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Research Designs & Standards Organisation
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No. EL/3.2.165 **Dated : 30.9.99**

TECHNICAL CIRCULAR NO. ELRS/TC/0050 REV. `0'

-Chief Electrical Engineer,

-Central Railway, Mumbai CST – 400001.
-Eastern Railway, Calcutta – 700001
-Northern Railway, New Delhi – 110001
-Southern Railway, Park Town, Chennai – 600003
-South Central Railway, Secunderabad –500 371
-South Eastern Railway, Garden Reach, Calcutta – 700043
-Western Railway, Churchgate, Mumbai – 400 020
-Chittaranjan Locomotive Works, Chittaranjan -713 331

Sub : Critical geometry features of helical springs to be given special attention during inspection of helical springs specially for WAP1/4 & WAG7 class of locomotives.

Ref : Recommendations in the RDSO's report No. ELRS/IR/0086, Rev. `O' of July '99 on problems of springs breakages in flexi-coil mark-I bogies of WAP1/4 class of locomotives.

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1.0 Introduction :

The failures of primary springs in WAP1/4 class of locomotives have been reported by almost all the homing Railways. Recently, cases of primary spring breakages in new WAG7 class of locomotives have also been reported by some of the Rlys. In almost all the cases of spring breakages, investigations carried out by RDSO have reached to the conclusion that spring material was found conforming to the specification but the failure was attributed to bad manufacture and lack of inspection. Almost all cases of failures in WAP1 / WAP4 locomotive were identical

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In the way that in all cases, the breakage had taken place at first active turn due to fatigue originated due to notch formation as a result of tip of the ineffective coil biting into the first active coil. The correct configuration is that the tip should be rounded and should not bite, instead the contact has to be line contact over minimum 1/3rd of mean dia of spring i.e. minimum 48 mm for primary spring of WAP1/WAP4 and not the point contact as is found in all the point contact as is found in all the cases. RDSO in their report referenced above has `touched upon the salient inspection and manufacturing clauses of the RDSO's specification for springs which are to be paid special attention. These salient clauses in RDSO's specification for springs were further verified with the drgs. Of imported helical springs of three phase locomotives (WAP5/WAG9) and were found true. This technical circular aims at reiterating the above salient clauses of RDSO's specification for springs so that Rlys. Can ensure their follow up during inspection and routine maintenance in the Sheds:

2.0 Salient Geometry Features of Helical Springs to be given special attention during Inspection :
(Ref : RDSO's Specification No. WD-01-HLS-94 of May '95)

Clause 2.7 : Both the end faces of the spring should be ground to ensure square seating of the spring. The ends should not have any sharp edges/burrs. (They are to be rounded off). The actual ground end surface shall be atleast 75% of the meancoil circumference of the spring. The end faces of the spring should not have blue marks due to end grinding as the same leads totemper brittleness.

Extract From Clause 2.6.3 :

The end gap between the tip and the adjacent effective coil should be such that the tip does not bite the effective coil under load as well as under no load.

Clause 3.2.2 : The tip thickness of finished springs shall not be less than 1/4th of the nominal bar dia up to 33 mm and 1/5th beyond 33 mm. It is to be ensured that the tip thickness of the finished spring does not in any way, affect the load test requirement given in the drawing.

Clause 3.3 : The pitch of the coils shall be sufficiently uniform so that when the spring is compressed to a height representing a deflection of 85% of nominal total travel, none of the coils shall be in contact with one another, excluding the inactive end coils. It should be ensured that as and when contact between the inefective coils and the adjacent effective coils is made, it should occur over a minimum length of 1/3rd of the mean coil dia of the spring.

3.0 Inspection Authority :

As the quantity of helical springs being procured by the homing shed of WAP1/4 and WAG7 locomotives is not very large, it is recommended that all lots of helical springs being procured should be inspected 100% by theauthorised representative of the consignee himself at the manufacturer's premises with special reference to above clauses. During routine maintenance in the sheds, every spring should be inspected again for above clauses before fitment in the locomotive bogie.

4.0 Agency for Implementation :

CLW, all Electric Loco Sheds and POH Workshops.

(O.H. Pande)
for Director General/Elect.

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