Reasoned document of draft specification no. IRS:R-43-24, February 2024 for Indian Railway Standard specification for axles of Diesel and Electric Locomotives, EMU motor coaches and powered Axles of Rail (Applicable to all Gauges) put on RDSO web- site from 12.02.2024 to 13.03.2024.

Draft specification no. IRS:R-43-24, February 2024 was uploaded on RDSO website for one month for comments/ suggestions as per ISO procedure. The draft specification was also sent to Zonal Railways, production units for comments and suggestions.

RWF, PLW submitted their comments on draft specification. No comments have been received from zonal Railways or any other party so far. Reasoned Statement on draft specification is tabulated below:

Clause no.	Clause contents	Comments from Zonal rlys, PUs & supplier		RDSO's View	Decision
A-5.2	Using the reference block the sensitivity of the equipment shall be adjusted to give an echo amplitude of about **12.5 mm** from the reference hole When probed from the opposite end face	RWF	Using the reference block the sensitivity of the equipment shall be adjusted to give an echo amplitude of about **12.5 %** from the reference hole When probed from the opposite end face.	'12.5 mm 'may be replaced by '20%'	The change is incorporated in the specification as per the attached sheet.
			Amplitude Setting shall be in increments of 1%. It is mentioned as 12.5% at present for Permeability Test as per Clause A-5.2 of IRS R-43. This is because, the current RDSO approved machines are not capable of saving gate position at 12.5. Hence same may be modified to 13/15% in place of 12.5%. Accordingly changes may be incorporated in M&C/NDT/125 Specification. Similar modification is required for Clause A-6.1.1 also for R-43 spec. and UFD spec). Two active gates to be provided for Depth measurement. This is required especially for RWF/YNK. As per IRS R-43 and IRS R-16 specifications, end scanning using DAC Curves need to be done for discontinuity test. This modification is required to be done in RDSO Spec M&C/NDT/125.		
		PLW	Nil		
		CLW	No response		
		DLW	No response		

<table>
<tr><td rowspan="4">A-6.1.1</td><td rowspan="4">With the sensitivity setting, as described in clause A-5 above, axles when scanned manually or by automated inspection techniques from one end face, shall produce a minimum of 25 mm back reflection from the opposite end face.</td><td>RWF</td><td>With the sensitivity setting, as described in clause A-5 above, axles when scanned manually or by automated inspection techniques from one end face, shall produce a minimum of 25 % back reflection from the opposite end face.</td><td>’25 mm ‘may be replaced by ’40%’</td><td>The change is incorporated in the specification as per the attached sheet.</td></tr>
<tr><td>PLW</td><td>Nil</td><td></td><td></td></tr>
<tr><td>CLW</td><td>No response</td><td></td><td></td></tr>
<tr><td>DLW</td><td>No response</td><td></td><td></td></tr>
<tr><td>FIG.6
(Appendix-A)</td><td><table><tr><th>FLAT BOTTOM HOLE (mm)</th><th>DISTANCE OF THE FLAT BOTTOM OF THE HOLES FROM THE TESTING FACE (mm)</th></tr><tr><td>ø3.2</td><td>76.2, 152.4, 254</td></tr><tr><td>ø3.2 & 6.4</td><td>381</td></tr><tr><td>ø6.4</td><td>508, 635</td></tr><tr><td>ø6.4 & 9.5</td><td>762</td></tr><tr><td>ø9.5</td><td>889, 1016, 1143</td></tr></table></td><td>RWF</td><td>For preparation of DAC Curve, longest axle to be taken as some area will be left without scanning. For Ex. In the draft specification, In Page 14, 1143mm was taken as maximum length, whereas WAG 7 axle length is 2559 mm, hence DAC Curve to be plotted up to half length of this size i.e 1279.5 or 1280mm</td><td>Last row should be replaced by following:

ϕ9.5: - 889, 1016, 1143- This applies to axles having half axle length up to 1143mm.

If half axle length is more than 1143mm, then an additional piece equal to half length of axle shall be prepared. e.g. if axle length is 2560 mm i.e. half-length 1280mm (which is greater than 1143mm), then additional piece of 1280mm with 9.5mm dia FBH shall be prepared.</td><td>The change is incorporated in the specification as per the attached sheet.</td></tr>
</table>

			Surface finish for end to end scanning is mentioned but surface finish for Radial Ultrasonic test not mentioned		
			We are at present using flat bottom hole standards for test in end to end testing, where as requirement of FBH in radial testing may be seen.		
			M&C Directorate/RDSO may please suggest how many DAC blocks are required for drawing DAC for half-length of axle, for all types of axle i.e. Loco, coaching and wagon. (RWF is manufacturing axle length varying from 1557mm to 2557 mm)		
			A joint exercise need to be carried out by RWF and M&C Dte., RDSO for preparation of Standard signals from geometry(contour) for both Finished /Rough turned Axles as RWF is planning to conduct end to end scanning in rough machined or Finish turned condition instead of forged condition being followed as on date.		
APPENDIX-A (Ref: Clause 9.2)	Ultrasonic Inspection of New axles in Rough Turned / Finished or both for Railway Rolling Stock (Traction & Trailing) – Method of Testing and Acceptance Standard.	PLW	Axles and Wheel Disces are received in PLW after ultrasonic testing (UT). Hence, further UT is not required just after finish turning of the Axles. The UT can be done after the assembly of Wheel Set.	No need for any change	No need for any change in the draft specification

APPENDIX-A
(Ref: Clause 9.2)

Ultrasonic Inspection of New axles in Rough Turned / Finished or both for Railway Rolling Stock (Traction & Trailing) – Method of Testing and Acceptance Standard.

A-1 SCOPE:

The method of testing and the acceptance standard set out hereunder shall be used to evaluate all types of new axles of railway rolling stock (locomotive, EMU, Carriage & Wagon) as stipulated in the relevant IRS Specification, for axle.

A-2 PURPOSE:

The axles shall be evaluated for

A-2.1 End-face to end-face penetrability.

A-2.2 Detecting discontinuities which may be harmful to the axle service.

A-2.3 Longitudinal discontinuity detection.

A-3 EQUIPMENT:

A-3.1 The instrument used must be of the pulse echo type.

A-3.2 The instrument shall be operated at 2 to 2.5 MHz for penetrability test, transverse discontinuity detection and longitudinal discontinuities.

A-3.3 The instrument may be used with various types of transducers namely, Bariumtitanate, PZT, Lead netaniobate etc. of 20 to 26 mm dia. or equivalent area probe, at the option of the axle manufacturer. Other types and sizes of transducers of similar response capability as those described may be used with the approval of the inspecting authority.

A-4 STAGE OF INSPECTION

The axles shall be ultrasonically inspected after the stipulated heat treatment and machining of the end faces to a finish better than 6.35 µm.

A-5 INSTRUMENT SENSITIVITY

A-5.1 The instrument sensitivity shall be adjusted with the help of a reference block manufactured from an axle forging in the normalised condition, and conforming to the relevant IRS specification for axle. The block shall be approximately 406 mm long. The two end faces shall be machined parallel to a finish better than 6.35µm. The reference standard shall be at flat bottom 3.2 mm dia. hole drilled perpendicular to one of the end faces at mid-radius to a depth of about 25 mm such that the flat bottom of the hole shall be located at a distance of 381 mm from the other end face.

A-5.2 Using the reference block the sensitivity of the equipment shall be adjusted to give an echo amplitude of about 20% from the reference hole When probed from the opposite end face.

A-6 SCANNING

A-6.1 Longitudinal penetration (end-face to end-face).

A-6.1.1 With the sensitivity setting, as described in clause A-5 above, axles when scanned manually or by automated inspection techniques from one end face, shall produce a minimum of 40% back reflection from the opposite end face.

A-6.1.2 The scanning shall be done from both the end faces of axles.

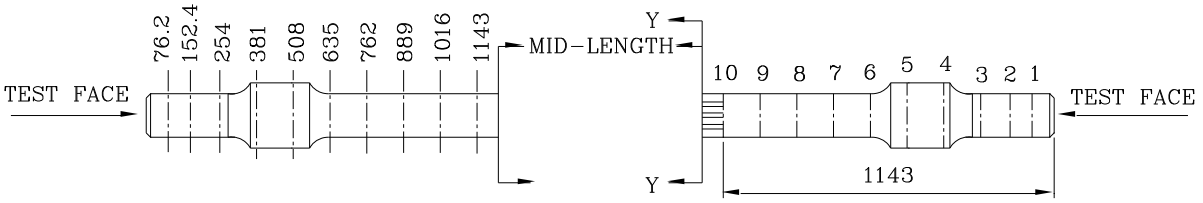

FIGURE-6a **FIGURE-6b**

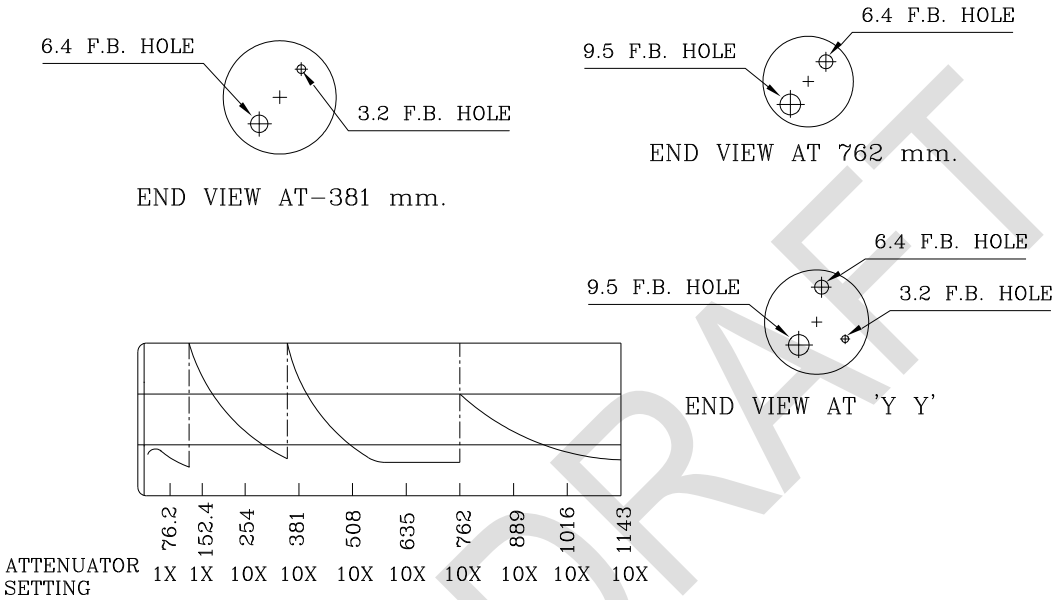

FIGURE-6c

FIGURE-6a, 6b,6c EXAMPLE OF ESTABLISHING DISTANCE-AMPLITUDE CURVE FOR A TYPICAL AXLE

TABLE FOR FIGURE-6a

FLAT BOTTOM HOLE (mm)	DISTANCE OF THE FLAT BOTTOM OF THE HOLES FROM THE TESTING FACE (mm)
Ø 3.2	76.2, 152.4, 254
Ø 3.2 & 6.4	381
Ø 6.4	508, 635
Ø 6.4 & 9.5	762
Ø 9.5	889, 1016, 1143 – This applies to axles having half axle length up to 1143mm. If half axle length is more than 1143mm, then additional piece equal to half length of axle shall be prepared. e.g. if axle length is 2560mm i.e. half-length 1260mm (which is greater than 1143mm), then additional piece of 1280mm with 9.5 mm dia FBH shall be prepared.

NOTE:- FIGURE-6b INDICATES THE LOCATIONS 1 TO 10 WHERE THE REFERENCE AXLE WILL BE PROGRASSIVELY SLICED AND TESTED.

FIGURE-6 (APPENDIX-A)