

Q. P. C. SECTION
O. F. KHAMARIA, JABALPUR
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VULCANISED CHLOROPRENE RUBBER COMPOUNDS (NEOPRENE)
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THIS SPECIFICATION OR ANY PATTERN, DRAWINGS OR OTHER INFORMATION ISSUED IN CONNECTION THEREWITH MAY ONLY BE USED FOR A SPECIFIC ORDER PLACED BY THE COMPETENT AUTHORITY. IT IS NOT TO BE USED FOR ANY OTHER PURPOSE WHATSOEVER WITHOUT THE EXPRESS WRITTEN SANCTION OF THE DIRECTOR GENERAL OF INSPECTION, MINISTRY OF DEFENCE, NEW DELHI - 110 011.

0. FOREWORD

0.1 This specification has been prepared by the Controllerate of Inspection (MILITARY EXPLOSIVES), KIRKEE, PUNE - 411 003.

0.2 For additional copies or any other enquiry regarding this specification reference should be made to the Inspection Authority named in the tender of contract (i.e. CQI (ME), KIRKEE).

1. SCOPE

1.1 This specification is meant to govern manufacture, supply and inspection of Vulcanised Chloroprene Rubber Compounds (Neoprene).

1.2 This specification covers five synthetic rubber C-40 to C80 (Chloroprene) Vulcanisates designated as compounds C2 to C6. The compounds are classified according to their hardness (as shown in Table I below)

1.3 The vulcanisates are primarily intended to meet the requirements of items in which resistance to weather and certain organic liquids is a necessary property.

1.4 The material is suitable for use in the manufacture of items such as sheets, washers, strips, gaskets, moulded articles and wrapped tubing etc.

TABLE I

Class	Compound No	Hardness (D.S. Rubber Hardness degrees)
C2	C 40	41-50 40 $\pm$ 5
C3	C 50	51-60 50 $\pm$ 5
✓C4	C 60	61-70 60 $\pm$ 5
C5	C 70	71-80 70 $\pm$ 5
C6	C 80	81-88 80 $\pm$ 5

2. RELATED DOCUMENTS

2.1 The related documents mentioned at clause 2.2 are those applicable at the date of publication of this specification. It is contractor's responsibility to confirm their current applicability and to obtain from the Authority Holding Sealed Particulars (i.e. CQI (ME), KIRKEE) information concerning any change that may be necessary due to cancellation, replacement or supersession of any of these documents.

2.2 Copies of the related specifications in clauses 3.5 and 9 are obtainable as follows :

DS 903	X
DS 903 -A-26 - 1969	X
DS 903 A-2 - 1971	X Indian Standards Institution
DS 903 A-19 - 1956	X Manak Bhavan,
DS 903 A-6 - 1969	X 9, Bahadur Shah Zafar Marg
DS 903 A-16 - 1971	X NEW DELHI - 110 002.
BS-007 - 1965	X
BS-805 - 1953 (Toluene)	X
BS-1995-1962	X
BS 2536-1954	X
BS 2637/8-1956 (I Sooctane)	X

3. COMPOSITION

3.1 Rubber Mix : The manufacture should prepare a suitable mix which on vulcanisation will give material conforming to the physical properties given in clause 9.2. The basic polymer may be Chloroprene Rubber No reclaimed synthetic rubber, ground vulcanised scrap or waste rubber shall be used. The mix should also contain suitable plasticisers, softeners, fillers, accelerators, anti-oxidance, vulcanising agents etc. in requisite proportion.

3.2 All ingredients used in the mix shall be of good commercial quality and free from grit and extraneous materials.

3.2.1 Di-2-ethylhexyl phthalate and Di-2-ethylhexyl sebacate used in the mix shall be in accordance with specification BS:1995-1962 and BS:2530-1956 amended to date respectively.

3.3 The manufacturer shall give a declaration of the mix he proposes to use for manufacturing articles against a particular contract and this mix shall not be altered in any way during the period of contract without the written permission of the Inspecting Officer, Inspection Authority.

3.4 The compounding and processing must be such that the material may be calendered, extruded, moulded or otherwise fabricated and give after suitable vulcanization, a product free from grit, foreign matter and sulphur bloom and from defects such as blisters, porosity and surface imperfections and complying with all the requirements of clause 9. The material shall have a smooth surface.

3.5 Mix which as been found to give satisfactory material is appended at Appendix 'E' for guidance.

3.6 The type of the mixes appended at Appendix 'E' shall be regarded as indicating the class of compositions which is considered suitable but depending on the brand of synthetic rubber used. It may be necessary for the contractor to adjust the proportions of carbon black or any of the vulcanising ingredients in order that the vulcanizate will comply with the requirements of the relevant class to this specification.

4. DESCRIPTION

4.1 The synthetic rubber must consist of suitable chloroprene polymer compounded with approved ingredients so that the composition is in accordance with requirements of this specification.

5. TENDER SAMPLE

5.1 Details of the composition of the mix which the contractor proposes to use together with test samples as given below shall be submitted to the Inspecting Officer for approval prior to the commencement of bulk manufacture.

5.1.1 The contractor shall submit, free of charge, one each of the following samples.

- i) Test slab size - 300 mm x 300 mm x (2.5 mm $\pm$ 0.25 mm thick)
- ii) Test slab size - 150 mm x 150 mm x (6.35 mm $\pm$ 0.125 mm thick)
- iii) Sample of finished stores -

A minimum of 100 grams which should contain atleast 3 Nos of actual size is normally required.

In case the finished component are of small dimensions and low weights, the quantum of samples required for tests, shall be decided by the Inspecting Officer on the merit of the case. However, these samples shall truly represent the bulk and their total mass shall not be less than 30 grams in such cases.

5.2 The samples will be manufactured from the mix proposed to be used by the contractor and for which declaration of the mix shall be given as per clause 3 above.

6. PRE-INSPECTION

6.1 Before tending the store to the Inspector, the supplier shall carry out a thorough inspection of each delivery to satisfy himself that the store fully conforms to this specification and shall render a certificate to that effect to the Inspecting Officer

7. INSPECTION

7.1 The vulcanised chloroprene rubber compound (Neoprene) and the packages in which it is contained, shall be subject to inspection by, and to the final approval of the Inspecting Officer/Inspection Authority.

7.2 Samples of the material and of the packages in which it is contained may be taken from any portion of the consignment.

7.3 If, on examination, any sample be found not to conform to this specification, the whole consignment is liable for rejection.

7.4 The foregoing provisions shall apply equally to prime contractors and to sub-contractors, if any.

8. SAMPLING

8.1 The number of samples to be drawn from each lot/consignment will be at the discretion of the Inspecting Officer.

9. TEST REQUIREMENTS

9.1 Samples drawn from any portion of the supply shall comply with clause 3 and 4 above and shall also conform to the following requirements.

9.2 PHYSICAL

Ⓟ See as per ~~MSL~~ attached

✓



For The existing table.
 READ as follows for Column 2 & 3

Test Method	SL. NO.	Characteristic	PASSING STANDARD					TEST METHOD
	1	2	3					4
Compound di NO-								
			40	C50	C60	C70	C80	
BS 903-A-28	1.	Hardness degree BS	40 ⁺⁵ -4	50 ⁺⁵ -4	60 ⁺⁵ -4	70 ⁺⁵ -4	80 ⁺⁵ -4	
BS 903-A-2	2.	Tensile strength in KPa. Min	9000	12000	13000	13000	13000	
BS 903-A-2	3.	Elongation at break point Min	450	400	250	200	100	
Appendix A Refer BS 903-A-6	4.	Compression set percent Max a) For 24 hrs at 70 °C b) 25% compression applied wrt original thickness	30	30	25	25	25	
Appendix B Ref BS A-16	5.	Swelling percent Max a) for 22 hrs at 40 °C b) use liquid B i.e. ISO-octane 70 Toluene 30	100	80	70	70	60	
Appendix C	6.	Adhesion to and corrosion of metals i.e. copper & mild steel.	There shall be no corrosion or pitting of metals and the vulcanizate shall not adhere to the metal surface shall not be considered objectionable.					
	7.	Resistance to heat ageing at 70 ± 1 °C for 168 hrs	a) The hardness shall not increase by more than 7 degree B.S. b) The tensile strength shall not decrease by more than 12% percent. c) The elongation at break shall not decrease by more than 12 percent					

8. Resistance to crystallisation

The test piece shall show no appreciable increase in stiffness

Appendix D

9.3 CHEMICAL

9.3.1 Carry out chemical analysis on any portion of the consignment or on sheet supplied for physical testing. Results of chemical tests shall be in accordance with the requirements specified and if necessary with the manufacturer's declaration of the composition.

9.3.2 Carry out the chemical tests by the appropriate methods described in BS 903 (Methods of testing vulcanised rubber).

10. PACKING AND MARKING

10.1 PACKING

- a) Components : Rubber component shall be packed loose in a wooden box/card-board box and shall be adequately dusted with french chalk, where wooden boxes are used, they shall be lined internally with brown paper.
- b) Sheets : Sheets in running length shall be rolled the rolls shall be covered with brown paper and then packed in hessian cloth. Sheets shall be dusted with french chalk during rolling.

10.2 MARKING

10.2.1 The packages constituting a consignment shall each be legibly and durably marked with the following details as applicable :

- i) Nomenclature and specification number of the material.
- ii) Name and address of the consignee.

- iii) AT/SO No. and date.
- iv) Consignment Number.
- v) Lot No./Batch No. and date of manufacture.
- vi) Gross and net mass.
- vii) Consecutive number of package and total No. of packages.
- viii) Date of supply.
- ix) Contractor's initials or recognised trade mark.

10.2.2 The components will be appropriately marked with initials/trade mark of the manufacture, date of manufacture, if specified, on the relevant component drawing.

10.2.3 In addition to above, the Inspecting Officer may suggest some more marking/identification, suitable at the time of inspection.

10.2.4 The inclusion of any foreign matter or impurities in any of the packages shall render the whole consignment liable to rejection.

SC/- X X X
(Dr.S.B.RAY)
DCSO/CIME
for DI (Armts).

..9/-

11. APPENDICES

APPENDIX 'A'

DETERMINATION OF COMPRESSION - SET

APPARATUS

- 1) Dies and knives - for cutting test pieces
- 2) Thickness gauge - micrometer dial gauge type A as per IS 907.
- 3) Compression apparatus - Two or more highly polished or chromeplated parallel plates of stainless steel sufficiently rigid which will withstand stress and which can be held together with bolts.
- 4) Specers - 4.73 ± 0.01 mm.
- 5) Oven - which will work as per requirement of temperature within limits.
- 6) Test Pieces - A cylindrical disc 13.0 ± 0.5 mm and thickness 6.3 ± 0.3 mm.

Procedure : Cut 3 test pieces as per requirement above and measure thickness of each piece. Compress the test pieces in between compression set plates by keeping required spacers so that the thickness of test pieces is pressed by 25%. Ensure full tightening and keep this assembly in the oven at $70^{\circ}\text{C} \pm 1$ deg C for a period of 24 hours. Take out the assembly from oven. Remove the rubber pieces. Keep the rubber pieces on wooden base and allow to cool and recover for 30 ± 3 minutes at $20^{\circ}\text{C} \pm 2$ deg C. Measure the thickness of the each test pieces. Calculate compression set percentage as follows :

$$\text{Compression Set at constant strain} = \frac{t_0 - t_1}{t_0 - t_s} \times 100$$

Where t_0 = original thickness of test piece.

t_r = thickness of test piece after recovery.

t_s = thickness of spacer.

APPENDIX 'D'

DETERMINATION OF SWELLING IN ISOCTANE AND TOLUENE MIXTURE

Weigh the test piece accurately in air (W_1) and then in distilled water at $20^\circ\text{C} \pm 2^\circ\text{C}$ (W_2). See that no air bubble exists while weighing in distilled water. Dry the test piece in air and keep in 100 ml of swelling liquid (mixture of isooctane) and toluene in the proportion of 70:30 in a well stoppered container. Keep the container along with test piece in an oven at $40^\circ\text{C} \pm 1^\circ\text{C}$ for 24 hours. Remove the container and quickly transfer the test piece to a fresh cool swelling liquid at $20^\circ\text{C} \pm 2^\circ\text{C}$ and allow to stand for 5 minutes. It is then dried and weighed in air (W_3) and then in distilled water at $20^\circ\text{C} \pm 2^\circ\text{C}$ (W_4). Swelling is calculated as follows :

$$Sv = \frac{(W_3 - W_4) (W_1 - W_2)}{(W_1 - W_2)} \times 100$$

Confirmation to specn DS 2637/8-1956
" to specn DS 805-1953

APPENDIX 'C'

ADHESION TO AND CORROSION OF METALS

Place a test piece approximately 25 mm square on a clean, smooth, finely ground surface of Mild steel plate of 50 mm square and 3 mm thick approximately. Place a copper plate, similar in dimension to that of steel plate, over the test piece in line with the steel plate and with the prepared surface against the test piece. Place the assembly in a vice. Apply sufficient pressure to bring the rubber and metal surface in intimate contact. Secure the assembly by means of wire or clamp and place it in an oven at $70^\circ\text{C} \pm 1^\circ\text{C}$ for 168 hours. Remove the assembly from the oven and cool to room temperature. Dismantle the assembly and observe the surfaces of the metal plates in contact with the test piece for corrosion or pitting and for adhesion of the compound. Adhesion of the compound shall be considered to have occurred, if on separation from the metal, particles of the compound remain affixed to either plate.

APPENDIX 'D'

RESISTANCE TO CRYSTALLISATION

Maintain a suitable test piece, at 0°C for 14 days and then allow to stand at room temperature for one hour. Test the piece by hand for any increase in stiffness. Do not flex the test piece at any time during the test.

IND/NE/804 (PROV)

APPENDIX 'E'

The following mixes have been found to give vulcanizates complying with the requirements of this specification:

Constituents	Compound Number				
	C.2 C.40	C.3 C.50	C.4 C.60	C.5 C.70	C.6 C.80
Chloroprene polymer*	100	100	100	100	100
Di-2-ethylhexyl sebacate	6	6	6	6	6
Di-2-ethylhexyl phthalate	6	6	6	-	-
Brown factice	10	10	10	10	10
Magnesia (light calcined)	4	4	4	4	4
Zinc Oxide	5	5	5	5	5
Stearic acid	1.5	1.5	1.5	1.0	1.0
Paraffin Wax	1.0	1.0	1.0	0.5	0.5
2-Mercaptoimidazoline	0.5	0.5	0.5	0.5	0.5
Phenyl-B-Naphthylamine	2.0	2.0	2.0	2.0	2.0
P.E.F. Carbon Black	1	25	45	55	80
Equivalent press cure: Min	45	45	45	45	45
(approx.) at 163°C for 0.1					
in (2.5 mm) thick sheets					

* In these compounds, Neoprene WRT has been used.
