

## REVISION OF SPECIFICATION / STR

Ref: Current Specification No. C- 9501 (Rev -3)

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	<b>In case of Firm / Individual:</b> Manufacturing experience of item (or similar Item) on which comments are offered	
9	<b>Where relevant:</b> 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:**

Director Carriage  
Research Designs and Standards Organization  
Manak Nagar, Lucknow – 226011

Email ID: [jdircd@gmail.com](mailto:jdircd@gmail.com)

## INDIAN RAILWAYS



सत्यमेव जयते

MASTER COPY

 Controlling Officer... Mohammad Saquib  
 Signature...  
 Designation... 27/10/16

**SCHEDULE OF TECHNICAL REQUIREMENTS  
FOR  
RUBBER SPRINGS  
FOR  
DRAW GEAR OF BG COACHES**

January - 2003

S. No.	Month/Year of Issue	Revision/ Amendment	Page No.	Reason for Amendment
1.	October, 2016	Amendment -1	3	To include the ISO Doc. No. QO-D-7.1-11, New sub clause No.1.3 added under clause no. 1 of Scope.

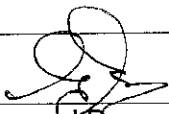

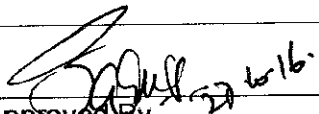
**Issued By:  
Research Designs and Standards Organization  
Manak Nagar, Lucknow-226 011**

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Name & Designation	Prepared By:- S.P. Awasthi SSE/Carriage	Checked By:- Subhash Singh SSE/Carriage	Approved By:- Mohammad Saquib Director/VDG/CD

**Amendments slip No. 1** of September, 2016 to Spec No. C-9501 (Rev.2) for SCHEDULE OF TECHNICAL REQUIREMENTS FOR RUBBER SPRINGS FOR DRAW GEAR OF BG COACHES.

**New sub Clause 1.3 added as under:**

**1.3** 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.

Signature			
Name & Designation	Prepared By:- S.P. Awasthi SSE/Carriage	Checked By:- Subhash Singh SSE/Carriage	Approved By:- Mohammad Saquib Director/VDG/CD

MASTER COPY

Controlling Officer

Signature :

Designation Dir./SS

INDIAN RAILWAYS

**SCHEDULE OF TECHNICAL REQUIREMENTS**

**FOR**

**RUBBER SPRINGS**

**FOR**

**DRAW GEAR OF BG COACHES**

January, 2003

Issued by

**RESEARCH DESIGNS & STANDARDS ORGANISATION  
LUCKNOW-226011**

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## **SCHEDULE OF TECHNICAL REQUIREMENTS FOR RUBBER SPRINGS FOR DRAW GEAR OF BG COACHES**

### **0 FOREWORD**

- 0.1 This specification is issued under the fixed Serial C-9501.
- 0.2 This specification is intended to cover the technical provisions and matters relating to material, construction and tests and does not include all the necessary provisions of the contract.
- 0.3 This specification draws reference to various IS and ISO specifications. The latest version of these specifications shall be taken as reference.
- 0.4 Whenever there is a conflict among the stipulations in the present specification, drawing or any of the relevant specifications, the most stringent requirement will apply.

### **1.0 SCOPE**

- 1.1 This specification prescribes the requirements, method of sampling and tests for individual rubber spring element as well as pack of 16 such elements having 1000 kgm minimum capacity for Drawgear of B.G. Coaches.
- 1.2 The spring elements used in draw gear arrangement comprises of 14(7X2) elements in each pack. Tests such as capacity, endurance and impact endurance shall be conducted on a pack of 16 elements as per the test procedures detailed in this specification. Packs of 14 rubber spring elements shall be formed from the lot so tested for draw gear arrangement.

### **2.0 REQUIREMENTS**

#### **2.1 Material**

- 2.1.1 Rubber - Natural rubber or elastomers or a blend thereof suitably compounded shall be used for the manufacture of rubber springs so as to conform to the requirements stipulated in this standard.
- 2.1.2 Steel - The metal plates used as integral part of the rubber spring shall be to IS: 2062 Fe 410WA.
  - 2.1.2.1 The metal plates shall be shot/grit blasted to IS: 9139 Grade SM300 or GM-30 and chemically cleaned before bonding with the rubber. It has to be ensured before bonding that the metal surface is free from rust, moisture and other foreign matter. The process

adopted for bonding of rubber to metal shall be a proven one using suitable bonding agents to achieve the required bond strength.

2.1.2.2 All sharp edges and burrs shall be removed from metal plates. Rubber shall be smooth and free from cracks, pin holes, foreign materials, trapped air blisters and other visual flaws.

2.1.2.3 The metal plate shall conform to geometrical dimensions as indicated on drawing.

### 2.3 CONSTRUCTION AND FINISH

2.3.1 The rubber springs shall be manufactured so that a pack of 16 pads will meet the the manufactured height requirement of 448 +8/-4 mm. The boundary dimensions & tolerances of each Rubber Pad shall be as per the drawing No.Sk-K3004 in the Annexure. Wherever a tolerance on rubber has not been specified, it shall be in accordance with clause of ISO: 3302 Table-1 Class M4.

2.3.2 All sharp edges and burrs shall be removed from metal plates. Rubber shall be smooth and free of pin holes, blisters and other visual flaws. The texture of the material should be homogeneous and compact

2.3.3 The rubber for elastomer utilised in manufacture of spring shall conform to characteristics indicated in Table-1.

**TABLE-1**

Characteristics	Test method	Results to be obtained
Hardness, shore A	IS:3400 Pt.II	(a) Hardness = 80 ±5.  (b) After ageing for 3 days in air at 70°C, Change -0/+5
Strength	IS:3400 Pt.I	Tensile strength 150 kg/cm <sup>2</sup> (Min.). After ageing for 72 hours change ±20%
Elongation at rupture	IS:3400 Pt.I	Elongation Min. 200%. After ageing for 3 days in air at 70 °C.Change ± 30%
Modulus of elasticity at 100% elongation.		Change in modulus of elasticity after 72 hours ageing at 70 °C shall be ± 20%
Compression set after 25% compression for 24 hours at 70 °C	IS:3400 Pt.X	Compression set 30% maximum
Specific Gravity		Must not exceed 1.22
Ash Content		5% Max

### 3.0 STATIC CHARACTERISTICS

- 3.1 A complete pack of 16 springs meeting the manufactured height  $448 \pm 4$  mm shall meet the following test requirements in static condition when tested as per item 4.1.

Pre compression force at 438 mm height	$750 \text{ kg} < F < 2000 \text{ kg}$
Compressive force at 423 mm height	$1000 \text{ kg} < F < 3000 \text{ kg}$
Compressive force at 388 mm height	$5000 \text{ kg} < F < 10000 \text{ kg}$
Compressive force at 323 mm height	$30000 \text{ kg} < F < 50000 \text{ kg}$
Stored energy $We^*$	$> 1000 \text{ kg m}$
Permanent set (30 minutes after test)	2.5% (Max.)

$We^*$  = The energy absorption capacity is to be calculated from the area under the load displacement characteristic curve drawn from pack height of 16 springs ( $448 \pm 4$  mm) to pack height of 323 mm.

The stored energy is measured in kilojoules(kj) or kilogram meter (kgm)

### 4.0 CHARACTERISTICS OF SPRING STACK

- 4.1 Static Characteristic Procedure:- Sixteen Spring elements manufactured with the steel plate components (Each conforming to RDSO Sk-K3004) shall be clamped together. Position of each spring element in the stack will be marked as well as given a clear identification number. This spring assembly shall be placed in a rig to act as a guide during compression test or when under dynamic load. The guide will be either through the central hole or the external guide. The spring shall be centrally placed with reference to the guide. It must be ensured that during the test, the spring assembly shall not come in contact with either the central guide or the external guides which might interfere with the compressive load applied and the stress rate.

The compressive load shall be applied at a speed of  $15 \pm 5$  mm per minute.

The load displacement curve from original height to the height at 323 mm is to be recorded. The zero setting for measurement for displacement should be done prior to 1st compression by putting weight of 50 kg so as to close any gap between the pads..

Results:- Values required in item 3.0 shall be read from the graph plotted above. Assembly should satisfy stipulations of item 3.0.

### 4.2 TEST OF COMPRESSION STRENGTH AFTER CLAMPING

Procedure: - The spring assembly 16 springs shall be clamped to a height of  $423 \pm 2$  mm. (pre-compressed height). It must be kept in this manner atleast for 72 hours at room temperature.



It will then be compressed from released height to a height of  $323 \pm 2$  mm. at a rate of  $15 \pm 5$  mm per minute.

The test results should be plotted in terms of force / displacement diagram.

Results: - The assembly should satisfy the characteristics mentioned in item 3.0.

Note: - This test may be carried out on separate spring pack.

#### 4.3 ENDURANCE TEST

Procedure: - The spring assembly of 16 pads shall be subjected to endurance test as follows. Repeated compression will be made between load range  $2t$  to  $10t$ .

- i) The spring assembly shall be compressed 10000 times in the load range  $2t$  to  $10t$  at a frequency of 30 cycles/minute minimum.
- ii) The spring in unclamped condition shall be kept for 24 hours for stabilisation.
- iii) Compression curve shall be plotted after the third cycle of compression in the load range of  $2t$  to  $10t$ . The compression speed shall be  $15 \pm 5$  mm per minute.
- iv) The load necessary to obtain height of 423 (Hi) mm shall be plotted based on (iii).

Note: - The manufacturer should have necessary facilities for carrying out endurance testing on such lot.

Results: -

- i) Stored energy in the load range of  $2t$  to  $10t$  recorded in this test shall not be less than 80% of the corresponding stored energy recorded during the compression test after clamping in item 4.2.
- ii) The force required to obtain the height of 423 mm shall not be less than 1000 kg.
- iii) The elastomer shall not exhibit any notches deeper than 2mm particularly near to locating

#### 4.4 IMPACT ENDURANCE TESTS

A pack of 16 springs pre-compressed to 423 mm shall be subjected to 500 blows by a 1000 kg load falling freely from a height of 1 m. The number of blows shall not be less than 30 per hour. The capacity when measured after half an hour after completion of this test should not be less than 85% of the capacity recorded under item 4.0. Bond failure of any individual spring will result in the pack being considered as failed.

test should not be less than 85% of the capacity recorded under item 4.0. Bond failure of any individual spring will result in the pack being considered as failed.

## 5.0 SAMPLING AND ACCEPTANCE

5.1 Acceptance test shall consist of following tests: -

- 1 Dimensions
- 2 Visual examination
- 3 Physical properties of elastomer before and after heat ageing (as per table)
- 4 Static characteristics
- 5 Compression after clamping
- 6 Endurance test
- 7 Impact endurance test
- 8 Compression set
- 9 Metal plate examination
- 10 Specific gravity
- 11 Ash content

5.2 Classification in batches

Each batch shall be distinctly marked with a consecutive No. without any break or repetition with batch No. commencing from (1) at the beginning of each year. Serial No. of the rejected batch will not be used again during that year.

5.3 A batch shall consist of a spring element of the same type and of the same dimensions coming from the same production series in accordance with the provision of the order. The spring element shall be tested as under:

Sl. No.	Nature of inspection	No. of sample pads for lots of		No. of measurements per sample	Shape and dimension of samples
		Upto 8000	more than 8000		
1	Physical Properties in as delivered condition and also after heat ageing				
	Hardness	6	10	3	Samples type 2 or sample for compression set
	Tensile test	5	8	3	Sample type II
	Compression set (+70 °C)	5	8	3	Sample Type II 13 mm dia. and 6.3 mm height
2	Dimensional check on element	20	30		The element itself
	Visual Examamination	20	30		

	Metal plate examination	5	5		
3	Test on the whole spring assembly				
	Static characteristics	1	2	1	
	Compression after clamping	1	2	1	The spring assembly itself
	Endurance test	1	2	1	The spring assembly itself
	Impact Endurance Test	1	2	1	The spring assembly itself
	Specific Gravity	3	5	1	Must not exceed 1.22
	Ash content	3	5	1	5% Maximum

- 5.4 The test pieces selected at random will be marked with indelible ink. The test pieces as selected above shall be prepared for 24 hours at  $27\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$  &  $60\% \pm 5\%$  relative humidity.
- 5.5 The test pieces to be tested after accelerated ageing shall be cut up and then oven heated upto  $70\text{ }^{\circ}\text{C}$  for 3 days. They shall then be prepared for 24 hours at  $27\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$  and  $60\% \pm 5\%$  relative humidity. The test shall be carried out in accordance with IS: 3400 Part-IV-1987.
- 5.6 If the samples fail on one or more of the criterion, 'double' the numbers of samples will be drawn and tested against the criterion in which the failure has occurred. If the 'double' sample passes the test, the lot shall be accepted. Failure of 'double' sample will, however, result in rejection of the lot.

## 6.0 APPROVAL OF FIRMS

- 6.1 These rubber springs shall be procured only from sources approved by RDSO.
- 6.2 For series production the supplier shall not change anything as regards the composition and the manufacturing processes used for these spring elements having successfully undergone the approval procedure.

## 7.0 GUARANTEE

The spring element shall be guaranteed by the suppliers for a period of 2 years following the year of delivery against any defects not detected during the acceptance test in the factory.

The guarantee period shall reckon from the date the spring elements are mounted in coaching stock. The spring elements, which during the guarantee period show manufacturing defects making them unsuitable for use or liable to shorten their service life shall be rejected. Joint inspection between the suppliers and the Railways will be

carried out before final rejections of the supplies by the Railways. The supply will stand finally rejected if the joint inspection confirms that the spring element had inherent manufacturing defects.

## **8.0 MARKING**

8.1 Each rubber spring shall be embossed in raised letters on the rubber portion as follows:

- i) Drawing number in force and 'IR'
- ii) Manufacturer's name (initial/trade mark can also be embossed)
- iii) Quarter and year of manufacture

The embossing shall be of the size and on the location shown in the drawing.

8.2 The exposed portion of metal plates shall be painted

8.3 Yellow colour rubber sticker of size 25 mm x 10 mm with the inscription "Coach Drawgear" to be vulcanized alongwith rubber pad.

## **9.0 PACKING**

9.1 Rubber spring shall be dusted with French chalk and packed as multiples of 14 rubber spring elements with particulars of the order/lot etc. to avoid any distortion and to prevent any damage during transit and storage.

## **10.0 STORAGE**

10.1 The rubber springs shall be stored in a cool and dry place.

10.2 Pads shall be kept covered and free from exposure to bright light, particularly sunlight.

10.3 Do not expose to grease, oil, solvent fumes or sources of ozone such as electric motors or generators.

10.4 Pads should be stocked and arranged in such order to ensure use of the old stock first.

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