



भारत सरकार  
रेल मंत्रालय

GOVERNMENT OF INDIA  
MINISTRY OF RAILWAYS

**SPECIFICATION**  
**FOR**  
**LOCO SIDE BUFFERS WITH BUILT IN CRASH ELEMENT FOR**  
**DIESEL/ELECTRIC LOCOMOTIVES**

**SPECIFICATION**  
**NO. MP- 0.41.00.08 (Rev. 00)**  
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## SCOPE

- 1.1 This specification covers the design, development and supply of high energy capacity side buffers with built in crash worthy features for locomotives of Indian Railways. This built-in crash worthy feature inside a buffer is required for controlled absorption of impact energy to minimize damage to rolling stock and crew members.

## PERFORMANCE AND DESIGN REQUIREMENTS

- 2.1 The crash buffer should be a combination of normal buffer and the impact-absorbing element. Buffer should be able to absorb impact energy through plastic deformation after the end of the reversible stroke.
- 2.2 The buffer should be able to protect the loco body from any deformation or damage due to the impact. The load at which the offered buffer would fail and individual components of the buffer, which would fail, should be indicated. The total energy absorbed by the buffer in the event of failure should also be indicated.
- 2.3 The buffer head should be designed to have the following features:
  - a) Should last at least 600,000 kms.
  - b) Low wear rate.
  - c) Material should be alloy steel or nodular cast iron.
  - d) Should be compatible with the buffers fitted currently on Indian Railway locomotives, which have round buffer faceplates of 457 mm dia.
- 2.4 The buffer has to work at the sharpest track curve of 175 m radius and 1 in 8 ½ turn out present on IR network. The width, height and shape of buffer face should be suitably decided. The buffer drop (vertical level difference) of 75 mm in between loco and adjacent coach is allowed in service.
- 2.5 The buffer has to work satisfactorily in a temperature range of – 5<sup>o</sup> C to 60<sup>o</sup>C and in dust and salt laden corrosive atmosphere.
- 2.6 The working of buffer should be smooth so that no jerk is passed on to loco body.
- 2.7 The crash buffer should be of lightweight construction, weighing not more than 150 kg.
- 2.8 The free length of the buffer shall be 635 + 2.0/-1.5 mm.
- 2.9 Reversible stroke shall be 110 +10/-5 mm in elastic zone.
- 2.10 The base plate of the buffer shall have four mounting holes of 29 mm dia each. The pitch of the mounting holes should be 210 mm laterally and vertically. The holes to be symmetrically located about the central axis of the buffer assembly.
- 2.11 Parts of the buffer shall be so designed that the reclamation/replacement of the parts become easy.
- 2.12 The crash buffer should be maintenance friendly and disassembly and replacement of component should be simple.
- 2.13 The static energy absorption capacity should not be less than 15 kJ during the reversible mode of buffer plunger operation with 100 mm travel.
- 2.14 The damping factor of the spring when measured across 100 mm of travel in the elastic zone shall be 0.5 mm in static mode and 0.6 mm in dynamic mode.

- 2.15 Total energy absorption capacity including plastic deformation should be 200 kJ per buffer, min.
- 2.16 The min. end force after 100 mm travel in elastic zone should be 1000 kN, during static testing.
- 2.17 The triggering force for starting plastic deformation shall be between 1600 kN and 1700 kN.
- 2.18 The average force during plastic deformation shall be  $1200 \pm 200$  kN. This force shall be constant over the full range of plastic deformation.
- 2.19 IR locomotives are designed and load tested under static conditions for a load of 3000 kN at the ends, i.e. 1500 kN at each side buffer. The crash buffer shall be so designed that the loco structure should not start collapsing before the plastic deformation of the buffers.

### **3.0 DESIGN APPROVAL**

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

- 3.1 Tenderer shall submit the bill of Material giving the list of items which shall form part of supply to meet the technical /design requirement mentioned in clause 2 above.
- 3.2 Crash buffers shall be subjected to detailed tests and trials at tenderer's premises. RDSO may decide to conduct field tests at RDSO, if desired.
- 3.3 Tenderer will put up the test protocol and acceptance criterion for the type test for the approval of RDSO. The special testing equipments, if any, required for trials at RDSO, will be provided by the tenderer.
- 3.4 A static test must be conducted with a crashworthy component over the totality of its nominal stroke (spring stroke and plastic stroke) at a maximum speed of 5 mm/sec. The trigger force and mean force of the plastic stage are measured.
- 3.5 A dynamic test (on test bench or to scale 1) must be performed on a crashworthy component impacted at a speed comprised between 5 and 15 m/sec. The speed, mass and energy must be chosen in order to achieve at least 75% of the plastic-deformation nominal stroke. The trigger force and mean force of the plastic stage are measured.
- 3.6 The manufacturer shall submit a detailed quality assurance plan to RDSO for approval before manufacturing.

### **4.0 DEVIATION STATEMENT**

- 4.1 In case the offer does not correspond to this specification in any respect a deviation statement shall be furnished. If there is no deviation from specification, manufacturer shall submit "NO DEVIATION" certificate.

### **5.0 MARKINGS**

- 5.1 Crash buffer shall have manufacture's Name/initial, date of manufacture, serial No. and type of buffer at suitable location of housing in 10 mm raised type letters.

### **6.0 INSPECTIONS AND REJECTION**

- 6.1 The inspection and rejection shall be done in accordance with the relevant clauses of special conditions of the contract issued by the Railways.

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

#### **7.0 MAINTENANCE REQUIREMENT**

7.1 The successful tenderer will also give at least 50 hard and 50 soft copies, of the maintenance manual of the buffer. The maintenance manual will cover detailed processes of all the maintenance activities required to be carried out by the loco shed and/or the repair workshop. On Indian Railway locomotives are attended to in the workshop every seven-year.

#### **8.0 WARRANTY/GUARANTEE**

8.1 Buffer failing or proving unsatisfactory in service due to defective design, material or workmanship, within 48 months from the date of deliver, or 36 months from the date of placing in service, whichever is earlier, shall be replaced by the firm at its own cost.

#### **9.0 MISCELLANEOUS**

9.1 The working design of crash buffer should be proven one and approved by other international railway systems for similar application on rolling stock. Documentary evidence, to this effect, must be submitted.

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