

GOVERNMENT OF INDIA
MINISTRY OF RAILWAYS
RESEARCH DESIGNS & STANDARDS ORGANISATION
MANAK NAGAR, LUCKNOW - 226011

No.SV.IB

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INSTRUCTION BULLETIN No. MP.IB.VL. 01.08.11 (Rev.00)

1. TITLE

Criteria for replacement/rejection of Rubber secondary spring in service fitted on EMD locomotives.

2. BACKGROUND

EMD Locomotive bogies (i.e. both WDG4 & WDP4 class of locomotives) support the superstructure through Rubber Springs in secondary stage of suspension. Hence they are exposed to direct static as well as dynamic loads in compressive as well as shear modes. Shearing, debonding and permanent set of these rubber springs are the major causes warranting their unscheduled replacements, which means unplanned work and detention of loco in shed besides unreliability in service. There was thus a long felt need particularly in maintenance sheds to clearly lay down the criteria for rejection of the secondary rubber springs in WDG4 and WDP4 series locomotives, so as to ensure not only proper ride quality and minimum unscheduled detention of locomotive in shed, but also to evaluate the performance of these rubber springs.

3. OBJECT

This instruction bulletin is intended to lay down the criteria for replacement/rejection of rubber spring assemblies in service.

4. DETAILS OF STUDY/EXPERIMENTATION DONE

The para 2.6 of the Maintenance instruction no. MI.1517, issued by M/s EMD stipulates that Rubber secondary spring should be checked during trip/ monthly, quarterly and Semi/Annual schedules, and recommends visual examination of Rubber secondary spring for damage with checks for various defects in service during scheduled maintenance. The MI.1517 recommends to check the unloaded spring for degradation and also mentions that a certain amount of superficial cracking of the rubber surface is not unusual or detrimental to performance. As per this MI, a rubber spring should be replaced if any layer has a tear or cut, which exceeds 25mm (1") in length and 6.25 mm (1/4") in depth, or if the accumulated tears in any layer exceed 100mm (4"). Lifting of rubber from bonded metal surface is limited to a depth of 2.5 mm (1/2") and/or a total length of 100 mm (4") on any one rubber/metal interface. If separation exceeds either of these specifications, the rubber spring should be replaced. Although this MI broadly covers the replacement criteria, it does not specify the permissible permanent set of Rubber secondary springs. However in para 5.5.2.3, secondary vertical stop clearances have been mentioned to be 16mm+/-3.1mm, and minimum limit as 6.4 mm. The working height of secondary rubber spring assembly is mentioned as 198.63 mm to 201.68mm in the concerned EMD drawing. In the EMD drawing no 40087066 (Drawing for truck application) recommendations have been given about use of different shims to maintain appropriate secondary vertical stop clearance.

In the absence of adequate data about permanent sets observed in WDG4/WDP4 locomotives, the actual permanent sets observed vis-a-vis the service time could not be ascertained. However as secondary rubber springs are also used in bogies of WDG3A, WDM3D and WAG7 locomotives and for those springs, the rejection limit for permanent set of '10mm or more in free height' is being followed by all maintenance sheds, vide RDSO I.B. no. MP.IB.VL.04.30.08(Rev. 00), dated 27.10.2008, without reporting any problem, a comparison was made in the characteristics of the secondary rubber springs used in EMD locomotives with those used in WDG-3A/WDM3D and WAG7 locomotives. The free height, stiffness, load etc are similar for both types of springs. Vehicle dynamic simulation was also done with permanent set of 10mm in WDG4 loco at 120 kmph, and the test results showed satisfactory performance except for certain minor deterioration in wheel load, well within permissible limit.

5. APPLICATIONS TO CLASS OF LOCOMOTIVES

All WDG4 & WDP4 class of locomotives

6. INSTRUCTIONS CONTENT

- (a) A rubber spring should be replaced if any of the following conditions is fulfilled:
- If the service life of the rubber spring has reached/exceeded 6 years.
 - If any crack is observed on the metal plate
 - If a Crack in the rubber exceeds 25mm length and 6.25 mm in depth or if the accumulated tears in any layer exceed 100mm.
 - If de-bonding of rubber from metal surface exceeds a depth of 12.5 mm or/and a total length of 100mm on any one rubber/metal interfaces.
 - If Crushing or crumbling of rubber is observed.
 - If a permanent set of 10 mm or more is observed in free height of rubber spring assemblies.
 - If a Dowel pin comes out from the metal plate.
- (b) Suitable shims should be applied to maintain the working / static heights of secondary suspension during replacement of secondary rubber spring. The free height of secondary rubber spring should not vary by more than 2 mm in one side of truck in secondary rubber spring. It should also be ensured that free heights of secondary rubber springs used in one truck should not vary by more than 4 mm.
- (c) If it is required to renew a secondary rubber spring of one bogie, all the four secondary rubber spring assemblies should be replaced in a set.

Note:

- Cracks means opening up of rubber layers.
- De-bonding means separation of bonding between rubber and metal.
- A rubber spring need not be replaced in case a certain amount of superficial cracking (crazing) of the rubber surface is observed. Wrinkles / folding lines observed on rubber spring assembly under loaded condition shall not be considered as cracks / bond failure.
- Permanent set should be checked only in unloaded condition, and it should be measured with reference to free height.

The proforma for feedback of rubber spring assembly is enclosed as Annexure I.

7. AGENCY FOR IMPLEMENTATION

Maintenance Sheds, Workshops & PUs maintaining overhauling/IOH & POH of EMD locomotives.

8. DISTRIBUTION

As per enclosed list.


(N.K. Barnawal)

Director / MP (Vehicle)
For Director General / MP

