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*Indian Standard*

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

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INDIAN STANDARDS INSTITUTION  
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG  
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## SPECIFICATION FOR HOT-WATER HOSE OF RUBBER WITH BRAIDED TEXTILE REINFORCEMENT

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SPECIFICATION FOR  
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BRAIDED TEXTILE REINFORCEMENT

**0. FOREWORD**

**0.1** This Indian Standard was adopted by the Indian Standards Institution on 3 December 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 condition in view, hoses suitable for conveying water at temperatures below 100°C under a pressure up to 7 kgf/cm<sup>2</sup> are recommended in the standard. 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. 796: 1955 Specification for hose of natural rubber with braided reinforcement, issued by the British Standards Institution.

**0.4** This standard contains clauses 3.3.3.1, 4.1, 4.2 and 6.1 which call for agreement between the purchaser and the supplier. Hoses of nominal bore sizes other than those specified in Table 1 may be supplied by 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 and the methods of sampling and test for water hose of rubber with braided textile reinforcement suitable for a working pressure of 7 kgf/cm<sup>2</sup>.

\*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 Material**

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

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

**3.1.3 Cover** — The cover shall consist of abrasion-resistant 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.

**3.2.2 Reinforcement** — The textile yarn shall be firmly and evenly braided over the lining. The plies of reinforcement shall be impregnated with a rubber compound.

**3.2.3 Cover** — The cover shall be reasonably uniform in thickness, concentric and free from air blisters, porosity and splits. The cover of the moulded hose shall be smooth or fluted as required. The cover of the braided hose manufactured on mandrels 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 and Number of Plies** — The normal bore size with tolerances of the hose when measured according to the method prescribed in 9.2 of IS : 443-1963\* and the minimum number of plies shall be as given in Table 1.

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

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

**3.3.3.1** The long length moulded hose shall be supplied in lengths as agreed to between the manufacturer and the buyer.

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



**3.3.3.2** The tolerance on hose length shall be  $\pm 1$  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 when tested according to the method prescribed in 4 of IS : 443-1963\* shall be as specified in Table 3.

**TABLE 1 BORE SIZES WITH TOLERANCES AND MINIMUM NUMBER OF PLIES**

( Clause 3.3.1 )

| Sl No. | NOMINAL BORE SIZES | TOLERANCE ON NOMINAL BORE SIZES | MINIMUM NUMBER OF PLIES |
|--------|--------------------|---------------------------------|-------------------------|
| (1)    | (2)                | (3)                             | (4)                     |
|        | mm                 | mm                              |                         |
| i)     | 10                 | $\pm 0.75$                      | 1                       |
| ii)    | 12.5               | $\pm 0.75$                      | 1                       |
| iii)   | 16                 | $\pm 0.75$                      | 1                       |
| iv)    | 20                 | $\pm 1.25$                      | 1                       |
| v)     | 25                 | $\pm 1.25$                      | 2                       |
| vi)    | 31.5               | $\pm 1.25$                      | 2                       |
| vii)   | 38                 | $\pm 1.25$                      | 2                       |
| viii)  | 45                 | $\pm 1.50$                      | 3                       |
| ix)    | 50                 | $\pm 1.50$                      | 3                       |
| x)     | 56                 | $\pm 1.50$                      | 3                       |
| xi)    | 63                 | $\pm 1.50$                      | 3                       |

NOTE — Other sizes within this range may be supplied by agreement. The tolerances shall be those of the next smaller size.

**3.4.2 Accelerated Ageing** — After ageing at  $70^\circ \pm 1^\circ\text{C}$  for a period of 72 hours, the rubbers used for lining and cover of the hose shall not vary by more than  $\pm 20$  percent for tensile strength and  $\pm \frac{10}{25}$  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 of 4.5 kg for the following, when tested according to the method prescribed in 6 of IS : 443-1963\* :

- Between plies,
- Between lining and ply, and
- Between cover and the ply.

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

TABLE 2 LINING AND COVER THICKNESS

( Clause 3.3.2 )

| NOMINAL BORE SIZES                 | LINING FOR ALL TYPES | COVER FOR ALL TYPES |
|------------------------------------|----------------------|---------------------|
| (1)                                | (2)                  | (3)                 |
|                                    | mm                   | mm                  |
| Up to and including 20             | 1.5                  | 1.5                 |
| Over 20 and up to and including 38 | 2.0                  | 1.5                 |
| Over 38                            | 2.5                  | 1.5                 |

NOTE — In the case of fluted hose, the cover thickness shall correspond to the measurement made at a point where the thickness of fluting is included therein.

TABLE 3 TENSILE STRENGTH OF LINING AND COVER

( Clause 3.4.1 )

| Sl. No. | CHARACTERISTIC                              | REQUIREMENT FOR LINING AND COVER |
|---------|---|----------------------------------|
| (1)     | (2)   | (3)                              |
| i)      | Tensile strength, kgf/cm <sup>2</sup> , Min | 60                               |
| ii)     | Elongation at break, percent, Min           | 300                              |

**3.4.4 Hydraulic Pressure** — The hoses shall withstand a minimum bursting pressure of 28 kgf/cm<sup>2</sup>, when tested according to 11 of IS : 443-1963\*.

**3.4.5 Proof Pressure** — Samples of production lengths of hose shall be subjected 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.

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

**3.4.6 Resistance to Hot Water** — When tested according to the method given in Appendix B, the test length of the hose shall show no sign of separation of the lining and reinforcement yarn. It shall neither develop cracks or tackiness nor it shall be in such a condition that it may be readily disintegrated.

**3.4.7 Water Absorption** — The water absorption of the rubber lining shall not exceed 0.01 g/cm<sup>2</sup>, when tested in accordance with the method prescribed in Appendix C.

#### 4. MARKING AND PACKING

**4.1 Marking** — Each length of the hose shall be indelibly marked adjacent to each end with:

- a) the manufacturer's name or trade-mark, if any, and hose denomination and grade; and
- b) the month and year of manufacture, if required by the purchaser.

**4.1.1** Each length of the hose 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 Packing** — 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.

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



**APPENDIX A**

( Clause 0.2 )

**RECOMMENDED MINIMUM OUTSIDE DIAMETERS**

**A-1.** The recommended minimum outside diameters for various nominal bore sizes are given in Table 4.

**TABLE 4 RECOMMENDED MINIMUM OUTSIDE DIAMETERS**

( Clause A-1 )

| Sl No. | NOMINAL BORE SIZE | *RECOMMENDED MINIMUM<br>OUTSIDE DIAMETER |
|--------|-------------------|--|
| (1)    | (2)               | (3)                                      |
|        | mm                | mm                                       |
| i)     | 10                | 15.5                                     |
| ii)    | 12.5              | 18.0                                     |
| iii)   | 16                | 21.5                                     |
| iv)    | 20                | 25.0                                     |
| v)     | 25                | 34.0                                     |
| vi)    | 31.5              | 41.0                                     |
| vii)   | 38                | 47.5                                     |
| viii)  | 45                | 57.5                                     |
| ix)    | 50                | 62.5                                     |
| x)     | 56                | 67.5                                     |
| xi)    | 63                | 75.5                                     |

\*In the case of fluted hose, this measurement shall be taken on the top of the flutes and the depth of the flutes shall not exceed 0.5 mm.

**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 metre long, leaving 75 mm of the space in hose between the plug and the glass tube. Then fill the hose

with hot water at  $90 \pm 3^\circ\text{C}$ . Place it in an oven maintaining a continuously uniform temperature of  $90 \pm 3^\circ\text{C}$  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 affecting slight compression of the walls of the hose.) Keep the sample in this position for 5 minutes and examine visually.

## B-2. ASSESSMENT OF RESULTS

**B-2.1** The sample shall show no signs of separation of the lining and the reinforcement yarn and shall not develop any cracks or tackiness or such a condition that it may be readily disintegrated.

# APPENDIX C

( Clause 3.4.7 )

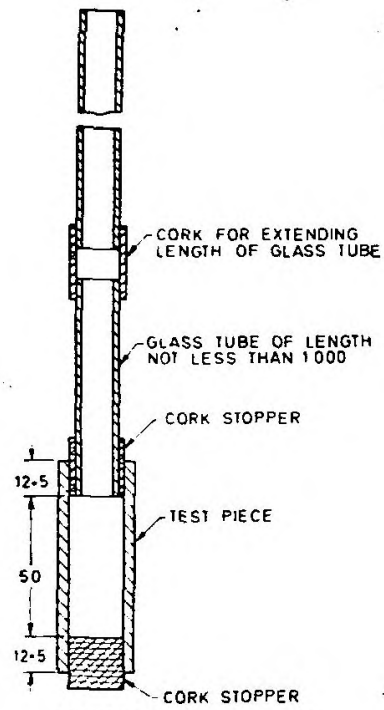
## TEST FOR WATER ABSORPTION

### 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 metre 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 the entire test piece with sufficient hot distilled water ( see IS : 1070-1960\* ), place it in a hot-air-oven and maintain the temperature at  $90^\circ \pm 3^\circ\text{C}$  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 re-weigh. Express the water absorption as the increase of weight in g/cm<sup>2</sup> of exposed surface area.

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

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All dimensions in millimetres.

FIG. 1 APPARATUS FOR TESTING WATER ABSORPTION