



भारत सरकार  
रेल मंत्रालय

**GOVERNMENT OF INDIA  
MINISTRY OF RAILWAYS**

लोकोमोटिव साइड बफ़र की तकनीकी  
अपेक्षाओं की अनुसूची  
( कन्वेंशनल)

**SCHEDULE OF TECHNICAL REQUIREMENTS  
FOR  
LOCOMOTIVE SIDE BUFFER  
(Conventional)**

विशिष्ट सं. चा.श.— 0.41.00.02 (संशोधन 0.00)  
अप्रैल 2002

( संशोधन संख्या—1, अक्टूबर 2003) एवं  
( संशोधन संख्या—2, जुलाई 2005)

**SPECIFICATION NO. MP- 0.41.00.02 (Rev 0.00)  
April 2002**

**WITH**

(Amendment No.1 of October 2003) &  
(Amendment No.2 of July 2005)

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**Price : Rs. 540/-**

**Amendment No.2 of July 2005 to STR No. MP-0.41.00.02 (Rev.0.00) April 2002 for Locomotive side buffer (Conventional).**

Clause 8.1 of **Section 'A'** of the above STR shall now be read as under:

“Each Buffer Assembly shall be tested at full stroke specified in the drawing and energy storage capacity shall be 490 Kg.m minimum. The procedure for calculating energy storage capacity of loco side buffers to drawing no, LA/BD-153/M shall be as under:

$$E_s = \frac{W_s \times (L_s + L_{sp})}{2}$$

**E<sub>s</sub>** = Energy storage capacity of loco side buffer in Kg-m.

**L<sub>s</sub>** = Deflection of spring in assembled condition, which is 0.127 metre as per drawing.

**L<sub>sp</sub>** = Deflection of springs due to pre compression, which is 0.012 metre.

**W<sub>s</sub>** = Load indicated on load meter for the designed stroke of 0.127 metre (this load is inclusive of pre compression load).

**Amendment No. 1 of October 2003 to STR No. MP-0.41.00.02 (Rev.0.00) April 2002 for Locomotive side buffer. (Conventional)**

1. Item S.No. 9 & 10 of **Table-1** shall now be read as under:

Buffer Spring (L.H) SK.DL-4514 Alt.1 WD-01-HLS- 94 (Latest Revision)  
(LB-01)

Buffer Spring (R.H.) SKDL-4515 Alt.1 WD-01-HLS-94 (Latest Revision)  
(LB-02)

2. Clause 8.1 of **Section ‘A’** of the above STR shall now be read as under:

“Each Buffer Assembly shall be tested for energy storage capacity at full stroke specified in the drawing. The capacity shall be 490 kg.m minimum.

3. In **Section ‘B’** clause 5.1 (i), the word ‘absorption’ is replaced by the word ‘storage’.

4. Para 1.0 (e) under **‘Quality Control Requirements’** shall now be read as under:

**“There shall be a proper system to ensure quality of all the components procured from other manufactures. Proper tests / inspection procedure in conformity with the requirement of the specifications for such components shall be developed and maintained. Steel coil springs shall be procured only from manufacturers approved by RDSO for supply of suspension coil springs of locomotives”.**

5. Annexure-I of this STR is deleted as buffer coil springs are subjected to load deflection test and hence functional testing of buffers shall be done at full stroke only.

6. Annexure-II shall be read as ‘Annexure’ and shall be on page 8. Index page is suitably amended.

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## **SCHEDULE OF TECHNICAL REQUIREMENTS FOR LOCOMOTIVE SIDE BUFFER ASSEMBLY**

### **SCOPE**

The BG diesel and electric locomotives presently deployed on Indian Railways are equipped with Side Buffers at the head stock ends to protect the passengers and locomotive underframe and equipments from sudden shocks. Two side buffer assemblies at each end (Total four) are provided on each locomotive. This document lays down the technical requirements for the procurement and supply of side buffer, which is considered one of the safety items for train operation. The arrangement of side buffer assembly shall conform to Drawing no. LA/BD - 153/M Alt. 6 consisting of parts as under.

**TABLE-1**

S.No.	Name Of Parts	Drg.No.	Alt. No.	Material Specification
1.	Buffer Plunger	L/BD-648/M	7	IS: 1030 Gr.280-520
2.	Buffer Casing	L/BD-650/M	7	IS: 1030 Gr.280-520
3.	Buffer Base	L/BD-652/M	4	IS: 1030 Gr.280-520
4.	Buffer Base Plate	L/BD-653/M	4	IS: 2062 Gr.B (Killed)
5.	Buffer Spring Base Guide	L/BD-654/M	5	IS: 2062 Gr.B (Killed)
6.	Check Sleeve	L/BD-655/M	6	IS: 3885 (Pt.1)
7.	Buffer Spring Seat (Centre)	L/BD-656/M	3	IS: 1030 Gr.280-520
8.	Buffer Spring Seat (Front)	L/BD-657/M	3	IS: 1030 Gr.280-520
9.	Draft & Buffer Spring (L.H.)	SKDL-4514	Nil	I.R.S.-R2
10.	Draft & Buffer Spring (R.H.)	SKDL-4515	Nil	I.R.S.-R2
11.	16 Dia Rivet snap head X 50mm long		—	IS : 1148
12.	24 Dia Rivet snap head X 60mm long		—	IS : 1148

**Note- Latest alteration of all drawings and specifications shall be referred.**

This document is divided in section-A and section-B. The former covers the technical requirements, method of sampling, testing and re-testing, marking etc. and the later covers mainly schedule of infrastructure requirements for manufacturing, testing, quality control and inspection for side buffer assembly used on BG locomotives.

## **SECTION-A**

### **1.0 TECHNICAL REQUIREMENTS**

1.1 General Arrangement of the Buffer Assembly shall be to Latest Alteration of RDSO assembly drawing No.LA/BD-153/M and part drawings mentioned in Table-1.

### **2.0 MATERIAL**

2.1 The material of all components of side buffer assembly shall be strictly in accordance with the specification stipulated in the respective component drawings.

2.2 In addition to tests and quality requirements mentioned in the STR, the provisions of various clauses of the respective material specification shall also apply.

### **3.0 CHEMICAL COMPOSITION:**

3.1 Chemical composition shall be checked on the finished products manufactured to material specification mentioned in Table-1. The variation of the chemical analysis of the product with respect to the ladle analysis shall conform to respective clauses mentioned in the material specification. Residual elements shall be permitted to the extent mentioned in relevant specification.

### **4.0 METALLOGRAPHIC EXAMINATION**

4.1 Metallographic examination shall be carried out for each heat treatment batch in respect to item no 1, 2, 3, 7 & 8 to ensure that the castings are properly normalised to avoid retention of cast dendritic structure.

4.2 Grain size observed shall be ASTM 5 or finer.

### **5.0 MECHANICAL TESTS**

(For Item 1 & 2 only)

#### **5.1 Tensile Test**

The tensile test shall be carried out in accordance with IS:1608 for each heat treatment batch. The minimum tensile strength, yield stress, elongation and reduction in area shall be 520 Mpa, 280 Mpa, 18 % and 25% min. respectively.

#### **5.2 Impact Test**

The impact test shall be carried out in accordance with IS:1757 for each heat treatment batch. The test shall be carried out on three samples from the same batch and average values obtained shall be higher than the minimum specified value of 22J. However, the individual values obtained shall not be less than 70% of the specified value.

#### **5.3 Bend Test**

The bend test shall be carried out in accordance with IS: 1599 for each heat treatment batch. Test pieces shall be capable of being bent cold without fracture to an angle of 60°. Test pieces shall be of suitable length convenient for bending on the machine, and shall have a rectangular section of 25 x 20 mm. The edge of a rectangular test piece shall be rounded to a radius of not more than 1.5mm and the test shall be done by bending the test piece over the thinner section.

## **6.0 NON-DESTRUCTIVE TESTS**

(For Item 1 & 2 only)

### **6.1 Radiography Test**

Two percent of the castings subject to minimum two per batch of each of the buffer plunger and casing shall be radiographically tested on the locations marked on respective drawings, throughout the circumference, in accordance with IS:2595 with acceptance standard ASTM E 446 conforming to level 2 in respect of shrinkage and level 3 in respect of porosity, sand and slag inclusions. Hot tears and cracks shall not be permitted.

### **6.2 Ultrasonic and Liquid Dye-Penetrant Test**

The firm shall carry out 100 percent ultrasonic testing on machined surfaces and liquid dye-penetrant test on locations marked on the respective drawings of buffer plunger and casing. The method and acceptance standard for ultrasonic and liquid dye-penetrant test shall be in accordance with IS:7666, IS:3658 and IS:9565, IS:11732 respectively.

## **7.0 DESTRUCTIVE TEST**

**7.1** Two percent of castings subject to minimum two per batch shall be subjected to destructive test in case of new development, change in casting process or any change in the design to ensure that it is free from porosity, shrinkage, slag inclusion and other defects. Minimum two longitudinal and one transverse section of the castings shall be made at the locations decided by the inspecting officer. Porosity up to a level of 2% of cross sectional area may be considered acceptable provided size of each blowhole is limited to 2mm both in diameter and length. Bunching of blowholes more than three numbers located less than 10mm apart shall be considered rejectable.

## **8.0 FUNCTIONAL TEST ON BUFFER ASSEMBLY**

**8.1** Each Buffer assembly shall be tested for its energy absorption capacity at full stroke specified in the assembly drawing. Minimum capacity should be in range of 5050-5395 J. Load deflection characteristics of buffer assembly should be as per Annexure-I.

## **9.0 ASSEMBLY INSTRUCTION**

**9.1** For guidance, brief assembly procedure is enclosed as Annexure-II.

## **10.0 MARKING**

**10.1** Marking on the buffer assembly / components shall be stamped / cast thereon as specified in the respective drawings. The buffer components with illegible markings shall be identified and must be rejected from the lot by manufacturer. If any of the components are found having illegible marking at the time of fitment in Railway workshops / sheds premises, those shall be replaced by the manufacturer free of cost. The cost of transportation shall also be borne by the manufacturer.

## **11.0 INSPECTION AND RETEST**

**11.1** For passing the batch, the inspector shall randomly select two percent of the assemblies subject to minimum two per batch, for carrying out following:

- i) Conformity of all the tests specified in clause 4.0 to 8.0,
- ii) Dimensional checks as per relevant drawings mentioned in clause No.1.0,
- iii) Freedom of non-machined cast surface from any visible defects e.g., cracks, scabs, sand, fusion, etc.  
(Parting line fins, risers, notches and sprues shall be ground smooth.)
- iv) The general surface finish of the cast surfaces shall be satisfactory and free from harmful imperfections with proper marking as per clause 10.0.

**11.2** In the event selected sample fails, double the number of samples drawn earlier shall be randomly picked up for passing the batch. If any of the samples fails to meet the requirement mentioned in clause 11.1, the batch shall be considered unacceptable.

**11.3** The records of all the tests done by the firm shall be maintained and made available to the inspector, if required.

## **12.0 TESTING AND INSPECTION FACILITIES**

**12.1** The manufacturer shall provide labour, appliances, material and other details at his own expenses, prepare and furnish test pieces required for testing as may be carried out at his premises in accordance with schedule. Failing to provide facilities at his own works for carrying out the prescribed tests, the manufacturer shall bear the cost of conducting the tests elsewhere.

## **13.0 WELD REPAIR**

**13.1** Minor repair of the casting shall be carried out as per Para 15 of IS: 1030, but no rectification is allowed on machine-finished casting. Details of repair done shall be recorded and furnished to inspecting official at the time of offering the material for acceptance / inspection.

## **14.0 REJECTION**

**14.1** The buffer assemblies and/or its components found defective due to improper workmanship or not complying with the provisions of this schedule shall be rejected.

**14.2** The manufacturer should ensure that the rejected materials are not re-offered for inspection/testing. The procedure for disposal of the rejected materials shall be clearly mentioned in the QAP of the manufacturer and details produced to the inspecting official on demand.

## **15.0 PROTECTION AND PACKING**

**15.1** After the completion of inspection, all parts of the buffers except machined surfaces, shall be applied red oxide – zinc chrome priming to IS: 2074. Thereafter when it gets dry, two coats of black enamel paint to IS: 128 shall be applied. Buffer assemblies need not to be packed in cases but exposed machined surfaces shall be protected with two coats of white lead and the exposed cylindrical portion of the plungers shall be cased in wood, secured with bands of hoop-iron.

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## **SECTION-B**

### **INFRASTRUCTURAL REQUIREMENT**

**1.0** All manufacturing firms seeking approval/registration for supply of Locomotive Side Buffer assembly must be RDSO approved Class 'A' foundry as per IS: 12117 and shall submit certificate to this effect along with application on standard proforma to be obtained from RDSO. The firm shall also be ISO-9000 certified organisation.

**2.0** Apart from infrastructure facilities of class-A foundry, as stipulated in IS:12117, the manufacturer shall have the facilities as under:

#### **3.0 MOBILE HANDLING AND CHARGING/DISCHARGING FACILITIES**

Suitable mobile handling facilities, e.g. transferring castings from moulding to heat treatment and then to machine shops, etc. Suitable facilities, e.g., manipulators for charging /discharging the casting in and out of heat treatment furnaces.

#### **4.0 FACILITIES FOR WELDING /MACHINING/ASSEMBLY/RIVETTING**

**4.1** Vertical boring, turning lathe, milling machines, etc. of adequate capacity for boring buffer casing of 220mm dia., turning 210mm dia. Plunger, facing plunger & casing ends and machining other components of buffer assembly.

**4.2** Universal drilling machines for drilling 30mm dia rivet holes on buffer base plate and casing.

**4.3** Jigs and fixtures for proper assembly of buffer.

**4.4** Facilities for hot riveting.

**4.5** Surface table of suitable size.

#### **5.0 FACILITIES FOR PRODUCT TESTING**

**5.1** Apart from testing facilities mentioned in IS: 12117 for Class-A foundry, certain other facilities shall also be available with the firm as indicated below:

i) Firm shall have capability to test the functionality of buffer assembly, i.e. energy absorption capacity subjected to full compression of the buffer assembly.

ii) Suitable micrometers, callipers, gauges, etc. for measurements and checking dimensions.

iii) Standard radiographs and relevant ASTM specification as mentioned in clause No. 6.1 of section A.

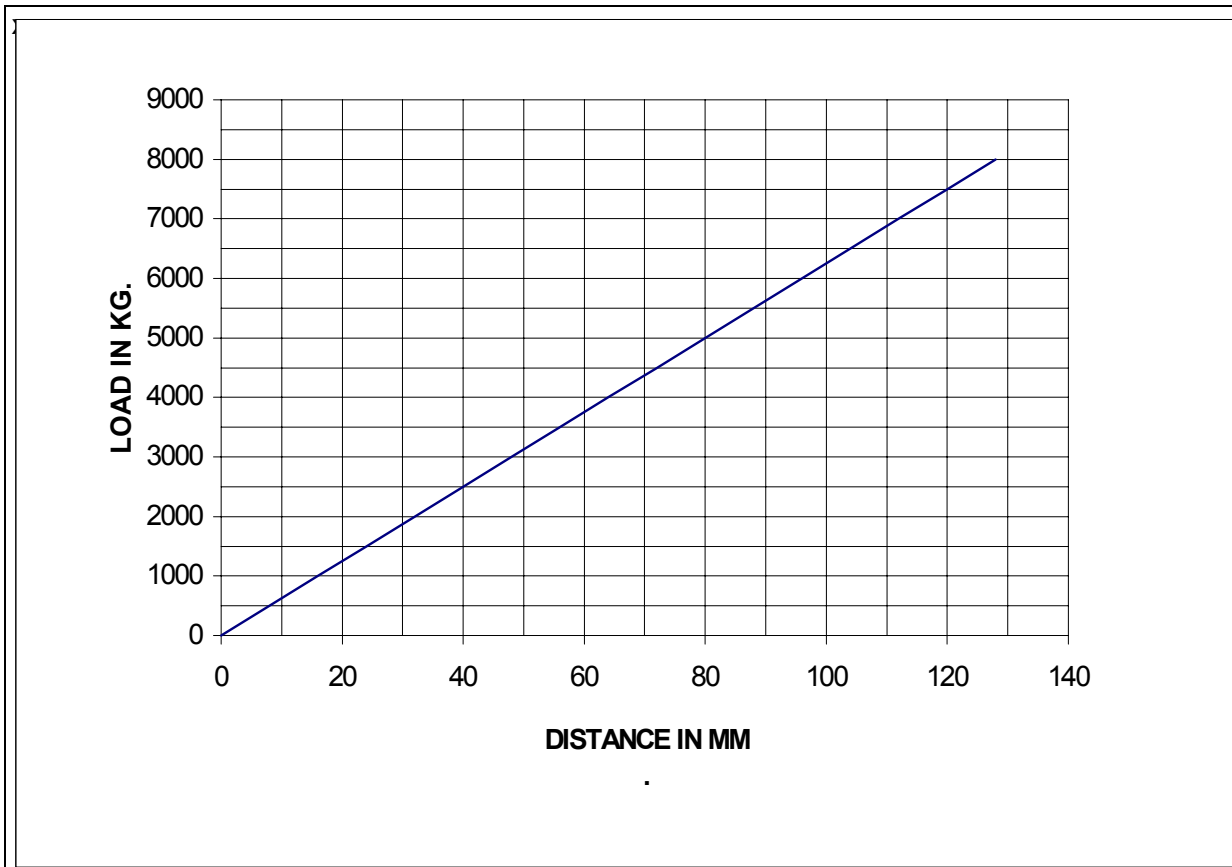
## **QUALITY CONTROL REQUIREMENTS**

- 1.0** The internal quality assurance programme (QAP) must cover the following:
- a)** The foundry shall have established control at various stages of manufacture such as raw material composition, charge composition, sand preparation, moulding, melting, heat treatment and product testing & inspection. The internal quality assurance plan at all the stages shall be prepared incorporating the acceptance criteria. The same shall be made available to the inspecting official whenever required.
  - b)** Manufacturer will not be permitted to sublet any of the operations for producing steel castings. RDSO approval will be required for any change in manufacturing process, place and material of buffer assembly and its components.
  - c)** Gauging scheme to ensure dimensional accuracy of the components. System to ensure that the gauges are recalibrated from time to time and are accurate.
  - d)** System to ensure use of correct raw material.
  - e)** There shall be a proper system to ensure quality of all the components procured from other manufactures. Proper tests / inspection procedure in conformity with the requirement of the specifications for such components shall be developed and maintained. Steel coil spring shall be procured from RDSO approved sources only and shall be manufactured and tested as per relevant specification.
  - f)** There should be a proper system for disposal of defective components identified during various stages of manufacture and implementation of QAP, so that such components are not mixed up with the lot being offered for inspection.
  - g)** Heat-wise identification of the casting shall be ensured.
  - h)** The manufacturer shall keep the records of internal Quality Assurance Programme properly for future references/investigations. The manufacturer shall present these records as and when asked by the purchaser/inspecting official or RDSO, Lucknow.
  - i)** It should be possible from the QAP records to identify the manufacturing details/tests of components with serial number marked on the components from QAP records. There must be relation between serial number marked on the components with heat number, batch number, date of manufacture and various test results.
  - j)** The accuracy of gauges shall be checked by inspecting authority before the commencement of inspection.

## **REGULATORY REQUIREMENTS**

- 1.0** The Inspecting Authority shall have free access at all times, while performing the work on the purchase contract, to all parts of the manufacturer's works, which concerns the manufacture of the ordered material. The inspector shall comply with all applicable safety rules and local regulations. The manufacturer shall accord the inspector, free of charges, all reasonable facilities and necessary assistance to satisfy the inspector that the material is being furnished in accordance with this specification. Test and inspection shall be made prior to despatch at the place of manufacture to ensure that provisions of this specification are being met. Any additional tests must be negotiated prior to placement of order. All inspections shall be conducted while not interfering with manufacturing operations.
- 1.1** All components of the buffer assembly shall be interchangeable.
- 1.2** Any deviation from specified tests shall be worked out with prior concurrence of the purchaser.
- 1.3** In case the offer does not corresponds to this specification in any respect, a DEVIATION STATEMENT shall be submitted by the tenderer. This statement shall give the deviations clause wise with technical reasons for the same .The manufacturer shall not make any change in the drawings. In case the tenderer does not require any deviation from the drawings and this specification, a no DEVIATION certificate shall be submitted.
- 1.4** The buffer 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.

## LOAD-DEFLECTION CHARACTERISTIC OF LOCOMOTIVE SIDE BUFFER ASSEMBLY



*Note- The energy absorption capacity at full stroke shall be within +20% to -10%.*

**ANNEXURE-II****ASSEMBLY OF BUFFER**

Before undertaking assembly it shall be ensured that all components of side buffer assembly conform to specified drawings and specifications. The assembly shall be made in the following sequence.

- i. Rivet buffer base plate with buffer spring base guide if integral cast steel buffer base to Drg No. L/BD- 652/M is not used.
- ii. Keep the plunger vertical with its head resting on floor / table. Apply graphite grease on its rubbing surfaces except on its check – sleeve seat.
- iii. Insert buffer casing with its base upwards on to the plunger, after applying the graphite grease on its rubbing surface.
- iv. Mount the check – sleeve properly in the recess of the plunger. The split provided in the check – sleeve may be opened a bit for easy insertion / mounting of the check – sleeve into the plunger recess. **Proper fitting of check – sleeve in the recess of plunger should be ensured.**
- v. Pull the buffer casing up until the inside edge of check – sleeve butts against the stepped shoulder of buffer casing bore. **It must be ensured that check – sleeve forms a positive locking device to hold the buffer casing and the plunger.**
- vi. Insert a distance piece between the back face of plunger head and front – end of buffer casing, so that the buffer casing may not slide down the plunger.
- vii. Insert buffer spring seat front, buffer spring (L.H.), buffer spring seat centre, and buffer spring (R.H.) into the plunger bore concentrically one after the other in the said order.
- viii. Put the buffer base plate / buffer base over the springs keeping its flat surface upwards. Position shall be such that the bolt holes and rivet holes must align with corresponding holes of the buffer casing.
- ix. Insert two long hex – head bolts from the bottom through the two diagonally opposite holes out of four – 28 mm holes provided on the flange of plunger casing and press the buffer base – plate against the spring pressure by tightening the nuts over these bolts (the nuts should be tightened one after another by small amount) until the buffer base plate sits properly against the buffer casing base. Remove distance piece.
- x. Check the length of the buffer (from plunger front face to back of buffer base plate). It should be  $635 \pm^{2.0}_{1.5}$  mm.
- xi. Move the assembly for riveting. Rivet the buffer base with four rivets with buffer casing, and unscrew the nuts and remove the two hex – head bolts as referred to in para (ix) of this annexure.