

**AUTOMOTIVE INDUSTRY STANDARD**

**Requirements for IC Engine  
Coolant Hoses**

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ON BEHALF OF  
AUTOMOTIVE INDUSTRY STANDARDS COMMITTEE

UNDER  
CENTRAL MOTOR VEHICLES RULES – TECHNICAL STANDING COMMITTEE

SET-UP BY  
MINISTRY OF SHIPPING, ROAD TRANSPORT & HIGHWAYS  
(DEPARTMENT OF ROAD TRANSPORT & HIGHWAYS)  
GOVERNMENT OF INDIA

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Status chart of the standard to be used by the purchaser  
for updating the record

<b>Sr. No.</b>	<b>Corr- igenda.</b>	<b>Amend- ment</b>	<b>Revision</b>	<b>Date</b>	<b>Remark</b>	<b>Misc.</b>

**General Remarks :**

## INTRODUCTION

The Government of India felt the need for a permanent agency to expedite the publication of standards and development of test facilities in parallel when the work on the preparation of the standards is going on, as the development of improved safety critical parts can be undertaken only after the publication of the standard and commissioning of test facilities. To this end, the erstwhile Ministry of Surface Transport (MoST) has constituted a permanent Automotive Industry Standards Committee (AISC) vide order No. RT-11028/11/97-MVL dated September 15, 1997. The standards prepared by AISC will be approved by the permanent CMVR Technical Standing Committee (CTSC). After approval, the Automotive Research Association of India (ARAI), Pune, being the Secretariat of the AIS Committee, has published this standard. For better dissemination of this information ARAI may publish this document on their Website.

The present automotive standard is prepared to provide requirements and methods of sampling and test for reinforced and flexible radiator hoses intended for use in IC engine coolant system applications.

Considerable assistance has been taken from the following National / International Standards:

IS 2765-1982	: Specification for Radiator Hose.
IS: 3400	: Methods of Tests for Vulcanized Rubbers ( Relevant Part)
SAE J 20-2002	: Coolant System Hoses”.

The Automotive Industry Standards Committee (AISC) responsible for preparation of this standard is given in Annex I.

## Requirements for IC Engine Coolant Hoses

### 1. SCOPE

The standard prescribes requirements and methods of sampling and test for reinforced and flexible radiator hoses intended for use of IC engine coolant system applications.

### 2. REFERENCES

2.1	JIS K 6330	: Testing Methods for Rubber and Plastic Hoses
2.2	IS: 7503	: Glossary of Terms Used in Rubber Industry
2.3	IS: 3400	: Methods of Test for Vulcanized Rubbers ( Relevant Part)
2.4	IS: 443-1975	: Method of Sampling and Test for Rubber Hoses (Second Revision)

### 3. TERMINOLOGY

For the purpose of this standards, the definition given in various parts of IS: 7503 (Glossary of terms used in rubber industry) shall apply.

### 4. TYPE OF HOSES

Based on compounding of synthetic rubber grades used for IC engine coolant, they are classified into following types:

Type A	: High temperature resistant for application where temp. upto 120°C may be encountered.
Type B	: High oil resistant for application where a degree of oil resistance is important and temperature upto 110°C may be encountered.
Type C	: Medium Oil Resistant.
Type D-1	: Low oil resistance, improved service.
Type D-2	: Low oil resistance, standard service.
Type D-3	: Low oil resistant, high temp. resistant, premium service.
Type F	: Low oil resistant, fibre elastomer composite.

### 5. REQUIREMENTS

#### 5.1 Material Properties

Radiator Hose material shall meet requirements as given in Table 1.

**TABLE 1**  
**Material Property Requirements for IC Engine Coolant System Hoses**

Parameter	Type A Silicone	Type B NBR	Type C CR	Type D-1 EPDM	Type D-2 EPDM	Type D-3 EPDM	Type E EPDM/Fiber	Test conditions / Method
Typical Temp. range °C	-55 to 175	-40 to 100	-40 to 100	-40 to 125	-40 to 125	-40 to 150	-40 to 125	---
<b>Original Properties</b>								
Durometer, points Shore A	55 to 75	55 to 75	55 to 75	55 to 75	55 to 75	55 to 75	65 to 85	IS: 3400 (Part 2)
Tensile, min. MPa	5.5	8.5	7.0	7.0	5.0	7.0	5.0	IS: 3400 (Part 1)
Elongation, min. %	200	250	200	300	150	300	100	IS: 3400 (Part 1)
<b>Oven Aging Conditions &amp; Change Limits, Hours/°C</b>	70/175	70/100	70/100	70/125	70/125	168/150	70/125	IS: 3400 (Part 4)
Durometer, points Shore A	+ 10	+15	+20	+15	+15	+15	+15	IS: 3400(Part 2)
Tensile, max. %	-15	-15	-20	-20	-20	-35	-20	IS: 3400(Part 1)
Elongation, max. %	-40	-50	-50	-50	-50	-65	-50	IS: 3400(Part 1)
<b>Oil Immersion Change Limits</b>								
ASTM No. 3 Oil or IRM 903 (IRM 903 is being phased in to replace ASTM No. 3) Hours/°C	70/100	70/100	70/100	---	---	---	---	IS: 3400 (Part 6)
Volume, max, %	0 to +45	-5 to +25	+80	---	---	---	---	IS: 443; clause 9.0
Tensile, max, %	-40	-20	-50	---	---	---	---	IS: 3400 (Part 1)
<b>Coolant immersion (Tube only) Change Limits</b>								
Hours/at Boiling Point	70	70	70	70	70	168	70	IS: 443; clause 9.0
Volume,%	0 to +40	0 to +20	0 to +20	-5 to +20	-5 to +20	-5 to +20	-5 to +20	IS: 443; clause 9.0
Durometer, Points Shore A	-10 to +10	-10 to +10	-10 to +10	-10 to +10	-10 to +10	-10 to +10	-10 to +10	IS: 3400 (Part 2)
Tensile, max, %	-30	-20	-20	-20	-20	-20	-20	IS: 3400 (Part 1)
Elongation, max, %	-25	-40	-40	-50	-25	-25	-25	IS: 3400 (Part 1)
Compression Set °C	125	100	100	125	125	125	125	----
70 h, max, %	40	50	75	75	85	75	85	IS: 3400 (Part 10)

## 5.2 Hose Performance Properties

Radiator to Hoses shall comply with following performance requirements:

### 5.2.1 Adhesion

When applicable, use test procedure ASTM D 413 with Strip Specimen Type A. The minimum requirement is 1400N/m between all elastomer or elastomer-coated plies.

### 5.2.2 Low Temperature Resistance

For hose 25.4 mm ID and smaller, specimen shall consist of a complete hose of length sufficient to perform bend test described as follows:

The hose shall be placed in a cold box for 5 h at - 40°C temperature. The hose shall then be flexed in the cold chamber through 180° from the centerline to a diameter of ten times the maximum outside diameter of the hose within 4 s. The hose shall not fracture and shall not show any cracks or breaks in the tube or cover.

For hose larger than 25.4 mm ID, specimens are to be 25.4 mm long sections of the complete hose. The specimen and test fixture shall be placed in a cold box for 5 h at - 40°C temperature. The specimen is then compressed to 50% of its original inside diameter between parallel plates within 4 s. The specimen shall not crack or break. The testing fixture shall be in the cold box during the entire test.

### 5.2.3 Ozone Test

IS: 3400, Part 20 shall be referred to conduct ozone test. For hose 25.4 mm ID and smaller, a specimen of hose of sufficient length shall be bent around a mandrel with an outside diameter equal to eight times the specified OD of the sample. The two ends shall be tied at their crossing with enameled Copper or Aluminum wire. After mounting, the specimen shall be allowed to rest in an ozone-free atmosphere for 24 h at standard laboratory test temperature. The mounted specimen shall be placed in a test chamber containing ozone at a partial pressure of 50 MPa ± 5 MPa at a temperature of 40°C ± 1°C.

After 100 h of exposure, the specimen shall be removed and allowed to cool to standard laboratory test temperature and then be inspected visually under 7X magnification. The sample must not show any cracks except for the area immediately adjacent to the wire, which shall be ignored.

### 5.2.4 Vacuum Test

The entire hose shall be tested as per JIS K 6330, clause 4.2.1.4 at -13 kPa vacuum for duration of 5 min. The minimum outside diameter shall decrease by no more than 20% during application of vacuum for 15s and not to exceed 30s.

### 5.2.5 Burst Test

The minimum burst pressure of the hose, when tested in accordance with clause 8.2 of IS: 443-1975 shall be as specified in Table 2.

**TABLE 2**  
**Minimum Burst Pressure of Radiator Hose**

Sr. No.	Nominal Bore, mm	Minimum Burst Pressure	
		Unreinforced MPa (kgf/cm <sup>2</sup> , approx.)	Reinforced MPa (kgf/cm <sup>2</sup> , approx.)
1.	Up to and including 31.5	0.2 (2)	1.0 (10)
2.	Above 31.5	0.2 (2)	0.7 (7)

## 6. CONSTRUCTION

- 6.1 The hose shall be manufactured with a polymeric lining. The hose shall normally contain a reinforcement based on natural or synthetic fibres and may have a polymeric cover.
- 6.2 The hose shall be uniform in quality throughout its length, free from porosity and uniformly vulcanized. The internal surface of the lining shall be smooth and clean.

## 7. SAMPLING

For the purpose of ascertaining the conformity of the hose in a consignment of this specification, the method of the sampling and the criteria for conformity shall be prescribed in 3 of IS:443-1975.

**ANNEX I**  
(See Introduction)  
**COMMITTEE COMPOSITION \***  
**Automotive Industry Standards Committee**

<b>Chairman</b>	
Shri B. Bhanot	Director The Automotive Research Association of India, Pune
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Member Secretary  
Mrs. Rashmi Urdhwareshe  
Deputy Director

The Automotive Research Association of India, Pune

\* At the time of approval of this Automotive Industry Standard (AIS)