the preparation and testing of rubber products

This British Standard specifies requirements for the rubber compounds when they are tested using a press-cured sample sheet. Where manufactured articles are to be tested the shape and size may prevent the preparation of some or all test pieces. In this case agreement between manufacturer and purchaser should be sought on the procedure to verify conformity of the manufactured article. Where standard test pieces can be prepared from the articles they may be used for quality control tests.

Finished rubber items should be free from surface imperfections, voids, inclusions, extrusion faults and defects which would impair satisfactory performance and should show minimal accelerator bloom.

Finished rubber items should be stored in accordance with BS 3574.

Annex B (informative)

Line call-outs

Line call-outs in accordance with BS 5176 for compounds specified in this standard are given in table B.1.

Table B.1 Line call-outs

BS 1155 designation	BS 5176 line call-out
R40	8MAA 414 A33 B13 Z1 Z2
S40	8MAA 417 A33 B13 Z1 Z2
T40	8MAA 417 A33 B13 Z1 Z2
R50	8MAA 514 A33 B13 Z1 Z2
S50	8MAA 517 A33 B13 Z1 Z2
T50	8MAA 517 A33 B13 Z1 Z2
R60	8MAA 610 A33 B13 Z1 Z2
S60	8MAA 614 A33 B13 Z1 Z2
T60	8MAA 614 A33 B13 Z1 Z2
R70	8MAA 709 A33 B13 Z1 Z2
T70	8MAA 711 A33 B13 Z1 Z2
T80	8MAA 809 A33 B13 Z1 Z2

NOTE 1. Z1 is the tolerance of ± 0.02 Mg/m^3 on the agreed value of density.

NOTE 2. Z2 is the compositional requirements according to clause **4** of this standard, i.e. BS 1155.

List of references (see clause 2)

Normative references

BSI standards publications

BRITISH STANDARDS INSTITUTION, London

BS 903:	*Physical testing of rubber*
BS 903 : Part A1 : 1980	*Determination of density*
BS 903 : Part A2 : 1989	*Determination of tensile stress-strain properties*
BS 903 : Part A6 : 1992	*Method for determination of compression set at ambient, elevated on low temperatures*
BS 903 : Part A19 : 1986	*Heat resistance and accelerated ageing tests*
BS 903 : Part A26 : 1969	*Determination of hardness*
BS 3574 : 1989	*Specification for the controlled storage and packaging of vulcanized rubber and rubber products*

Informative references

BSI standards publications

BRITISH STANDARDS INSTITUTION, London

BS 903 :	*Physical testing of rubber*
BS 903 : Parts B1 to B5 : 1992	*Preparation of material and extraction methods*
BS 903 : Parts B11 & B12 : 1992	*Rubber (polymer) determination*
BS 1154 : 1992[2)]	*Specification for natural rubber compounds*
BS 2751 : 1990[2)]	*Specification for general purpose acrylonitrile-butadiene rubber compounds*
BS 2752 : 1990[2)]	*Specification for chloroprene rubber compounds*
BS 3227 : 1990[2)]	*Specification for butyl rubber compounds (including halobutyl compounds)*
BS 3558 : 1980[2)]	*Glossary of rubber terms*
BS 3734 : 1978[2)]	*Specification for dimensional tolerances of solid moulded and extruded rubber products*
BS 4181 :	*Identification of rubbers by infra-red spectrometry*
BS 4181 : Part 1 : 1985	*Method for identification of hydrocarbon, chloroprene, nitrile and chlorosulphonated polyethylene rubbers*
BS 5176 : 1975	*Specification for classification system for vulcanized rubbers*
BS 5923 :	*Methods for chemical analysis of rubber*
BS 5923 : Part 2 : 1980	*EDTA titrimetric method for determination of zinc content of rubber products*
BS 6014 : 1991[2)]	*Specification for ethylene propylene rubber compounds*
BS 6996 : 1989[2)]	*Specification for mineral oil resistant acrylonitrile-butadiene rubber compounds*
BS 7164 :	*Chemical tests for raw and vulcanized rubber*
BS 7164 : Part 5 : 1991	*Methods for determination of ash content*
BS 7164 : Part 14 : 1990	*Methods for determination of carbon black content*

[2)]Referred to in the foreword only.

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