

REVISION OF SPECIFICATION / STR

Item Name: Rubber components, Air brake, ALCo locomotives-

Specification No.: IRS-R-48-88 (with 03 Corr.) (Final Draft under revision)

1. RDSO is reviewing the specification/STR to cater to the latest technological developments in the field, modify clauses not relevant in the present context and making them more enabling with focus on functional requirements.
2. It is requested that your comments / suggestions with regard to improvements / modifications in specification/ STR of the above mentioned item may be submitted in the following format along with the justification for the changes required.

Part A: Basic Information

SN	Particulars	Information
1.	Name	
2.	Designation	
3.	Professional Qualification	
4.	Organization / Firm's Name	
5.	Address for correspondence	
6.	Email ID	
7.	Whether firm is registered with RDSO for the subject item. If yes, details like date of registration, current status etc. If no, firm's experience in manufacturing of subject item or similar item.	
8.	Whether any technical document/ Report/ Study to support suggested changes in available/ enclosed for better appreciation.	

Part B: Comments / suggestions on the specification

SN	Clause No. of RDSO STR/ Spec	Clause, as it exists in RDSO STR/ Spec	Clause, as it should read after incorporation of comments/ suggestions in RDSO Spec / STR	Justification for changes

Comments may be sent to following address within one month from the date of publication on rdso.indianrailways.gov.in

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Manak Nagar, Lucknow – 226011

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भारत सरकार
रेल मन्त्रालय

**GOVERNMENT OF INDIA
MINISTRY OF RAILWAYS**

डीजल एवं इलैक्ट्रिक लोकोमोटिव, इलैक्ट्रिक मल्टिपल यूनिट (ई.एम. यू.) स्टॉक एवं डीजल रेल कारों के एयर ब्रेक उपकरण में प्रयुक्त रबर कॉम्पोनेंट के लिए भारतीय रेल मानक बिशिष्टि

**INDIAN RAILWAY
STANDARDS SPECIFICATION
FOR**

**RUBBER COMPONENTS USED IN THE AIR BRAKE EQUIPMENT OF DIESEL AND
ELECTRIC LOCOMOTIVES, ELECTRIC MULTIPLE UNIT (EMU) STOCK AND DIESEL
RAIL CARS**

Serial No. R-48- 21

March 2021

CONTENTS

Sl. No.	Particulars	Page No.
0.	Foreword	1
1.	General Requirement	2
2.	Diaphragms	3
3.	‘O’ Rings	5
4.	Piston Packing Cups	6
5.	Valve Seats, Gaskets & Gland Packing Washers	7
6.	Field Trial	8
7.	Preference To Make In India	9
8.	Vendor Changes In Approved Status	9
Appendix ‘A’	Code of Practice for Quality Control and Inspection of Rubber Component	10
Appendix ‘B’	Characteristics of Liquid ‘B’, Lubricating Oil & Grease	11
Appendix ‘C’	Air Leakage Test for Diaphragms	12

LIST OF AMENDMENTS

S. No	Amendment Date	Rev.	Revised Para	Details of Revision
1	March' 2021	-	0.5,0.6 & 0.8	Para deleted, in view of revision of this specification.
			1.3.1	Para revised to incorporate changes mentioned in amendment no. 3 dt. 28.09.2000.
			1.3.4	New para added to incorporate changes mentioned in amendment no. 3 dt. 28.09.2000.
			1.3.4 (a)	Technique for Identification of polymer has been mentioned.
			5.2.4.1 (b)	Para revised to incorporate changes mentioned in amendment no. 1 dt. August 1989 and amendment no. 2 dt. June 1990.
			6	New para added to incorporate field trial and field trial performance feedback format.
			7	Addition of new Para (Preference to Make In India) in compliance of directives issued by GOI for promotion of Make in India policy.
			8	Addition of new Para (Vendor Changes in Approved Status) in compliance to Vigilance cell note no. 13/Vig/Policy dated 08.09.2016.
			B.2.1	Para has been revised to address restrictive/narrow eligibility criteria.

INDIAN RAILWAY STANDARDS SPECIFICATION FOR RUBBER COMPONENTS USED IN THE AIR BRAKE EQUIPMENT OF DIESEL AND ELECTRIC LOCOMOTIVES, ELECTRIC MULTIPLE UNIT (EMU) STOCK AND DIESEL RAIL CARS

0. FORWARD

- 0.1** This specification is issued under fixed Serial No. R-48; the final number indicates year of adoption as standard or in case of revision, the year of last revision. This specification was adopted in 1972.
- 0.2** This specification is intended to cover the technical provisions relating to materials, constructions and tests, and does not include all the necessary provisions of the contracts.
- 0.3** This specification draws reference to some of the relevant IS Specifications. Latest Versions of these Specifications shall be taken as references.
- 0.4** 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 the IS:2. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.
- 0.5** This specification contains a code of practice for quality control & inspection of rubber components (Appendix 'A') to ensure satisfactory process & quality control at the works of the manufacturers. The provisions of this code shall be applicable for all the rubber components being used on the Railways. Similarly, provisions on 'Sampling and criteria for conformity' and 'Inspection and testing facilities' shall be applicable for all rubber components.
- 0.6** ~~Tests for compression set on 'O' rings & development of reinforced piston packing for brake cylinders with adhesion values between the reinforced fabric & the rubber are currently under standardization and shall be included in the specification when finalised.~~

1. GENERAL REQUIREMENTS

1.1 Sampling And Criteria For Conformity

- 1.1.1 A minimum of six samples or 0.5 % of the lot offered for inspection whichever is higher, shall be drawn for tests indicated in the relevant specification. In the event of no. of samples drawn for tests are not adequate to carry out all the tests, as per the provisions given in the methods of tests, the Inspecting/Purchasing authorities at their discretion shall draw more samples as required. Should the samples fail to meet the requirements, double the number of samples from the same lot shall be drawn for re-testing, Should any of the re-test samples fail to comply with the requirement, the entire lot shall be rejected.
- 1.1.2 In the event of rejection after the re-testing of the samples, the entire lot offered for inspection shall be made unusable in the presence of Inspecting/Purchasing authorities.
- 1.1.3 The manner of distribution of samples for different tests shall be at the discretion of the Inspecting / Purchasing Authorities.

1.2 Inspection and Testing facilities

- 1.2.1 The Inspecting/Purchasing authorities shall have access, at all reasonable time to the works where the materials/components are being manufactured or where they are stored. The materials offered for inspection shall not be withdrawn during the course of inspection. Any move to withdraw the materials or to interfere with the inspection in any way will render the entire lot being rejected. The manufacturers shall supply all equipment & chemicals required for testing free of charge, and shall be at their own cost, supply labour & apparatus for such tests as may be carried out at their works. Should the manufacturers fail to provide facilities at their works for carrying out the prescribed tests, they shall bear the cost of carrying out these tests elsewhere by an approved testing authority, with the prior approval of the Inspecting/Purchasing authorities. Confirmatory test samples, in addition, may be drawn by the Inspecting / purchasing authorities and submitted for tests to the approved testing authorities.

1.3 Method of Tests

- 1.3.1 All the tests shall be carried out on finished components where practicable or from prepared test slabs of approx. same degree of vulcanisation using the same rubber compound. The manufacturer shall prepared adequate number of test slabs or conducting tests at the manufacturer's premises during inspection by the inspecting authority, for the reference samples with inspecting authority and for the tests by the consignee. The method of tests shall be as per IS:3400, unless otherwise special conditions are stipulated in this specification.
- 1.3.2 Tension set-
The test shall be carried out on 'O' ring with its original cross section dia. The gauge Length of the test specimens shall be either 10 or 20 or 50 mm depending on free length available on cutting the 'O' ring. The length between the grip/jaw and gauge mark on either sides shall be 10 mm. The maximum possible gauge length shall be selected. Where minimum gauge length on 'O' rings of lower internal dia, cannot be obtained, the tests shall be carried out on 'O' rings with higher internal dia, specially manufactured as test specimens using same rubber compound and approximately same degree of vulcanisation.
- 1.3.3 Resistance to Liquid 'B' Lubricating oils & greases-
While determining the swelling by volume % in liquid 'B' lubricating oils & greases, the volume of the flat test specimens shall be 0.5 to 3 cc (select higher volume where practicable) & thickness 1 mm minimum. For test specimens, prepared from 'O' rings, the volume shall be 0.5 to 2 cc. The characteristics of Liquid 'B' lubricating oils & greases referred to in this specification are given in Appendix 'B'.

- 1.3.4 For the purpose of confirming/co-relating the composition of the tests slabs with that of the components, the following tests shall be performed both on tests slabs and the components and shall comply with the requirements is given as under:

a)	Identification of polymer	Observation shall be identical. (By Fourier Transform Infrared Spectroscopy technique)
b)	Specific gravity	The results shall be within ± 0.02
c)	Percent Ash content	The results shall be within ± 1.0 for ash content upto 20% and ± 1.5 for ash content above 20%
d)	Swelling by volume % in Reference Fuel 'B' at 27 ± 2 °C for 24 ± 0.2 hrs.	The results shall be within ± 5.0

1.4 Marking

- 1.4.1 Letters 'IRS', part number, manufacturer's name (initials/trade mark) and the quarter/year 'of manufacture shall be inscribed on each component where practicable, except on 'O' rings, on the locations shown in the drgs. on other components, where inscription is not practicable, the markings shall be done with indelible ink. 'O' rings shall be marked with indelible ink where practicable. 'O' rings and other smaller components where even marking with indelible ink is not practicable, shall be packed suitably and sealed with tags, bearing the above markings.

1.5 Packing

- 1.5.1 The components shall be dusted with French chalk & packed suitably to avoid movement or distortion or damage during transit and storage. The package shall bear the order number, quantity and markings similar to clause 1.4.

1.6 Storage

- 1.6.1 The rubber components shall be stored in cool and dry place, For guidance regarding proper storage of rubber components, IS:6713 shall be referred to.

2 DIAPHRAGMS

2.1 Scope

- 2.1.1 This Specification covers the requirements / method of tests for diaphragms used in contact with oil, grease or/ & moisture at temperature upto 80°C,

2.2 Types

- 2.2.1 The diaphragms shall be of the following three types:

- Type 1** - fabric reinforced and without central hole, in accordance with the relevant drgs.
- Type 2** - fabric reinforced and with central hole, in accordance with the relevant drgs.
- Type 3** - without fabric reinforcement, in accordance with the relevant drgs.

2.3 Requirements

2.3.1 Materials

2.3.1.1 Rubber:

The rubber used for the manufacture of diaphragms shall be either polychloroprene or any other synthetic elastomers or a blend thereof, suitably compounded so as to conform to the requirements as specified in this specification. The type of rubber and the grade to be used for the manufacture of diaphragms depending on application shall be as shown in the relevant drgs.

2.3.1.2 Fabric Reinforcement –

The fabric used for reinforcement in the diaphragms shall be either polyester or polyamide. The

breaking strength of the fabric shall not be less than 18-kgf/cm width in both the directions, tested as per IS:1969.

2.3.2 Construction, Workmanship & Finish

2.3.2.1 The diaphragms shall be smooth, free from pin holes, blisters, porosities and other visual flaws. In fabric reinforced diaphragms, the thickness of the rubber shall be even on both sides. The fabric shall be suitably treated to ensure satisfactory bond between the rubber and the fabric. The diaphragms shall be moulded in accordance with the relevant drgs.

2.3.3 Dimensions and Tolerances

2.3.3.1 The dimensions and tolerances of the diaphragms shall be as indicated in the relevant drgs.

2.3.4 Physical Properties of Rubber

2.3.4.1 The rubber compound used in the manufacture of diaphragms shall conform to the following requirements:

S.No.	Property	Polychloroprene			Synthetic Elastomer or Blend Grade 'D'
		Grade 'A'	Grade 'B'	Grade 'C'	
1.	Hardness (IRHD/ Shore 'A')	50±5	60±5	70±5	70±5
2.	Tensile strength (Mpa), min.	12	15	15	15
3.	Elongation at break (%), min.	350	300	300	300
4.	Compression set (%) max. at 100±1 °C for 24 +0/-2 hrs.	25	25	25	25
5.	Swelling by Vol. (%), max.				
	a) In Liquid 'B' at 27±2 °C for 24 +0/-2 hrs.	70	70	70	30
	b) In lubricating oil at 100±1 °C for 72 +0/-2 hrs.	+30 /-0	+25 /-0	+20 /-0	+10 /-5

Note: The purchasing authority shall designate type & grade of rubber in the relevant drawings.

2.3.4.2 Accelerated Ageing

2.3.4.2.1 After ageing at 100±1 °C in an air oven for 72 +0/-2 hrs., the hardness, tensile strength, elongation at break (%) shall not vary from the values obtained with the unaged samples by more than the following:

	<u>Grade A-C</u>	<u>Grade D</u>
a) Hardness (Shore 'A')	+7/- 0 Deg.	+7 /-0 Deg
b) Tensile strength	+10 /-15 %	± 20 %
c) Elongation at break (%)	+10 / -25 %	+10 / -30 %

2.3.5 Air Leakage Test

2.3.5.1 The air leakage test shall be carried out on samples of diaphragms as shown in Appendix 'C' & shall conform to the requirements indicated therein.

2.3.6 Dynamic Fatigue Test

2.3.6.1 The diaphragm shall be mounted on a fixture. The dimension of the fixtures shall be different for diaphragms of different dimensions. The fixture shall be fitted to a test lay out comprising of magnet

valve, time delay relay, recorder, air compressor, air fitter etc. as shown in figure -2. The diaphragm is subjected to a cyclic pressure of 5 kg/cm² and zero, at frequency 6 minimum 15 maximum cycles per minutes. The diaphragms shall withstand 1,00,000 cycles without failure or show sign of failures such as development of cracks on rubber and bond separation between the rubber and the fabric.

The test shall constitute as type test and is mandatory for product Approval. The Inspecting/Purchasing authorities, however, reserved the right to repeat the tests at their discretion.

3 'O' RINGS

3.1 Scope

3.1.1 This specification covers the requirements and method of tests for 'O' rings used at 80°C in contact with grease and/or moisture.

3.2 Requirements

3.2.1 Material

3.2.1.1 Rubber –

The rubber used in the manufacture of 'O' rings shall be either polychloroprene or any other synthetic elastomer or a blend thereof suitably compounded so as to conform to the requirements as specified in this specification. The type and grade of rubber to be used in the manufacture of 'O' rings depending on the applications, shall be as shown in the relevant drgs.

3.2.2 Construction, Workmanship & Finish

3.2.2.1 The 'O' rings shall be moulded in one endless piece with the spew trimmed to leave visible circumferential line and the measurement across these lines to be within the tolerances shown in the relevant drgs. The rings shall be uniform, smooth, free from pin holes, blisters, porosity and other visual flaws. The moulded flash shall be removed in such a manner so that no groove is formed on the body.

3.2.3 Dimensions & Tolerances

3.2.3.1 The dimensions & tolerances shall be as indicated in the relevant drgs,

3.2.4 Physical Properties of Rubber

3.2.4.1 The rubber compound used in the manufacture of 'O' rings shall conform to the following requirements:

Sl.	Property	Synthetic Elastomer or Blend					Polychloroprene Grade F
		Grade A	Grade B	Grade C	Grade D	Grade E	
1.	Hardness (IRHD/ Shore 'A')	50±5	60±5	70±5	80±5	85±5	70±5
2.	Tensile strength (Mpa), min.	12	15	15	15	12	15
3.	Elongation at break (%), min.	350	300	300	300 200	150	300
4.	Compression set (%) max. at 100±1 °C for 24 ⁺⁰ / - 2 hrs.	25	25	25	25	25	25
5.	Tension set (%) max. at 100±1 °C for 24 ⁺⁰ / - 2 hrs.	20	20	20	20	20	20
6.	Swelling by Vol. (%) max.						
	a) In Liquid 'B' at 27±20C for 24 ⁺⁰ / - 2 hrs.	30	30	30	25	25	70

	b) In grease at 100 ± 1 °C for 72 ± 0.2 hrs.	+15/-0	+15/-0	+15-0	+10 /-0	+10 /-0	+50 /-0
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Note: The purchasing authority shall designate type and the grade of rubber in the relevant drawings.

3.2.4.2 Accelerated ageing

3.2.4.2.1 After ageing at 100 ± 1 °C in an air oven for 72 ± 0.2 hrs. the hardness, tensile strength, elongation at break (%), shall not vary from the values obtained with the unaged specimens by more than the following:

	<u>Grade A to E</u>	<u>Grade F</u>
a) Hardness (Shore 'A')	+7 /- 0 Deg.	+7 /- 0 Deg
b) Tensile strength	± 20 %	+10 / -15 %
c) Elongation at break (%)	+10 / -30 %	+10 / -25 %

3.3 Stretch Test

3.3.1 The 'O' rings shall be stretched to 50% inner dia (I/D) on a suitable device with mandrels of diameters three times those of cross-additional dia of the 'O' rings and held in stretched condition for one hour at 27 ± 2 °C, The rings shall not snap or show sign of distress.

4 PISTON PACKING CUPS

4.1 Scope

4.1.1 This specification covers the requirements & method of tests for Piston packing cups used in contact with oil, grease or/and moisture at temperature upto 80 °C.

4.2 Types

4.2.1 The piston packing cups shall be of the following two types,

a) **Type 1:** Fabric reinforced, in accordance with the relevant drgs.

b) **Type 2:** Without fabric reinforcement in accordance with the relevant dregs.

4.3 Requirements

4.3.1 Materials

4.3.1.1 Rubber –

The rubber used in the manufacture of piston packing cups shall be Synthetic elastomers or a blend thereof suitably compounded so as to conform to the requirements as specified in this specification.

4.3.1.2 Fabric Reinforcement

4.3.1.2.1 Fabric reinforcement used as insertion in the piston packing cups shall be either polyamide or polyester. The breaking strength of the fabric shall not be less than 18 kgf /cm width in both the directions, tested as per IS:1969

4.3.2 Construction, Workmanship & Finish

4.3.2.1 The piston packing cups shall be smooth, free from pin holes, blisters, porosity and other visual flaws. In fabric reinforced piston packings, the fabrics shall be suitably treated to ensure satisfactory bond between the rubber and the fabric, and the thickness of the rubber shall be uniform.

4.3.3 Dimensions & Tolerances

4.3.3.1 The dimensions & tolerances of the piston packing cups shall be as indicated in the relevant drgs.

4.3.4 Physical Properties of Rubber

4.3.4.1 The rubber compound used in the manufacture of piston packing cups shall conform to the following requirements:

Sl.	Property	GRADE			
		'A'	'B'	'C'	'D'
1.	Hardness (IRHD/ Shore 'A')	60±5	70±5	80±5	85±5
2.	Tensile strength (Mpa), min.	12	12	12	12
3.	Elongation at break (%), min.	300	300	200	150
4.	Compression set (%) max. at 100±1 °C for 24 ^{+0/-2} hrs.	25	25	25	25
5.	Swelling by Vol.(%), max.				
	a) In Liquid 'B' at 27± 20C for 24 ^{+0/-2} hrs.	30	30	25	25
	b) In lubricating oil at 100±10 C for 72 ^{+0/-2} hrs.	+10 /-5	+10 /-5	+10 /-5	+10 /-5
	c) In grease at 100±1 °C for 72 ^{+0/-2} hrs.	+15 /-0	+15 /-0	+10 /-0	+10 /-0

Note: The purchasing authority shall designate type and the grade of rubber in the relevant drawings

4.3.4.2 Accelerated ageing

4.3.4.2.1 After ageing at 100±1 °C in an air oven for 72 ^{+0/-2} hrs., the hardness, tensile strength, elongation at break (%), shall not vary from the values obtained with the unaged specimens by more than the following:

- | | |
|----------------------------|--------------|
| a) Hardness (Shore 'A') | +7 /- 0 Deg. |
| b) Tensile strength | ± 20 % |
| c) Elongation at break (%) | +10 / -30 % |

5 VALVE SEATS, GASKETS & GLAND PACKING WASHERS

5.1 Scope

5.1.1 This specification covers the requirements and method of tests for valve seals (including metal bonded), gaskets & gland packing washers used in contact with oil or/and moisture at temperature upto 80°C.

5.2 Requirements

5.2.1 Materials

5.2.1.1 Rubber –

The rubber used in the manufacture of valve seats, gaskets & gland packing washers shall be either polychloroprene or any other synthetic elastomers or a blend thereof suitably compounded so as to conform to the requirements as specified in this specification. The grade of rubber to be used for each of the components depending on applications shall be as shown in the relevant drgs.

5.2.1.2 Metals –

The metals used in the manufacture of metal bonded valve seats shall be as specified in the relevant drgs..

5.2.2 Construction, Workmanship & Finish

5.2.2.1 The valve seats, gaskets & gland packing washers shall be smooth, free from pin holes, blisters, porosities and other visual flaws.

5.2.2.2 In metal bonded valve seats, the metal shall be grit/shot blasted or chemically cleaned before bonding with rubber. The process adopted for bonding of rubber to metal shall be a proven one using suitable bonding agents and vulcanised in-situ to achieve the required and durable bond strength. The bond strength shall be atleast equal to the strength of rubber. All sharp edges and burrs shall be removed from metal.

5.2.3 Dimensions & Tolerances

The dimensions & tolerances shall be as indicated in the relevant drgs.

5.2.4 Physical Properties of Rubber

5.2.4.1 The rubber compound used in the manufacture of valve seats, gaskets & gland packing washers shall conform to the following requirements:

Sl.	Property	Synthetic Elastomer or Blend					Polychloroprene Grade F
		Grade A	Grade B	Grade C	Grade D	Grade E	
1.	Hardness (IRHD/ Shore 'A')	50±5	60±5	70±5	80±5	85±5	80±5
2.	Tensile strength (Mpa), min.	12	12	12	12	12	15
3.	Elongation at break (%), min.	350	300	300	200	150	150
4.	Compression set (%) max. at 100±1 °C for 24 ^{+0/-2} hrs.	25	25	20	20	20	25
5.	Swelling by Vol. (%) max.						
	a) In Liquid 'B' at 27±2 °C for 24 ^{+0/-2} hrs.	30	30	30	25	25	65
	b) In Lubricating Oil at 100 ± 1 °C for 72 ^{+0/-2} hrs.	+10/-5	+10/-5	+10/-5	+10/-5	+10/-5	+20/-0

Note: The purchasing authority shall designate the grade of rubber in the relevant drgs.

5.2.4.2 Accelerated Ageing

5.2.4.2.1 After ageing at 100±1 °C in an air oven for 72 ^{+0/-2} hrs, the hardness, tensile strength, elongation at break (%) shall not vary from the values obtained with the unaged specimens by more than the following:

	<u>Grade A to E</u>	<u>Grade F</u>
a) Hardness (Shore 'A')	+10/-0 Deg.	+7/-0 Deg
b) Tensile strength	± 20 %	+10/-15 %
c) Elongation at break (%)	+10/-30 %	+10/-25 %

6 Field Trial

After inspection of the rubber components, it will be subjected for field trials to monitor its performance. Quantity of the rubber components for field trial and field trial period shall be as per RDSO ISO document no- MP-M-8.1-1 (latest version)

Field performance feedback format is as under:

S. No.	Shed/ Rly.	Loco No.	Date of fitment	Date of failure, if any	Reason of failure	Remarks

The acceptance criteria of field trial shall be the satisfactory field performance of equipment

7 PREFERENCE TO MAKE IN INDIA

The Government of India policy on 'Make in India' shall apply.

8 VENDOR CHANGES IN APPROVED STATUS

All the provisions contained RDSO's ISO procedures laid down in Document No. QO-D-8.1-11, dated 22.01.2021 (Titled "Vendor-changes in approved status") and subsequent version/amendment thereof, shall be binding and applicable on the successful vendor/vendors in the contract floated by Railways to maintain of products supplied to Railways.

9 DATE OF ENFORCEMENT

The date of enforcement of the specification is with effect from 1st October 2021.

APPENDIX 'A'

(Ref: Clause 0.7)

Code of Practice for Quality Control and Inspection of Rubber Component

A.1 THE SYSTEM

- A.1.1** The manufacturers shall furnish to the purchasing/ Inspecting Authorities information in respect of quality control systems in force at their works on rubber compound, fabric, metals, etc., used in the manufacture of components,

A.2 RECORDS, TESTS & SAMPLING

- A.2.1** The manufacturers shall furnish to the Purchasing / Inspecting Authorities the details of tests and inspection records and other relevant records as required under the quality control systems in force. These records & reports shall be maintained by the Competent Technical Authority of the manufacturers and shall be open to examination by the Purchasing / Inspecting Authorities at all reasonable time. The Purchasing / Inspecting Authorities at their discretion may draw samples of materials referred to in Para A.1 & products at any stage of production for conformity tests either at the works of the manufacturers or in an approved laboratory. In case the samples do not conform to the requirements of the manufacturers, double the number of samples from the same Lot/batch shall be drawn for re-tests. Should any of the re-test samples do not conform to the requirements, the entire lot/batch shall be rejected,

A.3 APPROVED MANUFACTURERS

- A.3.1** For reasonable quality assurance, it is desirable that the components are procured from manufacturers approved by Research, Designs & Standards Organization (RDSO), Lucknow or by any other agency as assigned by the Purchasing Authority, based on evaluation of the components as per the specification, manufacturing & quality control facilities and quality assurance program. However, such approval does not guarantee the supply of consistent quality of material /components & therefore, every lot/batch offered shall be subjected to inspection and testing as per the specification.
- A.3.2** The approved manufacturers shall be subjected to periodical re-appraisal (periodicity for each component shall be assigned by the approving authority). In case of withdrawal of any manufacturing & quality control facilities provided at the time of approval or the components produced at the time of re-appraisal are not conforming to the specification, the manufacturers are liable to be withdrawn from the approved list. The approving authority reserves the right to withdraw the manufacturers from the approved List without assigning any reason.
- A.3.3** The consignee may also periodically arrange testing, if so desired, in an approved laboratory for confirmatory tests within six months from the date of receipt of the supplies, in their original packings, In case the samples do not conform to the specification, the consignees may at their discretion suspend the manufacturer for further supply and the fact brought to the notice of approving/inspecting authorities for appropriate action .

APPENDIX 'B'
(Ref: Clause 1.3.3)

Characteristics of Liquid 'B', Lubricating Oil & Grease

B.1 LIQUID 'B'

B.1.1 The liquid 'B' commonly referred to as Reference 'Fuel 'B' shall conform to 1S:3400. (Part VI).

B.2 LUBRICATING OIL

B.2.1 The lubricating oil referred to in this specification shall have the following characteristics:

i.	Aniline point (°C)	95±5
ii.	Flash Point (°C), min.	210
iii.	Kinematic Viscosity	
	a) At 40 °C	50 – 85
	b) At 100 °C	7.5 - 10

Note: The brands of lubricating oils normally conform to the requirements are:
SERVOPRIME/SYSTEM-57 of IOC, TUABINOL-77 of HPC, TURBOL-78 of BPC or equivalent

B.3 GREASE

B.3.1 The grease referred to in this specification shall be Lithium base, Grade 3 of Regular type to IS:7623.

Notes: The common brands are:
SERVOGEM-RR-3, LITHON-3, BHARAT MP-3 and other equivalent.

APPENDIX 'C'
(Ref: Clause 2.3.5)

Air Leakage Test for Diaphragms

C.1 SCOPE

- C.1.1 This test is Applicable to all types of diaphragms used in air brake equipment of Diesel & electric locomotives, electric multiple unit (EMU) stock and diesel rail cars.

C.2 METHOD

- C.2.1 Air pressure Is applied on one surface of a diaphragms for a specified period at $27 \pm 2^{\circ}\text{C}$, and leakage of air or any rupture shall be detected with soap water solution.

C.3 APPARATUS

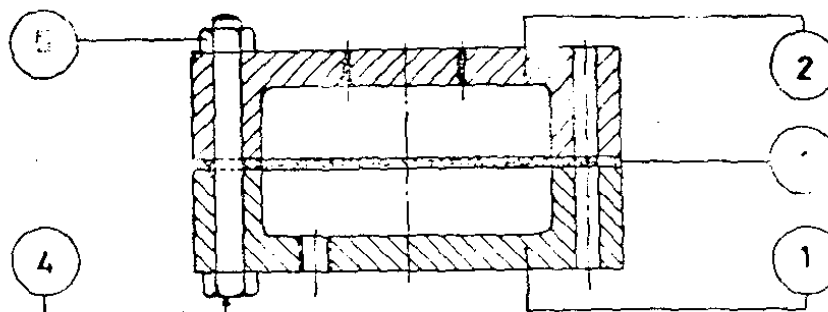
- C.3.1 The apparatus shall consist of a bottom test block (item 1) with a pressure point for air pipe. On the hubs of the top and bottom test blocks, the diaphragm is held tightly with the help of bolts and nuts (Items 4 & 5). The top test block is provided with a hole of 1.5 mm dia. The dimensions of each part of the apparatus would depend on the type of diaphragm under testing. The schematic diagram of the apparatus is shown in **Figure 1**.

C.4 PROCEDURE & CRITERIA FOR CONFORMITY

- C.4.1 The air pressure shall be raised slowly to 5.5 kgf/cm^2 through the pressure hole of the bottom test block and maintained for one minute. Then apply soap Solution at the orifices of the small hole on the top test block. The diaphragm shall not show any rupture and there shall be no leakage of air as observed by the formation of bubbles at the hole. The diaphragm shall not show any distortions.

AIR LEAKAGE TEST APPARATUS FOR DIAPHRAGMS

REF NO	DESCRIPTION	MATERIAL SPEC	QTY
1	BOTTOM TEST BLOCK	STEEL IS:1875	1
2	TOP TEST BLOCK	STEEL IS:1875	1
3	DIAPHRAGM	RUBBER	1
4	BOLT TO SUIT	STEEL IS:226	—
5	NUT TO SUIT	STEEL IS:226	—

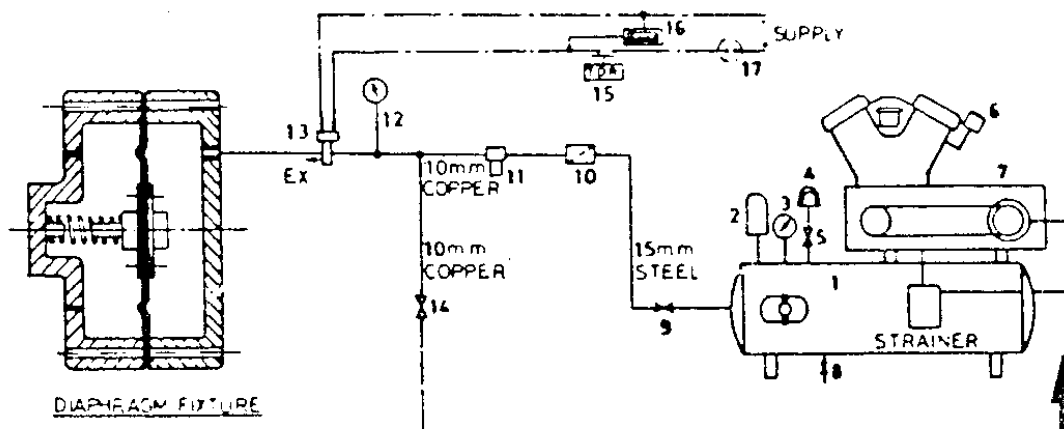


(REF - CL 2-35 SPEC R 48-88)

(FIG 1)

SCHEMATIC DIAGRAM FOR FATIGUE TEST RIG FOR DIAPHRAGMS

REF. NO.	DESCRIPTION	NO OFF
1	RESERVOIR	1
2	SAFETY VALVE	1
3	S P PRESSURE GAUGE	1
4	GOVERNOR	1
5	CUT OUT COCK	1
6	COMPRESSOR STRAINER	1
7	COMPRESSOR SUITABLE FOR 10 kg/cm ²	1
8	DRAIN COCK	1
9	AIR DELIVERY VALVE	1
10	AIR STRAINER 1/2"	1
11	LIMITING VALVE 1/2" RANGE 1.5 TO 8 kg/cm ²	1
12	AIR PRESSURE GAUGE 100 mm	1
13	MAGNET VALVE	1
14	CUT OUT COCK 10mm	1
15	TIME DELAY RELAY	1
16	COUNTER	1
17	SWITCH	1



NOTE—

- 1 STEEL PIPES AND FITTINGS TO IS:1239
- 2 COPPER TUBES TO IS:2501.
- 3 MAGNET VALVE (ITEM 13) TO BE OPERATED BY AN ADJUSTABLE TIME DELAY RELAY
- 4 ITEMS MARKED & ARE SOLD AS A COMPOSITE UNIT ALONG WITH COMPRESSOR

REF.—CLAUSE NO 2.3.5 IRS SPEC R 48-88)

(FIG-2)