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SPECIFICATION FOR HOT-WATER HOSE OF RUBBER WITH WOVEN TEXTILE REINFORCEMENT

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Indian Standard

SPECIFICATION FOR HOT-WATER HOSE OF RUBBER WITH WOVEN TEXTILE REINFORCEMENT

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 13 August 1970, after the draft finalized by the Rubber Products Sectional Committee had been approved by the Chemical Division Council.

0.2 These hoses are at present mostly used for conveying hot water in locomotives. Keeping the working conditions in view, hoses suitable for conveying water at temperatures below 100°C under pressures up to 7 kgf/cm² are recommended in the standard. Only bore sizes with tolerances have been prescribed in the standard. However, for the guidance of the manufacturers and consumers, recommended minimum outside diameters have been given in Appendix A.

0.3 In the preparation of this standard, assistance has been derived from B.S. 924 : 1955 'Specification for hose of natural rubber with cotton or rayon woven reinforcement' issued by the British Standards Institution.

0.4 This standard contains clauses **4.2** and **6.1** which call for agreement between the purchaser and the supplier.

0.5 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

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1. SCOPE

1.1 This standard prescribes the requirements, methods of sampling and test for hot-water hose of rubber with woven textile reinforcement, suitable for a working pressure up to 7 kgf/cm² and for conveying water at a temperature below 100°C.

*Rules for rounding off numerical values (*revised*).

2. TERMINOLOGY

2.1 For the purpose of this standard, the definitions given in **2** of IS : 443-1963* shall apply.

3. REQUIREMENTS

3.1 Materials

3.1.1 *Lining* — The lining shall consist of a suitable rubber compound.

3.1.2 *Reinforcement* — The textile reinforcement shall consist of woven fabric of natural or man-made fibre.

NOTE — For reinforcement of cotton textiles *see* IS : 4388-1967†.

3.1.3 *Cover* — The cover shall consist of rubber compound.

3.2 Construction

3.2.1 *Lining* — The lining shall be reasonably uniform in thickness, concentric and free from air blisters, porosity and splits. It shall be smooth in the bore and seamless for hoses up to and including 50·00 mm bore but may be built up of calendered sheet for hoses above 50·00 mm bore.

3.2.2 *Reinforcement* — The reinforcement shall consist of plies of woven fabric applied on bias at approximately 45° angle. The woven fabric shall be well rubberized on both sides with a rubber compound. The finishing end of the last ply shall overlap the start of the first ply by a minimum 6 mm.

3.2.3 *Cover* — The cover shall be reasonably uniform in thickness, concentric and free from air blisters, porosity and splits. The cover may have a cloth marked finish and the whole shall be consolidated by wrapping and uniformly vulcanized.

3.3 Dimensions and Tolerances

3.3.1 *Bore Size* — The nominal bore sizes with tolerances of the hoses when measured according to the method prescribed in **9.2** of IS : 443-1963*, shall be as specified in Table 1.

3.3.2 *Lining and Cover Thickness* — The thickness of the lining and cover shall be not less than that prescribed in Table 2, when tested according to **8** of IS : 443-1963*.

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*Methods of sampling and test for rubber hoses (*revised*).

†Specification for cotton fabrics for reinforcement of rubber hoses.

TABLE 1 BORE SIZES WITH TOLERANCES AND NUMBER OF PLIES

(*Clause* 3.3.1)

Sl No.	Nominal Bore Size	Number of Plies	Tolerances on Nominal Bore Size
(1)	(2)	(3)	(4)
	mm		mm
i)	10·00	2	± 0·75
ii)	12·50	2	± 0·75
iii)	16·00	2	± 0·75
iv)	20·00	3	± 0·75
v)	25·00	4	± 1·25
vi)	31·50	4	± 1·25
vii)	38·00	5	± 1·25
viii)	45·00	5	± 1·50
ix)	50·00	5	± 1·50
x)	56·00	5	± 1·50
xi)	63·00	6	± 1·50

NOTE — For hoses having 2 or more plies mentioned in this table, number of plies may vary by one ply provided the hose meets with the requirements of the specification.

TABLE 2 LINING AND COVER THICKNESS

(*Clause* 3.3.2)

Nominal Bore	Lining Thickness	Cover Thickness
(1)	(2)	(3)
	mm	mm
Up to and including 38 mm	1·5	1·0
Over 38 mm, up to and including 63 mm	2·0	1·0

3.3.3 *Length* — The standard length of the wrapped type hose shall be 15 metres.

3.3.3.1 The tolerance on hose length shall be ±1 percent.

3.4 Requirements for Physical Characteristics on Finished Hoses

3.4.1 *Tensile Strength and Elongation at Break of Lining and Cover* — The tensile strength and elongation at break of the rubber used for lining and

cover of the hose shall be as specified in Table 3, when tested according to the method prescribed in **4** of IS : 443-1963*.

TABLE 3 TENSILE STRENGTH OF LINING AND COVER

(*Clause* 3.4.1)

Sl No.	Characteristic	Requirements for Lining and Cover
(1)	(2)	(3)
i)	Tensile strength, kgf/cm², *Min*	60
ii)	Elongation at break, percent, *Min*	300

3.4.2 *Accelerated Ageing* — After ageing at 70° ± 1°C for a period of 72 h, the rubbers used for lining and cover of the hose shall not vary by more than ±25 percent for tensile strength and $^{+10}_{-25}$ percent for elongation at break of the corresponding values obtained before ageing, when tested according to the method prescribed in **7** of IS : 443-1963*.

3.4.3 *Adhesion* — The adhesion shall be such that the rate of separation does not exceed 25 mm per minute under a load 4·5 kg for the following when tested according to the method prescribed in **6** of IS : 443-1963*:

a) Between plies,

b) Between lining and ply, and

c) Between cover and ply.

3.4.4 *Hydraulic Pressure* — The hoses shall withstand a minimum bursting pressure of 28 kgf/cm², when tested according to the method prescribed in **11** of IS : 443-1963*.

3.4.5 *Proof Pressure* — Samples of production lengths of hose shall be subject to internal hydraulic pressure of 1·5 times working pressure for one minute. The hose shall not show any rupture, leakage or porosity, when tested according to the method prescribed in **12** of IS : 443-1963*.

Note — This test shall be carried out at the factory. If the hose is offered at places other than the factory, manufacturer's certificate shall be accepted.

3.4.6 *Resistance to Hot Water* — Test length of the hose shall show no sign of separation of the lining and the reinforcement fabric. It shall not develop any cracks or tackiness or shall be not in such a condition that it may be readily disintegrated when tested according to the method given in Appendix B.

3.4.7 *Water Absorption* — The water absorption of the rubber lining shall not exceed 0·01 g/cm², when tested according to the method prescribed in Appendix C.

*Methods of sampling and test for rubber hoses (*revised*).

4. MARKING AND PACKING

4.1 Each length of the wrapped type hose shall be indelibly marked adjacent to each end with:

a) the manufacturer's name or trade-mark, if any, and hose denominations and grade; and

b) the month and year of manufacture, if required by the purchaser.

4.1.1 Each length of the hose of both wrapped and moulded types may also be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act, and the Rules and Regulations made thereunder. Presence of this mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard, under a well-defined system of inspection, testing and quality control during production. This system, which is devised and supervised by ISI and operated by the producer, has the further safeguard that the products as actually marketed are continuously checked by ISI for conformity to the standard. Details of conditions, under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

4.2 The material shall be packed as agreed to between the purchaser and the supplier.

5. SAMPLING AND CRITERIA FOR CONFORMITY

5.1 For the purpose of ascertaining the conformity of the hose in a consignment to the specification, the scale of sampling and the criteria for conformity shall be as prescribed in **3** of IS : 443-1963*.

6. TESTS

6.1 Unless otherwise agreed to between the purchaser and the supplier, all tests shall be carried out within three months of the date of receipt of the material by the purchaser.

APPENDIX A

(*Clause* 0.2)

RECOMMENDED OUTSIDE DIAMETERS

A-1. The recommended minimum outside diameters for various nominal bore sizes of hot-water hose of rubber with woven textile reinforcement are given in Table 4.

*Methods of sampling and test for rubber hoses (*revised*).

TABLE 4 RECOMMENDED MINIMUM OUTSIDE DIAMETER

(*Clause* A-1)

Sl No.	Nominal Bore Size	Recommended Minimum Outside Diameter
(1)	(2)	(3)
	mm	mm
i)	10·00	16·5
ii)	12·50	19·0
iii)	16·00	22·5
iv)	20·00	27·0
v)	25·00	33·5
vi)	31·50	40·5
vii)	38·00	48·5
viii)	45·00	56·5
ix)	50·00	61·5
x)	56·00	67·5
xi)	63·00	76·0

APPENDIX B

(*Clause* 3.4.6)

RESISTANCE TO HOT WATER

B-1. PROCEDURE

B-1.1 Plug a 100-mm sample of hose at one end. Fit the other end of the hose with a glass tube, not less than 1 000 mm long, leaving 75 mm of the space in hose between the plug and the glass tube. Then fill the hose with hot water at 90° ± 3°C. Place it in an oven maintaining continuously uniform temperature of 90° ± 3°C for 72 hours and maintain a visible layer of water inside the glass tube. Remove and allow it to cool for 24 hours. Empty the hose, strip off the glass tube and the plug, and wipe and dry the surface. Cut 25 mm from one end and discard. Cut the next 25 mm from the hose and split longitudinally by cutting. Bend around the radius end of a steel plate, 3 mm in thickness so that the lining of the hose is on the outside of the bend and insert the whole in the jaws of a vice and press flat. (The pressure of the vice shall be sufficient to keep the sample flat without effecting slight compression of the walls of the hose). Keep the sample in this position for 5 minutes and examine visually.

B-1.1.1 *Assessment of Results* — The sample shall show no signs of separation of the lining and the reinforcement fabric and shall not develop any cracks or tackiness or in such a condition that it may be readily disintegrated.

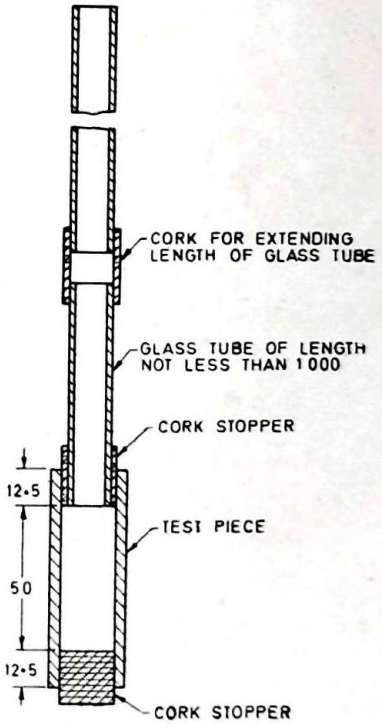
APPENDIX C

(*Clause* 3.4.7)

METHOD OF TEST FOR WATER ABSORPTION

C-1. PROCEDURE

C-1.1 Weigh 75 mm of the test piece cut from the hose and plug it at one end for 12·5 mm. Fit the other end with a glass tube of length not less than 1 000 mm through a single bore cork stopper leaving 50 mm of the test piece between the plug and the glass tube, as shown in Fig. 1. Fill



All dimensions in millimetres.

FIG. 1 APPARATUS FOR TESTING WATER ABSORPTION

the entire test piece with sufficient hot distilled water (*see* IS : 1070-1960*), place in a hot-air-oven and maintain the temperature at 90° ± 3°C for 96 hours. Throughout the test procedure, a level of water should be visible above the test piece. Remove and cool. Empty the test piece and plug; remove surface moisture as rapidly as possible by means of filter paper. Place the test piece in a desiccator for a period of five minutes; remove and reweigh. Express the water absorption as the increase of weight in g/cm² of exposed surface area.

*Specification for water, distilled quality (*revised*).