

REVISION OF SPECIFICATION / STR

Ref: Current Specification No. C –K 210 (Rev 03)

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:

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

Email ID: jdircd@gmail.com

INDIAN RAILWAYS



सत्यमेव जयते

MASTER COPY

 Controlling Officer...*Mohammad Saquib*
 Signature.....*[Signature]*
 Designation.....*SSE/Carriage*

**SCHEDULE OF TECHNICAL REQUIREMENTS
FOR
HIGH CAPACITY BUFFER SPRINGS
FOR
SIDE BUFFERS OF B.G. COACHES**

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.2.2 added under clause no. 2 of Scope.

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



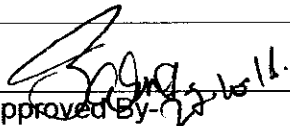
Signature	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>
Name & Designation	Prepared By:- S.P. Awasthi SSE/Carriage	Checked By:- Subhash Singh SSE/Carriage	Approved By:- <i>[Signature]</i> Mohammad Saquib Director/VDG/CD

Ref: CG-WI-4.2.1.1 (Ver -1)	Page 1 of 13	Date of Issue: October - 2016	Spec. No. C-K210 (Rev.03)
--------------------------------	--------------	----------------------------------	---------------------------

Amendments slip No. 1 of October, 2016 to Spec No. C-K210 (Rev.03) for Schedule of Technical Requirements for High Capacity Buffer Springs for Side Buffers of B.G. coaches.

New sub Clause 2.2 added as under:

2.2 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.

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

**GOVERNMENT OF INDIA
MINISTRY OF RAILWAYS**



MASTER COPY

Controlling Officer
Signature : *[Handwritten Signature]*
Designation DIR/CD

SCHEDULE OF TECHNICAL REQUIREMENTS

FOR

HIGH CAPACITY BUFFER SPRINGS

FOR

SIDE BUFFERS OF BG COACHES

S.No.	Month/Year of issue	Revision/Amendment	Page No.	Reason for amendment

ISSUED BY:

**RESEARCH DESIGNS AND STANDARDS ORGANISATION
MINISTRY OF RAILWAYS
MANAK NAGAR, LUCKNOW - 226011**

SECTION – A

S.No.	Description	Page No.
1.	Foreword	3
2.	Scope	3
3.	Requirements	3
4.	Tests	4
5.	Characteristics of spring stack	5
6.	Sampling and acceptance	6
7.	Approval of firms	8
8.	Guarantee	8
9.	Marking	8
10.	Packing	8
11.	Storage	9

SECTION – B

1.	Scope	9
2.	Requirements	9
3.	General & Manufacturing Facilities	9
4.	Testing Facilities	10
5.	Quality Control Requirements	11
6.	Documentation	12
7.	Training	13

SECTION-A

SCHEDULE OF TECHNICAL REQUIREMENTS FOR HIGH CAPACITY BUFFER SPRINGS FOR SIDE BUFFERS OF BG COACHES

1. FOREWORD

- 1.1. This schedule is in two parts viz. Section-A & Section-B. Section-A covers the technical requirements/ provisions relating to materials, constructions and tests and does not include all the necessary provisions of the contracts. Section-B covers the infrastructural, testing and quality control facilities to manufacture rubber buffer springs.
- 1.2. This schedule draws reference to some of the relevant specifications. Latest version of these specifications shall be taken as reference.
- 1.3. 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.

2. SCOPE

- 2.1. This specification prescribes the requirements, method of sampling and tests for individual rubber spring as well as a pack of 4 such elements having 1225 Kgm minimum capacity for Side Buffer of B.G Coaches.

3. REQUIREMENTS

3.1 MATERIAL

- 3.1.1. Rubber : Natural Rubber or elastomers or a blend thereof suitably compounded shall be used for the manufacture of the rubber springs so as to conform to the requirements stipulated in this standard.
- 3.1.2. The rubber or elastomers utilized 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 Part 2	Hardness = 70 ± 5 After ageing for 72 hrs in air at 70°C Change -0 +5
Tensile Strength	IS: 3400 Part I	Tensile strength 180.0 kg/cm ² (Min.). After ageing at 70° for 72 hrs Change $\pm 20\%$
Elongation at Rupture		Elongation 300 % (Min). After ageing for 3 days in air at 70°C Change $\pm 20\%$
200% Modulus of elasticity	IS: 3400 Part I	40.0 kg/cm ² (Min) Change in modulus of elasticity after 72 hrs ageing at 70°C shall be

		±20%.
Compression set after 25% compression for 24 hrs at 70°C	IS: 3400 Part X	Compression set 30% (Max.)
Specific Gravity	IS: 3400 Part IX	1.0 – 1.25
Ash content	IS: 3400 Part 22	5% (Max.)

3.1.3. Steel: The metal plates used as integral part of the rubber spring shall be to IS: 2062 Fe 410WA.

3.2 CONSTRUCTION AND FINISH

- 3.2.1 The rubber buffer springs should be manufactured by injection moulding process.
- 3.2.2 The rubber/ elastomer shall be smooth and free of pinholes, blisters, cracks, pitting, bulges and other visual flaws. The texture of the material should be homogenous and compact.
- 3.2.3 The metal plates shall conform to geometrical dimensions as indicated on drawing.
- 3.2.4 All sharp edges and burrs shall be removed from metal plates. The metal plates shall be shot / grit blasted to IS: 9139 grade, SM300 or GM-30 and chemically cleaned before bonding with the rubber.
- 3.2.5 The process adopted for bonding of rubber to metal shall be a proven one using suitable bonding agent to achieve the required bond strength.
- 3.2.6 The rubber springs shall be manufactured so as to be interchangeable as a complete pack, meeting the manufactured height requirement of 448 +4/-4 mm. The boundary dimensions and tolerances shall be as per the drawing No. SK-K2048. Wherever tolerance on rubber has not been specified, it shall be in accordance with clause of ISO 3302 Part I of Table I class M4.
- 3.2.7 Each Side Buffer shall be fitted with an assembly of four buffer spring elements

4 TESTS

4.1 Four buffer elements as per SK-K2048 of manufactured height 448 + 4 /-4 mm along with 2 additional parting plates of 5 mm each (Total height = 458 +4/-4 mm) shall meet the following test requirements in static condition when tested as per clause 5.1 & 5.2.

Pre compression force at 438 mm height	750 Kg	< F <	2000 Kg
Compressive force at 423 mm height	1000 Kg	< F <	4000 Kg
Compressive force at 388 mm height	5000 Kg	< F <	15000 Kg
Compressive force at 338 mm	65000 Kg	< F <	75,000 Kg

height			
Stored energy W_e^*	≥ 1225 Kgm		
Absorbed energy	$\geq 40\%$ of stored energy		

4.2 The load - displacement characteristic curve is to be drawn from free height to pack height of 338 mm. The stored energy (W_e) is to be calculated from the area under the curve (drawn while loading) between stack heights of 438mm and 338mm. For calculating the absorbed energy the graph is drawn in reverse releasing the load from pack height of 338 mm to free height and the area under the load displacement curve (while releasing), from 338mm to 438mm is calculated. The difference between the stored energy and the area calculated above is the absorbed energy.

4.3 The curve should be drawn with displacement on x-axis and load on y-axis.

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

5 CHARACTERISTICS OF SPRING STACK.

5.1 Static Characteristics Measurement Procedure

Four buffer spring elements (Each conforming to RDSO SK-K2048) along with two parting plates of 5 mm each, shall be clamped together to simulate the actual working condition. 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 elements 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 guide which might interfere with the compressive load applied and the stress rate.

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

The load displacement curve from free height to the height of 338 \pm 2 mm is to be recorded. Two dummy compression strokes upto a height of 338 \pm 2 mm are to be given on Buffer Spring stack. The load displacement curve corresponding to the third cycle of compression shall be recorded. The zero settings for measurement for displacement should be done prior to 3rd compression cycle by putting a weight of 50 Kg so as to close any gap between the pads.

Results: Values required in clause 4.0 shall be read from the graph plotted above. Assembly should satisfy stipulations of clause 4.0

5.2 Test of Compression Strength after clamping

Procedure: The Spring assembly with two parting plates of 5.0 mm thickness each shall be clamped to a height of 438 mm \pm 2 mm (pre-compressed height). It must be kept in this condition for 72 hours at room temperature. It will then be compressed from a height of 438 \pm 2mm to 338 mm \pm 2 mm at a rate of 15 mm \pm 5 mm per minute.

The Test Results i.e. force / displacement diagram shall be drawn during the 3rd cycle of compression.

Results: The assembly should satisfy the characteristics mentioned in clause 4.0.

5.3 Endurance Test

Procedure: The Spring Assembly of four pads along with two parting plates of 5.0 mm thickness (each) shall be subjected to endurance test as follows:

The Spring Assembly shall be compressed 10000 times in the load range 2t to 10t at frequency of 30 cycles/minute (minimum).

The springs in unclamped condition shall be kept for 24 hours for stabilisation.

Compression curve from free height to 10 t load, shall be plotted during the third cycle of compression. The compression speed shall be 15mm \pm 5mm per minute.

Note: The Manufacturer should have necessary facilities for carrying out endurance testing.

Results: Stored energy in the load range of 2 t to 10 t recorded in this test shall not be less than 80% of the corresponding stored energy recorded during the compression test in clause 5.2

The force corresponding to stack height of 423 mm shall not be less than 1000Kg

5.4 Impact Endurance Test:

A pack of four springs along with two parting plates of 5.0 mm thickness (each) pre-compressed to 438 \pm 2 mm shall be subjected to 500 blows by a 1000 Kg load falling freely from a height of 1 meter. The frequency of blows shall not be less than 30 per hour. The Stored Energy when measured half an hour after completion of this test shall not be less than 85% of the Stored Energy mentioned in clause 5.0. Bond failure of any individual spring will result in the batch being considered as failed.

6 SAMPLING AND ACCEPTANCE

6.1 Acceptance test shall consist of following tests:

- 6.1.1 Dimension check
- 6.1.2 Visual examination
- 6.1.3 All properties of elastomer as per Table 1
- 6.1.4 Static Characteristics.
- 6.1.5 Compression after clamping
- 6.1.6 Endurance test
- 6.1.7 Impact endurance test
- 6.1.8 Compression set
- 6.1.9 Metal plate examination

6.2 A batch shall consist of spring elements coming from the same production series. The spring element shall be tested as under:

Nature of Inspection	Sample size per lot		No of measurements
	Lot size Up to 2000 nos.	Lot size More Than 2000 nos.	
1	2	3	4

A) Physical properties in as delivered condition and also after heat ageing.

Hardness	1	2	3
Tensile Test	1	2	3
Compression	1	2	3
Specific Gravity	1	2	1
Ash Content	1	2	1

B) Dimensional check on element

Visual Examination.	5	10
---------------------	---	----

C) Testing on the whole Spring assembly (consisting of 4 elements and 2 parting plates)

Static characteristics	4	8
Compression	1	2
Endurance test	1	2
Impact Endurance test	1	2

6.3 The test pieces selected at random will be marked with indelible ink. The test pieces as selected above shall be conditioned for 24 hours at $27^{\circ}\text{C} \pm 2^{\circ}\text{C}$ for conducting test.

6.4 The test pieces to be tested after accelerated ageing shall be cut up and then oven heated upto 70°C for 3 days. They shall then be prepared for 24 hours at $27^{\circ}\text{C} \pm 2^{\circ}\text{C}$ for conducting test. The test shall be carried out in accordance with IS: 3400 part –IV-1987.

6.5 If the sample fails on one or more of the criteria, double the number of the samples will be drawn & tested against the criteria in which the failure(s) has/ have occurred. If all the samples pass the test, the lot shall be accepted. Failure of second lot of samples will however, result in rejection of the entire lot.

7 APPROVAL OF FIRMS

- 7.1 For Series production the supplier shall not change anything as regards the composition and the manufacturing processes used for these spring elements as followed during the approval process.
- 7.2 The procedure to be followed for approving firms desiring to supply this item is given below:
- 7.2.1 The firm shall have all the facilities mentioned in Section-B of this schedule.
- 7.2.2 Request for registration for the item should be made in the prescribed form to RDSO. The request for registration should be accompanied with in-house test results of the product.
- 7.2.3 The firm shall be assessed by RDSO for compliance of STR and QAP in accordance with extant procedures.
- 7.2.4 On completion of above, type tests on samples manufactured by the firm will be carried out by RDSO in accordance with this schedule.
- 7.2.5 Based on satisfactory assessment, verification of infrastructural facilities and type tests final approval of the firm shall be granted.

8 GUARANTEE

- 8.1 The firm shall stand guarantee for a period of 24 months from the date of supply regarding performance of Rubber Buffer Spring Element.
- 8.2 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 rejection of the supplies by the Railways. The supply will stand finally rejected if the joint inspection confirms that spring element had inherent manufacturing defects.

9 MARKING

- 9.1 Each Rubber Spring shall be embossed in raised letters on the Rubber portion as follows:
- 9.1.1 Drawing Number
- 9.1.2 Manufacturer's Name (Initial, Trade mark can also be embossed)
- 9.1.3 Quarter and Year of manufacture
- 9.2 The embossing shall be of the size and on the location shown in the drawing.

10 PACKING

- 10.1 Rubber Spring shall be dusted with French chalk and packed as multiple of four Rubber Spring Elements suitable for one complete Side Buffer Assembly to avoid any distortion and to prevent any damage during transit and storage.

11 STORAGE

- 11.1 The Rubber Spring shall be stored in a cool and dry place.
- 11.2 Rubber Spring shall be kept covered and free from exposure to bright light particularly sunlight.
- 11.3 Rubber Spring shall not be expose to Grease, Oil, Solvent Fumes or sources of Ozone such as Electric Motors or Generators.
- 11.4 Rubber Spring should be stocked and arranged in such order so as to ensure use of old stock first.

SECTION-B

REQUIREMENT OF INFRASTRUCTURE FACILITIES TO MANUFACTURE RUBBER SPRING ELEMENTS

1. SCOPE

- 1.1. This part covers the infrastructural requirements for manufacture of elements for rubber buffer spring for side buffers of coaches.

2. REQUIREMENTS

- 2.1. All vendors seeking registration with RDSO must fulfill the requirements of this Schedule.

3. GENERAL & MANUFACTURING FACILITIES

- 3.1. Covered area with adequate space for storage of raw rubber, carbon and chemicals should be available, which is free from dampness and humidity.
- 3.2. The following weighing facilities for measuring various raw material constituents and the product at various stages should be available.
 - 3.2.1. Electronic weighing balance of 2 to 5 Kg Capacity.
 - 3.2.2. Mechanical Spring Balance or Platform Weighing Machine of the capacity of minimum 50 kg of a reputed make.
 - 3.2.3. It should be ensured that the Weighing Machines are calibrated regularly as per manufacturers instructions/ IS specifications.
- 3.3. Minimum one number Bench grinding machine to remove sharp edges from the sheared/blanked/cut steel plates should be available.
- 3.4. At least two sets of Go & No-Go gauges should be available to check the dimensional accuracy of the steel plates as also the product.

- 3.5. Minimum one numbers Shot/ grit Blasting Machines capable of blasting the steel plates should be available. The shot/ grit blasting machine shall have in-built facility of sieving to screen under size shots/ grits.
- 3.6. Facility for degreasing should be available. The process of cleaning should be a proven one and must be capable of removing accumulated dirt/ dust, black spot, etc.
- 3.7. Suitable spraying facility for application of adhesive should be available. The spraying machine shall have an in-built provision of stirring the adhesive.
- 3.8. A Suitable capacity close mixing mill (Banburry) is preferable. However availability of at least one kneader /internal kneader is essential.
- 3.9. One extruder to ensure uniform mixing should be available.
- 3.10. Minimum one number open mixing mill for sizing of rubber sheets shall be available. The open mixing mill should be equipped with suitable cooling arrangements and digital temperature indicator.
- 3.11. Minimum one number injection moulding machine of adequate capacity along with suitable dies and moulds to manufacture high capacity buffer pack shall be available in accordance to the schedule.
- 3.12. It shall be ensured that the moulds are measured for their accuracy for various dimensions and profile at least on weekly basis or after a production of 500 packs which ever is later and the observations recorded.
- 3.13. In-house availability of minimum infrastructure for maintenance and polishing of dies and moulds shall be available.

4. TESTING FACILITIES

- 4.1. Controlled atmosphere laboratory to maintain standard temperature for rubber testing as per IS: 13867 shall be available.
- 4.2. Tensile testing machines capable to read the load and elongation as per the requirement of the product should be available. The tensile testing machine should have all the provisions in accordance with para 4.2 of IS: 3400 Part I.
- 4.3. One load-testing machine with load indicator having a least count of minimum 20 Kg should be available. The capacity of the machine should be adequate to operate the same at specified speeds and it should be capable to apply the required load for testing of the products for various deflections as required in the schedule.
- 4.4. One Rheometer should be available and must be used regularly. The record of batches that are checked on Rheometer should be maintained.
- 4.5. Suitable Tup Hammer as per product test requirement should be available.
- 4.6. Suitable Fatigue Test machine as per product Testing requirement should be available.

- 4.7. Minimum two numbers air ovens should be available to facilitate the testing in accordance with para 4.2 and 6.2 of IS: 3400 Part X.
- 4.8. Minimum one number muffle furnace should be available.
- 4.9. Ensure that minimum two numbers Shore Hardness testers with standard test pieces are available.
- 4.10. At least one number specific gravity testing apparatus should be available.
- 4.11. Facility to check the viscosity of the adhesive should be available.
- 4.12. Facilities for preparing test specimen as per IS: 3400 Part I should be available.
- 4.13. Below mentioned measuring instruments in adequate number should be available:
 - 4.13.1. Micrometers
 - 4.13.2. Dial Gauges
 - 4.13.3. Vernier Calipers
 - 4.13.4. Go-No-Go gauges
- 4.14. Minimum one number chemical balance and a crucible for measuring ash content should be available.
- 4.15. Compression set testing apparatus in accordance with para 4.1 of IS: 3400 Part X should be available.
- 4.16. Minimum two sets suitable fixtures for compression load deflection test should be available.
- 4.17. Suitable facilities for cutting the test specimen from the product should be available.

5. QUALITY CONTROL REQUIREMENTS

- 5.1. The manufacturer shall have their own valid ISO: 9000 series certification for the product for which an approval is sought.
- 5.2. There should be the system to ensure the traceability of the product beginning with raw material stage to finish product stage.
- 5.3. There should be the system to ensure 'first-in first-out' for all raw materials and intermediate stages to finish products.
- 5.4. It should be ensured that there is a Quality Assurance Plan for the product detailing the following various aspects:

- 5.4.1. Organisation chart.
- 5.4.2. Process flow chart.
- 5.4.3. Stage inspection details from raw materials stage to finish product stage.
- 5.4.4. Various parameters to be checked and level of acceptance of such parameters indicated and method to ensure control over them.
- 5.4.5. Disposal system of rejected raw material and components.
- 5.5. The quality manual of the firm for ISO: 9000 should clearly indicate the control over manufacturing at every stage and testing of the product.
- 5.6. There shall be at least one graduate degree holder with field experience of at least 5 years or a diploma holder with experience of 10 years in rubber technology for regular production and quality control.
- 5.7. It should be ensured that proper analysis is being done on monthly basis to study the rejections at various stages of production and is documented.
- 5.8. Latest version of all the relevant specifications, such as, IS, ASTM and RDSO standards and drawings with latest alterations should be available with the firm.
- 5.9. It should be ensured that a minimum of 2 Nos. GO and NO GO gauges are available for checking the dimensional accuracy of the products and these gauges are calibrated at regular frequency.

6. DOCUMENTATION

- 6.1. Firm shall maintain following documents/records:
 - 6.1.1. A well documented Quality Plan.
- 6.2. Incoming raw material register should be checked as per approved QAP.
- 6.3. Maintenance of stock register for use and balance of raw materials, bought out items, etc.
- 6.4. Stage inspection results, finished products results, as per approved QAP.
- 6.5. Records of internal rejection and its analysis vis-à-vis action plan.
- 6.6. Records of final products inspection by external agencies (like RDSO), NCRs raised and case analysis as well as action taken thereof.
- 6.7. Records for maintenance of dies/moulds.
- 6.8. Proper system for dealing with customer complaints.

7. TRAINING

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