

Reasoned document of draft specification no. MP-0.41.00.07 (Rev. 01) for 'Technical specification & schedule of technical Requirements for long life spring pad assembly used in side buffers of BG locomotives

Draft specification no. MP-0.41.00.07 (Rev. 01) "Technical specification & schedule of technical Requirements for long life spring pad assembly used in side buffers of BG locomotives" was uploaded on RDSO website for one month for comments/ suggestions as per ISO procedure. The draft specification was also sent to Zonal Railways, production units for comments and suggestions.

Only M/s Surlon Durel springs pvt. Ltd., New Delhi submitted comments on draft specification their comments. No other approved/developmental vendor submitted their comments. No comments have been received from zonal Railways, production units or any other party so far. Reasoned Statement (except Noted and complied by M/s Surlon Durel springs pvt. Ltd) on draft spec is tabulated below:

| Clause of Spec. | Clause as mentioned in draft specification | Comments by M/s Surlon Durel springs, New Delhi | Comments from Zonal and Pus or any other party | Stipulation in the Draft spec. with reason |
|-----------------|--|--|--|---|
| 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 and withstand buff load of 1000 kN | 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 Gr-E250C and withstand buff load of 1000 kN. | -- NIL-- | No change required Reason: This clause is same with the existing spec and no change has been proposed. Mechanical properties of separating metal plates material IS: 2062 E 410 A is better than IS: 2062 Gr-E250C. |
| 2.2 5) | Pre Compression load at installed height 584 mm | Pre-Compression load at installed height 584 -0/+5 mm | -- NIL-- | Agreed, Accordingly para 2.2 5) has been revised as: "Pre Compression load at installed height 584 (-0/+5) mm |
| 3.1 | Capacity test, endurance test, static Characteristics & dynamic Characteristics test of TPE spring pads assembly shall be carried out in accordance with UIC 526-1/UIC 827-1 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. | Capacity test, endurance test, static Characteristics & dynamic Characteristics test of TPE spring pads assembly shall be carried out in accordance with EN 15551 . The test shall be done at the premises of the elastomer pad manufacturer or the buffer manufacturer or the 3rd party lab authorized for EN testing . 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. | -- NIL-- | Agreed, Accordingly para 3.1 has been revised as: Capacity test, endurance test, static Characteristics & dynamic Characteristics test of TPE spring pads assembly shall be carried out in accordance with EN 15551 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. |

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| 3.2 | <p>Static characteristics</p> <p>The following static characteristics shall be checked in compression stroke on spring pad assembly</p> <p>.Initial force: between 10 and 15 kN</p> <p>Force following a 25 mm stroke: between 30 and 130 kN</p> <p>Force following a 60 mm stroke: between 130 and 400 kN</p> <p>Force following a 100 mm stroke: between 500 and 1000 kN</p> <p>stored energy (We) for an effort not exceeding 1000 kN ≥ 12.5 kJ</p> <p>These characteristics shall be measured at an ambient temperature of approximately 15⁰ 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.</p> | <p>Static characteristics</p> <p>The following static characteristics shall be checked in compression stroke on spring pad assembly. (72hr after assembly)</p> <p>Initial force: between 10 and 15 kN</p> <p>Force following a 25 mm stroke: between 30 and 130 kN</p> <p>Force following a 60 mm stroke: between 130 and 400 kN</p> <p>Force following a 100 mm stroke: between 500 and 1000 kN</p> <p>stored energy (We) for an effort not exceeding 1000 kN ≥ 12.5 kJ</p> <p>$W_a \geq 0.5 W_e$ – For 1st cycle</p> <p>$W_a \geq 0.42 W_e$ – For 2nd & 3rd cycle.</p> <p>These characteristics shall be measured at an ambient temperature of approximately 15⁰ C to 25⁰ C. The compression phase shall be followed immediately by the decompression phase, and the maximum displacement speed of the plunger in both directions (shall be less or equal 0,05 m/s) must be comprised between 0.01 and 0.05 m/s. When fully released the buffer must be in the same condition as initially.</p> | <p>-- NIL--</p> | <p>Agreed,</p> <p>Accordingly para 3.2 has been revised as:</p> <p>Static characteristics</p> <p>The following static characteristics shall be checked in compression stroke on spring pad assembly</p> <p>(72 hrs after assembly)</p> <p>Initial force: between 10 and 15 kN</p> <p>Force following a 25 mm stroke: between 30 and 130 kN</p> <p>Force following a 60 mm stroke: between 130 and 400 kN</p> <p>Force following a 100 mm stroke: between 500 and 1000 kN</p> <p>stored energy (We) for an effort not exceeding 1000 kN ≥ 12.5 kJ</p> <p>$W_a \geq 0.5 W_e$ – for 1st cycle</p> <p>$W_a \geq 0.42 W_e$ – for 2nd & 3rd cycle</p> <p>These characteristics shall be measured at an ambient temperature of approximately 15⁰ C to 25⁰ 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.</p> <p>No change is required in plunger speed between 0.01 and 0.05 m/s as speed is in reasonable range.</p> |
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| 3.3 | <p>Flexibility test</p> <p>The flexibility test shall be carried out as follows:</p> <p>i. TPE rings are stacked in such a way as to form a spring as used in service.</p> <p>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.</p> <p>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.</p> <p>iv. The semi-static diagram is recorded. It shall comply to the static characteristics requirements given in Para 3.2</p> <p>v. After tests the rings should show no breaks, defects, signs of cracking or abrasions.</p> | Flexibility testing not required for polymer springs. (Refer Annex C of EN 15551 for list of applicable test) | -- NIL-- | <p>Agreed,</p> <p>Accordingly para 3.3 has been Deleted</p> | | | | | | | | |
| 3.4 3.3 | <p>Endurance testing</p> <p>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.</p> <p>For endurance test a sinusoidal wave form of cyclic stroke C1 applied 3000 cycles corresponding of stored energy of 0.25 We, stroke C2 will be applied 1200 cycles corresponding of stored energy of 0.50 We and C3 will be applied 200 cycles corresponding of stored energy of 0.85 We. Frequency of compression shall be 6 cycles per minute.</p> <p>We represents the maximum value of stored energy corresponding to 30 kJ buffer spring assembly.</p> <table><tr><td>Number of compressions</td><td>Stroke</td></tr><tr><td>3000</td><td>C1</td></tr><tr><td>1200</td><td>C2</td></tr><tr><td>200</td><td>C3</td></tr></table> <p>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.</p> | Number of compressions | Stroke | 3000 | C1 | 1200 | C2 | 200 | C3 | <p>Kindly refer Annex F for Endurance testing under service load for elastic system of EN 15551.</p> <p>Note: - For Prototype testing Only.</p> | -- NIL-- | <p>Agreed,</p> <p>Accordingly para 3.4 has been revised as:</p> <p>Endurance testing of spring pad assembly will be done as per procedure given in Annexure F & G of EN 15551</p> |
| Number of compressions | Stroke | | | | | | | | | | | |
| 3000 | C1 | | | | | | | | | | | |
| 1200 | C2 | | | | | | | | | | | |
| 200 | C3 | | | | | | | | | | | |

| 3.6 3.5 | Characteristics after dynamic stresses As per para 2.3.2 of UIC-827-1 | Kindly refer Annex E for Dynamic characteristics and clause no. 5.5.3 as per EN 15551 | -- NIL-- | Agreed, Accordingly para 3.6 has been revised as: <u>Dynamic Characteristics Test (Type Test)</u> As per Annexure E of EN 15551 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| 3.7 3.6 | Physical Properties <table><tr><th>SN</th><th>Property</th><th>Test Method</th><th>Units</th><th>Permissible Limit</th></tr><tr><td>1.</td><td>Tensile Strength</td><td>ISO 37 or Equivalent BIS standard</td><td>kg/cm2</td><td>250 (Min)</td></tr><tr><td>2.</td><td>Elongation at Break</td><td>ISO 37 or Equivalent BIS standard</td><td>%</td><td>350 (Min)</td></tr><tr><td>3.</td><td>Modulus at 200 % Elongation at Machine speed 200mm/ min</td><td>ISO 37 or Equivalent BIS standard</td><td>kg/cm2</td><td>150 (Minimum)</td></tr><tr><td>4.</td><td>Compression Set after 25 % compression for 24 hours at 70 ± 1°C</td><td>ASTM D 395 or Equivalent BIS standard</td><td>%</td><td>30 Max.</td></tr><tr><td>5.</td><td>Compression Set after 25 % compression for 24 hours at -300 ± 10C measured after stabilizing for 03 minute at -30o C</td><td>ASTM D 1229 or Equivalent BIS standard</td><td>%</td><td>55 Max.</td></tr><tr><td>6.</td><td>Ash Content IS-3400 Pt.22</td><td>IS-3400 Pt.22</td><td>%</td><td>0.5 Max.</td></tr></table> Change in properties after Accelerated Ageing at 70 ⁰ ± 1°C for 7 days <table><tr><td>Change in Tensile Strength at Break</td><td>± 20 % Max.</td></tr><tr><td>Change in Elongation at Break</td><td>± 30 % Max.</td></tr><tr><td>Change in 200% Modulus</td><td>± 20 % Max.</td></tr></table> | SN | Property | Test Method | Units | Permissible Limit | 1. | Tensile Strength | ISO 37 or Equivalent BIS standard | kg/cm2 | 250 (Min) | 2. | Elongation at Break | ISO 37 or Equivalent BIS standard | % | 350 (Min) | 3. | Modulus at 200 % Elongation at Machine speed 200mm/ min | ISO 37 or Equivalent BIS standard | kg/cm2 | 150 (Minimum) | 4. | Compression Set after 25 % compression for 24 hours at 70 ± 1°C | ASTM D 395 or Equivalent BIS standard | % | 30 Max. | 5. | Compression Set after 25 % compression for 24 hours at -300 ± 10C measured after stabilizing for 03 minute at -30o C | ASTM D 1229 or Equivalent BIS standard | % | 55 Max. | 6. | Ash Content IS-3400 Pt.22 | IS-3400 Pt.22 | % | 0.5 Max. | Change in Tensile Strength at Break | ± 20 % Max. | Change in Elongation at Break | ± 30 % Max. | Change in 200% Modulus | ± 20 % Max. | As per Annex C of EN 15551 Table C.1 the test which are applicable for TPE are. 1. Shore hardness D according to EN ISO 868 2. Compression set after 25 % compression for 24 h at 50 °C according to ISO 815-1 3. Compression set after 25% compression for 24h at -30°C after stabilizing for 3min. at -30°C measured according to ISO 815-2 at ambient temperature. As per table C.2 of EN 15551 static characteristic test is to be done only during prototype. | -- NIL-- | Partially Agreed. <table><tr><th>S N</th><th>Property</th><th>Test Method</th><th>Units</th><th>Number of Samples</th><th>Permissible Limits</th></tr><tr><td>1</td><td>Hardness IRHD</td><td>ISO 48 or Equivalent BIS standard</td><td>IRHD</td><td>2</td><td rowspan="5">The approval values are the average values of the tests done during the type test (Table C.2 of Annexure C of EN 15551)</td></tr><tr><td>2</td><td>Tensile Strength</td><td>ISO 37 or Equivalent BIS standard</td><td>kg/cm2</td><td>2</td></tr><tr><td>3</td><td>Elongation at Break</td><td>ISO 37 or Equivalent BIS standard</td><td>%</td><td>2</td></tr><tr><td>4</td><td>Modulus at 200 % Elongation</td><td>ISO 37 or Equivalent BIS standard</td><td>kg/cm2</td><td>2</td></tr><tr><td>5</td><td>Compression Set after 25 % compression for 24 hours at 70 ± 1°C</td><td>ISO 815-1 or Equivalent BIS standard</td><td>%</td><td>30 Max.</td></tr><tr><td>6</td><td>Compression Set after 25 % compression for 24 hours at -30 ± 1°C measured after stabilizing for 03 minute at -30° C</td><td>ISO 815-2 or Equivalent BIS standard</td><td>%</td><td>55 Max.</td><td></td></tr></table> Change in properties after Accelerated Ageing at 70 ± 1°C for 7 days <table><tr><td>Hardness IRHD according to EN ISO 48</td><td>± 5 IRHD</td></tr><tr><td>Change in Tensile Strength at Break</td><td>± 20 % Max.</td></tr><tr><td>Change in Elongation at Break</td><td>± 30 % Max.</td></tr></table> | S N | Property | Test Method | Units | Number of Samples | Permissible Limits | 1 | Hardness IRHD | ISO 48 or Equivalent BIS standard | IRHD | 2 | The approval values are the average values of the tests done during the type test (Table C.2 of Annexure C of EN 15551) | 2 | Tensile Strength | ISO 37 or Equivalent BIS standard | kg/cm2 | 2 | 3 | Elongation at Break | ISO 37 or Equivalent BIS standard | % | 2 | 4 | Modulus at 200 % Elongation | ISO 37 or Equivalent BIS standard | kg/cm2 | 2 | 5 | Compression Set after 25 % compression for 24 hours at 70 ± 1°C | ISO 815-1 or Equivalent BIS standard | % | 30 Max. | 6 | Compression Set after 25 % compression for 24 hours at -30 ± 1°C measured after stabilizing for 03 minute at -30° C | ISO 815-2 or Equivalent BIS standard | % | 55 Max. | | Hardness IRHD according to EN ISO 48 | ± 5 IRHD | Change in Tensile Strength at Break | ± 20 % Max. | Change in Elongation at Break | ± 30 % Max. |
| SN | Property | Test Method | Units | Permissible Limit | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1. | Tensile Strength | ISO 37 or Equivalent BIS standard | kg/cm2 | 250 (Min) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2. | Elongation at Break | ISO 37 or Equivalent BIS standard | % | 350 (Min) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3. | Modulus at 200 % Elongation at Machine speed 200mm/ min | ISO 37 or Equivalent BIS standard | kg/cm2 | 150 (Minimum) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4. | Compression Set after 25 % compression for 24 hours at 70 ± 1°C | ASTM D 395 or Equivalent BIS standard | % | 30 Max. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5. | Compression Set after 25 % compression for 24 hours at -300 ± 10C measured after stabilizing for 03 minute at -30o C | ASTM D 1229 or Equivalent BIS standard | % | 55 Max. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6. | Ash Content IS-3400 Pt.22 | IS-3400 Pt.22 | % | 0.5 Max. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Change in Tensile Strength at Break | ± 20 % Max. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Change in Elongation at Break | ± 30 % Max. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Change in 200% Modulus | ± 20 % Max. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| S N | Property | Test Method | Units | Number of Samples | Permissible Limits | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | Hardness IRHD | ISO 48 or Equivalent BIS standard | IRHD | 2 | The approval values are the average values of the tests done during the type test (Table C.2 of Annexure C of EN 15551) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | Tensile Strength | ISO 37 or Equivalent BIS standard | kg/cm2 | 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | Elongation at Break | ISO 37 or Equivalent BIS standard | % | 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | Modulus at 200 % Elongation | ISO 37 or Equivalent BIS standard | kg/cm2 | 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | Compression Set after 25 % compression for 24 hours at 70 ± 1°C | ISO 815-1 or Equivalent BIS standard | % | 30 Max. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6 | Compression Set after 25 % compression for 24 hours at -30 ± 1°C measured after stabilizing for 03 minute at -30° C | ISO 815-2 or Equivalent BIS standard | % | 55 Max. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Hardness IRHD according to EN ISO 48 | ± 5 IRHD | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Change in Tensile Strength at Break | ± 20 % Max. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Change in Elongation at Break | ± 30 % Max. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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| | | | | <table><tr><td>Change in 200% Modulus</td><td>± 20 % Max.</td></tr><tr><td>Static Characteristics after ageing 7 days at 70 °C according to ISO 188</td><td>± 8 % Max</td></tr></table> <p>Note: For further details Table C.1 and C.2 of Annexure C of EN 15551 may be referred.</p> <p>Discussion on Firms Points:</p> <ol style="list-style-type: none">1. Shore hardness D according to EN ISO 868. Reason: As per Annex C of EN 15551 this test is not applicable for rubber elastomer.2. Compression set after 25 % compression for 24 h at 50 °C according to ISO 815-1. Reason: As per Annex C of EN 15551 this test is not applicable for rubber elastomer.3. Compression set after 25% compression for 24h at -30°C after stabilizing for 3min. at -30°C measured according to ISO 815-2 at ambient temperature. Reason: Included in specification. | Change in 200% Modulus | ± 20 % Max. | Static Characteristics after ageing 7 days at 70 °C according to ISO 188 | ± 8 % Max |
| Change in 200% Modulus | ± 20 % Max. | | | | | | | |
| Static Characteristics after ageing 7 days at 70 °C according to ISO 188 | ± 8 % Max | | | | | | | |
| 4.1 | The firm has to submit Internal test results of physical properties and manufacturing processes used for manufacturing buffer TPE spring pads. | The manufacturing process is proprietary & patented that why we are not able to provide the manufacturing process. We will provide Internal test report as per EN 15551. | -- NIL-- | No Change Required. This clause has not been changed in the proposed spec as compared to existing spec. Hence no change is required in this clause. | | | | |
| 4.3 | All metallic parts of spring pad assembly should be coated with corrosion resistant material. | Destruction tube and taper washer are spray painted. Intermediate disc is zinc plated. Spindle as machined. | -- NIL-- | No Change Required. This clause has not been changed in the proposed spec as compared to existing spec. Hence no change is required in this clause. | | | | |
| Annexure-B Para 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 | Not applicable | -- NIL-- | Para has been revised (by internal review at RDSO) removing the requirement of injection moulding machine. a) Tensile Testing Machine of adequate capacity b) Load Compression Testing Machine of suitable capacity | | | | |

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| | <p>machine and one set of mould.</p> <p>b) Tensile Testing Machine of adequate capacity</p> <p>c) Load Compression Testing Machine of suitable capacity</p> <p>d) Equipment for humidity control of laboratory</p> <p>e) Hardness tester</p> <p>f) Melting Point Apparatus</p> <p>g) Muffle Furnace</p> <p>h) Melt Flow Index Tester</p> <p>i) One Rheometer</p> | | | <p>c) Equipment for humidity control of laboratory</p> <p>d) Hardness tester</p> <p>e) Melting Point Apparatus</p> <p>f) Muffle Furnace</p> <p>g) Melt Flow Index Tester</p> <p>h) One Rheometer</p> <p>Reason: Manufacturing of polymer pads may be done by other methods also instead of injection moulding.</p> | | | | | | | | | | |
| Annexure-2 | Prototype Inspection test Plan of long life spring pad assembly (SK.DL-4726) | -- NIL-- | -- NIL-- | <p>Regular/ Prototype Inspection test Plan of long life spring pad assembly (SK.DL-4726)</p> <p>Reason: Title of check sheet has been changed in order to use of check sheet for prototype and regular inspection both.</p> | | | | | | | | | | |
| | 2 Intermediate Disc IS: 2062 Fe410 WA. given in RDSO Spec.no. MP.0.41.00.07 | IS:2062 Gr-E250c (Approved from RDSO) | -- NIL-- | <p>No change required</p> <p>Reason: Mechanical properties of separating metal plates material IS: 2062 Gr-F410A is better than IS: 2062 Gr-E250C</p> | | | | | | | | | | |
| 10 | -1 G = Ø101(+01 /-0.0)mm | G = Ø101(+01 /-0.0)mm | -- NIL-- | <p>Agreed and corrected as G = Ø101(+01 /-0.0)mm</p> <p>Typographical error</p> | | | | | | | | | | |
| Physical properties 2,3,4 | Physical properties | | | <p>Agreed, Accordingly para has been revised as:</p> <table><tr><td>Hardness IRHD</td><td>ISO 48 or Equivalent BIS standard</td><td>IRHD</td><td rowspan="3">The approval values are the average values of the tests done during the type test (Table C.2 of Annexure C of EN 15551)</td></tr><tr><td>Tensile Strength (for type test only)</td><td>ISO 37 or Equivalent BIS standard</td><td>02 Nos.</td></tr><tr><td>Elongation at Break (for type test only)</td><td>ISO 37 or Equivalent BIS standard</td><td>02 Nos.</td></tr></table> | Hardness IRHD | ISO 48 or Equivalent BIS standard | IRHD | The approval values are the average values of the tests done during the type test (Table C.2 of Annexure C of EN 15551) | Tensile Strength (for type test only) | ISO 37 or Equivalent BIS standard | 02 Nos. | Elongation at Break (for type test only) | ISO 37 or Equivalent BIS standard | 02 Nos. |
| | Hardness IRHD | ISO 48 or Equivalent BIS standard | IRHD | | The approval values are the average values of the tests done during the type test (Table C.2 of Annexure C of EN 15551) | | | | | | | | | |
| | Tensile Strength (for type test only) | ISO 37 or Equivalent BIS standard | 02 Nos. | | | | | | | | | | | |
| | Elongation at Break (for type test only) | ISO 37 or Equivalent BIS standard | 02 Nos. | | | | | | | | | | | |
| Tensile Strength | ISO 37 or Equivalent BIS standard | 02 Nos. | 250 kg/cm2 (Min) | | | | | | | | | | | |
| Elongation at Break | ISO 37 or Equivalent BIS standard | 02 Nos. | 350 % (Min) | | | | | | | | | | | |
| 200 % Modulus of Elasticity | ISO 37 or Equivalent BIS standard | 02 Nos. | 150 kg/cm2 (Min) | | | | | | | | | | | |
| | Not acceptable for elastomeric pad. Kindly refer Annex C of EN 15551 standard | | | | | | | | | | | | | |

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|--|---|---|----------|--|---|---|-------------|------------------------|-------------|--|-----------|----------|----------|---|
| | | | | <table><tr><td>200 % Modulus of Elasticity (for type test only)</td><td>ISO 37 or Equivalent BIS standard</td><td>02 Nos.</td><td></td></tr></table> | 200 % Modulus of Elasticity (for type test only) | ISO 37 or Equivalent BIS standard | 02 Nos. | | | | | | | |
| 200 % Modulus of Elasticity (for type test only) | ISO 37 or Equivalent BIS standard | 02 Nos. | | | | | | | | | | | | |
| 5 | Compression Set after 25 % compression for 24 hours at 70 ⁰ ± 1 ⁰ C Test Method: ASTM D 395 or Equivalent BIS standard | Compression Set after 25 % compression for 24 hours at 50 ⁰ C Kindly refer Annex C of EN 15551 standard | -- NIL-- | Not Agreed. Reason: Compression Set at 50 ⁰ C is not applicable for rubber Elastomers. Para has been revised as “ Compression Set after 25 % compression for 24 hours at 70 ⁰ ± 1 ⁰ C (for type test only) Test Method: ISO 815-1 or Equivalent BIS standard | | | | | | | | | | |
| 6 | Compression Set after 25 % compression for 24 hours at -30 ⁰ ± 1 ⁰ C measured after stabilising for 03 minute at -30 ⁰ C Test Method: ASTM D 1229 or Equivalent BIS standard | Compression Set after 25 % compression for 24 hours at -30 ⁰ C measured after stabilizing for 03 minute at -30 ⁰ C Kindly refer Annex C of EN 15551 standard | -- NIL-- | Agreed. Para has been revised as under: “Compression Set after 25 % compression for 24 hours at -30 ⁰ ± 10C 1 ⁰ C measured after stabilizing for 03 minute at -30c C ± 1 ⁰ (for type test only) Test Method: ISO 815-2 or Equivalent BIS standard” | | | | | | | | | | |
| 7 | Ash Content Test Method: IS-3400 Pt.22 | Not acceptable for elastomeric pad Kindly refer Annex C of EN 15551 standard | -- NIL-- | Agreed Para has been Deleted | | | | | | | | | | |
| New Para | Change in properties after Accelerated Ageing at 70 ⁰ ± 1 ⁰ C for 7 days (for type test only) (ref para 3.6 of this specification) <table><tr><td>Hardness IRHD according to EN ISO 48</td><td>± 5 IRHD</td></tr><tr><td>Change in Tensile Strength at Break</td><td>± 20 % Max.</td></tr><tr><td>Change in Elongation at Break</td><td>± 30 % Max.</td></tr><tr><td>Change in 200% Modulus</td><td>± 20 % Max.</td></tr><tr><td>Static Characteristics after ageing 7 days at 70 °C according to ISO 188</td><td>± 8 % Max</td></tr></table> | Hardness IRHD according to EN ISO 48 | ± 5 IRHD | Change in Tensile Strength at Break | ± 20 % Max. | Change in Elongation at Break | ± 30 % Max. | Change in 200% Modulus | ± 20 % Max. | Static Characteristics after ageing 7 days at 70 °C according to ISO 188 | ± 8 % Max | -- NIL-- | -- NIL-- | Details has been added in check sheet as per Para 3.6 of RDSO specification |
| Hardness IRHD according to EN ISO 48 | ± 5 IRHD | | | | | | | | | | | | | |
| Change in Tensile Strength at Break | ± 20 % Max. | | | | | | | | | | | | | |
| Change in Elongation at Break | ± 30 % Max. | | | | | | | | | | | | | |
| Change in 200% Modulus | ± 20 % Max. | | | | | | | | | | | | | |
| Static Characteristics after ageing 7 days at 70 °C according to ISO 188 | ± 8 % Max | | | | | | | | | | | | | |

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|--------------------------------|--|-----------------|---|--|----------|---|---------------------|---|---|
| Tests as per Para 3.1 | Capacity test | 01 No. / lot | 1000 KN End load Stroke : 105 mm | -- NIL-- | -- NIL-- | Capacity test | 03 Nos. / lot | 1000 KN End load Stroke : 105 mm | Sample test size per lot has been increased from 01 No./lot to 03 Nos. /lot for better quality assurance. |
| | 3 Flexibility Test | | | Not acceptable for elastomeric pad Kindly refer Annex C of EN 15551 standard | -- NIL-- | Agreed Para has been Deleted | | | |
| | 4 Endurance test | | | Noted and complied Refer Annex F as per EN 15551 standard | -- NIL-- | Agreed Annex F referred in Para 3.3 of spec | | | |
| | 6 Characteristics after dynamic stresses | | | Noted and complied Refer Annex E as per EN 15551 standard | -- NIL-- | Para has been deleted Due to test already covers under dynamic characteristics testing | | | |
| | 7 dynamic Characteristics Test Method: UIC-526 | | | Noted and complied Refer Annex E as per EN 15551 standard | -- NIL-- | Agreed Accordingly para has been revised Dynamic Characteristics Test Test Method: Annexure E of EN 15551 | | | |