

REVISION OF SPECIFICATION / STR

Ref: Draft Spec. No. RDSO/2007/CG-06 (Rev. 1) Specification for Injection Moulded Silent Block for Centre Pivot of B.G. Coaches.

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 this item may be submitted in the following format alongwith 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	Contact No.	
7	Email ID	
8	<u>In case of Firm / Individual:</u> Manufacturing experience of item (or similar Item) on which comments are offered	
9	<u>Where relevant:</u> Whether any technical document to support suggested changes is available / enclosed for better appreciation	

Part B: Comments / suggestions on the specification

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

Comments may be sent to:

Executive Director /Carriage
Research Designs and Standards Organization
Manak Nagar, Lucknow – 226011
Email: edcar.rds@gmail.com, dirssrds@gmail.com

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INDIAN RAILWAYS



सत्यमेव जयते

SPECIFICATION FOR INJECTION MOULDED SILENT BLOCK FOR CENTRE PIVOT OF B.G. COACHES

S. No.	Month/Year of issue	Revision / Amendment	Page No.	Reason for Amendment
1.	February - 2009	-	-	First issue
2.	August-2020	Rev.1	5,8&9	<ul style="list-style-type: none"> • Clause no. 3.5 is added under Endurance Test in Section -A. • Clause 3.1, 3.2, 3.5 & 3.6 modified in Section-B

ISSUED BY:

CARRIAGE DIRECTORATE
RESEARCH DESIGNS AND STANDARDS ORGANISATION
MANAK NAGAR LUCKNOW - 226 011

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**SPECIFICATION FOR INJECTION MOULDED SILENT BLOCK
FOR CENTRE PIVOT OF B.G. COACHES**

1.0 SCOPE:

- 1.1 This schedule consists of two sections i.e. Section-A and Section-B. Section-A covers technical requirements, methods of sampling and tests for Silent Blocks. Section-B covers schedule of infrastructure, manufacturing and testing facilities and Quality control requirements.
- 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.'

SECTION -A

2.0 REQUIREMENTS:

2.1 MATERIAL:

2.1.1 Rubber, natural rubber or Elastomer or a Blend thereof suitably compound shall be used for the manufacture of the Silent Blocks so as to achieve requirements stipulated in this schedule.

2.1.2 STEEL:

2.1.2.1 Inner part of the Silent Block shall conform to IS: 2062 Grade Fe 410 WC.

2.1.2.2 Outer cover of the Silent Block shall be made from 125 mm nominal bore seamless pipe with minimum outer diameter 141 mm to IS:1161-79 Grade YST - 240 (Heavy). Alternatively steel to IS: 2062 Grade Fe 410 WC may also be used.

2.1.3 The bonding area on the metal parts shall be degreased and mechanically cleaned by shot/grit blasted to IS: 9139 Grade S M 300 or G M 30. It has to be ensured before rubber metal bonding that the metal surface is free from rust, moisture and other foreign matter.

2.2 CONSTRUCTION AND FINISH:

The Silent Block shall be manufactured as per RDSO Drg. No.CG-K7121 with latest alteration. The inner metal part and the outer metal part of the silent block is to be chemically bonded with rubber. The silent block shall be manufactured by Injection Moulding Process.

2.3 TECHNICAL REQUIREMENTS:

2.3.1 PHYSICAL PROPERTIES:

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2.3.2 Physical properties of rubber before ageing shall be as per Table-1:

Table-1

S. No.	Properties	Values
1	Tensile strength in Kg/cm ² (Minimum)	200
2	Elongation at break in % (Minimum)	300
3	Modulus of Elasticity at 200% Elongation in Kg/cm ² (Minimum)	40
4	Compression set for 24 +0/-2 hrs. at 70 +1/-0 °c in % (Maximum)	20.
5	Shore hardness	70± 5
6	Ash content in % (Maximum)	7
7	Specific Gravity (Maximum)	1.25
8	Bond strength in PSI (Minimum)	500

- Note:**
1. Tests shall be carried out as per IS: 3400. For this purpose, the suppliers shall supply two test slabs of size 2 x 250 x 250 mm and three numbers of test buttons as per IS: 3400 part-10, large type, prepared from rubber compound used for batch production along with internal test results.
 2. The bond strength between metal and rubber shall be assessed as per method 'B' as given in IS: 3400 Part 14-1984. The sample for test shall be produced from the same lot of rubber compound and adhesive used for production by the supplier.

2.3.2 Variation in physical properties of rubber after aging at 70 (+1, -0) °c for 72 (+0, -2) hrs. in an air oven.

1	Change in tensile strength in %	±20
2	Change in Elongation at break in %	±25
3	Change in hardness IRHD	+7, -0
4	Change in Modulus of Elasticity (at 200 % Elongation)	+20, -0 %

2.3.3 PERFORMANCE REQUIREMENTS OF SILENT BLOCK FOR CENTRE PIVOT:

The Silent Block shall be tested for following properties in the finished condition:

S. No.	Properties	Requirements
1	Compressive load test with 14 tonnes load	1. No damage to rubber or steel
		2. Deflection not more than 2 mm
		3. Permanent set not to exceed 0.5 mm when measured 30 minutes after release of load.
2.	Torsional stiffness for 7 degree deflection	1. Torque required should be within 25,000 to 40,000 kg cm

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	2. Permanent set not to exceed 1 degree
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Note: In all the above two cases, the Silent Blocks should be subjected to 3 successive loading up to maximum limit and 4th time reset the pointer at zero position and take the final readings.

3.0 ENDURANCE TEST:

The endurance test of silent block shall be carried out in finished condition and shall be carried out as per following procedure:

- 3.1 Silent Blocks shall be subjected to load of 5000 Kg. on radial direction as given in Annexure -A. The inner metal part is to be rested on the edges and the load is to be applied on the outer metal part. The material shall then be subjected to a continuous cyclic loading between 5000 kg. and 15000 Kg. at a frequency between 1 to 2 Hz (i.e. 1 to 2 cycles/second).
- 3.2 The test shall be carried out for 2,50,000 cycles. After the completion of 2,50,000 cycles, material shall be checked for any cracks on the rubber or de-bonding from metal. On successful completion of the test, silent block shall be rotated 180 degree and the test shall be repeated for further 2,50,000 cycles as per para 3.1.
- 3.3 On completion of 5,00,000 cycles, the materials shall not show any cracking or de-bonding of rubber from inner or outer metal part.
- 3.4 The endurance test shall be conducted during approval/renewal of the firm and also after every 2,500 pieces supply and the test certificate has to be shown to the inspecting authority as and when required.
- 3.5 The firm should have suitable facility for testing "Endurance Test" and also satisfy the requirement of clause no. 2.4 of Section-B. Until the "Endurance test" facility is not available with the manufacturer, the manufacturer should arrange testing of the item from NABL/NABCB accredited Lab or reputed Lab as decided between IR and manufacturer. The cost of the testing shall be borne by the manufacturer.

4.0 LOT SIZE, METHOD OF SAMPLING OF MATERIAL:

The lot size of Silent Blocks for Centre Pivot to be offered in one inspection shall be maximum 200 Nos. or part thereof

- 4.1 From the above lot offered for inspection, the following samples shall be drawn by the inspection authority for various tests:

1	Dimension	8% (minimum of 10 nos.)
2	Visual examination	8% (minimum of 10 nos.)
3	Compressive load test	1% (minimum of 3 nos.)
4	Torsional stiffness test	1% (minimum of 3 nos.)
5	Physical properties of rubber	Two test slabs of size 2 x 250 x 250mm and three numbers of test buttons as per IS: 3400

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	part-10, large type.
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4.2 Material offered for inspection shall not be withdrawn during the course of inspection. Any move to withdraw the material or interfere with inspection in any way shall render the entire lot being rejected.

4.3 If the samples fail in one or more of the criteria, double samples will be drawn and tested against the criteria in which the failure had occurred. If the double samples pass, the lot shall be accepted. Failure of the double samples will however, result in the rejection of the lot.

5. MARKING:

5.1 Each Silent block shall be marked as given in the drawing.

6.0 PACKING:

6.1 The exposed -machined surface of the silent block shall be coated with rust prevention oil to prevent oxidation from exposed surface. The oil should not come in contact with the rubber or the bonding part of the silent block. The silent blocks shall be wrapped in corrugated paper and then packed in wooden cases.

7.0 WARRANTY:

7.1 The injection moulded silent block for centre pivot shall be deemed to bear a warranty against defective material/workmanship and performance for a period of 42 months from the date of supply or 36 months from the date of fitment whichever is earlier. In case, the material shows any defect/fails within the warranty period, it shall be replaced by new one without any cost.

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SECTION-B

**SCHEDULE OF INFRASTRUCTURE, MANUFACTURING & TESTING FACILITIES
AND QUALITY CONTROL REQUIREMENTS**

1.0 GENERAL & MANUFACTURING FACILITIES:

- 1.1 Covered area with adequate space for storage of raw rubber, carbon and chemicals should be available. The covered area should be free from dampness and humidity.
- 1.2 The weighing facilities for measuring raw materials constituents and the product at intermediate stages should be available.

The following facilities are required.

- a) Minimum one number electronic weighing balance of 0 to 6 kg. capacity.
- b) Minimum one number mechanical spring balance (preferably electronic) or platform weighing machine of the capacity of minimum 50 kg. of reputed make.
- 1.3 It shall be ensured that the weighing machines are calibrated regularly by the government approved agency. Frequency of calibration shall be as per manufacturers' recommendation.
- 1.4 At least two sets of Go - No Go gauges should be available to check the dimensional accuracy of Ball Shaft and outer cover and also the products at intermediate stage & final stage.
- 1.5 Ensure that the Go - No Go gauges are calibrated on or before due date and the record is available. The Go - No Go gauges, should have a mention on it indicating the date of calibration and the date next due.
- 1.6 Minimum one number open mixing mill for sizing of rubber sheets should be available. The open mixing mill should be equipped with suitable cooling arrangement and digital temperature indicator.
- 1.7 Minimum one number PLC controlled automatic injection moulding machine of adequate capacity shall be available.
- 1.8 One mould for preparation of sample test pieces for method -B of Bond test in accordance with IS: 3400 Pt. 14 with latest alteration shall be available.

2.0 TESTING FACILITIES:

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- 2.1 Controlled atmosphere laboratory to maintain standard temperature and humidity for rubber testing as per IS: 13867 should be available.
- 2.2 Tensile testing machine preferably electronic type capable to read the load and elongation as per the requirement of the product should be available. The tensile machine should have all the provisions in accordance with Para 4.2 of IS: 3400 Pt. I.
- 2.3 One Universal testing machine or suitable load deflection testing machine with load indicator having least count of minimum 50 kg with adequate capacity to apply the required load for conducting tests like compressive load tests with 15,000 kg of load.
- 2.4 One endurance-testing machine with hydraulic power pack should be available which satisfies the following requirements:
 - a) It should be able to apply the continuous cyclic compressive load of 5 tonnes to 15 tonnes as per para 3.1 of Section A.
 - b) It shall be possible to read the load applied as well as the number of cycles directly on the machine/counter.
 - c) Provision should be there to ensure that the loading cycles are maintained at the frequency of 1 to 2 cycles per second.
- 2.5 A suitable machine /fixture and calibrated angle measuring chart with graduation 0.5⁰ minimum up to the reading of 8⁰ to measure rotational movement of Silent Block under torsion should be available.
- 2.6 The firm should have minimum one number of air oven to facilitate the testing in accordance with Para 4.2 to 6.2 of IS: 3400 Pt. IV.
- 2.7 The firm should have minimum one number Muffle Furnace with adequate crucibles and desiccators.
- 2.8 The firm should have one number Shore hardness tester.
- 2.9 Below mentioned measuring instruments should be available.
 - a) Vernier Calipers with Digital display
 - b) Go - No Go gauges for all the important dimensions for the product.

2.10 The firm should have the facility for Compression set testing.

3.0 QUALITY CONTROL REQUIREMENTS:

- 3.1 The firm should have acquired ISO: 9001- 2000~~2015~~ or Latest certification and the product for which the approval is sought should be broadly covered in the scope of the certification for manufacture and supply.

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- 3.2 The Quality manual of the firm for ISO: 9001- 2000 **2015 or Latest** should clearly indicate at any stage the control over manufacturing and testing of the said railway product.
- 3.3 There should be a system to ensure the traceability of the product from raw material stage to finished product stage. The system should also facilitate to identify the raw material composition from the finish product stage.
- 3.4 It should be ensured that there is a Quality Assurance Plan for the product detailing the following various aspects:
- Organisation chart
 - Process flow chart
 - Stage inspection details from raw materials stage to finish product stage
 - Various parameters to be checked and level of acceptance of such parameters indicated and method to ensure control over them.
 - Disposal system of rejected raw material and components.
- 3.5 There should be at least one full time technologist **qualified** ~~having a minimum bachelor's degree~~ in relevant field with experience of at least ~~5- 12 years~~ **2** years ~~or a person with diploma in relevant field with 12 years' experience.~~ He should be free from day-to-day production, testing and quality control responsibilities. He should be mainly responsible for development of a product, analysis of products, control over raw material, and corrective action in case of difficulties in achieving the parameters.
- 3.6 Ensure that the in charge of the Quality Control Section is having a qualification ~~of minimum bachelor's degree~~ in the relevant field and has a minimum of ~~5- 12 years'~~ **2** years' experience. ~~Alternatively, he should be a diploma holder with minimum of 12 years' experience.~~ He should be actively involved in day-to-day activities of quality control/stage inspection / compliance of QAP etc.
- 3.7 The firm must ensure that proper analysis is being done on monthly basis to study the rejections at various internal stages and it is documented.
- 3.8 The firm should ensure that latest version all the relevant specifications, IS standards are available with the firm.

4. DOCUMENTATION:

Firm shall maintain following documents/records:

- 4.1 A well-documented Quality Plan.
- 4.2 Incoming raw material register with Test Certificates references of suppliers and internal test results.

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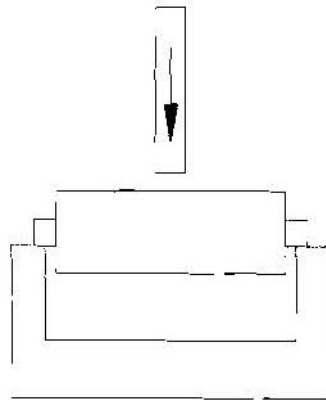
- 4.3 Stage inspection results including finished products results.
- 4.4 Records of internal rejection and its analysis vis-a-vis action plan.
- 4.5 Records of final products inspection by external agencies (like RDSO), Non-conformity reports and case analysis as well as action taken thereof.

5. TRAINING:

- 5.1 Training needs should be identified for all concerned officials and regular training shall be organized and imparted on maintenance of machines, quality assurance, safety parameters etc.

ANNEXURE-A

CYCLE LOAD BETWEEN 5000 Kgs
TO 15000 Kgs AT FREOUENCY
BETWEEN 1 TO 2 Hz



SCHEME FOR FATIGUE TEST

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