



आज़ादी का
अमृत महोत्सव

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No: MC/WA/Failure

Date: 07.08.2023

Through e-mail

Principal Chief Mechanical Engineer,

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3. Central Railway, CSMT, Mumbai - 400 001.
4. Eastern Railway, Fairly Place, Kolkata- 700 001
5. Southern Railway, Park Town, Chennai – 600 003.
6. North Frontier Railway, Maligaon, Guwahati – 781 001.
7. North Eastern Railway, Gorakhpur -273 001.
8. South Eastern Railway, Garden Reach, Kolkata – 700 043
9. South Central Railway, Secunderabad – 500071.
10. West Central Railway, Jabalpur-482 001.
11. South East Central Railway, Bilaspur - 495 004.
12. South Western Railway, Hubli - 580023.
13. East Coast Railway, Railway Complex, Bhubaneswar - 751 023.
14. East Central Railway, Hajipur - 844 101.
15. North Western Railway, Jaipur - 302 006.
16. North Central Railway, Allahabad -211 001.
17. Konkan Railway Corpo. Ltd., Corporate Office, Belapur Bhawan, Navi Mumbai - 400 614.
18. Integral Coach Factory, Chennai -600 038.
19. Rail Coach Factory, Kapurthala, Punjab 144 602.
20. Modern Coach Factory, Raebareli, 229120.

Sub: Wheel disc crack in LHB coaches.

Ref: i. Railway Board letter No. 2011/M(C)/137/4Wheels dated 03.07.2023 & 06.07.2023.

ii. RDSO letter No. MC/WA/Failure dated 30.08.2022, 25.01.2023, 11.05.2023, 03.07.2023, 06.07.2023 & 07.07.2023.

1. In the Financial year 2022-23, four cases of wheel disc crack of M/s KLV Wheel Co, Switzerland have been reported to this office. All the culprit wheels were supplied under Railway board contract no 2020/RS(WTA)-514/wheels/874/1 dated 08.03.2021. In view of these incidents and to prevent further online failure of KLV wheels, the following corrective actions were advised to zonal Railways:
 - i. RDSO vide letter dated 30.08.2022 mentioned under reference (ii) has advised Zonal Railways to remove all wheels of heat no. 211130 from service.
 - ii. RDSO vide letter dated 25.01.2023 mentioned under reference (ii) has issued instructions for UST of wheel disc rim over entire circumference of heat no. 210980 and same was to be completed in 3 months in associated IR workshop.
 - iii. RDSO vide letter dated 11.05.2023 mentioned under reference (ii) has issued instructions for UST of all wheel discs of M/s KLV make, supplied against WTA-514 (36000 nos.).
2. Further, two more cases of wheel failure of M/s SAIL make has been reported in the financial year 2023-24 till date. Accordingly, following corrective actions have been advised to zonal Railways:
 - i. Railway Board vide letter dated 03.07.2023 mentioned under reference (i) and RDSO letter dated 03.07.2023 mentioned under reference (ii) advised ZRs to take out all the 30 nos. wheels of heat no. 17/344 from service for UST testing in associated IR workshops. Railway Board has also issued direction that all the workshops to carry out UST testing of all LHB wheel discs on the rim and tread region, whenever wheels/wheelset sent to workshops.

- LHB
- ii. Vide this office letter dated 07.07.2023 mentioned under reference (ii), it was advised to zonal Railways to take out all remaining 64 wheels of heat no. 17/345 from service for UST testing in associated IR workshops.
 3. Further, Railway Board vide letter dated 06.07.2023 mentioned under reference (i) has advised RDSO to impart training and to carry out demo for testing as per UST testing code issued to all major workshop. Accordingly, RDSO team conducted a UST training program from 10.07.2023 to 13.07.2023 at MTN/CR for total of 42 CMT/ACMT and supporting UT staff of various ZRs.
 4. **In view of recurring occurrence of wheel crack at rim and tread area of wheel discs** following instructions are being issued to be followed in various schedule of maintenance for all LHB wheel discs:
 - i. **Trip/D1 & D2 Schedule** – Careful visual inspection to be carried out at rim inner/outer side for any visible wheel defects as per RDSO CMI – K 003 (Guidelines for interpretation of wheel defects) copy attached as **Annexure-1**.
 - ii. **D3 Schedule** – Thorough examination for surface crack of rim inner/outer area and web area through ECA technique to be carried out. For this, all coaching depot are required to ensure availability of requisite M&Ps and T&Ps. It is to be noted that ECA shall be calibrated on simulated defect of size 0.3 mm deep, 0.3 mm wide and 10 mm long, the testing procedure is attached as **Annexure-2**. Zonal Railways has to arrange ECA equipment as early as possible if same is not available, may continue with DPT testing for the max. period of six months only.
 - iii. **SS-I & SS-II** – When wheelsets are sent to workshop, **thorough examination of wheel rim & tread areas through UST as per RDSO COP (Annexure-3)** and wheel web with ECA technique as per existing practice shall be ensured and these wheels can be permitted back in service after ensuring no integrity defect.
 - iv. The testing of LHB wheels as per COP issued by RDSO will also include training module of regular and refresher course of UST operators from mechanical and C&M streams of ZRs as per RDSO COP (**Annexure-3**).

This is for kind information and necessary action please.

Encl: As above


(Anil Kumar Singh)
Executive Director Stds. /Carriage

Copy to: for kind information please.

1. EDME (Chg.), Railway Board, New Delhi – 110 001
2. PED/CAMTECH, Gwalior
3. ED/M&C/RDSO

4.4 Wheel and Axle Assembly

4.4.1 Maintenance Procedure In The Workshop

4.4.1.1 Pre-Inspection Of Wheels In The Workshop

During inspection of incoming wheels, the wheel-set is inspected for assessing the condition of the components. Following measurements are carried out on all the wheels, received in shop for repairs.

4.4.1.1.1 Measurement of A Wheel Gauge (Distance Between Two Wheels Flanges On The Same Axle)

Measurement of a wheel gauge (distance between two wheels flanges on the same axle) For new wheel discs 1600 +/- 1 mm Service limit 1600 +2 / -1 mm
This measurement should be taken at four locations 90 degree apart with the help of an wheel distance gauge /instrument. If wheel gauge is not within permissible limits, then the wheel disc(s) have to be pressed off and then pressed on.

Note: The wheels to be gauged after taking off from the coach. Under loaded condition, these limits are not applicable

4.4.1.1.2 Measurement of Wheel Diameter (Tread Diameter)

The wheel diameter is measured with the help of a trammel gauge with a least count of 0.1 mm.

The difference in tread diameter of the two wheels on the same axle should not exceed 0.5 mm after tyre turning. There is no 'In service' limit for this variation and rejection shall be decided by tyre defect gauge

During last shop issue the wheel is to be turned to RDSO SK-91146.

4.4.1.1.3 Inspection of Wheel Disc As Per CMI-K003

The wheel should be inspected for reject able defects in accordance with RDSO's instructions CMI-K003

4.4.1.1.4 Inspection of Wheel Flanges

The flanges on both sides of a wheel set are checked with the help of a profile gauge to measure the height and thickness of flanges. Accurate measurement of flange height and flange thickness is not possible with the profile gauge. It is, therefore, recommended to use a wheel profile gauge with which accurate measurement of flange height and flange thickness to the extent of 0.1 mm can be made.

After recording the diameters of wheels and wheel flange measurements, the wheel set is nominated for necessary repairs.

4.4.1.1.5 Inspection of Axle

Axle journals should be thoroughly cleaned for inspection to detect flaws, pitting, ovality, taper, ridges etc. Each axle should be ultrasonically tested for detecting internal flaws and defects as per the code of procedure issued by RDSO. Axles found flawed, pitted or with under size journals should be replaced.

4.4.2 Examination and Repair Practice in Carriage Maintenance Depot

Depot maintenance staff should ensure the following things in respect of proper functioning and safety of rolling gear:

4.4.2.1 Wheel and Axle

Wheel profile should be checked with Tyre defect gauge to ensure the profile dimensions are within the permissible limits. Coaches with wheels having thickness

and profile worn below condemning limit should not be allowed to continue in service and the coach should be marked sick for change of wheels in the sick lines.

4.4.2.1.1 Limits for Flat Tyres

The limits for permissible maximum flat surfaces on tread for BG ICF coaches is 50 mm (reference Rly. Bd.'s Letter no. 83/M (N)/960/1/Vol I dated 15/18.3.99)

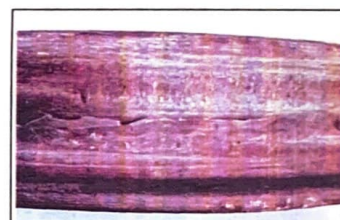
4.4.2.1.2 Guidelines for Wheel Inspection in Open Line Depots (Ref RDSO CMI-K003)

In addition to normal checks exercised on wheel condition during primary/secondary maintenance of coaches, a detailed inspection of wheels should be done when the coaches are received in sick line for attention for either schedules or out of course attention. The wheels sets shall be inspected for the following conditions and action taken as indicated for each condition:

Shattered Rim – a wheel with a fracture on the tread or flange must be withdrawn from service. This does not include wheels with localized pitting or flaking without presence of any rejectable condition.



Spread Rim- If the rim widens out for a short distance on the front face, an internal defect may be present. Spreading of the rim is usually accompanied by a flattening of the tread, which may or may not have cracks or shelling on the tread. Such wheels must be withdrawn from service.



This condition should not be confused with a uniform curling over of the outer edge of the rim around the entire wheel, which is called rim flow. Rim flow is not a defect.

Shelled Tread -Shelling can be identified by pieces of metal breaking out of the tread surface in several places more or less continuously around the rim. Shelling takes place when small pieces of metal break out between the fine thermal checks. These are generally associated with small skid marks or "chain sliding.". Such wheels should be withdrawn from service and sent to workshops for re-profiling.



Railways are facing the problem of wheel shelling on LHB coaches. A shelled wheel requires re-profiling to ensure that unsafe situations do not arise. For this purpose, following shelling limits need to be followed.

- 1) Depth of shelling marks has reached to 1.5 mm.
- 2) Length of shelling marks has reached to 40 mm.
- 3) Depth of hollow tyre reached to 3 mm. This limit of 3 mm is kept to study the effect of wheel shelling and service life of wheels. The rejectable limit of hollow tyre will continue as more than 5 mm as specified in IRCA part IV.

The turning of LHB wheels as per the above guidelines will increase the frequency of wheel turning but loss of diameter in turning will be less. So over all wheel life will increase. It is seen during the study that the average diameter reduction during the

tyre turning at present is 11mm where as per new guidelines; diameter reduction is expected to be 6-7 mm only.

Railways should maintain the kilometer earning and diameter reduction during turning as per the above yard sticks to assess the enhanced wheel life Railways are requested to immediately implement the above instructions.

Thermal Cracks – Thermal cracks appear on a wheel tread due to intense heating of the wheel arising out of severe brake binding. Such cracks occur on the tread and generally progress across the tread in a transverse & radial direction. Whenever such a crack becomes visible on the outer face of the rim or tread crack has reached the outer edge (non-gauge face) of the rim, the wheel should be withdrawn from service. If a crack becomes visible on the outer flange face, the wheel should be withdrawn from service. Such wheels should be sent to workshop for examination and subsequent rejection.



Wheels involved in service brake binding should be examined carefully during the maintenance to rule out the possibility of rejectable thermal cracks. Such wheels may be identified by presence of flats (even within acceptable limits) and severe discoloration or blue black heating marks on the tread.

Heat checks – Thermal cracks are deeper and need to be distinguished from fine superficial cracks visible on the tread on or adjacent to the braking surface. These are called heat checks, which are usually denser than the thermal cracks. Heat checks are caused on the tread due to heating and cooling cycles undergone by the wheel during normal braking. Such wheels do not need to be withdrawn but should be carefully distinguished from the rejectable thermal cracks.



Note: All wheel sets withdrawn from service for any of the conditions mentioned above must be sent to the associated workshops for detailed investigations and further disposal.

- I. The date and station code of the maintenance depot where the wheels are changed should be stenciled on the end panels. An entry should also be made in the maintenance card of the coach.
- II. The defective wheel should be sent to workshop for repairs after entering in the maintenance card details of the work order and date of dispatch to workshop.
- III. No repairs, except wheel profiling of wheel sets is permitted to be done in the maintenance depot.

4.4.2.2 Cartridge Bearing Unit

A coach should invariably be detached from service for the following defects

MASTER COPY

Controlling Officer

Signature:



CMI K 003

GUIDELINES FOR INTERPRETATION OF WHEEL DEFECTS IN SOLID/ TYRED COACHING/EMU WHEELS IN OPEN LINE AND WORKSHOPS

The following guidelines are issued to make the visual inspection of wheels during maintenance more focussed and effective. The following wheel conditions should be paid special attention during the visual inspections of solid and tyred wheel discs used on coaches and EMU's.

A. OPEN LINE MAINTENANCE TO BE CARRIED OUT AT ALL COACHING / EMU DEPOTS

In addition to normal checks exercised on wheel condition during primary / secondary maintenance of coaches, a detailed inspection of wheels should be done when the coaches are received in sickline for attention for either scheduled or out of course attention. The wheel sets shall be inspected for the following conditions and action taken as indicated for each condition:

1. Shattered Rim - a wheel with a fracture on the tread or flange must be withdrawn from service. This does not include wheels with localized pitting or flaking without presence of any other rejectable condition.

2. Spread Rim - If the rim widens out for a short distance on the front face, an internal defect may be present. Spreading of the rim is usually accompanied by a flattening of the tread, which may or may not have cracks or shelling on the tread. Such wheels must be withdrawn from service.

This condition should not be confused with a uniform curling over of the outer edge of the rim around the entire wheel, which is called rim flow. Rim flow is not a defect.

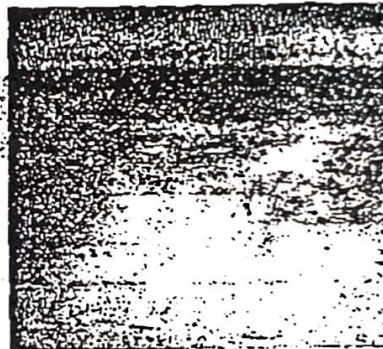
3. Shelled Tread - Shelling can be identified by pieces of metal breaking out of the tread surface in several places more or less continuously around the rim. Shelling takes place when small pieces of metal break out between the fine thermal checks. These are generally associated with small skid marks or "chain sliding." Such wheels should be withdrawn from service.

4. Thermal Cracks - Thermal cracks appear on a wheel due to intense heating of the wheel arising out of severe brake binding. Such cracks occur on the tread and generally progress across the tread in a transverse & radial direction. Whenever such a crack becomes visible on the outer face of the rim or a tread crack has reached the outer edge (non-gauge face) of the rim; the wheel should be withdrawn from service. If a crack becomes visible on the outer flange face the wheel should be withdrawn from service.



Wheels involved in severe brake binding should be examined carefully during the maintenance to rule out the possibility of rejectable thermal cracks. Such wheels may be identified by presence of flats (even within acceptable limits) and severe discoloration or blue black heating marks on the tread.

5. Heat checks - Thermal cracks are deeper and need to be distinguished from fine superficial cracks visible on the tread on or adjacent to the braking surface. These are called heat checks, which are usually denser than the thermal cracks. Heat checks are caused on the tread due to heating and cooling cycles undergone by the wheel during normal braking. Such wheels do not need to be withdrawn but should be carefully distinguished from the rejectable thermal cracks.



NOTE:

All wheel sets withdrawn from service for any of the conditions mentioned above must be sent to the associated workshops for detailed investigations and further disposal.

B. INSPECTION IN WORKSHOPS :

Wheel shops are responsible for thorough inspection of wheelsets. Wheel inspection should be done by experienced, skilled staff with good judgement and deep knowledge of the wheel defects and repair procedures. All wheelsets must be cleaned with high pressure jet cleaning machines to expose the surface for inspection entering the wheel shop should be cleaned thoroughly before inspecting them for defects. Any wheel with a rejectable defect that cannot be removed by machining within the prescribed tolerances should be condemned. Wheelsets, which need to be machined to eliminate visual defects, must be segregated and subjected to thorough inspection including rim UST to ensure complete removal of defects. Rejected wheels should be damaged to make them unusable to avoid any mix up.

The workshop shall pay special attention to the following wheel conditions in addition to various aspects enumerated above for checking in open line:

- (a) **Overheated wheels** - A wheel which has been subjected to over-heating by being subjected to severe brake-binding which is visible by presence of bluish black heat marks / discoloration and/or flat places should be examined carefully to rule out the presence of thermal cracks. Wheels with thermal cracks or heat checks must be subjected to ultrasonic testing of the rim prior to removal of defect by machine.
- (b) **Loose Assembly** - A wheel-disc that is bent or shows signs of being loosely fitted on the axle should be rejected.
- (c) **Wheel sets overheated due to involvement in fire accidents.**
Such wheels should be rejected.

(d) Wheel sets withdrawn and sent to Workshops by open line for defects in (A) above :

Such wheels should be subjected to thorough inspection including rim UST, supported by dye penetrant testing to assess the severity of flaws. If during the examination or subsequently during machining voids or laminations or flaky condition appear on the tread, presence of sub-surface defects is indicated. The wheel should be used within permissible size limits only after completely machining out the defect and verifying the wheel with rim UST.

C. RECORDS TO BE MAINTAINED :

The following records should be maintained for the wheels withdrawn from service by each depot/ workshop on the Railways and details advised to RDSO and Railway Board on a monthly basis.

WHEEL DISC NO. & DIA.	COACH NO.	YEAR OF MANUFACTURE OF WHEEL DISC	WHEEL DISC MANUFACTURED BY	HEAT NO. OF WHEEL DISC	TYPE OF BRAKE SYSTEM	REASON FOR WITHDRAWAL	TYPE OF BRAKE BLOCK USED



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Annexure-2

No. MC/WA/GenI

Date: 02.09.2019

Principal Chief Mechanical Engineer:

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2- Northern Railway, Baroda House, New Delhi - 110 001	12- North Central Railway, Allahabad - 211 001
3- Central Railway, Chhatrapati Shivaji Terminus, Mumbai-400 001	13- South Central Railway, Rail Nilayam, Secunderabad - 500 071
4- South Eastern Railway, Garden Reach, Kolkata - 700 043	14- East Coast Railway, Chandrasekharpur, Bhubaneswar - 751 016 (Orissa)
5- North Western Railway, Jaipur - 302 006	15- South Western Railway, Hubli - 580 023
6- Western Railway, Churchgate, Mumbai - 400 020	16- Eastern Railway, Fairlie Place, Kolkata - 700 001
7- North Eastern Railway, Gorakhpur - 273 001	17- Integral Coach Factory, Chennai - 600 038
8-Northeast Frontier Railway, Maligaon, Guwahati-781 011	18- Rail Coach factory, Kapurthala- 144 602
9- South East Central Railway, Bilaspur - 495 004	19- Modern Coach factory, Lalganj, Raebareli-229 206
10- East Central Railway, Hajipur - 844 101	20- Konkan Railway Corporation Ltd., Belapur Bhavan, Navi Mumbai - 400 614

Sub: Surface defect detection by Eddy Current Array on LHB wheel.

As per instructions issued by RDSO, dye-penetration-test (DPT) of LHB wheels is required to be carried out during D3 schedule & SS-I/SS-II/SS-III schedules. Railways are reporting difficulties in removal of paint before Dye-penetration-test (DPT) of LHB wheels. Accessibility of wheel during DPT is also being found difficult by Zonal Railways. In this context, RDSO has studied the feasibility of an alternate non-destructive testing technique known as Eddy Current Array (ECA). The details are as under:

Principle of Eddy Current Array Testing: The technique is based on the principle of Electro-magnetic Induction and is applicable for detection of defects in electrically conducting materials. An electrically conducting wire is excited by alternating current & wire coil produces an alternating magnetic field around itself. The magnetic field so produced also oscillates at the same frequency as frequency of alternating current running through the coil. When this current carrying coil is placed over conductive material under test, Eddy current is produced in conductive material. If defect is present in the conductive material under test, the path of eddy current gets disturbed and it creates a local magnetic field which changes the balanced condition of the system, such changes can be detected by monitoring variations in the impedance of the coil. Eddy current array testing consists multiple of coils i.e. Array arrangement in single probe for generating Eddy current and the technique is known as Eddy current array. This provides larger scanning area on component in single scan. Since, the flexible probe adopts surface geometry, the multi coil arrangement can be accommodated in flexible coil to facilitate detection of defects in non planer surface. The ECA technique can also be used on thin coated surface like painted surface. The technique is very sensitive and can detect tight surface cracks also.

Advantages of Eddy Current Array Testing: Some advantages of Eddy Current array testing are:-

No consumable required (Green technology), simple to use, Instant results and Rapid coverage of large areas (High Productivity), Large coverage area in single scanning,

O/c

Time saving, better probability of detection of defects, Post process analysis and scanning of large surface area in one go.

In view of the above, Railways may use Eddy Current Array (ECA) Testing technique as an alternate method to DPT for testing of LHB wheels for detection of surface cracks. It is to be noted that ECA equipment should be calibrated on simulated defect of size 0.3 mm deep, 0.3 mm wide and 10 mm long.

Encl.: Nil



5-9-19

(Shobhit Pratap Singh)
Joint Director (VDG) / Carriage

Copy to:

O/c

1. EDME/Coaching, Railway Board, Rail Bhawan, New Delhi
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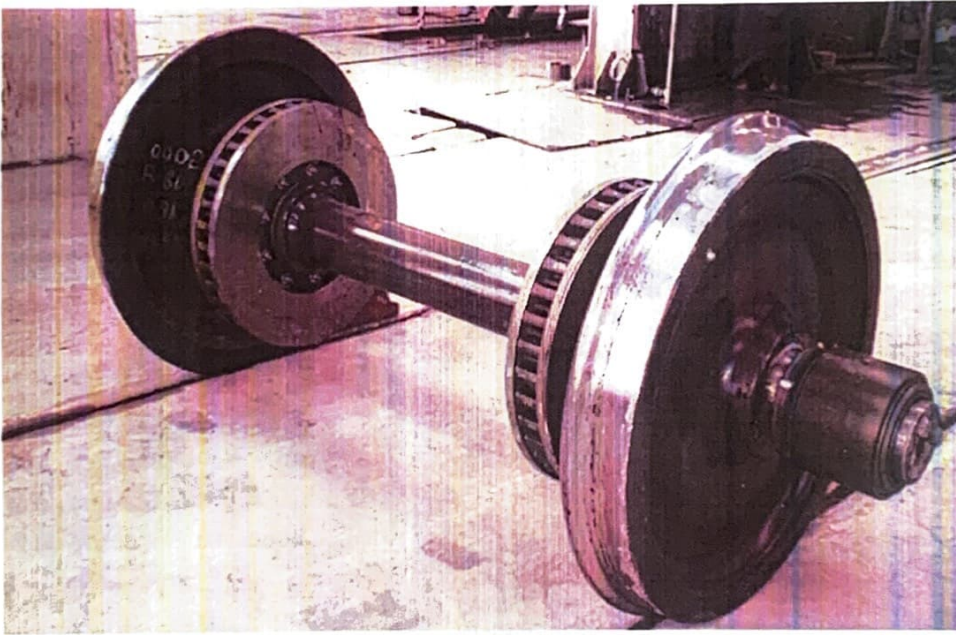

4/1/19

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**GOVERNMENT OF INDIA
MINISTRY OF RAILWAYS
RESEARCH DESIGNS AND STANDARDS ORGANISATION
LUCKNOW**



**CODE OF PROCEDURE FOR ULTRASONIC TESTING OF
LHB WHEEL IN SERVICE**

METALLURGICAL AND CHEMICAL DIRECTORATE

CODE OF PROCEDURE No. MC-182

August- 2023 (Revision 1)

PREFACE

This report is based on Ultrasonic Tests conducted by the Metallurgical and Chemical Directorate of RDSO at RDSO Lucknow Matunga Workshop/ C. Rly. . The views expressed in this report are subject to modification from time to time in the light of fresh data.

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- Shri Amrish Kumar, Assistant Research Officer, NDT/M&C
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**M&C DIRECTORATE
RDSO/LUCKNOW**

CODE OF PROCEDURE FOR ULTRASONIC TESTING OF LHB WHEEL IN SERVICE

1. **PREAMBLE:** Generally, the wheels are not being ultrasonically tested in service once it is UT tested during manufacturing process. Recently, some case of LHB wheel failure at Rim region in service has been reported at RDSO. The failure occurred due to fatigue defect parallel to tread region and approximately 15-25mm below the tread surface. Keeping in view of the above study, this ultrasonic testing of LHB wheels in service is being introduced in the Indian Railways for Ultrasonic testing LHB wheels in service for detection of fatigue defect parallel to tread region.
2. **Reference:** a) Carriage Directorate of RDSO's Itr No. MC/WA/Failure, dtd. 25.01.2023 and requirement of Ultrasonic testing of M/s KLW make LHB wheels in service for detection of fatigue defect parallel to tread region from different zonal Railways.
b) Carriage Directorate of RDSO's Itr No. MC/WA/Failure dtd. 06.07.2023 for testing of all LHB wheel disc irrespective of wheel manufacturers.
3. **SCOPE:** This code of procedure embodies the requirement of the equipment, calibration, examination procedure and acceptance standard for ultrasonic testing of make LHB wheels running in service. The principal objective of the technique given here is detection of fatigue defect parallel to tread region of LHB wheels. These LHB wheels shall be examined by the normal beam Ultrasonic testing technique in service.
4. **NORMATED REFERENCES:** The following RDSO / IS standards contain provisions, which through reference in this text constitute provisions of this code of procedure. At the time of publication, the editions indicated were valid.

S.No.	Specification No.	Title
i.	ROSO specification No. M&C/NDT/125/ 2004 or its latest version.	Portable Digital Ultrasonic Flaw Detector with A-Scan storage.
ii.	RDSO Specification No. WD-17-MISC-92 or Equivalent	Soft Grease
iii.	IS: 1628:2013	Axle Oil
iv.	IS: 12666-2018	Methods for performance assessment of Ultrasonic flaw detection equipment

5. **Surface Finish:** The finish of probing areas should be such that there should be proper acoustic coupling of the probe.

6. **Equipment, accessories & Personnel engaged in testing:**

6.1 **Equipment:** Ultrasonic flaw detector as per RDSO specification No. ROSO specification No. M&C/NDT/125/2004 or its latest version shall be used for testing.

6.2 **Accessories:**

(i) **Probe for testing from tread surface:** The frequency of the double crystal transducer shall be 4 MHz for normal beam scanning with crystal dia. 15 mm or 15 x 15 mm square for testing from tread surface.

(ii) **Probe for testing from Rim face:** (a) The frequency of the double crystal transducer shall be 4 MHz for normal beam scanning with crystal dia. 20 mm or 20 x 20 mm square for testing from Rim face (flange side).

Or

(b) The frequency of the single crystal transducer shall be 2.5 MHz for normal beam scanning with crystal dia. 20 mm or 20 x 20 mm square for testing from Rim face (probing from both side).

(iii) **Couplant:** Soft grease or axle oil (medium) to RDSO specification No. WD17- MISC-92 or IS: 1628 (2013) Reaffirmed in Feb. 96.

(iv) **Reference Standard:**

(a) Standard simulated flaw of 3 mm dia. drilled flat bottom holes as per Figure 1.

(b) Physical, Chemical and mechanical properties shall be same as of LHB wheels to be tested and surface finish of the block shall be representative of the surface finish of the LHB wheel to be tested.

6.3 **Personnel engaged in testing:** Testing shall be done only by trained and having valid RDSO certificate or ISNT/ASNT Level II certified in UT. In case of engagement of ISNT/ASNT level II operators competency shall be judged by ACMT/CMT/Dy. CCMT.

7. **Scanning technique (Manually or Automated system)**

7.1 **Calibration:** Test range shall be calibrated weekly with IIW Block V1 or 50 x 50 mm or 50 x 100mm based on thickness of the job to be tested. Set the mode to Dual or Single in USFD equipment for range

calibration based on selection on probe. Range shall be 100mm (longitudinal wave) for Tread testing and 150 mm (longitudinal wave) for RIM face testing.

7.2 Setting of sensitivity for fatigue defect parallel to tread region (before testing): The amplitude shall be kept 60% of full screen height (FSH) from 3 mm FBH hole as given in figure-1.

7.2.1 Scanning of LHB Wheel for fatigue defect parallel to tread region: The scanning shall be performed at a gain setting of +6dB from reference level sensitivity but while classifying the defect, reference gain (dB) shall be considered.

7.2.2 Scanned area: Scanning area for tread as per figure-2.

7.2.3 Rejection criteria: Any signal (other than back echo/echo from wheel geometry / standard noise echo) at reference gain shall be treated as defect signal.

7.3 Setting of sensitivity for end to end discontinuity from Rim (flange side / both sides) (before testing): The amplitude of back echo shall be kept 80% of full screen height (FSH).

7.3.1 Scanning of LHB Wheel for end to end discontinuity from Rim (flange side/ both sides): The scanning shall be performed at a gain setting of +6dB from reference level sensitivity from reference level sensitivity but while classifying the defect, reference gain (dB) shall be considered.

7.3.2 Scanned area: Scanning of LHB Wheel for end to end discontinuity from Rim is capable of detecting defects originating within the area specified in figure- 3a / 3b for testing from flange side / both side as per probe used

7.3.3 Rejection criteria: (i) Drop of back echo upto 50% or more of reference FSH. Back-wall drop from geometry or due to condemning limit groove shall not be cause for rejection.
(ii) Any other signal other than back echo shall be a cause of rejection.

8. Test report: Test report must have at least following information: Equipment details, Probe details, Operator details, date of Testing, Test sample ID, Location of defect and Depth of defect from probing surface. The detailed report should be signed by UST personnel.

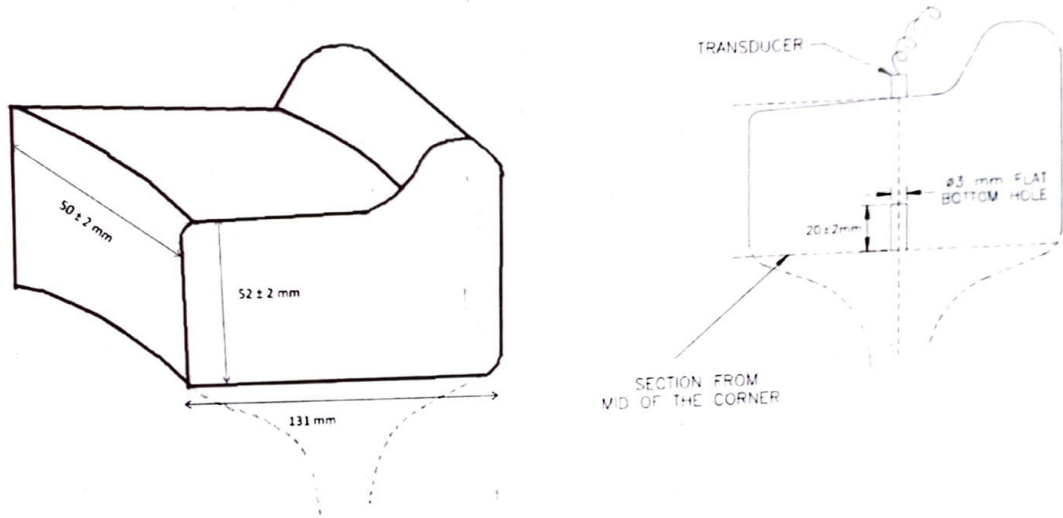


Figure-1 Reference LHB wheel block.

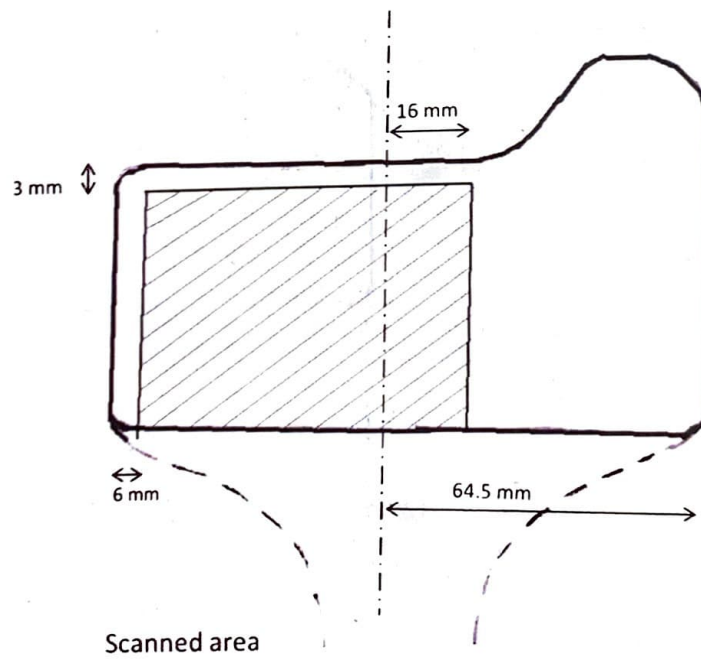


Figure 2 - Scanned area of LHB Wheel for fatigue defect parallel to tread region.

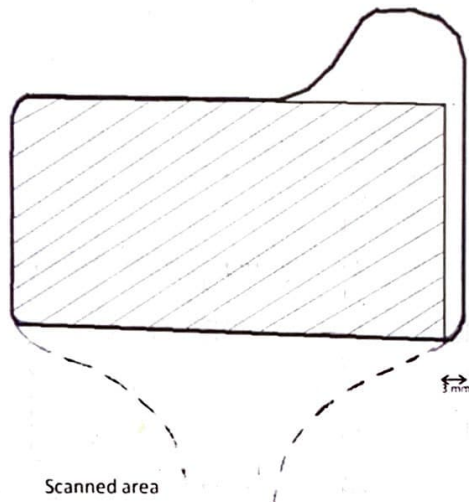


Figure 3(a) - Scanned area of LHB Wheel for end to end discontinuity from Rim (Testing from flange).

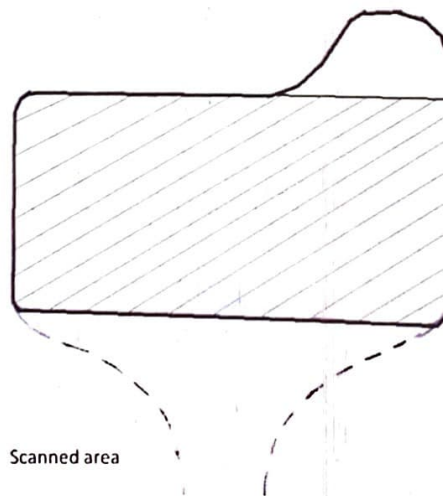


Figure 3(b) - Scanned area of LHB Wheel for end to end discontinuity from Rim (Testing from both side).