



**GOVERNMENT OF INDIA  
MINISTRY OF RAILWAYS**

**INDIAN RAILWAY  
STANDARD SPECIFICATION**

**FOR**

**GROOVED RUBBER SOLE PLATES (6mm THICK)  
FOR PLACING BENEATH RAILS**

**Serial No. T- 47- 2020  
(Revision-01)**

**TRACK DESIGN DIRECTORATE  
Research Designs & Standards Organisation  
Lucknow-226 011.**

Indian Railway Standard Specification  
For  
Grooved Rubber Sole Plates (6mm thick)  
for placing beneath rails  
Serial No. T- 47-2020  
Revision- 01

**FOREWORD**

- 0.1 This specification was originally adopted as provisional specification in 1987 and was revised in 1997 and issued as provisional - 1997 (The specification was further revised and issued as provisional 2002). This revision was done with a view to making this standard self contained with the inclusion of some of the amendments issued in the interregnum with stress on quality and with respect to method of tests, documentation of test results, scheme of testing for pre-acceptance and acceptance tests for approval of samples and for regular inspection of grooved rubber sole plates.
- 0.2 This IRS Specification (provisional)-1997 was revised in 2006 and issued under the fixed serial No.T-47-2006.
- 0.3 For the purpose of deciding whether a particular requirement of this standard is complied with the final value observed and calculated expressing the results of a test or analysis, shall be required to be rounded off in accordance with IS: 2-1960. The number of significant places retained in the rounded off value shall be the same as that of the specified value in this standard specification.
- 0.4 Some IS codes have been revised or re-affirmed since 2006, therefore there was a need of incorporating the latest IS codes in this revision, which has been done in the reference documents para2.0.
- 0.5 This specification has been revised incorporating all 03 no. amendments issued to this specification till date.

**1.0 SCOPE**

- 1.1 This specification covers the requirements, method of tests, sampling and scheme of testing for 6mm thick Grooved Rubber Sole Plate for placing beneath rails, at rail seat of the PSC sleepers.
- 1.2 All the provisions contained in RDSO's ISO procedures laid down in Document no. QO-D-7.1-11 dated 19.07.2016 (Titled "vendor-changes in approved status") and subsequent versions/amendments thereof, shall be binding and applicable on the successful vendor/vendors in the contracts floated by Railways to maintain quality of products supplied to Railways.

## **2.0 REFERENCE DOCUMENTS**

- 2.1 The BIS specification as follows and the RDSO drawing of the sole plate under manufacture shall be available at the manufacturer's works. "Latest versions of the specification are to be followed".
- 2.1.1 IS:7503 (Part I to IV) : Glossary of terms used in Rubber Industry.
- 2.1.2 IS:3400 (Part 1) 2012(Reaffirmed 2017): Methods of test for vulcanized rubbers : Part 1 Determination of Tensile stress strain properties (3<sup>rd</sup> revision).
- 2.1.3 IS:3400 (Part II) 2014(Reaffirmed 2019): Methods of test for vulcanized rubbers : Part II hardness (4<sup>th</sup> revision).
- 2.1.4 IS:3400 (Part IV) 2012(Reaffirmed 2017): Methods of tests for vulcanized rubbers: part IV Accelerated ageing and Heat resistance( 3<sup>rd</sup> revision).
- 2.1.5 IS:3400 (Part IX) 2014(Reaffirmed 2019): – Methods of test for vulcanized rubbers: Part IX Determination of Density (3<sup>rd</sup> revision)
- 2.1.6 IS: 3400 (Part X)-1977 (Reaffirmed 2019): Methods of tests for vulcanized rubbers: part X compression set at constant strain (first revision).
- 2.1.7 IS: 3400 (Part XIII)-1983(Reaffirmed 2019): Methods of tests for vulcanized rubbers: part XIII Tension Set (first revision).
- 2.1.8 IS: 3400 (Part XV)-1971(Reaffirmed 2019): Methods of tests for vulcanized rubbers: part XV volume resistivity of electrically conducting and antistatic rubbers.
- 2.1.9 IS: 3400 (Part 22):1984(Reaffirmed 2019) - Methods of test for vulcanized rubber: Part 22 Chemical analysis.
- 2.1.10 IS: 2-1960 Rules for rounding off numerical values.
- 2.1.11 IS: 4905: Methods for Random sampling
- 2.2 IS:7151: Corrugated Fibre Board Boxes of internal dimensions 890x380x560mm for para dropping of supplies.
- 2.3 The specific provisions in this standard specification over-ride those in the above BIS specifications where these are not in conformity with one another. The specific requirement given in the drawing of the sole plate will over-ride the relevant provision of this specification.

### 3.0 **MANUFACTURE**

#### 3.1 MATERIAL

- 3.1.1 The grooved rubber sole plate shall be manufactured using natural rubber, Ribbed Smoked Sheet (RSS) either of grade 1 to 4 or a blend with Styrene Butadiene Rubber (SBR) and/or Poly Butadiene Rubber (PBR) suitably compounded and vulcanized so as to conform to the requirements of the properties specified in the standard under clause 3.2 to 3.5, 4 & 6.
- 3.1.2 For GRSP made of natural rubber with a particular grade of RSS 1 to 4, the manufacturer should have license from Rubber Board for procurement of the raw rubber to be used for manufacturing of rail pads. During inspection of rail pads, the supplier should submit invoice in support of procurement of natural rubber of a particular grade from the approved sources of Rubber Board with proof of filing annual return with Rubber Board. Similarly, invoice of carbon blacks of suitable ASTM grades as per ASTM D 1765 procured from the primary manufacturing sources or their authorized dealer shall be submitted at the time of RDSO inspection. A record shall be maintained showing procurement & consumption of natural rubber and carbon blacks used for the production of rubber sole plates.
- 3.1.3 Each mix/batch of compound shall be tested for Relaxed Modulus (before ageing) and electrical resistance (before water immersion) and subject to their conforming to the requirement as given in clause SN 4 of 3.2 and 3.4.2 respectively, the manufacture of sole plates shall be undertaken from such mix / compound.

#### 3.2 **PHYSICAL PROPERTIES OF FINISHED 6MM THICK GROOVED RUBBER SOLE PLATES**

SN	Property/Test	Units	Acceptance Value for 6mm thick GRSP	Test Method
1.	Hardness	Shore 'A'	75	Appendix 'A'
2.	Tensile Strength			
	a) Before ageing	Kg/cm <sup>2</sup>	120 (min)	Appendix 'B'
	b)After ageing at 100±1°C for 96 + 0/-2 hours	Kg/cm <sup>2</sup>	100 (min)	
	c)Retention after ageing	%	80 (min)	
3.	Elongation at break			
	a) Before ageing	%	200 (min)	Appendix 'B'
	b)After ageing at 100±1°C for 96+0/-2 hours	%	150 ( min.)	
	c)Retention after	%	65 (min.)	

	ageing			
4.	Relaxed Modulus at 100% elongation			
	a) Before ageing	Kg/cm <sup>2</sup>	45-60	Appendix 'C'
	b) Change after ageing at 100±1°C for 96+0/-2 hours	% of actual value	+30(max) -10	
5.	Compression set subjected to 50% compression at 100±1°C for 24+0/-2 hours	%	30(max)	Appendix 'D'
6.	Tension set subjected to 50% stretch at 100±1°C for 24+0/-2 hours	%	25(max)	Appendix 'E'
7.	Load Compression Test	mm	0.4-0.6	Appendix 'F'
8.	Electrical resistance	Mega Ohms	100(min)	Appendix 'G'
9.	Ash content	%	Approved value ± 5 Subject to not exceeding 29%	IS : 3400 (Part 22) :1984
10.	Specific gravity	-	Approved value ± 0.03 Subject to not exceeding 1.27	IS: 3400 (Part IX) :2014
11.	Secant Stiffness Test	KN/mm	150-250	Appendix 'H'
12.	Impact Attenuation Test	%	30(min)	Appendix 'I'

3.2.1 Impact Attenuation test shall be conducted at RDSO during initial approval and / or quality audit of firms by RDSO.

### 3.3 LOAD - COMPRESSION TEST:

The test shall be carried out as per the method of testing given in Appendix 'F', where area of the GRSP is less than 180 cm<sup>2</sup>. The test shall be conducted on specially prepared test specimen of size 130 mm x 200 mm.

3.3.2 For acceptance the compression shall be between 0.4 to 0.6mm under 15t load.

### 3.4 ELECTRICAL RESISTANCE TEST:

3.4.1 This test shall be conducted on three sample sole plates before as well as after immersion in distilled water for 48 hrs. at ambient temperature. Method of testing shall be as described in Appendix 'G'.

3.4.2 For acceptance the Electrical resistance value arrived at in the manner given in Appendix 'G' shall not be less than 100 Mega ohms in either case i.e., before and after immersion in distilled water for 48 hours.

### 3.5 SPECIFIC GRAVITY AND ASH CONTENT:

3.5.1 Specific gravity shall be 1.27 (max.). The tolerances in the specific gravity of the approved samples shall be  $\pm 0.03$  subject to not exceeding 1.27.

3.5.2 The percent ash content shall be 29% max. The tolerances in the percent ash content shall be  $\pm 5$  of the approved sample subject to not exceeding 29%.

3.5.3 The manufacturers if so desire shall be permitted to seek changes in the specific gravity and percent ash content of the approved samples beyond tolerances subject to the maximum limits set for these properties in clause 3.5.1 & 3.5.2. With any such changes will be permitted after complete evaluation of fresh samples by RDSO as per extant rules.

### 3.6 Finger Printing of Chemical Composition

Finger printing of the chemical composition of GRSP shall be done by measuring the values of Specific Gravity and Ash content which shall not vary from initial approved values and specified tolerance duly communicated to the firm at the time of fresh registration so that there will be no major change in composition of Grooved Rubber Sole Plate in regular supply.

i) Specific Gravity – Approved value  $\pm 0.03$   
Subject to not exceeding 1.27

ii) Ash content % – Approved value  $\pm 5$   
Subject to not exceeding 29%

## 4.0 **DIMENSIONS AND TOLERANCES:**

The dimensions and tolerances of sole plates shall be as per the relevant drawing of the grooved rubber sole plates. Unless otherwise specified a tolerance of  $\pm 5$ mm shall be allowed on the length,  $+ 0/-2$  mm on width, and  $+ 0.5/-0.0$  mm on the thickness. The dimensions of pads shall be checked with suitable gauges as per drawing approved by inspecting agency.

## 5.0 **MARKING :**

Each sole plate shall bear the following marking in 0.8mm deep raised letters/figures in a recess on one face of the sole plates:

- a) Manufacturers' initials or trade mark.
- b) First 2 digit for the month and last two digit for years as follows:  
01-02.  
02-02 etc.
- c) Drawing Number.

## **6.0 FREEDOM FROM DEFECTS:**

The sole plates shall have clean cut sides and shall be free from defects such as porosity, blow holes or the presence of any other extraneous matter. The sole plates shall also have smooth surface and the grooves shall be unobstructed at the ends and along their whole length.

## **7.0 PRE-ACCEPTANCE TESTS:**

- 7.1 In case of unapproved and unregistered firms, prior to regular production samples of sole plates shall be approved by the approving authority as per test scheme given in Appendix 'J'.
- 7.2 For approval/acceptance, the sample shall meet the requirements given in Para 3.2 to 3.5, 4 & 6 of this standard.

## **8.0 ACCEPTANCE TESTS**

### **8.1 LOT SIZE:**

For the purpose of inspection, 10,000 numbers of sole plates or part thereof shall constitute a lot.

- 8.2 SAMPLE SIZE: Sampling scale for dimensional and visual check shall be as follows:

<u>Quantity of pads</u>	<u>Number of samples</u>
Upto 10,000	50
Upto 20,000	80
Upto 30,000	100
Above 30,000 and upto 50,000	120
Above 50,000 and upto 70,000	140
Above 70,000 and upto 1,00,000	150

15 pads for 10,000 nos. above 1,00,000 of pads to same drawing number. The system of sampling shall be as per IS: 4905.

### **8.3 TESTS:**

- 8.3.1 Except for dimensions, the scheme of testing for the inspection of a lot of Grooved Rubber sole plates shall be as per Appendix 'J'.
- 8.3.2 The test methods shall be as per Appendix 'A' to 'I' and the criteria for acceptance and rejection of the particular test shall be as per Para 3.2 to 3.5, 4 & 6. However, all the values obtained shall meet the requirement of the specification.

## **9.0 RE-TEST:**

- 9.1 Should the test results be not satisfactory in more than one property under test clause 8.3 (excluding dimensions) no re-testing shall be done and the entire lot is rejected and should be made unusable.
- 9.2 Should the samples fail in only one property under test clause 8.3 (other than dimensions) the particular test shall be repeated in the same manner with twice the number of samples drawn from the same lot, For acceptance of the lot, these samples should meet with the acceptance requirements of that particular test.
- 9.3 Should the samples fail in dimensions, the manufacture may re-offer the sole plates lot-wise after sorting out the defectives after written permission from the inspecting authority. The re-offered material shall be inspected for all the tests in terms of clause 8.3.

## **10.0 FINAL INSPECTION/TESTING AND DOCUMENTATION:**

The manufacturer shall carryout the final inspection and testing internally in accordance with the requirement of tests under clause 8.3 & submit the internal test report along with the inspection call.

## **11.0 PACKING:**

- 11.1 The rubber sole plates shall be packed such that each of 50 pads of 6mm GRSP are placed flat on top of one another and bound by rubber bands in two perpendicular directions. The rubber bands used for packing the pads shall be of 15-20 mm width and due care shall be taken to avoid any extra stress developed in such packing. Six such packets placed flat one upon another shall then be placed in a plastic bag / HDPE bag (except PVC bag) and this bag shall be placed in a corrugated box to IS:7151-91, a quality suitable for para dropping of supplies and has waterproofing property for the outer layers of the box, to avoid any damage in transit. This corrugated box shall also be bound by two plastic straps of 15-20mm width in two perpendicular directions using suitable strapping tensioner & sealer tool. The packing shall ensure that no displacement of rail pads should occur during transit.
- 11.2 The boxes shall be sealed and labeled bearing:
- a) Name of supplier
  - b) Purchase order number and date
  - c) Quantity
  - d) Consignee



**12.0 TEST FACILITIES:**

The manufacturer of sole plates shall install all the necessary test facilities for inspection of sole plates in a separate well lit, clean and properly ventilated laboratory cum inspection room provided with easily maintainable floor and platform.

**13.0 INSPECTING GAUGES:**

The inspection gauges for dimensional check shall conform to the approved drawings. The manufacturer shall submit two sets of inspection gauges for approval by inspecting officer. One set shall be used as 'Master Gauge' and shall be preserved safely by the sole plate manufacturer. The second set shall be for use by the inspecting officer. For internal checks the firm should use separate set of gauges.

**14.0 DISPOSAL OF REJECTED GROOVED RUBBER SOLE PLATES:**

The rejected grooved rubber sole plates shall be cut into pieces and made unusable.

**15.0 GENERAL:**

- 15.1 The manufacturer shall furnish at his own cost, the sole plates required for all tests and shall provide necessary manpower and facilities for carrying out tests at his cost.
- 15.2 Purchaser/Inspecting officer shall have free access to the works of the manufacturer at all reasonable times and shall be at liberty to inspect the manufacture at any stage and to call for records pertaining to manufacture and testing which shall be made available within a reasonable time.
- 15.3 The material shall be offered for inspection as per call letter given in Appendix 'K'.
- 15.4 The material shall be stored as per the guidelines laid down in Appendix 'L'.

**DETERMINATION OF HARDNESS**

A.1 Number of test samples.

Five sample sole plates shall be considered for hardness test.

A.2 Apparatus: Shore 'A' durometer

A.3 Test method IS : 3400 Part II shall apply

A.3.1 It is proposed that minimum 5 samples shall be checked for shore hardness 'A'. However, following method may be adopted for checking hardness of the grooved rubber sole plates. The sole plate under test shall be placed on another sole plate of same drawing, such that the grooves at upper side of both the sole plates are on the same line. Hardness shall be measured on the portion of the pad in which no groove exists. Five measurements shall be taken at different places on each sole plate.

A.4 Acceptance Criteria:

A.4.1 Results of all the test samples, individually shall be within the range specified as 'Acceptance value' in Clause 3.2.

A.5 Report:

A.5.1: The median of the five measurements obtained shall be considered as result to be taken into account and reported.

**DETERMINATION OF TENSILE STRENGTH AND ELONGATION AT BREAK PERCENTAGE**

B.1 No. of test samples

Five test specimens shall be tested

B.2 Test Method IS:3400 Pt.I shall apply.

B.2.1 The test specimens shall be in the shape of dumb bell. The Dumb-bell shall have the outline and dimensions as shown in Fig.3. Two test specimens shall be cut from each of the five sole plates such that the groove coincides with the central line of the test specimen. The part between the upper edges of the connecting shoulders shall have uniform width and thickness along its length. Gauge length ( $L_0=50\text{mm}$ ) shall be marked on the test specimens for measuring the elongation.

B.2.2 Five test specimens, one from each of the five sample sole plates, shall be tested before ageing and the remaining five test specimens shall be tested after ageing at  $100 \pm 1^\circ\text{C}$  for  $96 + 0/- 2$  hours in an air oven as per IS : 3400 Pt. IV. "Accelerated ageing". The specimens cut from the same sole plate shall bear the same number.

B.3 Tensile strength (T.S.)

B.3.1 The tensile strength shall be calculated by the formula:

$$\text{T.S. (Kg/Cm}^2\text{)} = \frac{\text{Breaking load (kg)}}{\text{Initial cross-sectional area (cm}^2\text{)}}$$

Note : For calculating the initial cross-sectional area of the test specimen, sectional area of groove shall not be deducted.

B.3.2 Percent retention of tensile strength after ageing:

B.3.2.1 Percent retention of tensile strength after ageing shall be calculated with respect to the reported values before and after ageing.

B.3.2.2 The percent retention of tensile strength after ageing shall be calculated by the formula:-

$$\% \text{ retention of T.S.} = \frac{\text{T.S. after ageing}}{\text{T.S. before ageing}} \times 100$$

### B.3.3 Elongation at break

B.3.3.1 The elongation at break shall be expressed in percent and calculated by the formula:

$$\text{Elongation at break (\%)} = \frac{L - 50}{50} \times 100$$

where: L= Length in mm between bench marks at break.

### B.3.4. Percent retention of elongation after ageing

B.3.4.1 Percent retention of elongation after ageing shall be calculated with respect to reported values before and after ageing .

B.3.4.2 Percent retention of the elongation at break after ageing shall be calculated by the formula :

$$\% \text{ retention} = \frac{\text{Elongation at break (\%)} \text{ after ageing}}{\text{Elongation at break (\%)} \text{ before ageing}} \times 100$$

### B 4 Acceptance Criteria:

B.4.1 Results of all the test samples, individually shall be within the range specified as 'Acceptance value' in Clause 3.2.

B.4.2 For tensile strength & Elongation at break before and after ageing 5 test pieces shall be tested and there should be no failure. Should there be any failure, 5 test pieces for Tensile Strength & Elongation at break shall be tested from different pads and there should be no failure. If there is any failure in retest, the sample shall be considered as not meeting the requirement of specification.

### B.5 - Report

B.5.1 For all the above tests, the results of tests to be taken into account (criteria value) both before and after ageing shall be third in each series of five measurements arranged in order of decreasing values.

**DETERMINATION OF MODULUS (RELAXED) AT 100 % ELONGATION**

- C.1 Number of test samples -Three sole plates shall be considered for the tests.
- C.2 Test specimens.
- C.2.1 Test specimens shall be cut and marked in similar manner as indicated in clause B.2.1 of Appendix 'B'.
- C.2.2 Three dumb bell specimens, one from each of the three sample sole plates shall be tested before ageing and the remaining three test specimens shall be tested after ageing at  $100 \pm 1^{\circ}\text{C}$  for  $96 + 0/-2$  hours in an air oven, as per IS : 3400 Part IV, "Accelerated ageing".
- C.3. For test methods IS: 3400 Part I shall apply. The test specimen shall be stretched to 100%of its gauge length (i.e. upto 100 mm) at the rate of 450-600 mm/mt. and then allowed to return to the normal position at the same rate. Immediately after the first stretching, the test specimen shall be re-stretched to 100% of its gauge length (i.e. upto 100mm) at the same rate, and the load shall be recorded.
- C.4 Calculations and Reporting.

C.4.1 Calculations

C.4.1.1 Modulus (relaxed) at 100% elongation shall be calculated by the formula :

$$\text{Modulus (relaxed)} = \frac{\text{Load at 100 \% elongation (Kg)}}{\text{Initial cross-sectional area (cm}^2\text{)}}$$

C.4.1.2 The initial cross-sectional area of the test specimen shall be considered in the same manner as in Clause B.3.1 of Appendix 'B'.

C.4.1.3 Calculation of change of relaxed modulus after ageing at  $100 \pm 1^{\circ}\text{C}$  for  $96 + 0/-2$  hours shall be as given below:

$$\% \text{ change} = \frac{B - A}{A} \times 100$$

where A = Relaxed Modulus before ageing.  
B = Relaxed modulus after ageing.

C.4.2 Acceptance Criteria:

C.4.1 Results of all the test samples, individually shall be within the range specified as 'Acceptance value' in Clause 3.2.

C.4.2.2 For Relaxed Modulus before and after ageing 3 test pieces shall be tested and there should be no failure. Should there be any failure, 3 test pieces shall be tested from different pads and there should be no failure. If there is any failure in retest, the sample shall be considered as not meeting the requirement of specification.

C.5 Report:

C.5.1 The results of tests to be taken into account (Criteria value) shall be second in each series of three measurements arranged in order of decreasing values, both before and after ageing.

**DETERMINATION OF COMPRESSION SET SUBJECTED TO 50% COMPRESSION**

D.1 Number of test samples.

Three sole plates shall be considered for the tests.

D.2 Test specimens.

D.2.1 Three round test specimens, one from each of the three sample sole plates shall be cut  $37 + 0.0/-0.3$  mm in diameter and whose axial plane coincides with that of one of the grooves.

D.3 Test Method.

D.3.1 For testing IS.3400 (Part X) shall apply.

D.3.2 Thickness of test specimen ( $T_o$ ) shall be measured and it shall be compressed in a compression device to 50% of its original thickness ( $T_o$ ) by using suitable spacers.

D.3.3 The assembly shall be kept at  $100 \pm 1^\circ\text{C}$  for  $24 + 0/-2$  hours in an air oven.

D.3.4 The device shall then be removed from the oven and allowed to cool at ambient temperature for 30-35 minutes. The test specimen shall then be removed from the device. The thickness ( $T_r$ ) of test specimen shall be measured after 24 hours but not later than 48 hours from the time of removal from the device.

D.4 Calculation and Reporting.

D.4.1 Calculations:

Compression set (%) shall be calculated by the formula:

$$\text{Compression set (\%)} = \frac{T_o - T_r}{T_o} \times 100$$

D.4.2 Acceptance Criteria:

D.4.1 Results of all the test samples, individually shall be within the range specified as 'Acceptance value' in Clause 3.2.

D.4.2.2 For Compression Set, if there is failure of one test piece out of 3 test pieces tested, further 3 test pieces from different pads shall be tested and there should be no failure. If there is any failure in retest, the sample shall be considered as not meeting the requirement of specification.

D.5 Report

D.5.1 The results to be taken into account (criteria value) shall be the second in the series of three measurements arranged in order of decreasing values.

**DETERMINATION OF TENSION SET(%) SUBJECTED TO 50% STRETCH**

E.1 Number of test samples.

Three sole plates shall be considered for tests.

E.2 Test specimens.

E.2.1 Three test specimens of the type (Dumb bell) described in clause B.2.1 of Appendix 'B' shall be prepared one from each of the three sample sole plates.

E.3 Test Method.

E.3.1 For testing IS: 3400 part XIII shall apply.

E.3.2 The gauge length of 50 mm shall be marked on the test specimen and it shall be stretched in a suitable stretching device upto 50% of the gauge length.

E.3.3 The device shall be then kept at  $100 \pm 1^{\circ}\text{C}$  for  $24 + 0/-2$  hours in an air oven.

E.3.4 The device shall then be withdrawn from the oven and allowed to cool at ambient temperature in stretched condition for 30-35 mts and then freed.

E.3.5 The deformed length ( $L_r$ ) over the gauge mark shall be measured after 24 hours but not later than 48 hours on removal from the oven.

E.4 Calculation and Reporting.

E.4.1 Calculations

Tension set (%) shall be calculated by the formula

$$\text{Tension set (\%)} = \frac{L_r - 50}{50} \times 100$$

E.4.2 Acceptance Criteria:

E.4.1 Results of all the test samples, individually shall be within the range specified as 'Acceptance value' in Clause 3.2.

E.4.2.2 For Tension Set, if there is failure of one test piece out of 3 test pieces tested, further 3 test pieces from different pads shall be tested and there should be no failure. If there is any failure in retest, the sample shall be considered as not meeting the requirement of specification.

E.5 Report

E.5.1 The results to be taken into account (criteria value) shall be the second in the series of three measurements arranged in order of decreasing values.

**LOAD COMPRESSION TEST**

- F.1 Two number samples to be tested per lot. The sample size will be same as the pad offered for inspection, only the horns (if there any) to be chopped off. The load to be applied, may be calculated as follows:-

$$\frac{t \times A}{260}$$

Where A = Area of pad under test in square cm

t = 1,5,10,15 & 20 tonne.

Note : A-If horns are present these are to be chopped off before measurement of area.

Note: B- If the actual pad size is big enough to cut a piece of size 200mm X 130mm, the test shall be done on test pieces of above said size.

- F.2 Apparatus:  
Compression testing machine : Capacity 25 tonne min. suitably fitted with two dial gauges capable of reading 1/100th of mm.

- F.3 Test Condition:

- F.3.1 Test shall be carried out at  $27 \pm 2^{\circ}\text{C}$  and at relative humidity  $65 \pm 5\%$ .

- F.4 Test Method:

The test specimen shall be placed between two rigid metal plates, the surfaces of which shall be smooth and shall absolutely flush with each other. The size of the plates shall be 210mm X 140mm (min.). A piece of '0' number emery paper shall be inserted between the test specimen and the metal plates both at the top and bottom. The measurement of thickness variation shall be carried out by means of two dial gauges of least count 0.01mm suitably placed both side of the test specimen either along the length or the width.

- F.4.2 Two consecutive loading of  $\frac{20 \times A}{260}$  t shall be applied before any deformation readings are taken. A load of  $\frac{A}{260}$  t shall be then applied and the dial gauges shall be adjusted for '0' reading. Loads in tonnes for 5,10 & 15 t in the formula given above, then applied and when each load is static for one minute, the dial gauge readings shall be recorded at load corresponding to 15 tonne. The deformation to be considered for report shall be the average of the readings taken from 2 dial gauges at load corresponding to 15 tonne, which shall not differ more than 0.3mm for a given load.

- F 5 - Report

- F.5.1 Compression (mm) at a load  $\frac{15 \times A}{260}$  t for the two GRSP to be reported.



**DETERMINATION OF ELECTRICAL RESISTANCE**

G.1 No. of test samples.

G.1.1 Three test samples shall be considered for the test.

G.1.2 Samples shall be tested first as such and again after immersion in distilled water for 48 hours at ambient temperature.

G.2 Preparation of the test specimen

The surface of the sole plate test specimens shall be gently rubbed with fine emery cloth for the purpose of removing any thin superficial layer of insulating substances with which they may be covered.

G.3 Apparatus.

Million Mega ohm-metre or any other suitable equipment capable of measuring electrical resistance more than 500 Megaohms.

G.4 Test Method.

G.4.1 For testing IS:3400 (Part XV) shall apply.

G.4.2 The test arrangement shall be as given in Figure 4. The test specimen shall be placed on a metal plate whose dimensions are not less than those of the sole plates. On the test specimen shall then be placed a metal ring of iron or brass whose outer diameter shall be 92mm, inner dia 72mm and height 30 mm. Inside the metal ring a cylindrical metallic disc of iron or brass having  $62 \pm 1$  mm diameter & height 30 mm, shall be placed in concentric fashion & subjected to a load of about 50 kg. The measuring circuit shall be completed as given in figure 4. Measurement shall be carried out at 200-250 volts after a charge lasting for 60 seconds and measurements shall be repeated after reversing the direction of the current.

G.4.3 In case of test specimen immersed in distilled water it shall be ensured that the sole plates before being tested on removal from water shall be wiped off with a dry cloth or blotting paper so that no apparent trace of water remains, especially in the grooves.

G.5 - Report

G.5.1 Individual value before as well as after immersion under water shall meet the minimum requirement laid down before and after reversal of current.

**SECANT STIFFNESS TEST**

1. Place the test pad between steel platens, as shown in Figure1. A piece of '0' number emery paper shall be placed between the pad and the platens, with the abrasive side against the pad.

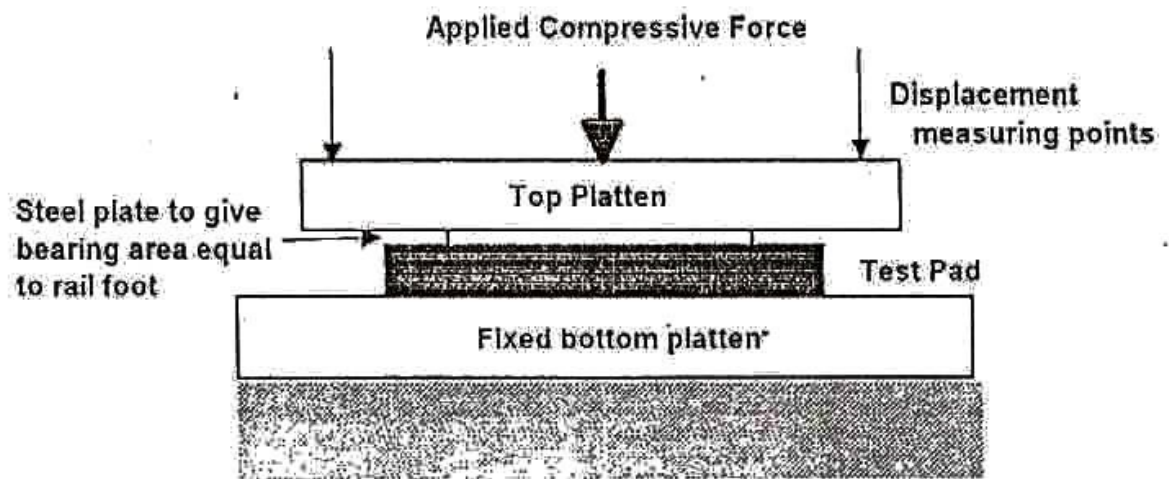


Figure 1

2. Apply consecutive loading of 100 KN, and remove it, six times. The loading times shall each be at least 12 seconds.
3. Upon release of the final pre-conditioning deformation a pre-load up to 100N shall be applied before setting deflection measuring devices to zero.
4. Apply a compressive force up to 100 KN at a rate of  $50 \pm 10$  KN/min. As the load increases, record continuously the displacement at the four corners. From this record, determine the displacements with applied loads of 20 KN and 90 KN. If the difference between the largest and smallest of the four displacement measurements is more than 30% of the mean value, the test results are invalid, and the test must be repeated, ensuring that the pad is suitably placed in the test machine. If the difference is less than 30% of the mean, calculate the mean displacement,  $S_{20}$ , with 20 KN applied, and the mean displacement,  $S_{90}$ , with 90 KN applied. For used pads drawn from service, this difference shall be considered as 40%, max.
5. Two number samples to be tested per lot and each individual value shall meet the requirement of the specification.
6. The static secant stiffness,  $k_{20-90}$ , is calculated from

$$k_{20-90} = 70/(S_{90} - S_{20}) \text{ KN/mm}$$

**IMPACT ATTENUATION TEST**

1. The impact attenuation of the pad is to be measured in a drop weight test rig of the type shown in Figure 2. The drop weight has a mass of between 10 kg and 50 kg. In order to set the calibration of the rig, the rail fastening should first be assembled with 6mm thick plain hard plastic rail pad(HDPE or EVA), with stiffness not less than 750MN/m. The mass and height of the drop weight should be adjusted so that a clear impulse signal is obtained in the strain gauge, within 2 milliseconds and 5 milliseconds, with the peak strain not exceeding 2/3 of the initial cracking strain of the sleeper. Once these parameters are established for a particular test rig, a new sleeper should be strain gauged and installed for regular testing.

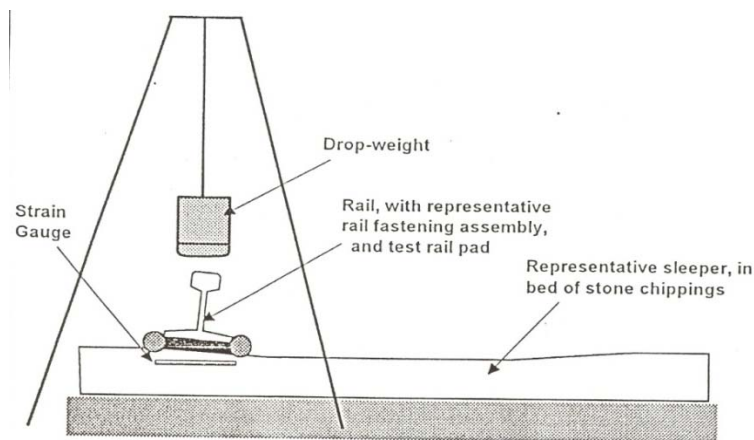


Figure 2

2. For test, standard rail fastening components as per RDSO Drg. No. RDSO/T-3731 using concrete sleeper to Drg. No. RDSO/T-2495 and RDSO/T-2496 are to be used.
3. The test is carried out as follows:
  - 3.1 With a hard plastic pad (stiffness greater than 750 MN/m) in place in the rail fastening assembly, drop the weight from the height established in the preparatory test, record the peak strain value. Repeat the test twice more. The average value of the three strains is recoded as  $\xi_{ref}$ .
  - 3.2 Dismantle the rail fastening assembly, and re-assemble it with the test pad in place. Drop the weight from the same height and record the peak strain value. Repeat the test twice more. The average of these three peak strains is recorded as  $\xi_{test}$ .
4. The impact attenuation of the pad A is defined by
 
$$A = (1 - \xi_{test} / \xi_{ref}) \times 100\%$$
5. Two samples shall be tested and each individual value shall meet the requirement of the specification.

**SCHEME OF TESTING FOR PRE-ACCEPTANCE/ACCEPTANCE TESTS FOR GROOVED RUBBER SOLE PLATES**

Property	No of samples to be tested	Criteria value for acceptance/ rejection	No. of samples to be drawn
1. Hardness shore 'A'	5	Individual	5
2. Tensile strength (Kg/cm <sup>2</sup> )			
(a) Before ageing	5	Third in the series of 5 measurements arranged in order of decreasing value in each case.	5
(b) After ageing at 100 ± 1°C for 96 + 0/-2 hours	5		
(c) Retention after ageing (%)			
3. Elongation at break (%)			
(a) Before ageing	5	- do -	-
(b) After ageing at 100 ± 1°C for 96+ 0/-2 hours	5		
(c) Retention after ageing (%)			
4. Modulus (relaxed) at 100% elongation			
(a) Before ageing (kg/cm <sup>2</sup> )	3	Second in the series of 3 measurements arranged in order of decreasing value in each case.	3
b) Change after ageing at 100 ± 1°C for 96+ 0/-2 hours	3		
5. Compression set subjected to 50% compression at 100 ± 1°C for 24+ 0/-2 hours.	3	- do -	3
6. Tension set subjected to 50% stretch at 100 ± 1°C for 24 + 0/-2 hours	3	- do -	3

7. Load - Compression test	2	Individual	2
8. Electrical resistance test			
a) On normal GRSP	3	Individual	3
b) On GRSP after immersion in distilled water for 48 hours.			
9. Secant stiffness Test	2	Individual	2
10. Impact Attenuation Test	2	Individual	2
11. Dimensional check	8	Individual as per relevant drawing	8

- Note: 1. In case of acceptance tests for dimensional check number of samples to be tested shall be as per clause 8.2.
2. The tests shall be conducted as per relevant test method of the property as given in the specification.
3. Specimen for tests before and after ageing are to be prepared from the same GRSP.
4. Samples shall be signed by the firm's representative and the inspecting officer drawing the samples.
5. All samples shall be free from surface defects and shall bear marking as per requirement of relevant drawing.
6. Electrical resistance tests are to be conducted on same pads before and after immersion in water.
7. Total no. of samples per lot required for physical tests shall be:
- (i) 25 nos. of finished pads as per relevant drawing.
  - (ii) 3 Nos. for load-compression test of. Size 200mm x 130mm.

Letter of offer from the firm

To,  
(Address of inspecting agency)

Sub: Call Letter for inspection of \_\_\_\_\_  
to drg. No. RDSO/T-

Ref: \_\_\_\_\_ Railway/Railway Board P.O.No-  
\_\_\_\_\_ for \_\_\_\_\_ to Drg.  
No- RDSO/T-

\* \* \* \*

The .....as per following details are offered for inspection in terms of the above referred purchase order. These have been internally checked and found satisfactory as per drawing No. RDSO/T..... and relevant IRS specification (copy of test report enclosed).

1. Installment No.
2. Quantity on order
  - a) Against original order
  - b) Against extension
3. Quantity previously inspected and passed
4. Quantity now offered for inspection
  - a) Against original order
  - b) Against extension
5. Batch Nos.
6. Rate Per.....
7. Marking on.....
8. Delivery period.....
9.
  - a) Original.....
  - b) Extended.....
  - c) Letter No (for extension)
9. Consignee
10. Packing

Yours faithfully,

## APPENDIX-L

The rubbers whether under storage or in use continue to deteriorate and ultimately may become unserviceable. The deterioration may be the result of one particular factor or a combination of factors viz. the action of oxygen, ozone, light, heat, humidity etc. The deleterious effects of these factors may, however, be minimised by adopting appropriate conditions of storing and duration of storage. This guide line provides suitable conditions for the storage of rubbers in all forms.

- (i) The rubber components should be stored in a cool place as far as practicable, preferably below 30 deg.C.
- (ii) They should be kept away from direct sunlight preferably in a dark place. Direct sunlight causes much faster degradation of the rubber components.
- (iii) The humidity of the storage condition should not be such that condensation of moisture takes place on the surface of the components.
- (iv) In the vicinity of these components, any loose electrical connections should be avoided, as these cause production of ozone, which adversely affects rubber.
- (v) They should be stored away from contact with materials containing copper and manganese, which act as poisoning agents and resulting in their faster degradation.
- (vi) Under no circumstances rubber components should be stressed during storage. The portion under stress undergoes deformation with permanent set and loading or degradation. They should be stacked in such a way so that any super imposed stresses are substantially avoided.
- (vii) Any contact with grease or oil should be avoided as these cause swelling, softening and deterioration of rubbers.
- (viii) French chalk or soapstone or mica should liberally be applied on the surface of rubber components.
- (ix) Great care is to be exercised so that the material is used in the order of their receipt in the stores i.e. 'first-come-first issue basis'. The rubbers whether under storage or in use continue to deteriorate. The only difference is that under service condition, deterioration is much faster. Every moment of storing is at the cost of useful life and prolonged storage of the material may render it unserviceable due to progressive deterioration.

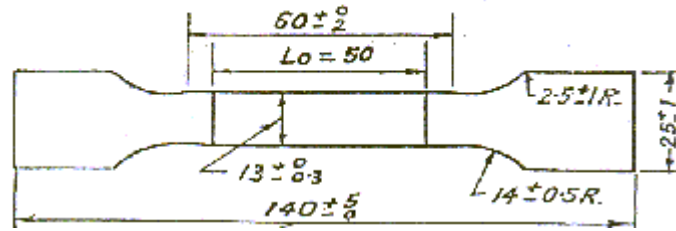


FIGURE 3  
All dimensions in millimeters

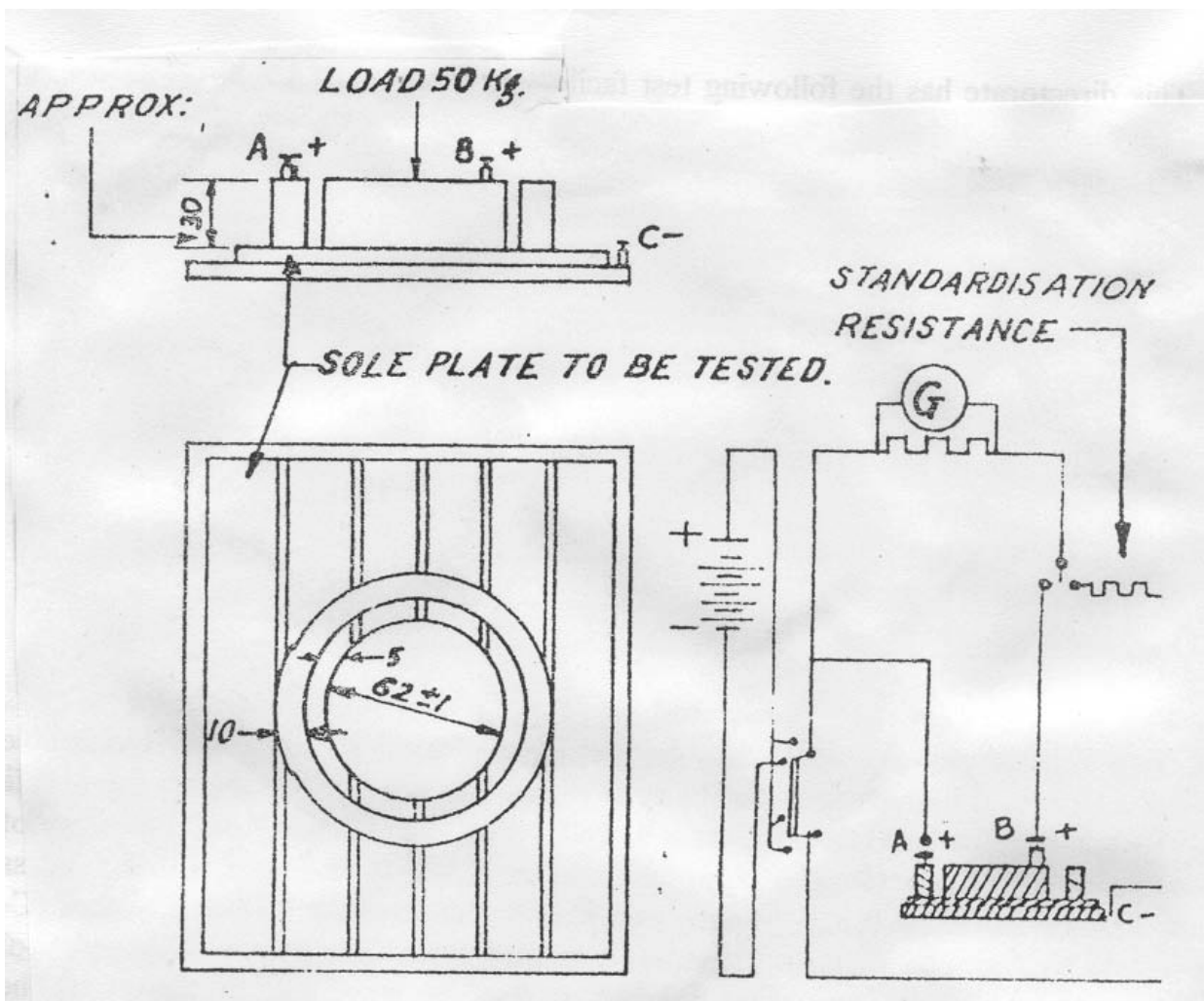


FIGURE 4