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सत्यमेव जयते

भारत सरकार – रेल मंत्रालय
अनुसंधान अभिकल्प और मानक संगठन
लखनऊ – 226 011
Government of India – Ministry of Railways
Research, Designs & Standards Organization,
LUCKNOW – 226 011

EL/3.2.108

Date: 19.10.2015

Chef Electrical Engineer
1- Central Railway, Mumbai CST - 400001
2- Northern Railway, Baroda House, New Delhi - 110001
3- Eastern Railway, Fairlie Palace, Kolkata- 700001
4- Southern Railway, Park , Chennai -600003
5- South Central Railway, Rail Nilayam, Secunderabad -500071
6- Western Railway, Church Gate, Mumbai - 400020
7- South Eastern Railway, Garden Reach, Kolkata - 700043
8- East Central Railway, Hazipur, Bihar - 844101
9- West Central Railway, Jabalpur - 482001
10- South East Central Railway, Bilaspur- 495004
11- East Coast Railway, Bhubneshwar- 751016
12- North Central Railway, Hasting Road, Allahabad- 211001
13- Chittaranjan Locomotive Works, Chittaranjan- 713 331

Technical Circular No: ELRS/TC/0047 (2000) (Rev- 02).

Sub: Ultrasonic testing (UST) procedures for axles of electric locomotives.

1. From time to time, RDSO have circulated ultrasonic testing procedures of axles used in different classes of locomotives. Separate procedures are to be adopted for different types of axles viz WAM4/ WAG5, WAG5 (Hitachi), WAP1, WAP3, WAP4, WAG7/WCAM3, WCM2, WAP5, WAG9, WCAM2P etc. The procedures generally differ from each other in following two aspects:-

(i) Type of probe to be used for Low Angle Near End (NELA) scanning technique used for testing the portion of the axle near the probing end. This technique is meant for the examination of cracks, if any, in the raised wheel seat, stopper seat and gear seat which are not scanned during Far End (FE) scanning or for confirming the flaw obtained in far end scanning.

(ii) The Oscillogram patterns as obtained from a flawless axles and axle with simulated flaw using various scanning techniques.

2. The periodicity for Ultrasonic testing of locomotives axles is to be carried out as per instruction contend in Railway Board letter no. 81/M(W)/814/6 dated 06.12.1985 which state the following:-

SN.	Axle of Electric Loco used on	Speed (kmph)	Frequency of UST
1.	Goods	< 120	12 month
2.	Passenger	< 120	12 month
3.	Passenger	≥120	06 month

In addition to above all axle of locomotives passing through wheel shop for any repairs shall be tested for flaw detection irrespective of last date of testing.

With reference to the Railway Board letter referred above, it may please be noted that the above instruction is a general one and if, based upon experience, existing practice and / or administrative decision, a Railway/shed does UST prior to the time mentioned above, there is no harm in doing so. However, in no case, the time interval should be more than 12 months.

3. As per RDSO letter no. EL/3.2.108 dated 31.05.2012, Whenever a newly manufactured loco arrives to loco shed for schedule/schedule maintenance, UST shall be carried out at the first available opportunity.

4. Cases of locomotive axle breakages have been reported by Railways in WAG-7 locomotives dispatched by M/s BHEL between 31.03.2009 to 31.7.2013. Vide RDSO letter no. EL/3.2.108 dated 30.08.2013 instruction have been issued to carry out UST of axles as per procedure code no. MC-7 during IC schedule of locomotive.

5. The *Code of Procedure (COP) No. MC-135/Dec. 2010* may also be used for detection of loose inner races of axle by Ultrasonic testing in WAG-7 type of electric locomotive.

6. The guidelines to be followed during Ultrasonic examination of axles circulated vide letter no M&C/NDT/1/8 dated 04-11-1991 shall be implemented.

7. It is mandatory that each axle of the locomotive must be tested by Far End (FE), Near End-Low Angle (NELA) scanning techniques at schedule intervals. In addition, selective scanning of wheel seat and gear seat should be done by High Angle (HA) scanning as and when the probing area is accessible. Axles found to produce prominent flaw signal (other than those signals shown in the relevant trace patterns) during scanning by far end and near and low angle techniques and subsequently confirmed by scale expansion trace delay and high angle technique, as the case may be, shall be withdrawn from service. In case of doubt, axles shall be kept under observation and tested more frequently. Before testing the axles, ultrasonic testing equipment must be calibrated and checked for the function and sensitivity of the equipment and probes.

8. The A-Scan patterns of all axles/wheels obtained during ultrasonic testing shall be saved to the A-Scan memory of the equipment and same can be transferred to a computer on regular basis. The soft copy of these data must be saved for a period of three years.
During Far-End (FE) scanning, probing to be done from entire axle end face (except holes) and minimum 4 A-scan patterns, one from each quadrant may be saved.
During Near- End Low Angle (NELA) scanning, probing to be done from entire outer periphery as per relevant Code of Procedure and minimum 4 A-scan patterns, one from each quadrant may be saved.
In case of any flaw signal obtained, during FE scanning or NELA scanning; only one A- scan pattern containing the flaw signal may be saved.

To avoid entry of Wrong axle particulars, two digit numeric values (01, 02, etc.) assigned to each axle for particular date may be entered and corresponding details of the axle may be entered in a computer/register.
The A-scan data from Ultrasonic Flaw Detector may be transferred to a computer before the memory of the equipment is exhausted.

9. The Ultrasonic flaw detector shall be purchased as per specification no. M&C/NDT/1 2004 Rev. 2011 or latest version from RDSO approved vendors only. The approved vendor list is available in our website www.rdso.indianrailways.gov.in→Vendor interface→VendorDirectory→Mechanical (M&C items).
The Ultrasonic testing equipment characteristic shall be checked as per IS: 12666-1988 (latest version) once in a month.

10. M&C directorate of RDSO have already issued detailed instruction on procurement and inspection of probes vide letter no. M&C/NDT/1/8 dated 2/10.3.2000. The instructions basically emphasize on procurement of probes to RDSO specification No. M&C/NDT/116/2000 and compatibility of the probes with the available equipment. These instructions must be followed strictly.

11. The ultrasonic testing shall be carried out only by personnel certified by RDSO and having valid certificate issued by RDSO. The training courses for ultrasonic test are organized by M&C directorate of RDSO for which eligibility criteria & training calendar is available on RDSO website- Directorate→Metallurgical & Chemical→HRD
The validity of Regular course certificate is 3 years & that of Refresher Course is 5 years.

Enclosed: List of Code of Procedure for Ultrasonic testing of electric loco axles.

(A. K. Rastogi)
For Director General/Elect.

Annexure

List of Code of Procedures for Ultrasonic testing of Electric loco Axles

S. No	Type of axle	Drawing No	M&C Report Number	Date of Issue
1.	WAG1/WAG3	SFAC.L-ii-402T	K-144	Dec 1975
2.	WAG2	WAG-30	K-119	1973
3.	WAG4/WAM1	1WAM1-1822	K-114, K-100	1973
4.	WAM2/WAM3	E-50003	K-97,K-123	1973
5.	WAM4/WCAM1=WAG5D=5AG5 (Design Changed as per load carrying) WAG5D as per ELW/BSL/WAM4/2/62.042	D/WL-5024, D/WL-5026	K-160	Dec 1976
6.	WCM2(Low & High angle)	D/WL-4992	K-223	1973
7.	WCM2	D/WL-4992	K-270	Dec 1982
8.	WCM3	1EM/3-19	K-145	Feb 1976
9.	WCM4	1WCM-4/19	K-136	1975
10.	WCM5	1WCM/5 43	K-128	1975
11.	WCG1	EF/1-15 & 16	K-161	Feb 1977
12.	WCG2	D/DL- 4975	K-158	June 1976
13.	WCM4	1WCM-4/19	K226	1977
14.	WAM4B	D/WL-5025	K-295	June 1984
15.	WCM1	1.EM/1-26	K-331	Dec 1985
16.	WAP1	29.05.02	MC-8	Feb 1990
17.	WAG6B	Mito WorkS Drg No-313-3C-104568	MC-10	Mar 1990
18.	WAG5	05/02/11/104	MC-5	Sept 1991
19.	WAG6C	Mito Works Drg NO-313-3C-104565	TC	Sept 1994
20.	WAG7	SKDL-4188	MC-7	Aug 1994
21.	WAP1(Hitachi Moter)=WAP4	03.2.11.48	MC-12	Oct 1995
22.	WAG6A	1248.803.887	TC	Jan 1996
23.	WAP5	667.111.01.01	MC-9	June 1999
24.	WAG9=WAP7	668.111.01.01	MC-13	Dec 1999
25.	WAM4(Modified Axle)=TOACHI AXLE	SKEL-4511	MC-94	Oct- 2005
26.	WCAM2P Loco Axle	2-719-11-03-007 (BHEL DRAWING)	MC11	Dec 2006
27.	WAG6C	313-3C-104565	MC-144	Mar 2010
28.	Code of procedure for detection of loose inner races of Electric loco type WAG5, WAM4, WCG2	---	MC-135	Dec 2010
29.	WAP1 AXLE for traction motor type TAO	SKEL–4735	MC-162	Mar 2014

Note:- The Code of Procedure (COP) No. MC-135/Dec. 2010 may also be used for detection of loose inner races of axle by Ultrasonic testing in WAG-7 type of electric locomotive.