SPECIFICATION No. RDSO/M&C/RP-182/2020 (Revision 1.0)

Government of India

Ministry of Railways

Indian Railway Standard Specification for

12 mm thick Side & End Rubber Pads for Mono Block Sleeper in Ballastless Track Assembly (Revision 1.0)

M&C Directorate
Research Designs & Standards Organization
Lucknow - 226011

0. FORWORD:

0.1.1 This specification is issued under fixed Serial No RDSO/M&C/RP-182/2020 (Revision 1.0) the final number indicates year of adoption as standard or in case of revision, the year of last revision. This specification was first adopted in the year 1994.

0.1.2 This specification is intended to cover the technical provision relating to materials, manufacture and tests and does not include all the necessary provisions of the contracts.

0.1.3 This specification draws reference to some of the relevant IS and IRS specifications. Latest versions of these standards shall be taken as references.

0.1.4 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value observed or calculated, expressing the results of a test or analysis, shall be rounded off in accordance with the IS: 2: 1960 (Reaffirmed 2016). The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

0.1.5 In framing the specification, due consideration has been given to the development in the field of elastomeric materials and process technologies, serviceability requirements of the Indian Railways and the practices followed in advanced countries in this field. While framing the specification experience gained with the use of ballast less track over the years in MTP Calcutta has been availed of.

0.1.6 This specification contains a code of practice for quality control and inspection of rubber components (Appendix 'I') to ensure satisfactory process and 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.

1. SCOPE:

1.1.1 This specification covers the requirements, methods of sampling and approval & acceptance tests for grooved rubber sole plates placed on the sides & ends of PSC mono block sleeper used in ballast less track assembly. The rubber pads are subjected to shear and compression both static and dynamic under extreme climatic conditions prevailing in the country.

2. MANUFACTURE

2.1.1 Material:

Natural rubber or elastomers or a blend thereof suitably compounded shall be used for the manufacture of rubber sole plates so as to conform to the requirements stipulated in the specification.

3.0 FREEDOM FROM DEFECTS

3.1.1 The rubber pads shall be substantially free from defects such as blowholes and other visual flaws and presence of any other extraneous matters; they must have smooth surface and the grooves must be unobstructed at the ends and along their whole length.

4.0 DIMENSION & TOLERANCES

4.1.1 The dimensions are tolerances of rubber sole plates shall be as per the relevant drawings. Unless otherwise specified, a tolerance of ± 5 mm shall be allowed on the length, +0/-2 mm on width and +0.5/-0.0 mm on the thickness.

5.0 LOT SIZE AND SAMPLING

5.1.1 For the purpose of inspection, 1000 numbers of rubber sole plates or part thereof, in case ordered quantity is not a multiple of 1,000 numbers, shall constitute a lot. Five numbers of rubber sole plates shall be selected at random from each lot, and out of these a maximum of two may be subjected to destructive tests as required for conducting various tests specified. However, any deviation in the distribution of the samples for different tests shall be at the discretion of the Inspecting/Purchasing authority.

6.0 TESTS:

6.1.1 Hardness (clause 6.2.1) and compression set (clause 6.2.5), tests shall be carried out from the finished rubber pads. All other tests shall be carried out from the prepared test slabs (approx 4-6 mm thick) using the same compound and vulcanized under identical conditions.

6.1.2 The method of tests shall be as given in the respective Appendices. The details of the test methods shall be as per the relevant part number of IS: 3400 without any infringement upon special conditions laid down in Appendices. The physical characteristics of the rubber shall comply with the requirements stipulated in clause 6.2

6.2 **Physical characteristics of the rubber:**

Sl No.	Properties	Unit	Specified Value	Test Method as per Appendix
(i)	Hardness	Shore 'A'	50±5	A
(ii)	Tensile strength			B
	a) Before ageing, min.	kg/cm^2	175	
	b) After ageing at 100 ± 1 °C for 96 + 0/-2 hrs. min.	kg/cm^2	140	
	a) Percentage retention after ageing, min.	%	75	
(iii)	Elongation at break			B
	a) Before ageing, min.	%	450	
	b) After ageing at 100 ± 1 °C for 96 hrs. + 0/-2, min.	%	350	
	c) Percentage retention after ageing, min	%	70	
(iv)	Modulus (relaxed) at 100% Elongation			C
	a) Before ageing	Kg/cm^2	15-30	
	b) Percentage change after ageing at 100 ± 1 °C for 96 +/-2 0 hrs., min.	%	± 40	
(v)	Compression set (%), subjected to 50% compression at 100 ± 1 °C For 24 + 0 -2 max	%	25	D
(vi)	Tension set (%), subjected to 50% stretch at 100 ± 1 °C For 24 + 0 -2 hrs., max	%	20	E

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

a) Specific Gravity: The results shall be within ± 0.02
b) Percent Ash; The results shall be within ± 1.0 %

6.3 Load- deflection characteristics

6.3.1 The test shall be carried out on pads as per the Appendix 'F'. The deflection for increment in stress value from 0.0 kg/cm^2 to 5.0 kg/cm^2 shall be within 1.0 ± 0.2 mm.

6.4 Resistance to oil

6.4.1 The increase in weight of a specimen 50 x 25 mm cut from the rubber pad, after immersion in axle oil conforming to IS: 1628 :1986 (Reaffirmed 2018), at 27 ± 2°C for 24 + 0/-2 hrs, shall not exceed 5 percent of the original weight.

7.0 RE-TEST

7.1.1 Should the samples fail to meet with the requirements of the tests of clause 6, the tests shall be repeated in the same manner with double the number of samples from the same lot comprising two sets of tests. Should any of the set of tests fail to meet the requirements, the entire lot represented by these test samples shall be rejected.

7.12 In the event of rejection of the entire lot, after the retest, the lot offered for inspection shall be made unusable in the presence of Inspecting/Purchasing authority.

8.0 DIMENSIONAL CHECK

8.1.1 The rubber sole plates complying with requirements of clauses 6 and 7 shall be arranged in lots of 1000 or part quantity thereof.

8.1.2 Two percent of rubber pads selected at random shall be checked for dimensions and tolerances stipulated in the drawing.

8.1.3 If any of the sample rubber pads do not conform to the dimensions and tolerances as stipulated in drawing, twice the number of samples taken for check earlier shall be checked. Should any of these samples fail to meet the requirements of dimensions, the lot represented by these samples shall be rejected and or otherwise, the batch shall be accepted.

8.1.4 If the rubber pads do not meet the stipulations of clause 8.1.2 and 8.1.3, the manufacturer shall re-submit the quantity of rubber sole plates after sorting out the defective pieces. The quantities so offered shall meet the requirements of clauses 8.1.2 and 8.1.3.

9.0 MARKING

9.1.1 Each rubber pad shall bear the following in 0.8 mm raised letters/figures placed in a recess on one of its surfaces:

a)Maufacturer's initial or trade mark as approved by the purchaser
b)Last two digits of the year of manufacture along with the quarter of manufacture.
c)Drawing Number.

10.0 PACKING

10.1.1 The rubber pad shall be packed placed flat one upon another in stout wooden boxes to avoid any damage in transit. The packing inside the box should be such that no displacements of rubber pads occur during transit. The boxes shall be sealed and labeled bearing:

a) Name of the supplier

b) Order No. and date

c) Period of manufacture

d) Consignee

e) Quantity

11. "Firm should comply Make in India policy and Public Procurement (Preference to Make in India) order -2017 under this specification" and subsequent amendment done time to time.

APPENDIX 'A'

DETERMINATION OF HARDNESS

A.1.1 Three pads shall be selected for hardness measurements.

A.2 Apparatus

A.2.1 Shore ' A' durometer.

A.2.1.1 The hardness shall be measured at a distance of at least 1 cm from the side of the rubber pads. Five measurements shall be taken at different places on each of the pad, which is itself resting on a very smooth rigid surface.

A.3 Report

A.3.1 The median of the five readings obtained shall be considered as result to be taken into account and reported.

APPENDIX 'B'

DETERMINATION OF TENSILE STRENGTH & ELONGATION AT BREAK:

B.1 No. of test specimens

B.1.1 Ten test specimens of the type (4 to 6 mm thick) shall be prepared from the test slabs. Gauge length for the purpose of measuring percent elongation shall be 50 mm.

B.1.2 Five test specimens shall be chosen for conducting before ageing test and the balance of the five test specimens for after ageing test at 100 ± 1ºC for 96+0/-2 hrs in an air oven, as per IS: 3400 Pt IV :2012 (Reaffirmed 2017).

B.2 Apparatus

B.2.1 Tensile testing machine

B.3 Test Method IS: 3400 Pt. I: 2012 (Reaffirmed 2017) shall apply.

B.4 Report

B.4.1 The results to be taken into account both before and after ageing shall be the third in each series of five measurements arranged in order of decreasing values.

B.4.2 Percentage retention of tensile strength and elongation at break shall be calculated with respect to the reported values before and after ageing. The percentage retention of tensile strength and elongation at break shall be calculated by the formula:-

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

APPENDIX 'C'

DETERMINATION OF MODULUS (RELAXED) AT 100% ELONGATION

C.1 No. of test specimens

C.1.1 Six test specimens of the type (4 to 6 mm thick) shall be cut from the test slabs. Gauge length for the purpose of measuring percent elongation shall be 50 mm.

C.1.2 Three test specimens shall be chosen for conducting tests before ageing and the balance of the three test specimens after ageing at 100± 1ºC for 96 +0/-2hrs in an air oven.

C.1.3 The test specimens shall be stretched up to 100 mm at a speed 450-600 mm/min. and then allowed to return to the normal position at the same speed. Immediately after the first stretching, the test specimen shall be stretched to 100% of its gauge length i.e. 100 mm at a same speed and the load recorded.

C.2 Report

C.2.1 The results to be taken into account before and after ageing shall be the second in each series of three measurements arranged in order of decreasing values.

C.2.2 Calculation of change of relaxed modulus after ageing at 100 ± 1ºC for 96 +0/-2 hrs shall be given below:

% Change = (B-A) / A x 100

Where A = Relaxed Modulus before ageing.

B= Relaxed Modulus after ageing.

APPENDIX 'D'

DETERMINATION OF COMPRESSION SET % SUBJECT TO 50% COMPRESSION:

D.1 No. of test specimens

D.1.1 Three round specimens, one each from three rubber pads shall be cut having a diameter 37 mm.

D.1.2 The test specimens shall be compressed in a compression device up to 50% of its original thickness(To) by using spacers and the assembly shall be kept at 100 ± 1ºC for 24 + 0/-2 hrs in an air oven. The specimens shall be removed from the device after 30 minutes on removal from the oven. The thickness of the test specimen (Tr) shall be measured between 24-48 hrs on removal from the oven.

D.2 Report

D.2.1 Compression set % shall be calculated from the following formula:-

$$\text{Compression set \%} = \frac{To - Tr}{To} \times 100$$

D.2.2 The results to be taken into account shall be the second in the series of three measurements arranged in order of decreasing values.

APPENDIX 'E'

DETERMINATION OF TENSION SET % SUBJECT TO 50% STRETCH

E.1 No. of test specimens

E.1.1 Three test specimens of the type (4 to 6 mm thick) shall be prepared from test slabs. The gauge length for the purpose of measuring the tension set shall be 50 mm.

E.1.2 The test specimens shall be stretched in a suitable stretching device up to 50% of the gauge length of 50 mm and then the assembly kept in an air oven at 100 ± 1ºC for 24 +0/-2 hrs. The test specimens shall then be removed from the device after 30 minutes on removal from the oven. The deformation occurred over the gauge mark (Lr) shall be measured between 24 – 48 hours on removal from the oven.

E.2 Report

E.2.1 Tension set % shall be calculated from the following formula:-

$$\text{Tension Set \%} = \frac{Lr - 50}{50} \times 100$$

E.2.2 The results to be taken into account shall be the second in the series of three measurements arranged in order of decreasing values.

APPENDIX 'F'

DETERMINATION OF LOAD-DEFLECTION CHARACTERISTICS

F.1 No. of test specimens

F.1.1 Two test specimens measuring 200 x 100 mm (approx) shall be cut from two different pads. Dimensions shall be measured accurately and the area 'A' in cm^2 calculated.

F.1.2 The test shall be carried out in an universal testing machine or hydraulic press having capacity up to ten ton and provided with suitable device for measuring deflection with accuracy of 0.01 mm. In case of hydraulic press two dial gauges shall be provided at two ends for measuring deflection. The platens of the testing machine shall be rigid and smooth.

F.3.1 Test shall be carried out at 27 ± 2ºC and at relative humidity 65 ± 5%.

F.1.4 The test specimen shall be placed between the platens and three times consecutively loaded at a speed of 25 ± 5 mm per min up to 1 ton. Immediately after the third loading, the measuring device or the dial gauges shall be set at zero at a load of 50 kg. The deflection shall e recorded during the fourth compression at an interval of 200 kg up to 1200 kg.

F.1.5 Stress (load in kg divided by area in cm^2) vs deflection in mm shall be plotted for each test specimen. Deflection corresponding to stress value 5 kg/cm^2 shall be read out from the graphs and the values recorded. The average of values shall be within the stipulated limits.

APPENDIX 'I'

CODE OF PRACTICE FOR QUALITY CONTROL AND INSPECTION OF RUBBER AND PLASTIC COMPONENTS

I.1 THE SYSTEM

I.2 RECORDS, TESTS & SAMPLING:

I.2.1 The manufacturer shall furnish the Purchasing/Inspecting authorities the detail of tests and inspection records and other relevant records as required under the quality control systems in force. These records and reports shall be maintained by the Competent Technical Authority of the manufacturers and shall be open to examine by the Purchasing/Inspecting authorities at all reasonable time. The Purchasing/Inspecting authorities at their discretion may draw samples of materials used in manufacture and products at any stage of production for conforming 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 specification double the number of samples from the same lot/batch shall be drawn for re-tests. Should any one of the re-test a sample does not conform to the requirements, the entire lot/batch shall be rejected.

I.2.2 The manufacturer shall supply and submit all gauges for the approval of the Inspecting Officer.

I.2.3 All tests required by the Inspecting Officer shall be carried out in his presence and he shall be supplied with a copy of the results signed by the manufacturer or his representative.

I.2.4 The manufacturer shall furnish the material for all tests required and shall also provide the necessary labour and appliances for carrying out such tests. Failing facilities at his own works, the tests shall be carried out at a testing works approved by the Purchaser at the expense of the manufacturer.

I.2.5 The gaskets shall be supplied to the purchaser when requested, free of cost for testing.

I.2.6 The gaskets found to be defective in any way after delivery may be returned to the manufacturer at his own expense notwithstanding the fact that they may have passed the tests prescribed by the specification and have been accepted by the Inspecting Officer.

I.2.7 The notice shall be given to the Inspecting Officer when the components are ready for inspection.

I.2.8 The gasket shall not be dispatched from the manufacturer's works before an acceptance certificate has been obtained from the Inspecting Officer.

I.3 APPROVED MANUFACTURERS:

I.3.1 The manufacturer should have complete manufacturing and quality control facilities as per the specification at their works.

I.3.2 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 and quality control facilities and quality assurance programme. However, such approval does not guarantee the supply of consistent quality of material/components and therefore every lot offered shall be subjected to inspection and testing as per the specification.

I.3.3 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 and quality control facilities provided at the time of approval of the component 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.

I.3.4 The consignee may also periodically arrange testing if so desired, at RDSO or in an approved laboratory for confirmatory tests within six months from the date of receipt of the supplies, in their original packing. In case of samples do not conform to the specification, the consignee may at their discretion suspend the manufacturer for further supply and the fact brought to the notice of approving/inspecting authorities for appropriate action.
