# REVISION OF SPECIFICATION / STR

**Item Name:** Spring Pads Assembly, Side Buffer, Long life PL No: 11816430 (**UVAM ID:** 3100251001)

**Specification:** MP-0.41.00.07

1. RDSO is reviewing the specification to cater to the latest technological developments in the field, inclusion of STR & 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 the above mentioned item may be submitted in the following format along with 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. | Email ID | |
| 7. | Whether firm is registered with RDSO for the subject item.<br>If yes, details like date of registration, current status etc.<br>If no, firm's experience in manufacturing of subject item or similar item. | |
| 8. | Whether any technical document/ Report/ Study to support suggested changes in available/ enclosed for better appreciation. | |

## Part B: Comments / suggestions on the specification

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

**Comments may be sent to following address within one month from the date of publication on rdso.indianrailways.gov.in**

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भारत सरकार
रेल मंत्रालय

**GOVERNMENT OF INDIA**
**MINISTRY OF RAILWAYS**

# TECHNICAL SPECIFICATION & SCHEDULE OF TECHNICAL REQUIREMENTS FOR LONG LIFE SPRING PAD ASSEMBLY USED IN SIDE BUFFERS OF BG LOCOMOTIVES

**SPECIFICATION**
**NO. MP- 0.41.00.07 (Rev. 01)**
XXXX' **2024**



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# SECTION-A

## Specification for Buffer Spring Assembly for BG Locomotives

### 1.0 SCOPE:

This specification covers scope of supply, design, performance requirements and inspection procedure of this buffer spring assembly.

### 2.0 DESIGN REQUIREMENTS:

**2.1** Material of spring pad should be Thermoplastic Elastomer (TPE) with high damping characteristic. The design shall be in one piece sandwich type stack. Material of separating metal plates used shall conform to IS: 2062 ~~Fe410 WA~~ Gr- E 250 A / E 250 C and withstand buff load of 1000 kN.

**2.2** Other design requirements are tabulated hereunder:

| S.No. | Parameters ( buffer spring stack) | Design Requirements |
|---|---|---|
| 1. | Travel of spring pads assembly | $105^{0}$ mm (in Compression) |
| 2. | End load | 1000 kN (Max.) |
| 3. | Dynamic energy capacity | 30 kJ (Min.) |
| 4. | Energy absorption | > 60 %, as per annexure 1 |
| 5. | Pre-Compression load at installed height ~~584 (0/+5) mm~~ | 10 kN to 15 kN |

### 3.0 TESTING REQUIREMENTS:

Design approval shall be subjected to fulfillment of the following tests/requirements.

~~**3.1**~~ Capacity test, endurance test, static Characteristics ~~& dynamic Characteristics~~ test of TPE spring pads assembly shall be carried out in accordance with EN 15551 /UIC 526-1/UIC 827-1 at the premises of the manufacturer/supplier of TPE spring pads assembly in the presence of RDSO representative. ~~The test shall be done at the premises of the elastomer pad manufacturer or the buffer manufacturer or the 3rd party lab. The test facilities shall be certified by a reputed agency in compliance to EN/UIC/AAR or any other equivalent national/ international standard for carrying out this type of test.~~

~~**3.2 Static characteristics**~~

~~The following static characteristics shall be checked in compression stroke on spring pad assembly . (72 hrs after assembly)~~

~~- Initial force: between 10 and 15 kN~~

~~- Force following a 25 mm stroke: between 30 and 130 kN~~

~~- Force following a 60 mm stroke: between 130 and 400 kN~~

~~- Force following a 100 mm stroke: between 500 and 1000 kN~~

~~- stored energy ($W_e$) for an effort not exceeding 1000 kN ≥ 12.5 kJ~~

~~Wa ≥ 0.5 We – for 1st cycle~~

~~Wa ≥ 0.42 We – for 2nd & 3rd cycle~~

These characteristics shall be measured at an ambient temperature of approximately $15^0$ C. The compression phase shall be followed immediately by the decompression phase, and the maximum displacement speed of the plunger in both directions must be comprised between 0.01 and 0.05 m/s. When fully released the buffer must be in the same condition as initially.

### 3.3 Flexibility test

The flexibility test shall be carried out as follows:

i. TPE rings are stacked in such a way as to form a spring as used in service.

ii. The stack thus formed is tested on a test bench equipped with a chart recording device. The test bench shall be calibrated at least once in a year.

iii. The spring is compressed 20 times to the maximum stroke i.e. 105 mm and the load maintained, each time, for 30 s, up to this stroke.

iv. The semi-static diagram is recorded. It shall comply to the static characteristics requirements given in Para 3.2

v. After tests the rings should show no breaks, defects, signs of cracking or abrasions.

### 3.4 Endurance testing

In order to ascertain the satisfactory behavior of a buffer in service it is necessary to check by, carrying out an endurance test. After static characteristics test the endurance test must be performed on same assembly at impact test bench or on a press having chart recording facility.

For endurance test a sinusoidal wave form of cyclic stroke C1 applied 3000 cycles corresponding of stored energy of 0.25 $W_e$, stroke C2 will be applied 1200 cycles corresponding of stored energy of 0.50 $W_e$ and C3 will be applied 200 cycles corresponding of stored energy of 0.85 $W_e$. Frequency of compression shall be 6 cycles per minute.

$W_e$ represents the maximum value of stored energy corresponding to 30 kJ buffer spring assembly.

| Number of compressions | Stroke |
|---|---|
| 3000 | C1 |
| 1200 | C2 |
| 200 | C3 |

Static characteristics test will be again repeated after completion of endurance test. The energy stored by the buffer should be 80 % of the energy stored before endurance test.

### 3.5 Mechanical characteristics after clamping

The compression/ displacement curve after clamping of the spring assembly at designed installed height for a minimum of 72 h at $23^0$ C ± $2^0$ C shall be between the limiting curves specified in firm's drawing.

### 3.6 Characteristics after dynamic stresses

As per para 2.3.2 of UIC-827-1

~~**3.7 Physical Properties**~~

| ~~SN~~ | ~~Property~~ | ~~Test Method~~ | ~~Units~~ | ~~Permissible Limit~~ |
|---|---|---|---|---|
| ~~1.~~ | ~~Tensile Strength~~ | ~~ISO 37 or Equivalent BIS standard~~ | ~~kg/cm2~~ | ~~250 (Minimum)~~ |
| ~~2.~~ | ~~Elongation at Break~~ | ~~ISO 37 or Equivalent BIS standard~~ | ~~%~~ | ~~350 (Minimum)~~ |
| ~~3.~~ | ~~Modulus at 200 % Elongation at Machin speed 200mm/ min~~ | ~~ISO 37 or Equivalent BIS standard~~ | ~~kg/cm2~~ | ~~150 (Minimum)~~ |
| ~~4.~~ | ~~Compression Set after 25 % compression for 24 hours at $70^0 \pm 1^0$C~~ | ~~ISO 815-1/ ASTM D 395 or Equivalent BIS standard~~ | ~~%~~ | ~~30 Max.~~ |
| ~~5.~~ | ~~Compression Set after 25 % compression for 24 hours at $-30^0 \pm 1^0$C measured after stabilizing for 03 minute at $-30^0$ C~~ | ~~ASTM D 1229 or Equivalent BIS standard~~ | ~~%~~ | ~~55 Max.~~ |
| ~~6.~~ | ~~Ash Content~~ | ~~IS-3400 Pt.22~~ | ~~%~~ | ~~0.5 Max.~~ |

~~Change in properties after Accelerated Ageing at $70^0 \pm 1^0$C for 7 days~~

| | |
|---|---|
| ~~Change in Tensile Strength at Break~~ | ~~± 20 % Max.~~ |
| ~~Change in Elongation at Break~~ | ~~± 30 % Max.~~ |
| ~~Change in 200% Modulus~~ | ~~± 20 % Max.~~ |

## 4.0 PARTICULAR REQUIREMENTS:

**4.1** The firm has to submit Internal test results of physical properties and manufacturing processes used for manufacturing buffer TPE spring pads.

**4.2** Firm should be either manufacturer of TPE spring pads or authorized representative of OEM of TPE spring pads (who holds IPRs / Design) having the MOU / Technology Collaboration Agreement / License Agreement which is valid for sufficient period i.e. minimum five years.

Firm should submit valid authorization document /MOU to RDSO at the time of application of fresh vendor registration ~~and at the time of renewal as the case may be.~~ The spring pad manufacturer shall have a suitable tie-up in the form of a written Memorandum of Understanding (MOU) with the raw material supplier covering supplies and technical support. Firm should submit the same to RDSO at the time of application for vendor registration.

**4.3** All metallic parts of spring pad assembly should be coated with corrosion resistant material.

**4.4** The surface of the elastomer parts shall be smooth and shall free from cracks, air bubbles, surface streaks, splash marks, pinholes, crazing, blistering, bulges or burrs. All the edges shall be neatly finished and free from flash.

**4.5** ~~In the time of application for vendor registration, the spring pad manufacturer shall have a suitable tie-up in the form of a written Memorandum of Understanding (MOU) with the raw material supplier covering supplies and technical support. Firm should submit the same to RDSO.~~

**4.6** Use of regenerated / re-constituted material is not permitted.

## 5.0 DEVIATION STATEMENT:

In case the offer does not correspond to this specification in any respect a deviation statement shall be furnished by the manufacturer/supplier. If there is no deviation from specification, manufacturer shall submit “NO DEVIATION” certificate.

**6.0 MARKINGS:**

**6.1** Marking on TPE spring pads shall be in an area not subjected to wear or stress concentration, if possible, where they can be readily seen without removal of pads. Marking on ~~all components of~~ the spring pad assembly shall have manufacturer initials, serial number, month & year of manufacturing. The manufacturer shall ensure that marking details are legible and are of good quality, which shall remain legible throughout the entire service life of spring pad assembly and its components.

**6.2** Buffer polymer spring pads with illegible markings shall not be acceptable.

**7.0 INSPECTION AND REJECTION:**

The manufacturer shall provide labour, appliances and other facilities necessary for the inspection at his own cost.

**8.0 PREFERENCE TO MAKE IN INDIA**

The Govt. of India policy on 'Make in India' shall apply.

**9.0 VENDOR CHANGES IN APPROVED STATUS**

AII the provisions contained in RDSO's ISO procedures laid down in document no. QO-D-8.1-11(latest), ~~dated 07.07.2023~~ (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.

**10.0 WARRANTY/GUARANTEE:**

The Buffer polymer spring pads stack shall be guaranteed for satisfactory performance for a period of 8 years after putting into service. The guarantee shall cover design, material and workmanship related issues. The defective TPE spring pads assembly shall be replaced by the supplier free of cost.

**11.0** The spring pad assembly manufacturer shall supply all the spare parts required for the maintenance of buffers supplied by them for use on Indian Railways against specific requirements of Railways, failing which their approval shall liable to be cancelled.

**12.0 PROTOTYPE INSPECTION AND FIELD TRIAL:**

Prototype inspection of offered sample of long life side buffer spring pad assembly will be done as per the test plan given at Annexure- 2

After successful prototype development and testing spring pad assembly shall be fitted inside locomotive side buffers for the quantity specified in item master on UVAM and field performance shall be monitored for the specified period.

Field performance feedback will be obtained from zonal railways/ loco sheds in format as under:

| S. No. | Shed/ Rly. | Loco No. | Date of fitment | Date of failure, if any | Reason of failure | Remarks on performance |
|---|---|---|---|---|---|---|
| | | | | | | |

The acceptance criteria of field trial shall be the satisfactory field performance of long life spring pad assembly.

# SECTION- B

## MINIMUM INFRASTRUCTURE REQUIREMENTS (STR) FOR APPROVAL OF MANUFACTURER

**1.0** The firm shall be ISO 9001 certified organization.

**2.0** Covered area with adequate storage space and robust floor to accommodate the following:

a) Space for storage the raw material
b) Manufacturing Activities.
c) Inspection and Testing
d) Storage and dispatch of finished products

**3.0** Electronic weighing machine of suitable capacity.

**4.0** Suitable tools i.e. cutters, polishing files and buffing machine for deflashing of molded products.

**5.0** Adequate material handling equipment viz. Mobile crane/Fork lifter/ Pay loader/ Tractor Trolley/ Loading Tempo should be available for handling of material at all stages of production.

**6.0** At least two sets of Go & No-Go gauges shall be available to check the dimensional accuracy of the parts and final product at intermediate stage & final stage.

**7.0** Below mentioned measuring instruments in adequate number shall be available and calibrated at least once in a year:

a. Inside/ outside calipers
b. Vernier calipers
c. Steel scale
d Height guage
e. Surface table

**8.0** Load testing machine of suitable capacity should be available to check the static parameters like travel, preload, energy absorption and end load requirements of spring pad assembly given in Para 2.2

**9.0** The polymer pad manufacturer should have at least the following testing facilities installed in the laboratory with controlled temperature and humidity for carrying out various tests specified under Para 3:

~~a) At least one injection moulding machine and one set of mould.~~
b) Tensile Testing Machine of adequate capacity
c) Load Compression Testing Machine of suitable capacity
d) Equipment for humidity control of laboratory
e) Hardness tester
f) Melting Point Apparatus
g) Muffle Furnace
h) Melt Flow Index Tester
~~i) One Rheometer~~

## 10.0 QUALITY CONTROL REQUIREMENTS

**10.1** The vendor shall prepare QAP as per the format given in Annexure-A7 of RDSO doc no. QO-F-8.1-7, Ver latest, for manufacturing, testing and supply of spring pad assembly, and it should be submitted to RDSO for approval.

**10.2** There shall be a system to ensure the traceability of the product beginning with raw material stage to finish product stage.

**10.3** There shall be a system to ensure 'first-in first-out' for all raw materials and intermediate stages to finish products.

**10.4** It shall 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 with relevant IS.
- Various parameters to be checked and level of acceptance of such parameters indicated and method to ensure and control over them.
- Disposal system of rejected raw material and components.

**10.5** Latest version of all the relevant specification IS, ASTM and RDSO standards and drawings with latest alterations shall be available with the firm.

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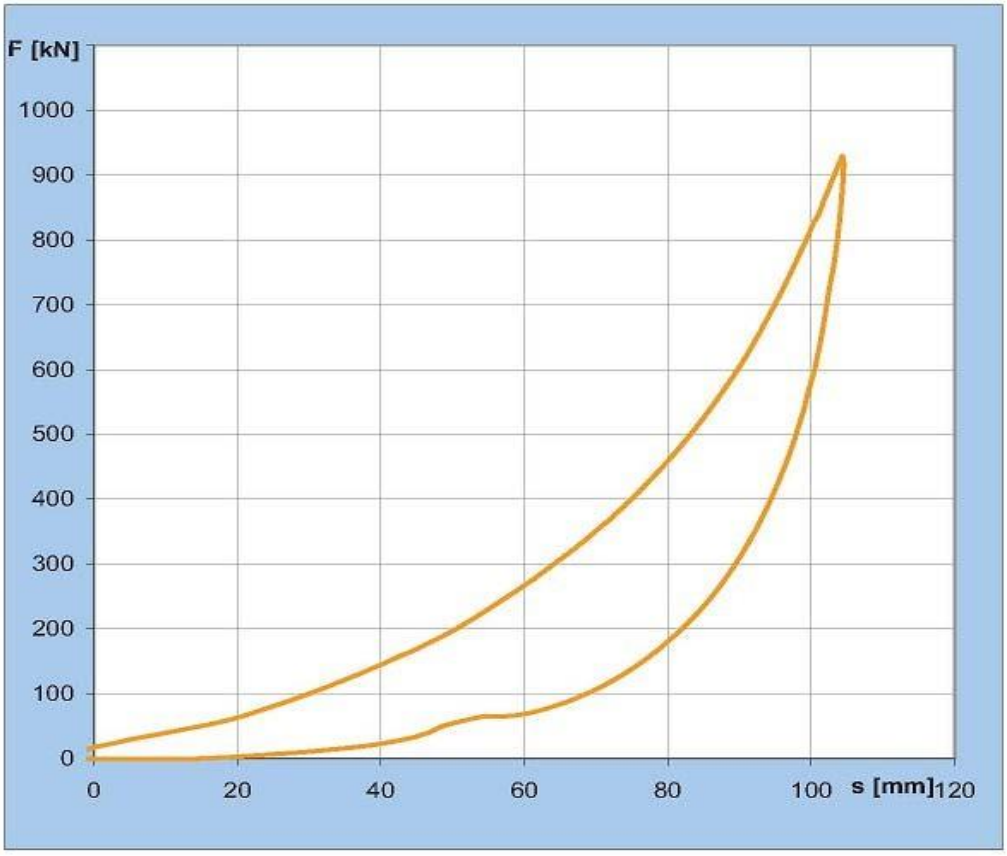
# Annexure-1




**Static Characteristics Graph**

# Annexure-2

## Regular/ Prototype inspection test Plan of long life spring pad assembly (SK.DL-4726)

**Actual sample size: Sl. No. 1 to 3**- At least one no. from each lot and **SI. No. 4 to 12 (04 Nos. or 10% of lot whichever is more )**

| S. No | Items | Material | Specified Value | Observation | Remark |
|---|---|---|---|---|---|
| 1. | Washer | IS:2062 Gr-E 250 A/ E 250 C ~~C=0.20 % max, min=1.50%max Si=0.40 max,S=0.040%max P=0.040%max~~ | ~~In house testing /~~ WTC to be checked from NABL approved Laboratory | | |
| 2. | Destruction Tube | IS:1030 Gr- 280-520 W/ IS:2062 Gr-E 250 A ~~C=0.25 % max, mn=1.20%max Si=0.60 max,S=0.035%max P=0.040%max~~ | | | |
| | Intermediate Disc | IS:2062 ~~Fe410 WA~~ Gr- E 250 A/ E 250 C ~~Given in RDSO Spec.no. MP.0.41.00.07~~ | | | |
| 3. | Spindle | IS:1875 CL- 4 ~~C=0.40 % - 0.50% ,Si=0.15 % - 0.35% Mn = 0.60 % - 0.90%, S=0.04 % max, P= 0.04 % max~~ OR EN8 ~~C=0.35 % - 0.45%, Si = 0.05% - 0.35% Mn = 0.60 % - 1.00%, S = 0.06% max, P=0.06%max~~ | | | |
| 4. | Buffer spring pad assembly | - | Ø170±2.5 mm | | |
| 5. | | - | R15 mm | | |
| 6. | | - | R10 mm | | |
| 7. | | - | Ø87±2.5 mm | | |
| 8. | | - | R6 mm | | |
| 9. | | - | Ø170±2.5 mm | | |
| 10. | | - | G = Ø101(+01 /-0.0)mm | | |
| 11. | | Length | H=584 (00/+5) mm | | |
| 12. | | Preload | 10-15 kN | | |
| 13. | | Polymer pad | TPE pads assembly as per approved firm drawings | P.O. No. and quantity to be matched with WTC of firm | |
| 14. | Visual | All components of spring pad assembly | The surface of elastomer parts shall be smooth and having no cracks, pitting, bulges, slits or burrs. All metal parts of spring pad assembly should be frees from | | |

| | | | | | |
|---|---|---|---|---|---|
| | | | cracks, sharpedges, burrs & coated with corrosion resistant material. | | |

**Note**: "After completion of 1000 nos. of subject item, inspection official may send the materials mentioned at S. No.1, 2&3 to NABL lab"

## ~~Physical Properties~~ Type tests

| ~~SN~~ | ~~Property~~ | ~~Test Method~~ | ~~Sample Size~~ | ~~Permissible Limit~~ | ~~Observation~~ |
|---|---|---|---|---|---|
| ~~1.~~ | ~~Visual~~ | ~~Eye~~ | ~~10 Nos.~~ | ~~The surface of elastomer parts shall be smooth and having no cracks, pitting, bulges, slits or burrs. All metal parts of spring pad assembly should be frees from cracks, sharpedges, burrs & coated with corrosion resistant material.~~ | |
| ~~2.~~ | ~~Tensile Strength~~ | ~~ISO 37 or Equivalent BIS standard~~ | ~~02 Nos.~~ | ~~250 kg/cm2 (Minimum)~~ | |
| ~~3.~~ | ~~Elongation at Break~~ | ~~ISO 37 or Equivalent BIS standard~~ | ~~02 Nos.~~ | ~~350 % (Minimum)~~ | |
| ~~4.~~ | ~~200 % Modulus of Elasticity~~ | ~~ISO 37 or Equivalent BIS standard~~ | ~~02 Nos.~~ | ~~150 kg/cm2 (Minimum)~~ | |
| ~~5.~~ | ~~Compression Set after 25 % compression for 24 hours at $70^{0} \pm 1^{0}C$~~ | ~~ISO 815/ ASTM D 395 or Equivalent BIS standard~~ | ~~02 Nos.~~ | ~~30 % Max.~~ | |
| ~~6.~~ | ~~Compression Set after 25 % compression for 24 hours at $-30^{0} \pm 10C$ measured after stabilising for 03 minute at $-30^{0}C$~~ | ~~ASTM D 1229 or Equivalent BIS standard~~ | ~~02 Nos.~~ | ~~55 % Max.~~ | |
| ~~7.~~ | ~~Ash Content~~ | ~~IS-3400 Pt.22~~ | ~~02 Nos.~~ | ~~0.5 % Max.~~ | |



As per para 3.0( Section A) of this specification.

## ~~Tests as per Para 3.1~~

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| ~~SN~~ | ~~Test~~ | ~~Sample Size~~ | ~~Test Procedure~~ | ~~Pass/Fail Criteria~~ | ~~Remarks~~ |
|---|---|---|---|---|---|
| ~~1.~~ | ~~Capacity test~~ | ~~01 No. / lot~~ | ~~Compressive load on a test bench/ press up to~~ | ~~1000 KN End load Energy absorption > 60 %, Stroke : 105 mm~~ | |

| | | | | | |
|---|---|---|---|---|---|
| | | | 105 mm stroke | - | |
| 2. | static Characteristics | 01 No. / lot | Para 3.2 | Para 3.2 | |
| 3. | Flexibility Test | 05 Nos. / lot | Para 3.3 | After the tests the rings shall show no breaks, defects, signs of cracking or abrasions. | |
| 4. | Endurance test | Type test | Para 3.4 | 1. Static characteristics again repeated ater completion of endurance test. Energy stored by buffer should be at least equal to 80% of energy stored before endurace test.<br>2. After the tests the rings shall show no breaks, defects, signs of cracking or abrasions. | |
| 5. | Mechanical characteristics after clamping | 01 Nos./lot | Para 3.5 | Compression curve to be within limit as specified in para 3.2 | |
| 6. | Characteristics after dynamic stresses | Type test | Para 3.6 | UIC-827 | |
| 7. | dynamic Characteristics | Type test | UIC-526/ EN 15551 | Annexure E of EN 15551 | |

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